Styles of Pig Farming

A Techno-Sociological Inquiry of Processes and Constructions in Twente and The Achterhoek

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Voorwoord

Sinds de jaren tachtig groeit de behoefte aan nieuwe concepten voor de landbouw en het platteland. Het doel van de landbouw verschuift steeds meer van agrarische bulkproductie naar duurzaamheid en verbreding van functies. Om deze ontwikkeling te ondersteunen zijn ook nieuwe beleidsconcepten nodig. Het bestaande concept van bedrijfsstijlen verklaarde de verscheidenheid in bedrijfsvoering in de landbouw, maar was niet direct toepasbaar als basis voor beleidsontwikkeling. Deze studie is bedoeld om het begrip van bedrijfsstijlen te verbreden door het ontwikkelen van een meer objectieve (computer) methode voor de classificatie van bedrijven. Ik hoop dat deze uitbreiding van het begrip bedrijfsstijlen bijdraagt aan het overbruggen van de kloof tussen wetenschap en beleid. Ik ben alle mensen die mij geholpen hebben om dit onderzoek mogelijk te maken heel dankbaar voor hun hulp.

In de jaren tachtig en negentig heeft het Ministerie van Landbouw, Natuurbeheer en Visserij (LNV) een verschuiving gemaakt in de beleidsbenadering van de landbouwsector. In hoofdzaak betrof het een verschuiving in dominantie van sectorbeleid (gericht op productie) naar facetbeleid. De belangrijkste facetten in het nieuwe beleid voor de landbouw waren in eerste instantie ‘ruimtelijke ordening’, ‘milieu en water’ en ‘economie’. In de loop van de negentiger jaren kreeg ‘water’ een zelfstandige plaats naast ‘milieu’ en werd steeds belangrijker. De aspecten ‘dierenwelzijn’ en ‘voedselveiligheid’ werden later toegevoegd aan de aandachtsvelden. Het facet ‘economie’ verminderende als aandachtsveld en werd halverwege de jaren negentig vervangen door het facet ‘leefbaarheid op het platteland’. Het proefschrift biedt steun aan de gedachte dat de landbouw als economische drager van de leefbaarheid op het platteland, eigen aandacht van de overheid behoeft.

De verschuiving in de beleidsbenadering had ook invloed op de effectiviteit van de beleidsinstrumenten. Het ontwikkelen van een gemeenschappelijke visie op ontwikkelingen in de sector – hetgeen in samenspraak met de landbouw en haar taakomgeving plaatsvond voor het verkrijgen van draagvlak – blijkt steeds minder effectief als basis voor sturing door de overheid. De instrumenten onderzoek, voorlichting en onderwijs zijn verzelfstandigd, omdat zij niet langer worden gezien als een verlengstuk van het beleid van de overheid. De overheid zelf richt zich in toenemende mate op juridische (generieke) beleidsmaatregelen. Maar de generieke regelgeving in de context van het facetbeleid blijkt te leiden tot een enorme groei aan maatregelen. Deze maatregelen hebben een beperkte doelmatigheid, omdat zij sterk betrekking hebben op de manier waarop de bedrijfsvoering wordt uitgevoerd.

Naast generieke regelgeving die beperkend werkt, is het regionaal en individueel stimuleringsbeleid gegroeid, in samenhang met beleidsontwikkelingen in de Europese Unie. De stimuleringsregelingen voor gebiedsontwikkeling en individuele praktijk-initiatieven zijn sterk uitgebreid en het bedrijfsleven is gestimuleerd om via (keten)-certificaten zelfregulering ter hand te nemen. De effectiviteit van stimulerings-regelingen blijkt eveneens beperkt, vanwege de reikwijdte van de regelingen. De diversiteit van de praktijk blijkt moeilijk in regelingscriteria te vangen. Hetzelfde geldt voor criteria voor certificering: de uniformering van criteria en regels voor verkrijging van certificaten doet soms weinig recht aan de verscheidenheid aan mogelijkheden in de bedrijfsvoering om het beoogde te bereiken.

In de loop van de jaren negentig is de roep om overheidsbeleid dat zich richt op de diversiteit aan mogelijkheden in de praktijk steeds sterker geworden. Er is onder andere gediscussieerd over de vraag in hoeverre het concept van bedrijfsstijlen daarvoor een basis kan bieden. Op die vraag bleek geen direct antwoord te zijn. Er ontbrak een drager; een soort brugfunctie tussen de probleembenadering vanuit de invalshoek van beleid en van stijl.

Dat vraagstuk intrigeerde mij persoonlijk, omdat zo’n soort vraag al diverse malen in mijn leven en in verschillende hoedanigheden bij mij opkwam. Dat begon toen Jan Douwe van de Ploeg in 1986 vroeg aan mij (destijds bij de vakgroep Veehouderij van de Landbouw Universiteit) om tot samenwerking te komen tussen rurale sociologie en veehouderij. Dat lukte toen niet op inhoudelijke gronden. Ook het vraagstuk naar de onderlinge relatie tussen de bedrijfssysteembenadering en het begrip bedrijfsstijlen dat zich eind jaren negentig opwierp, paste voor mij in dezelfde lijn.

In 1995 had ik een drieledige aanleiding om dieper op dat vraagstuk in te gaan. Een belangrijke aanleiding was de teleurstelling die ik voelde bij de reorganisatie van de provinciale consulentschappen van het Ministerie van LNV naar de regiodirecties. Ik vond dat die nieuwe regiodirecties ‘tussen wal en schip’ hingen – enerzijds een reorganisatie te ver (vanaf het sectorbeleid) en anderzijds een reorganisatie niet ver genoeg (naar nieuw beleid). Naar mijn gevoel waren daarmee de voorwaarden geschapen voor een op zichzelf gerichte organisatie. De situatie inspireerde mij om te zoeken naar een voorzet voor verdergaande beleidsvernieuwing. Naast de opgelegde taken bleek er ruimte voor eigen invulling van mijn werk. Het doen van beleids-ondersteunend onderzoek leek tot de mogelijkheden te behoren. Dat leidde tot het onderhavige onderzoek. (Toen het onderzoek eenmaal op gang was, bleek er toch minder ruimte voor dan verwacht.)

Een tweede belangrijke aanleiding voor dit onderzoek was het besef in april 1995, dat ik die drager, die brugfunctie tussen beleidsbenadering en het concept van diversiteit in bedrijfsstijlen zou kunnen vinden als ik daar gericht naar zou zoeken. Dat besef drong door, toen in een discussie een varkensboer ter sprake kwam, wiens stallen naar moderne maatstaven niet goed zijn voor het welzijn van varkens, maar die bovendien als Peelgids actief was in de natuurbescherming. Ik hield toen een betoog over het verschil in ‘handelingsruimte’ die bepaald is door het samenspel van drie factoren: de capaciteiten van de persoon, de aard en eigenschappen van de ‘stimulans’ (varkens, natuur, contacten als gids) en de gehele omgeving in tijd, plaats en alles wat daarmee samenhangt, waarbinnen de activiteit plaatsvindt. Het was een spontane variant van mijn kennis van de diergezondheid. In mijn vroegere colleges bij de Wageningen Universiteit doceerde ik over ‘factorenziekten’, waarvan het verloop en de uitkomst bepaald wordt door diverse soorten factoren: het dier, de ziekteverwekker en de omgeving in tijd, plaats en fysieke mogelijkheden, waarin die twee elkaar ontmoeten. De vierde factor is de gerichte (veterinaire en niet-veterinaire) interventie die het verloop en de uitkomst van het ziekteproces in gunstige zin tracht te beïnvloeden. Dit voorval heeft de richting aangegeven voor het onderwerp voor het huidige onderzoek.

De derde aanleiding voor dit onderzoek was het feit dat ik met mijn eerste ideeën direct enthousiast ben ontvangen door Jan Douwe van der Ploeg (hoogleraar Rurale Sociologie) en Martin Verstegen (hoogleraar Diervoeding en voormalig collega bij de vakgroep Veehouderij). Hun motivatie was, dat mijn voorstel een β-/γ-geïntegreerd onderzoek betrof dat aanhaakte op het concept van bedrijfsstijlen en zij beiden het vertrouwen hadden dat ik daar iets goeds van zou kunnen maken. Maar de steun die ik vervolgens kreeg, heb ik als overweldigend en ontroerend ervaren.

De steun begon met het helpen formuleren van een onderzoeksvoorstel, het inbedden daarvan als project in het Mansholt Instituut en het creëren van een werkplek bij de leerstoelgroep Rurale Sociologie, waarbij ik tevens als gastonderzoeker van alle faciliteiten gebruik mocht maken. Vervolgens vond Jan Douwe een onderzoeksbudget voor mij. Ook vond Jan Douwe een manier om mij gedurende twee jaar voor een extra dag in de week in dienst te nemen bij de Wageningen Universiteit, zodat ik er tijdelijk twee dagen per week aan kon werken. En toen ik in de fase van het uitwerken van dit onderzoek de inhoudelijke contacten binnen het werk teveel begon te missen, vond Jan Douwe een leuke nevenklus voor mij. Sindsdien ben ik betrokken bij een interuniversitaire samenwerking met Zuid-Afrika, waar ik veel inspiratie uit haal. Ik ben oprecht ontroerd doordat Jan Douwe steeds voor een oplossing zorgde als er zich essentiële belemmeringen voordeden. Inhoudelijk heeft Jan Douwe mij heel erg mijn ‘eigen proefschrift’ laten schrijven. Hij heeft vooral geholpen de structuur van het onderzoek en de verslaglegging te bewaken. Daardoor heeft de hoofdlijn van het betoog in dit proefschrift duidelijk aan helderheid gewonnen.

Het werkklimaat bij de leerstoelgroep heb ik ook als erg prettig ervaren. Ik voelde mij volledig opgenomen als lid van de leerstoelgroep. De manier waarop de mensen met elkaar omgaan is ontspannen, hoewel de laatste jaren de hectiek in het werk sterk toeneemt. Maar de mensen accepteren elkaar, vertrouwen elkaar en hebben wat voor elkaar over. Dat heb ik in sterke mate ervaren in de eindfase van de verslaglegging, toen ik behoefte had aan inhoudelijk sociologisch commentaar op de details van het proefschrift. Jaap Frouws bleek onmiddellijk bereid om het gehele proefschrift hoofdstuk voor hoofdstuk met mij door te nemen en het in minutieus detail van commentaar te voorzien, waarna ik in alle hoofdstukken belangrijke wijzigingen heb aangebracht en sommige hoofdstukken geheel heb herzien.

De steun van Martin Verstegen was voor mij evenzeer onmisbaar. Tijdens het vooronderzoek was die steun nog enigszins op afstand. Maar toen van alles in mijn leven vast begon te lopen, omdat er tegelijkertijd moeilijkheden waren bij het Ministerie van LNV, er in mijn privé-leven een verdrietige periode was en de analyse van het onderzoeksmateriaal vastliep, toen bleek Martin er voor mij te zijn met persoonlijke en inhoudelijke steun. De bijeenkomsten die we 's morgens heel vroeg hadden op Zodiac waren altijd zeer rustgevend en inspirerend. In het begin stond vooral het sociale aspect van het contact centraal; het moed inspreken. Maar allengs werden de discussies steeds inhoudelijker. De lijnen die we konden trekken tussen wetmatigheden in de dierwetenschappen en met name de fysiologie en de wetmatigheden in de sociologie vond ik zeer bijzonder.

De definitieve doorbraak uit de vastgelopen analyse kwam voor mij op het moment dat Martin mij voorhield dat zijn conclusie uit mijn onderzoek was, dat de waarde van een big voor een boer in een bedrijfsstijl kennelijk vergelijkbaar is met de waarde van een kilogram voer voor een dier. De waarde van een kilogram voer hangt namelijk niet alleen af van het dier (soort, leeftijd, gewicht, enz.) en van de externe omstandigheden (welke in experimentele situaties geüniformeerd kunnen worden), maar ook van het voerniveau en van de oorsprong, vorm en samenstelling van het overige voer. Zelfs de wijze van grootbrengen van het dier kan een rol spelen. De additieve waarde van een kilogram voer voor een dier is dus niet onafhankelijk en eenduidig vast te stellen. En bovendien is fysiologisch vastgesteld dat elke kilogram voer invloed heeft op het dier als geheel en nooit exclusief op bepaalde (prioritaire) lichaamsfuncties.

Uit het inzicht dat die vergelijking tussen fysiologie en sociologie opleverde, trok ik twee kernrichtlijnen voor de opbouw van de analyse van het onderzoeksmateriaal:

1. In de analyse van de gegevens mochten geen impliciete veronderstellingen zijn ingebouwd over eenduidigheid van de waarde van productie.
2. De gegevens uit de enquêtes moest ik voor de factoranalyse niet op voorhand opsplitsen in verschillende thema's, maar eerst als een geheel in een totale data-analyse gebruiken voor de bepaling van bedrijfsstijlen.

Met deze kernrichtlijnen kwam ik vervolgens tot een onderbouwde methode voor de analyse van het onderzoeksmateriaal en tot consistente resultaten over bedrijfsstijlen, waarna ik het onderzoek kon afronden met het uitschrijven van dit proefschrift.

Daarmee was het proefschrift nog niet klaar. Een essentieel onderdeel was daarna de invulling en correctie van het gebruikte Engels in het proefschrift. Daarbij ging het niet alleen over de verbetering van de gebreken in mijn beheersing van de Engelse schrijftaal. Zeer essentieel was ook de woordkeuze voor de kernbegrippen die in dit proefschrift zijn ontwikkeld en waarvoor ik in veel gevallen ook worstelde met de woordkeuze in de Nederlandse taal. Het heeft mij gesterkt in enkele overtuigingen. Het ontwikkelen van een techno-sociologische vocabulaire (in elke taal) om de bevindingen uit te drukken op een manier die zowel β- als γ-wetenschappers kunnen hanteren, bleek een moeilijk onderdeel bij de weergave van dit onderzoek. Maar voor zover taal belangrijk is, is het essentieel dat een taalvaardig persoon voor wie die taal de moedertaal is daarbij betrokken wordt. Ik ben Catharina de Kat-Reynen erkentelijk voor al het voortreffelijke werk dat zij voor mij heeft verricht.

Aansluitend dank ik Hans-Joachim Krüger (Duits) en François-Joseph Daniel (Frans) heel hartelijk voor vertaling van de samenvatting in hun talen.

Waar voor mij het inhoudelijke werk ten einde liep, daar begon voor Ans van der Lande (tekst en eindredactie) en Jaap Bijkerk (tekeningen) een eigen uitdaging: het klaarmaken van dit proefschrift voor de drukker. Dat bleek niet eenvoudig vanwege de (vele) ingewikkelde tekeningen en tabellen die ik heb ontworpen. Die lieten zich niet gemakkelijk inlezen in de moderne tekstverwerkingsprogramma's. Het feit dat we al eens eerder gezamenlijk een boekje hebben gemaakt (de voorstudie 'Gesloten Bedrijven' in 1998) baatte niet. Inmiddels zijn alle programma's helemaal veranderd en deze programma's stellen weer geheel andere eisen aan de toelevering. Hartelijk dank voor jullie toewijding om te zorgen dat het boek bijtijds is voltooid.

De boeren zelf die bereid zijn geweest om mee te werken aan dit onderzoek, ben ik eveneens dankbaar. Zonder hun bereidwillige hulp zou dit onderzoek nooit tot stand zijn gekomen. Het was telkens inspirerend om interviews af te nemen en met enquêtes rond te gaan. Elk bedrijf gaf een eigen ervaring. Ook bedank ik Sjako Dekkers van Siva Software B.V. en aan Siem van Leeuwen van Comvee BV voor de plezierige samenwerking bij het zoeken naar bedrijven en het verzamelen van gegevens.

Een woord van dank past ook aan het interviewbureau van Astrid Hendrikse voor het professionele werk van de enquêteurs: Agnes, Amarens, Christian, Dik, Jorit, Keete, Maartje, Martine en Renée. Aansluitend wil ik Ans en Marleen hartelijk danken voor hun hulp bij het invoeren van de dataset in de computer.

Ik bedank ook alle overige personen die mij geïnspireerd hebben om dit onderzoek te doen. Dat zijn er teveel om op te noemen. Mijn naaste oud-collega's bij de Directie Zuid van het Ministerie van LNV hebben daarin een aparte plaats. Zij zijn weliswaar niet direct betrokken geweest bij dit onderzoek, maar indirect hebben zij een inspirerende rol gespeeld.

Tenslotte wil ik een woord van waardering richten tot de beide paranimfen die mij bij de gelegenheid van de promotie vergezellen. Marianne Bruining is een vriendin sinds het begin van mijn studietijd in Wageningen. Samen hebben wij hard gestudeerd en veel beleefd en ik vond bij Marianne vaak even die rust die ik in mijn roerige leven nodig had. Ik vind het een plezier om elkaar telkens weer te blijven tegenkomen. Agatha Spierings is mijn oud-kamergenote bij de Directie Zuid van het Ministerie van LNV. Onze samenwerking in het werk verliep uitstekend en heb ik altijd als zeer plezierig ervaren. Bovendien konden wij elkaar begrijpen en ondersteunen in de roerige ontwikkelingen aldaar. Ik ben er trots op dat jullie bij deze gelegenheid naast mij willen staan.

Preface

Since the 1980s there has been a growing need for new concepts related to agriculture and rural areas. The aim of agriculture is shifting from a focus on production to sustainability and diversification of functions. To support this development of diversification, new policy concepts are required as well. The existing concept of styles of farming explained the diversity in farming practices but was not directly applicable as a basis for policy developments. This study is meant to broaden the understanding of the concept of styles of farming by adding a more objective (computerised) method to classify farms. My hope is that such an extended understanding could help bridge the gab between science and policy.

The Dutch government has been ambivalent in supporting this research. It was predominantly supported by the enthusiastic support of Wageningen University – and in particular of Professor Jan Douwe van der Ploeg (Rural Sociology) and Professor Martin Verstegen (Animal Nutrition). In this co-operation between scientific fields, the comparison between physiology and sociology revealed remarkable similarities.

The breakthrough in this research was the insight that the value of production to a farmer in a style of farming is comparable to the value of feedstuff to an animal. The value of an extra kilogram of feedstuff to an animal depends not only on the animal's characteristics (species, age, weight, etc.), and the current external conditions (which can be standardised in experiments), but also on the level of feed intake and on the origin, form and composition of the rest of the feedstuff. Even the upbringing of the animal can influence the value of that kilogram of feedstuff. So the additional value of a kilogram of feedstuff cannot be determined independently and unambiguously. Moreover, any kilogram of feedstuff influences all the life functions of an animal and never just specific (priority) body functions.

From insights gained by comparing physiology and sociology, two key guidelines were formulated for objectifying the analysis in the current study:

1. In the analysis there should not be an implicit presumption about the unambiguity of the value of production.
2. The responses to the questionnaire should not be subdivided into different issues for examination before the factor analysis is completed, but should be examined as a whole in a data analysis.

These key guidelines led to the solution of the analytical problems in the study and to consistency in the identification of styles of farming.

I am very grateful to all those who have contributed to this work: the promoters and other scientific supporters, the pig farmers, the corrector, the editor, the draughtsman, the management support providers of the farmers, the interviewers, the people who helped to enter the data into the computer, and all people that inspired me to conduct this work. I also thank my paranimfs for flanking me at the promotion.

1 Introduction and Hypothesis

The idea for this study emerged through my work at the Ministry of Agriculture, Nature Management and Fisheries (LNV). It was not part of any ongoing research programme – nor could it be incorporated in any regular programme. Yet it appealed to a few of my former colleagues at Wageningen University, particularly because it implied a techno-sociological (β-/γ-integrated) approach and it had high societal relevance. The β-/γ-integrated approach was still new in 1995 and virtually unexplored. So the challenge was both for me to conduct the study and for my promoters to guide me in the process. The outline for the study was discussed in depth with over 50 scientists and experts before the research plan was made.

The motivations for this research are described in Section 1.1, followed in Section 1.2 by a discussion of the historical context of the research area, the Netherlands as a whole, and of the concept 'styles of farming'. Section 1.3 introduces the hypothesis of this study, namely, that the quantitative description of farming practices in the context of Productivity, Intensity and Scale is connected to the qualitative description of these practices in the orientation on Ability, Technology and Business.

1.1 Research Motivations and Aim

1.1.1 Motivations for the Research

General Societal Motivations

Sustainability has over 386 definitions (Van der Zijpp 2001; Rigby and Caceres 2001), which shows how ideologically involved modern society has become with the concept since its introduction by Brundtland (1987). The need for more sustainable development of global resources is often linked to a need for a change in scientific approaches.

Modern farming, especially pig farming, is an important topic of debate: both among farmers themselves as well as among other sectors of society, including the general public, lobbying organisations, and government institutions. Many issues related to farming are perceived as problems for society: manure pollution, animal welfare, animal health, current management practices, etc.

These issues have been fragmented into different technical and social discussions. The manure problem has been addressed in technical government measures. However, these measures not only reduce the environmental pollution, they also block some new developments in manure management. The discussion about animal welfare is not directly connected to discussions about food prices. So a discrepancy is growing between animal welfare management in The Netherlands and the welfare of the animals that serve as resources for food products in the Dutch supermarkets. European government instructions about animal treatment in case of disease outbreaks are disconnected from the traditional attitudes to animal culling.

This research was therefore focussed on the perspective of pig farming with respect to both the demands of the society and the opportunities of farmers to deal with these demands.

Motivation for Using the Concept of Styles of Farming

In agricultural science there is a growing interest to combine approaches from technical and social scientific disciplines into a techno-sociological integrated discipline (β-/γ-integration). These combined approaches can reveal consequences for society related to developments in various scientific fields. The problem with any attempt to combine techno-sociological sciences is that science itself is approached differently and the scientific vocabularies often do not match. Research in the technical sciences is usually systematic (hypotheses-research-conclusion oriented), and expressed in formulas, tables and figures. Social science research is often heuristic (theorem-research-design oriented), and expressed in paradigms and conceptual vocabularies. So it is an important challenge to try and find a match between these scientific approaches.

The concept of styles of farming was developed over the years since 1945 in the field of sociology. Since the late 1980s this concept has been turned into an instrument for participatory[1] research. Differences in styles of farming were revealed and at the same time farmers were encouraged to use their strengths for renewing the countryside, for implementing alternative environmental protection measures and for broadening their basis for farm income. Consequently, the concept of styles of farming incorporated technical aspects in its (basically) social scientific approach. The inspiration for using the concept of styles of farming to develop techno-sociological research was in the fact that the concept of styles of farming is founded in diversity in farming practices.

From the late 1980s onwards Van der Ploeg and his colleagues at Wageningen University, who were working on styles of farming, tried to bridge the gap between sociology and the technical sciences. In the1990s a few technical scientists who encountered problems with fragmentation of technical and social problems in their work felt inspired to try and find techno-sociological scientific integration by using the concept of styles of farming. This research is one of these attempts[2]. The inspiration for this research was founded in my work in rural policy development in the Ministry of Agriculture, Nature Management and Fisheries (LNV) in The Netherlands. In particular, my work on policies for economic development of valuable (and vulnerable) cultural landscape areas in central Limburg, and on new farmers' co-operatives for environmental protection and nature management in east of Brabant served as sources of inspiration.

Motivation from the Perspective of Government Intervention

Governments devise interventions in agriculture at individual, general, and regional level. Interventions at general level are common. They usually take the form of regulations. These generic measures are based on the principle of equality for all: all farms that meet the stated criteria are subjected to the measures. These measures can involve both privileges (subsidies) and restrictions. Interventions at intermediate level are usually related to regional projects. The boundaries of a region or area are specified. Within that area specific regulations (privileges or restrictions) are effective.

Since the mid-1980s the number of government regulations in The Netherlands for agriculture have dramatically increased, particularly on the issues of manure and mineral management and other aspects of environmental pollution, animal health and welfare, and animal hygiene and prevention of outbreaks of diseases. Farmers have often felt that these regulations are not fair or supportive of the specified goals[3]. Consequently, the question was raised as to whether regulations could be made more specific rather than generic, without violating the demand for equality. The idea arose that the concept of styles of farming might shed new light on the search for criteria for selectively privileging or restricting certain types of developments in farming practices – instead of imposing generic measures.

Motivation for Selecting Pig Production

By the late 1990s pig farming had grown to be one of the most important farm branches in The Netherlands – both in terms of national economy and in terms of farm intensity and industrialisation. It had also grown to be the most disputed branch in terms of government regulations.

In the 1980s and early 1990s a lot of research was been done on styles of farming. Most of the research covered arable production, dairy farming and mixed farming. In all these types of farming land use played an important role. Only one study was conducted in The Netherlands on styles of farming in which land use was not an issue: it focussed on greenhouse horticulture (Spaan & Van der Ploeg 1992). In that research three different styles of farming were found.

It seemed relevant, therefore to fill the gap of knowledge with a study of styles of farming in pig production – with a special focus on the combined aspects of technological developments and societal disputes, which currently receive much public and media attention.

Motivation for Focussing on Industrialised Pig Production and the Study Area

In the early years after the Second World War (1945), when farming was hardly industrialised, styles of farming were related to different farm products: crops versus dairy in two different areas in the province of Groningen (Hofstee 1948, 1985). By the end of the 1980s, intensity and scale of farming had increased dramatically. Then styles of farming were related to technology and market – and they could even be defined in relation to one product in the same area: either crops or dairy (Van der Ploeg & Van Dijk 1995; Van der Ploeg & Long 1994). Farming became also an activity that was disconnected from acreage - the availability of land for feedstuff. Therefore it became interesting to continue the study of styles of farming in a farm branch with advanced industrialisation (disconnected from acreage) and in relation to the production of a specific standard product.

It also appeared that the more a farming branch had been industrialised, the more technical indicators had been specified for evaluation of the production process, and the more farmers became involved in management support programmes. By the late 1990s, about 80 per cent of the Dutch pig producers were involved in management support based on production indicators[4]. So the population of pig producers with management support was almost representative of the whole national population of pig producers. A study among farmers with data for management support would make a study of styles of farming interesting from both a qualitative perspective and a quantitative perspective. In the pig production branch, farmers with such a management programme would represent about 80 per cent of all farms involved in that branch. That was more than in the fattening branch, which is considered a different branch in The Netherlands.

Pig farming in The Netherlands is a large agricultural industry, which is technically highly advanced. The industry is divided into a supply industry, a breeding industry for sperm and maiden sows, a feeder pig production industry (to 25 kg), a pig fattening industry, and a food industry. Each fragment provides a standard product for the next element in the food chain. So the pig production industry was an obvious choice for this study.

To be divisible into styles of farming, the group of producers should be large enough to contain sub-groups. In addition, the production system has to have sufficient complexity. So that differences in the co-ordination of farming practices could be established. There has to be a sufficient number of different issues involved with the production process to find patterns in farming practices. In pig farming, the pig production stage is complicated (sow selection, breeding, feeding, health care and rearing piglets) and it is done by a relatively large number of farmers[5]. The resulting product is standard: feeder pigs of about 25 kg. The prices for these pigs are set on a bulk market. So the differences in farming practices that could be found would be related to differences in production practices and not to differences in products or marketing practices. Pig fattening is much fewer complex (mainly feeding and health care), so there are less issues on which farmers might differ in opinion or practice. Therefore this research focussed only on pig production.

For me personally the pig production branch was a relatively new challenge, because my specialisation in livestock was dairy cattle. However, as a rural development specialist I was used to approaching farming from a broad perspective. And as an animal scientist I was familiar with the pig production branch from a disciplinary perspective – particularly health, hygiene and housing.

As I was working at the time in the south of the country for the Ministry of Agriculture, Nature Management and Fisheries (LNV), a logical choice might have been to conduct a participatory study with 'Environmental Co-operative De Peel', a new farmers' co-operative for improving environmental protection in the east of Brabant. In this farmers' co-operative there are predominantly pig farmers involved. This would have been a good option from a research point of view: most people (including farmers) are more motivated to contribute to social research if the results would be incorporated in a process of change. But such a participatory study could also have been confusing in relation to the other work that I was doing for the ministry, because political lines do not always match with practical demands.

Moreover, a large outbreak of swine fever occurred in the concentration area in the south from February 1997 until May 1998, which resulted in the destruction of 11million pigs. This event had long-lasting effects on the farms. Some farms were empty for over a year. After production resumed, it took a few years before a reliable sequence of yearly overviews of management results would become available. So when the time came to collect data (at the end of 1998) the south was no longer an option for conducting this survey[6].

Since the area of Twente and The Achterhoek was also a concentration area for pig farming, this area was considered to be the best option under the circumstances. An additional advantage of this choice for the study area was that the area is known for its scenic landscape. Part of the area (the surroundings of Winterswijk) was an 'area with a valuable cultural landscape, which received subsidies for balanced economic rural development. Through my work in central Limburg on this policy issue I was familiar with the economic and environmental circumstances of such status, which helped me devise specific questions on that matter for the questionnaire.

1.1.2 The Aim of the Study

The aim of the study was to gain knowledge about perspectives for pig production in Twente and The Achterhoek as perceived by the pig producers in relation to society and to the production results of the farms. Pig production was studied based on the production processes and the constructions to support production (stables, equipment, networks and indicators). The farmers' perspectives were differentiated according to styles of farming. A method for factor analysis of the diversity in styles of farming was developed in relation to farm Productivity, Intensity and Scale.

The research consisted of an initial explorative study and a main explanatory study. In the initial study (conducted in 1996), farmers from 25 pig production farms distributed all over The Netherlands were involved in open interviews on farming practices and on their perceptions of issues concerning pig production. The responses were analysed for contrasting perceptions and practices. Four styles of farming were distinguished: entrepreneurs (E), craftsmen (C), inheritors (H) and tenders (T). These styles of farming seemed to be related to farm size, intensity and scale. This initial study was described in a previous publication (Commandeur 1998).

The main explanatory study consisted of three steps:

- the development of a methodology for computer analysis of styles of farming

- the description of differences in styles of farming
- an explanatory analysis of the processes and constructions in pig production

The processes (social approach) covered in this study were farm labour, activities, income, integration in the region, and attitudes towards pig farming. The constructions (technical approach) covered in this study were stables and equipment, management networks, and production indicators.

1.2 Historical Context of the Research

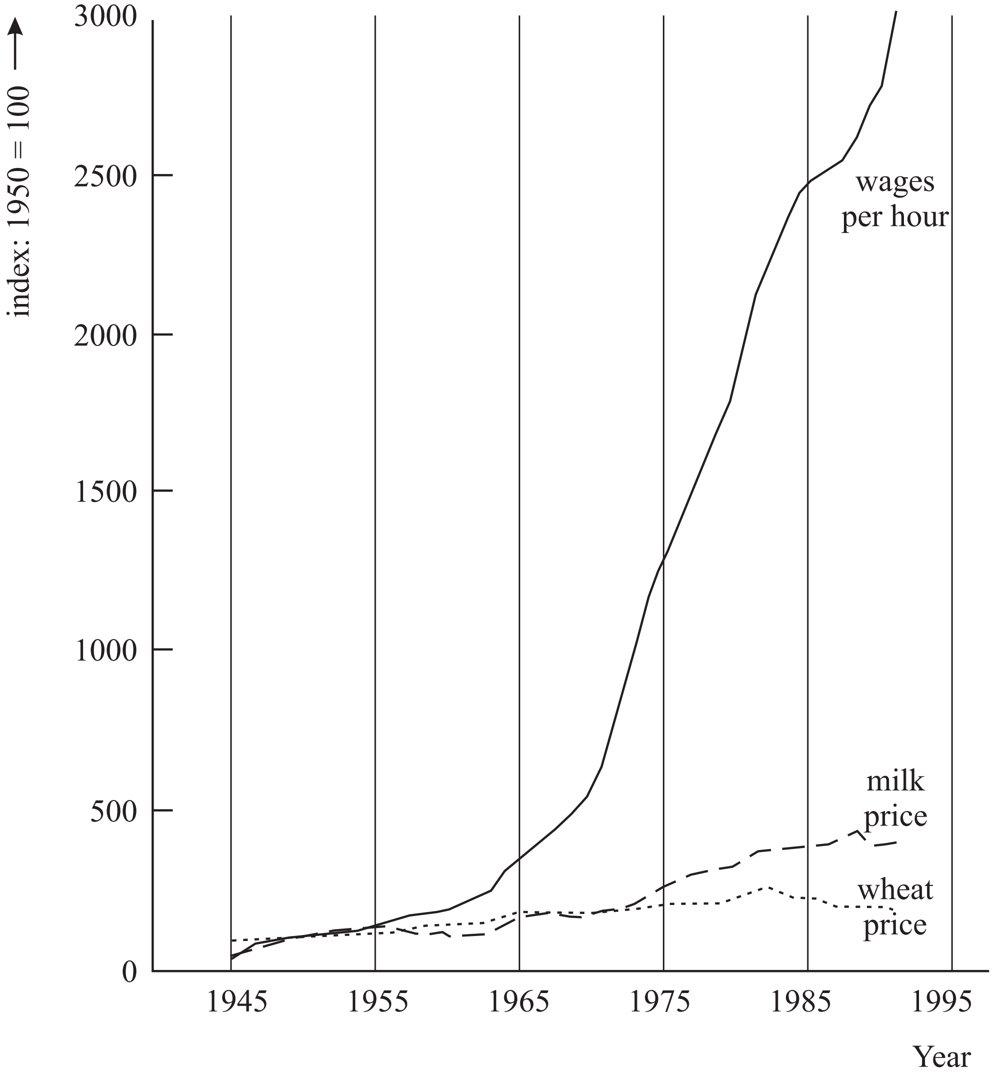
1.2.1 Technical and Market Developments

In the course of the 20th century farming practices changed dramatically. In the second half of the 20th century farm productivity increased impressively, both on individual farms and in rural regions. The dramatic increase in productivity in The Netherlands began at the end of the 19th century. From about 1890 onwards a national policy of network structures for technological research, extension and education was institutionalised. Until 1940 the concept for agricultural policies was dominated by 'land-saving' modernisation. In the early 1950s the policy concept of labour-saving technologies was added to the goals. Especially between 1963 and the mid-1980s there was an acceleration in labour-saving technological developments. This process was enforced by the need to bring farm and family income levels in line with income levels in the industrial sectors. The increases in wages per hour in the urban industries and the persistence of low prices for agricultural products boosted farm intensification, to ensure sufficient income for farming families (Schot *et al.* 2000) (Figure 1.1). The main issues in this process were land use improvement, water management, mechanisation, biological technologies, and farm specialisation.

From the mid-1970s onwards a turning point emerged, in so far as the period of unlimited expansion ended. The adage 'produce, specialise, and rationalise' lost its relevance. Instead a period of crisis and instability started with overproduction and increasing budgetary pressure for the European Union (Schot *et al.* 2000). The crisis and instability continued from the mid-1980s onwards in connection to the intensity of production. A growing societal concern for the environment, animal welfare and food safety resulted in a 'regulatory treadmill' of new rounds of obligatory investments (Ward 1993). This resulted in an outflow of financial resources from the agricultural sector to other economic sectors in society. In macro-economic terms the Gross Value of Production (GVP) stabilised and stagnated from the early 1990s onwards. The integration of Central and Eastern European countries into the European Union (EU) and the continuing global negotiations of the World Trade Organisation (WTO) are likely to aggravate this tendency (Van der Ploeg *et al.* 2002A). As a result, the difference between GVP and costs squeezed agrarian income, which began to fall in real terms (Figure 1.2) (Van der Ploeg *et al.* 2002A, LEI 2000, Van Broekhuizen and Van der Ploeg 1997).

Thus, after World War II productivity, in terms of intensity and scale, increased dramatically through labour-saving technologies. At the same time, prices dropped through international market developments. These developments led to crisis and instability.

Figure 1.1 Comparison of index prices for milk, wheat, and wages per hour in Dutch agriculture (index: 1950 = 100). (Source: Schot *et al.* 2000)

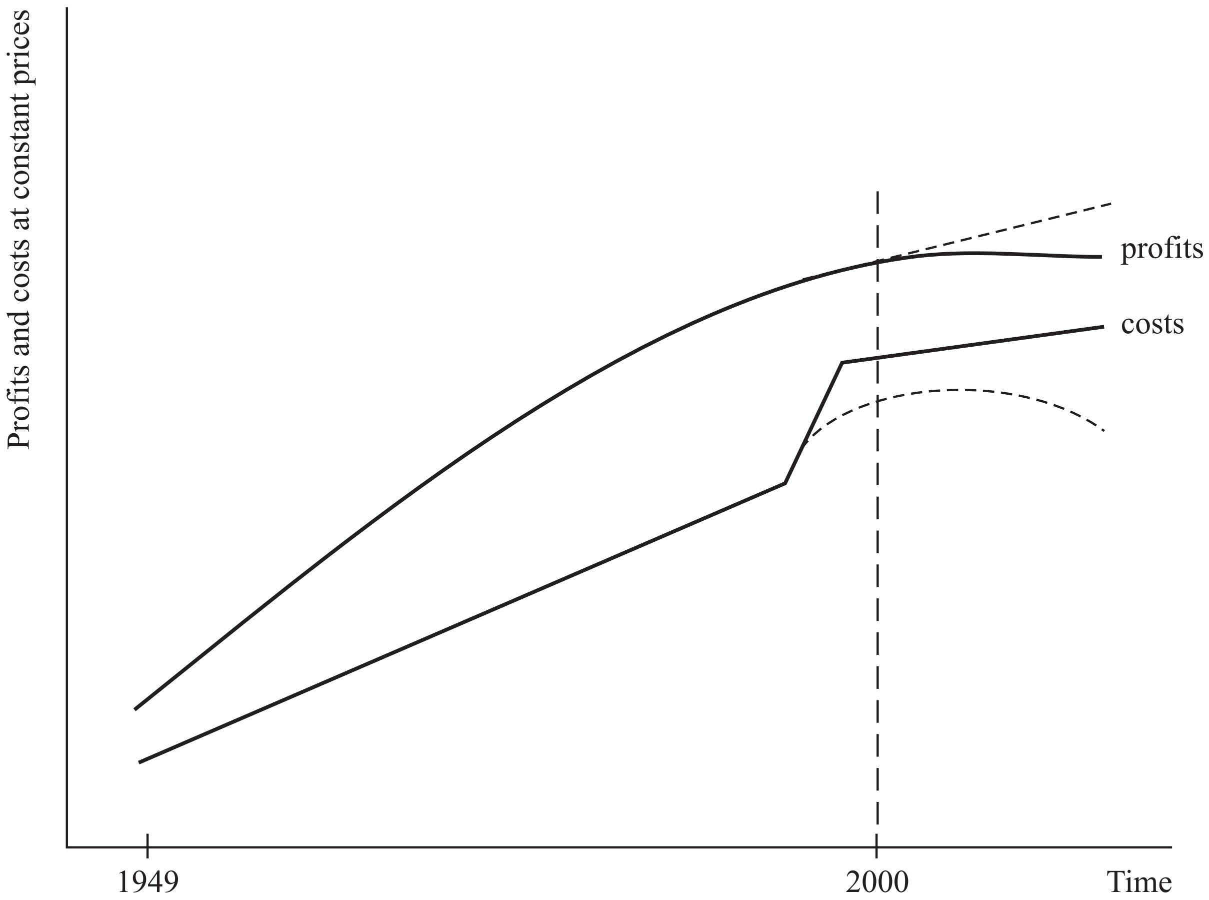


1.2.2 Agricultural Politics in The Netherlands

The development of various styles of farming was clearly influenced by the political atmosphere. In 1950 the Dutch Minister of Agriculture, Mansholt, released a plan for European collaboration in agriculture, which was implemented in the European Union[7]. This plan was aimed at *'...the greatest possible increase of agricultural production, and to obtain this in the most efficient way possible'*. The plan included farm specialisation, a more liberal exchange of produce, price stabilisation, technical improvement of European agriculture and the foundation of a European Board of Agriculture and Food.

By the 1970s the problem of overproduction at European level emerged. The political focus in The Netherlands though had changed from agriculture as 'fulfilment of the needs for food supply' to 'contribution to the national economy'. The Dutch government wished to stimulate both international export and to moderate development of industrial labour wages through low food prices. The Netherlands became one of the most important exporters of agricultural products, second only to the USA. Yet, in this period too awareness started to increase about animal welfare problems – as demonstrated by the 1978 Commission for Welfare of Farm Animals. And warnings about a rising manure problem emerged already earlier in The Netherlands (Algra 1970).

Figure 1.2 Post-war agricultural development and the contours of rural development (sources: Van der Ploeg *et al.* 2002; Van Broekhuizen and Van der Ploeg 1997).



In the 1980s the adage for Dutch agriculture became 'competitive, safe and sustainable'. This minister of agriculture wanted Dutch agriculture to stay competitive in the international market – to contribute to the national economy. At the same time he wanted to support the reduction of overproduction at European level. Food safety guarantees should support international export. The minister also wanted to solve the environmental problems caused by the excessive manure production. In 1987 the Minister put the first regulations into effect on manure and mineral emissions.

In the mid-1990s a new priority became the renewal of the countryside. The desire was to conserve an economically and ecologically vital countryside and a strong cultural heritage (landscape). The economic vitality should not be concentrated in the agricultural productions, but should also be conserved in the effects of the production process – by creating ecological (nature) and landscape values. In that period diversification of on-farm activities – like home processing of food and nature management by farmers, as well as organic farming were supported. This coincided with new regulations for animal health and welfare (1992) – in particular for the welfare of pigs (1998).[8] At the same time, the 'open borders' policy of the European Union (Schengen-agreement) was implemented in 1994. This boosted the international trade of live animals, which enabled Dutch transport and trade companies to expand their activities. The turn of the century was marked by the outbreaks of important livestock diseases, like swine fever (1997/1998) and foot- and mouth disease (2001). The Minister introduced a package of measures for animal hygiene and food safety, which were supposed to restore international confidence in the health of Dutch livestock and the safety of Dutch agricultural products. This package of measures will lead to new policy developments in 2003 *'…which will be noted for strong directive measures by the government and many – detailed and compelling – regulations'*.[9] A Reconstruction Law (2002) was developed for regional integration of regulations for farm production – and in particular for pig farming, about manure, smell, and animal hygiene as well as for conservation of nature areas.

1.2.3 Agriculture in Twente and The Achterhoek

The Achterhoek consist of three counties: Graafschap, IJsselstreek and Leimers. To the west and south-west the area is sharply bounded by the IJssel river. Until well into the 20th century, the IJssel was an obstacle to communication and interaction with the more prosperous parts of The Netherlands (Benvenutti 1961). Twente is situated north of The Achterhoek and its urban centre has historically experienced a higher level of industrialisation – especially involving the production of textiles.

The study area (Twente and The Achterhoek) has a long-standing history of agriculture (Figure 1.3). Throughout history agricultural crises have had a big impact on the economically poor rural area in Twente and The Achterhoek. The area had a feudal system from the Middle Ages to 1805, when it was replaced by regulations enforced by Napoleon.[10]

The Netherlands experienced an agricultural crisis in 1820, and again in 1840. For this reason, and because of religious changes in the area (the rise of Protestantism), many farmers emigrated to North America. At the same time, North American exports of grain to Europe made the production of grain less lucrative and the remaining farmers focussed increasingly on livestock. In the late 1800s and early 1900s many waste lands (peat lands) were prepared for agricultural production. In that period many farms were founded that still exist to the present day. By then, family farming had become the usual way of farming.

Figure 1.3 Map of The Netherlands and the study area Twente and The Achterhoek

Despite the economic crisis in 1930, farmers persisted in mixed farm production until the end of World War II (1945). After 1945 there was again an outflow of farmers to North America – as well as of urban workers. This process allowed the remaining farms to increase in size. During the intensification and expansion of the 1960s and 1970s farm sizes grew substantially. Most farms continued as mixed family farms with 50 per cent dependency on (acreage-connected) dairy production and 50 per cent dependency on industrialised[11] pig farming (usually either pig production or fattening). Some farms still have a branch of arable crop production. Mixed farming in the sense of the presence of two or three different farm branches, with an emphasis on dairy and pigs, is still the most common form of farming in the study area.[12]

1.2.4 Cultural Diversity in Farm Economics

The relevance of styles of farming was first noted in reference to Intensity and Scale as described in the work of Hayami and Ruttan (1985; 1971). In their work on agricultural economy development from an international perspective, Hayami and Ruttan emphasised a dynamic dualistic approach[13]. Hayami & Ruttan put the dualistic theory in a micro-economic perspective (1985; 1971). Thus they developed a model for agricultural labour productivity in a dualistic approach of intensity versus scale. Productivity was defined as the mathematical product of intensity and scale, expressing the balance between them. In their model they found culturally based differences in productivity levels among different global regions. Hayami and Ruttan did not mention the term styles, but they instead spoke of ‘paths’. They substantiated the model with impressive amounts of empirical support (Figure 1.4).

In the Revised Version of 1985 the model was further detailed. Hayami and Ruttan distinguished then three distinct paths reflecting different cultures in agriculture at different levels of Productivity: the Asian path, European path and New Continental path (Figure 1.5).

According to Van der Ploeg (1991), variation among European regions in trends of intensity and scale ranges from intensification and scale reduction to scale increase and expansion – and all possible combinations in between (Figure 1.6).

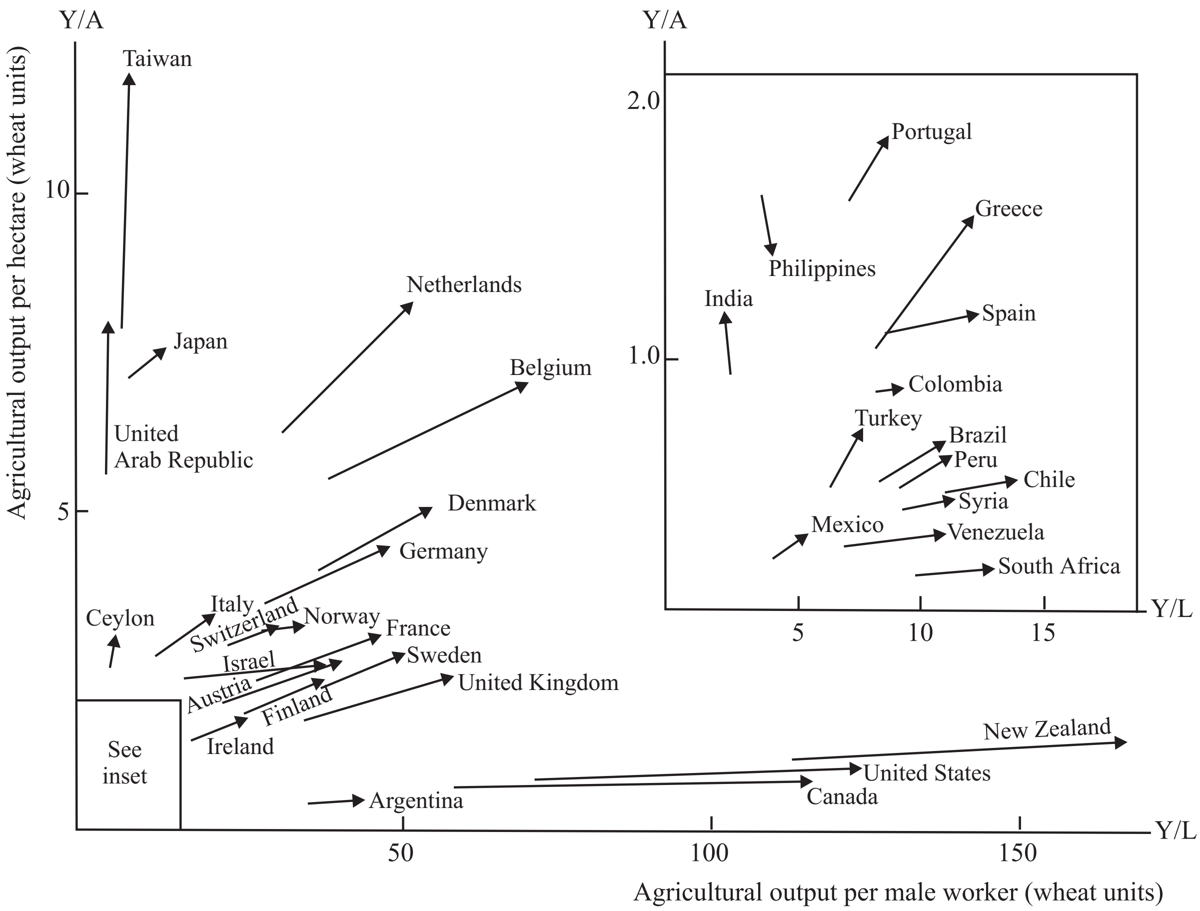
1.2.5 Diversity in Farming Practices

Bolhuis and Van der Ploeg (1985) studied the work of Hayami and Ruttan closely in their thesis and used the model in a sociological approach to describe the diversity in individual farming strategies and practices in Italy and Peru. They tried to explain the differences they found in entrepreneurship and craftsmanship of farmers. Bolhuis and Van der Ploeg challenged the micro-economic assumption of Hayami and Ruttan, about the representative value of ‘the average farmer’. According to Bolhuis and Van der Ploeg the individual 0diversion from ‘the average farmer’ in farming strategies is increasing. This development should not be ignored, because this diversion is not caused by random action. Thus differences in stylised growth patterns in agricultural productivity are not randomly created, but are the result of culturally based strategic deviations from average behaviour: they are styles of farming.

1.2.6 Developments in Styles of Farming

Styles of farming exist because there is *space to manoeuvre*. There is space for variety in farm decisions and activities, in moments for making decisions, and in ways of performing farming practices. In literature about styles of farming in The Netherlands there is some work based on older research by Hofstee and his colleagues that described styles of farming in relation to production locations. Farm industrialisation was underdeveloped at that time. Van der Ploeg and his colleagues conducted more recent studies, when farm industrialisation was more advanced. Those studies described styles of farming in relation to production branches (see also Chapter 2).

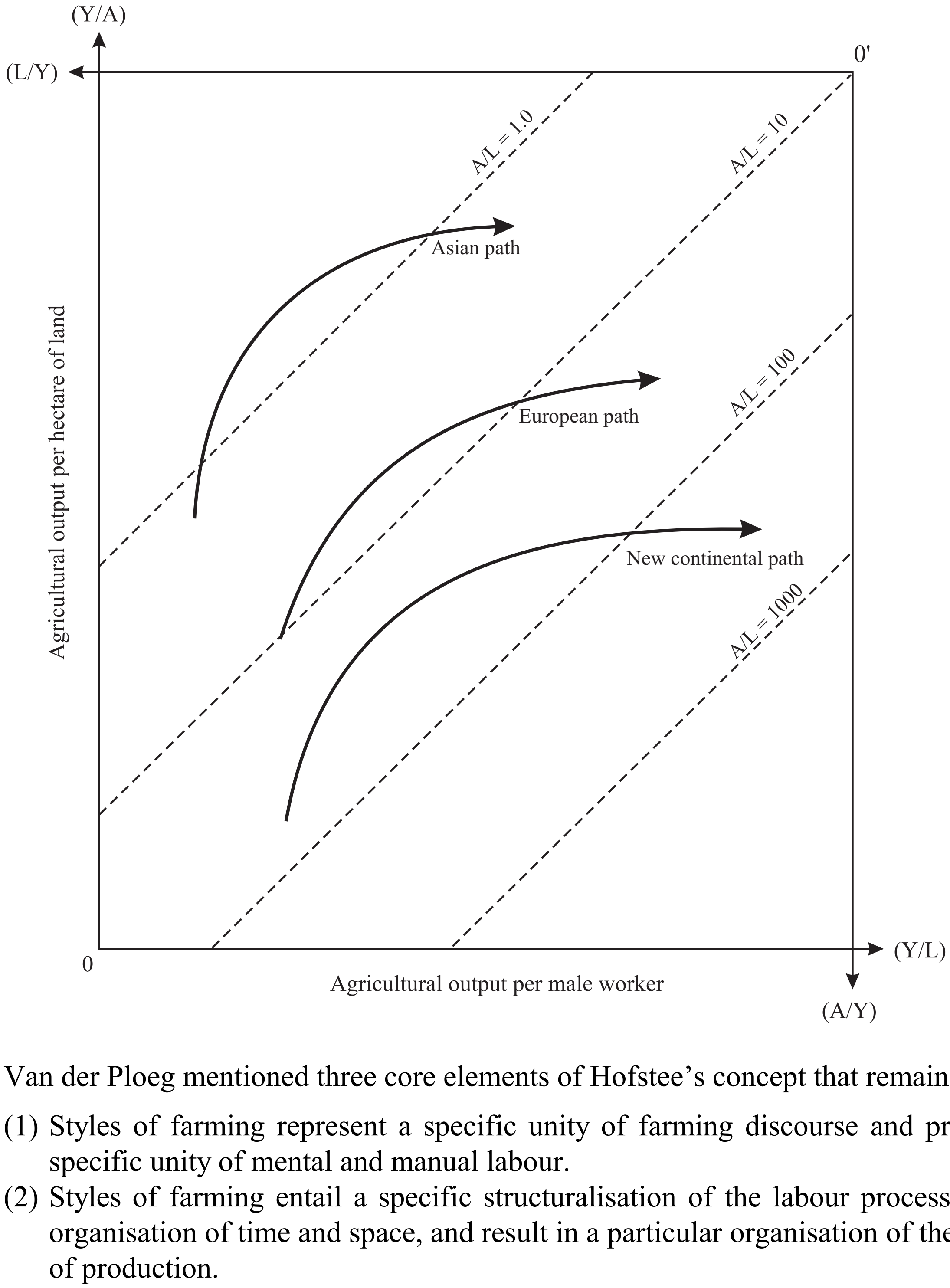
Figure 1.4 Differences in agricultural productivity among countries around the world. Intercountry cross-section comparison of changes in agricultural output per male worker and in output per hectare of agricultural land between 1955 and 1965 (Source: Hayami & Ruttan 1971)



In his work, Hofstee (1946)[14] pointed towards the social phenomenon that when in a specific society a certain way of life is accepted by the dominant group, the rest cannot and does not want to deviate from it. The way of life becomes imperative: it becomes a lifestyle. In economic life this might be referred to as a *style of operation*. Hofstee introduced the term *style of farming*[15] to describe these social patterns. In 1985 Hofstee emphasised that in every more or less homogeneous group of farmers in a certain area a specific style of farming emerges, being the general accepted way of performing farming practices. Next, he listed why farmers resist change in their style of farming. The most important reason is a general sense of insecurity about change. Second, there is fear of personal criticism and loss of social status. Third, the technical and economic infrastructure is integrated in the status quo: the existing system of production.

According to Van der Ploeg (1994) styles of farming is a concept that can be defined from various points of view. Since the 1950s the local-based principles for structuring styles of farming were transformed into (intra-regional) responses of farmers to technology and markets. And *'...since the structuralisation of markets and the orientation of technological developments have become increasingly the object of* *agrarian policy, styles of farming have ... emerged as farmers' responses to national and international agrarian policies.*

Figure 1.5 Stylised patterns in growth of labour and land productivity in agriculture. (Source: Hayami & Ruttan 1985)



Van der Ploeg mentioned three core elements of Hofstee's concept that remained:

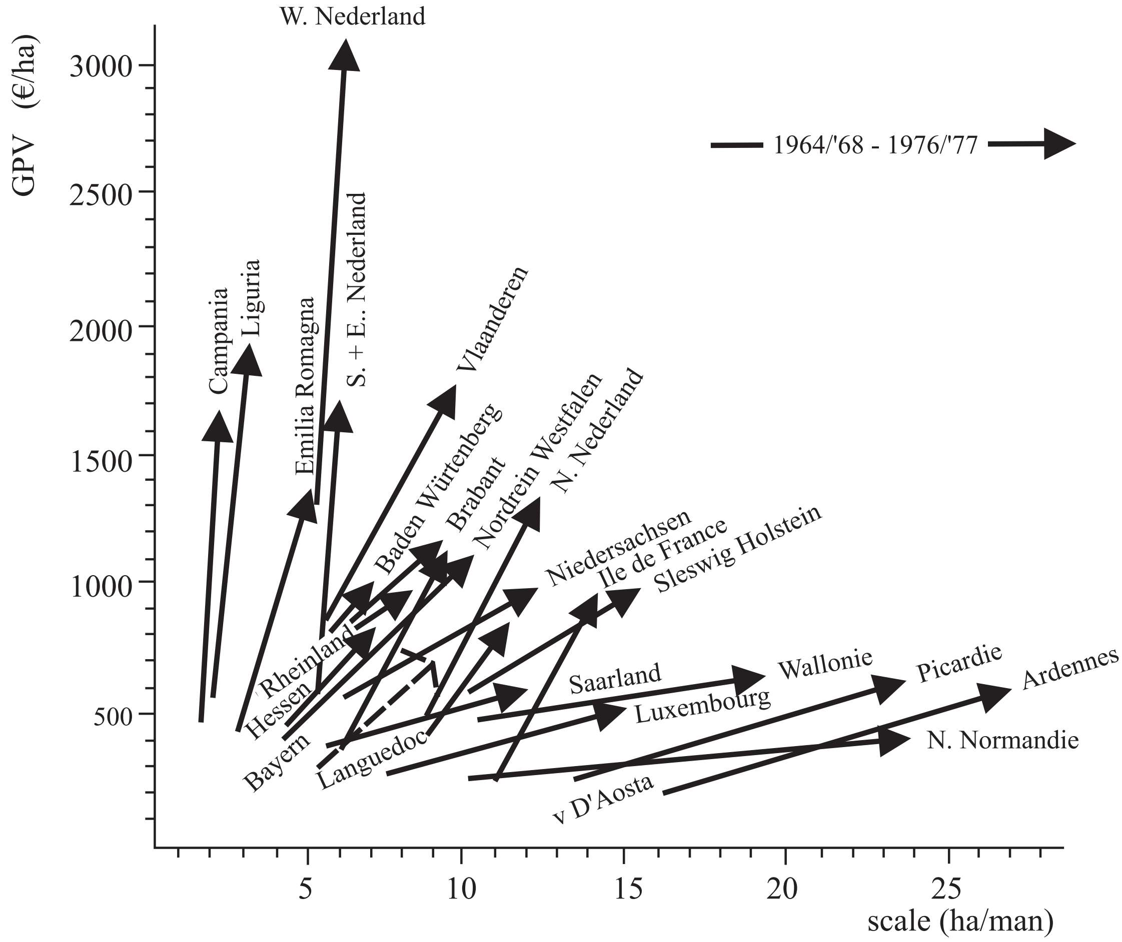
(1) Styles of farming represent a specific unity of farming discourse and practice, a specific unity of mental and manual labour.

(2) Styles of farming entail a specific structuralisation of the labour process and the organisation of time and space, and result in a particular organisation of the process of production.

'...Consequently styles of farming might be defined in terms of their scale, their level of intensity, the implied interrelations between capital and labour, and the specificity of particular technico-productive aspects and relations.

(3) Styles of farming represent specific connections between economic, social, political, ecological and technological 'dimensions', a specific co-ordination of the domains of production and reproduction (see Chapter 2).

Figure 1.6 Developments of scale (ha/man) and proceeds (euro/ha) in various European countries between 1964/68 and 1976/77. (Sources: Meeuws *et al.* 1988; Van der Ploeg 1994 [p10]).



Styles of farming are thus cultural repertoires (patterns) in farming practices. They can be defined from various points of view. In the pre-industrialised farming practices there were locally based cultural patterns. After the industrialisation, the structuring principles were connected to technology and markets.

1.2.7 Orientation towards Technology and Markets

To represent the differences between styles of farming Van der Ploeg (1994) created a diagram for the *space to manoeuvre.* The axes represented technology and markets.

The vertical axis referred to the difference between a straightforward application of new technologies on the one hand and its skill-oriented adaptation on the other hand. It represented

'...the conversion of resources into values. This conversion implies a particular technique or way of combining resources so as to obtain the required amount of value. ... Technological designs are frequently deconstructed. Particular elements of the designs are then reconstituted and combined with elements already existing to provide the most appropriate methods for 'conversion' – methods that differ, sometimes considerably, from the original technological design. In other words, craftsmanship replaces external technological design as an ordering principle for organising the labour process, i.e. the "conversion" of resources into values' (Van der Ploeg 1994: p. 9).

In other words: craftsmanship is a qualitative value (skill) that is linked with an orientation on technology. This value contrasts with a different quality that is linked to technology: the ways technology is accepted, handles and applied.

The horizontal axis refers to the integration in markets: the mobilisation of resources.

'...These might be mobilised on the various markets: labour to a large extent on the labour market; capital through loans and credits on the capital market; and land through tenancy mechanisms. Cows also enter the process of production as commodities since they are acquired on the cattle market; feed and fodder may be bought (instead of produced on the farm itself); and the same goes for soil-nutrients etc... A growing number of empirical studies have demonstrated that along this horizontal axis there is considerable empirical diversity, both between and within regions... In synthesis, farmers relate their farm enterprises in quite different ways to markets, and although markets might increasingly represent one and the same set of external variables for farming, the way in which farming is linked to this set of variables is highly variable' (Van der Ploeg 1994: p. 8).

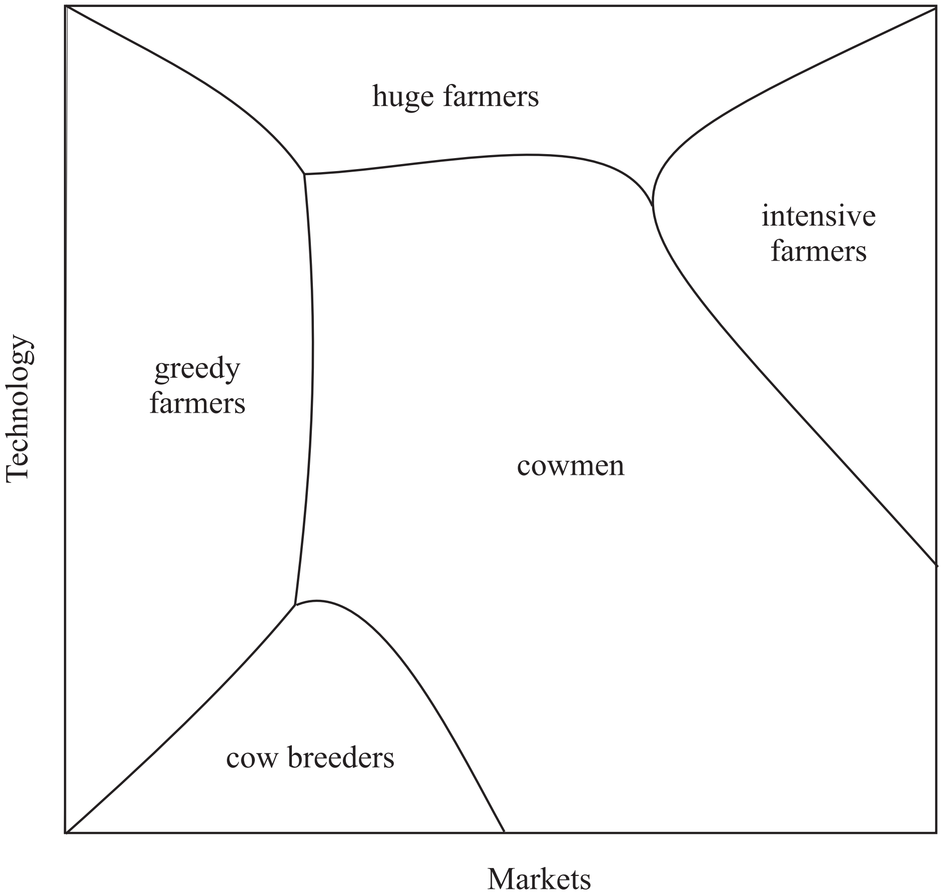
Based on a study in Friesland (Van der Ploeg *et al.* 1992), Van der Ploeg created a diagram of the diversity in styles of farming on Friesian dairy farms (Figure 1.7).

As Van der Ploeg explained in his study, a position in the orientation toward 'Market' is not necessarily a trade contact – it is about mobilisation of resources in a broad sense. It might also refer to the structuralisation of farm activities in relation to business matters, like the organisation of farm labour and succession.

Yet in his studies Van der Ploeg focussed particularly on the trade aspect (supplies and sales) in the business network. In the current study the emphasis is both the physical transformations on the farm and on external contacts: in trade and otherwise. Therefore the reference 'orientation on Markets' is replaced by 'orientation on Business'.

Orientation on farm business is the organisation of the mobilisation of labour and the involvement of capital. Both labour and capital can either be mobilised from the farm itself or through market integration. Labour can be mobilised from family labour or through labour markets. Capital can be mobilised from savings or through loans and credits.
Feedstuff can be produced on the farm or purchased from feedstuff suppliers.
Maiden sows can be produced and reared on the farm or bought from a maiden sow producer. So the horizontal axis reflect both an orientation on the organisation of physical transformations on the farm and an orientation on markets.

Figure 1.7 Diagram of styles of farming on Friesian dairy farms in relation to Technology and Markets (source: Van der Ploeg 1994: p.20)



Van der Ploeg did not specify the product of Technology and Business (Markets) in a general term, though he did mention the term ‘capacity’ or ‘capability’ in connection to expressions ending with *...ship* – for example entrepreneurship and craftsmanship.

In the current study it was convenient to have a specification for the farmers’ way of dealing with capacity, because such a specification could be defined as analogous to Productivity: as the product of Technology and Business. In analogy to Productivity, which represents the quantitative product of Intensity and Scale, the term ‘Capacity’ is now specified as the qualitative product of Technology and Business.

Capacity is a balance that describes business qualities in connection to styles of farming. It is the outcome of the combination of farmers’ goals in their orientation toward the purpose of Technology and their structuralisation of Business:

Capacity = Technology * Business

Styles of farming can thus be presented in a diagram reflecting the farmers’ orientations toward Technology and Business. The dimensions reflect differences in qualitative values.

1.2.8 Analytical Framework for Styles of Farming (Initial Study)

In the work of Van der Ploeg and Long (1994), diversity in styles of farming played a key role. In a study about dairy farms in Friesland, styles of farming were found in the context of Technology and Markets (Van der Ploeg 1994). In a study about dairy production in the Veenweiden area in South Holland styles of farming were found in the context of Intensity and Scale (Roep and De Bruin 1994). According to Van der Ploeg the results of the two studies were largely identical, although they were shown in different ways. In the study of Van der Ploeg the results were shown as contours of fields in which the styles of farming were orientations towards the dimensions Technology and Market (Figure 1.7). In the study of Roep and De Bruin the results were shown as positions of classes of farms in the dimensions Intensity and Scale.

In my own initial study, I diagrammed the resulting styles of farming both as stylised foundations in a context of Capacity, Technology and Business (Figure 1.8) and as data in a context of Productivity, Intensity and Scale (Figure 1.9). Four styles of farming were found in that study: entrepreneur (E), craftsman (C), inheritor (H) and tender (T). The styles of farming were clearly presented in both contexts (Commandeur 1998).

The presentation (Figure 1.8) of styles of farming in the design Capacity, Technology and Business suggested that the four styles of farming did not contrast equally in each direction. Entrepreneurs and craftsmen shared a focus on competition and achievements (called a ‘sphere of competition’), and Inheritors and Tenders shared a focus on needs and continuation of farming (called a ‘sphere of care’). The contrast between these two spheres was more pronounced than the contrasts within the spheres. In summary, the following contrasts and similarities were found:

a) *Within the sphere of competition: evaluation was based on achievements, but*
- Entrepreneurs emphasised financial balance, while
- Craftsmen emphasised production results.

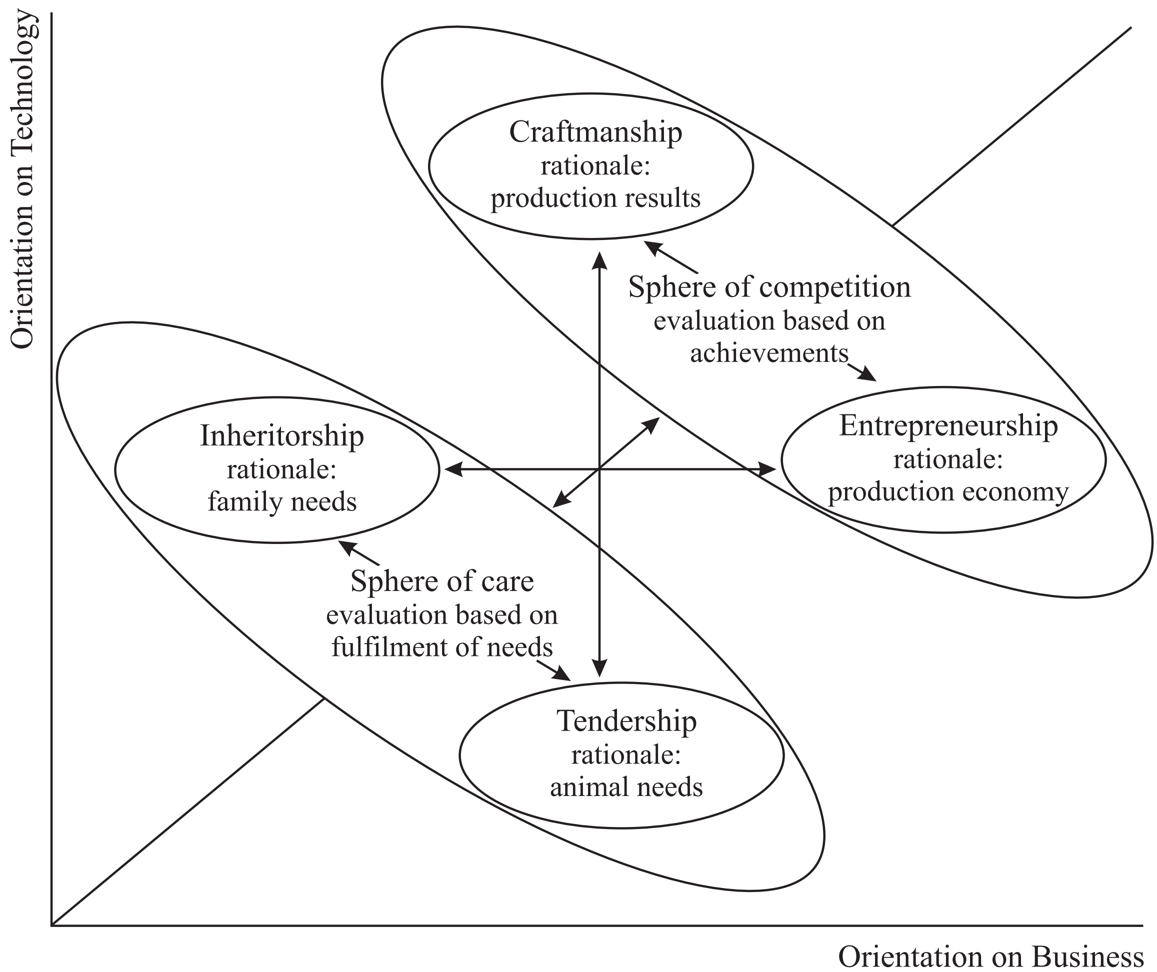
b) *Within the sphere of care: evaluation was based on needs, but*
- Inheritors emphasised the family’s needs, while
- Tenders emphasised the animals’ needs

In the initial study the differences in contexts were not further specified. To avoid confusion in the evaluative study, the following specifications were given to refer to the contrasts among styles of farming:

- ambition refers to the contrasts between spheres
- rationale refers to the contrasts within ambition.

The presentation of styles of farming within a system of Productivity, Intensity and Scale (Figure 1.9) suggested that there might be interactions between Productivity, Intensity and/or Scale. The simplest regression that is suggested is a linear regression between Intensity and Scale – resulting in Productivity with an angle ($\alpha > 0$). In addition interactions between Productivity, Intensity and/or Scale, which indicate different levels of Productivity were differentiated from those that indicate different levels or Intensity and/or Scale at equal levels of Productivity.

Figure 1.8 Stylised presentation of styles of farming in a context of Technology and Business. (Technology: 'animal science dimension', Business: 'farm economy dimension'). Styles of farming appear in contrasting spheres and in contrasting positions within different spheres. (Source: Commandeur 1998)

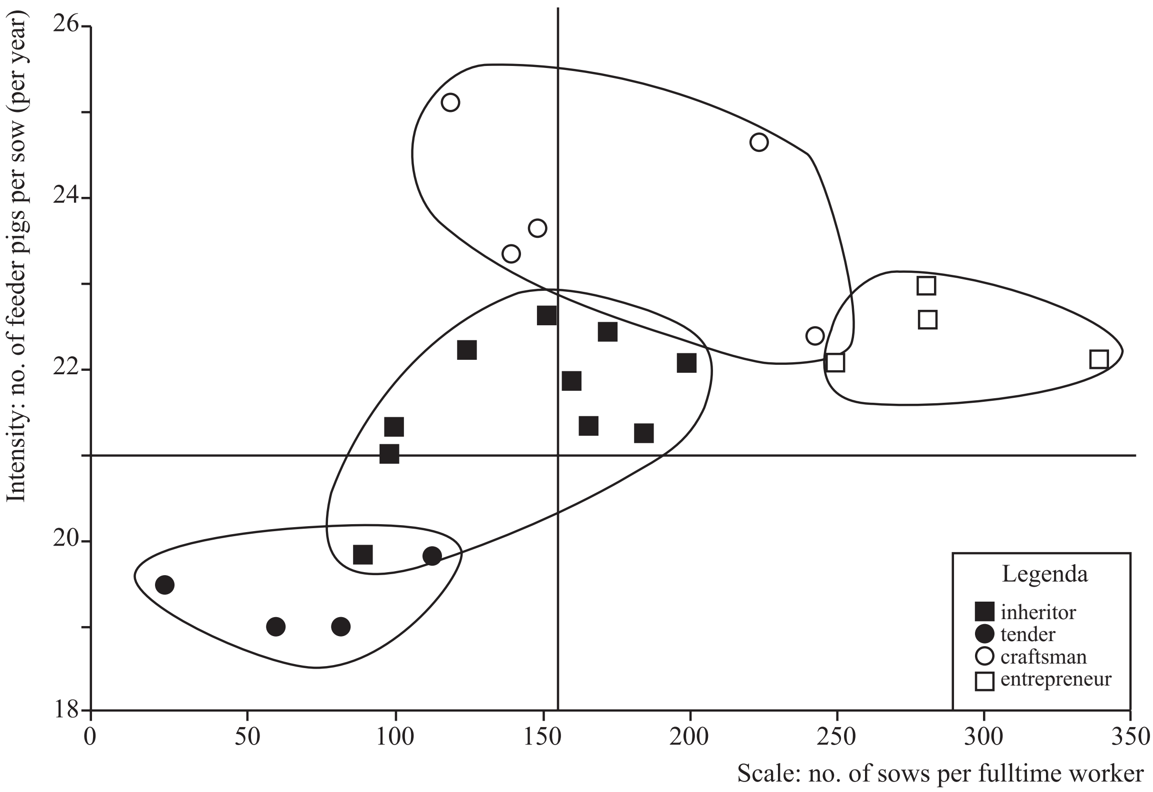


Styles of farming can thus be presented both in a qualitative design Capacity, Technology and Business and in a quantitative system of Productivity, Intensity and Scale. The presentations show similarities, but they reflect different aspects of the styles of farming. In the current evaluative study, the contrasts among spheres are called 'ambitions', and the contrasts within foundations (within spheres) are called 'rationales'. In the system of Productivity, Intensity and Scale explicit and implicit interactions between the dimensions are suggested.

1.2.9 Scopes of Processes and Constructions

In the initial study various types of contrasts were found in farming practices: processes, constructions and developments in styles of farming. In the current study the focus is on processes and constructions.

Figure 1.9 Styles of farming in a context of Intensity (in: produced feeder pigs per sow per year) and Scale (in: number of sows per unit of full-time farm labour). (Source: Commandeur 1998).



Processes are…
factors of farming in which one can become involved. They can be influenced, led, guided, controlled, or even blocked. The division of tasks on a farm is considered a process, as well as farm succession and the social interactions in the region, and even a person's thoughts.

Constructions are…
factors that can be created, defined, specified, reconstructed or destroyed. Constructions can be material, like buildings and equipment. But management constructions for farm work or for market network contacts are also constructions, and the definition and specification of farm indicators are also constructions.

In the initial study the differentiation of styles of farming was supported by differences related to the processes and constructions (Table 1.1).

Table 1.1 Interactions of domains and the issues related to these interactions that were approached differently among various styles of farming. The table is based on the initial study

Interactions	*Issues in farming practices related to diversity in approaches*
Processes:	
Social network	Neighbourhood organisations, farmers' organisation, study clubs
Physical environment	Landscape, infrastructure, nature and wildlife, government restrictions
Constructions:	
Physical / material	Land availability, stables, feedstuff, manure,
Production chain networks	Extension service

Scope of Processes

In the initial study regional differences were studied in connection to the focus on processes. The diversity in styles of farming in the initial study showed differences among the various regions in The Netherlands. Particularly the regional contrasts between the two concentration regions for pig farming, in the east (Twente and The Achterhoek) and in the south-east (east Brabant and north Limburg), were pronounced. The main difference seemed to be between the regional averages. The concentration area for pig farming in the south was much more oriented on issues related to business expansion and market orientation than the area in the east. The diversity in styles of farming in comparison to the separate regional averages was similar.

As far as attachment to the region is concerned, in both areas the farmers felt linked to where they lived. They were not keen on leaving both for cultural reasons and for reasons of family tradition. Yet there were historical differences in farmers' migration processes between the east and the south. The east is a very old agricultural area, where periods of influx and outflow of farmers (in the last few centuries particularly to the U.S.A.) alternated in history. The south is a relatively newly cultivated area, where farms started only about a hundred years ago – which represents only three to four generations of farm succession. This observation in the south of the country is consistent with findings at global scale: farmers are more oriented on farm expansion and market and have higher levels of productivity in (relatively) newly colonised areas, like in the Americas, Australia and New Zealand (Hayami and Ruttan 1971; 1985).

These differences between the south and the east were also associated with differences in specialisation. In the south of the Netherlands the most common farm organisation was a combination of pig production and fattening – because when these farms started there was usually no extra land available. In the east mixed farms are more common – particularly mixes of pig farming with dairy production in combination with the availability of 10 to 25 hectares of grassland.

Scope of Constructions

As far as the requirement for land is concerned, the opinions of the farmers in the initial study differed. Some discussed the value of land as life insurance or as a source for the disposal of manure. On average the farmers did not think that land was important for pig producers as such, but it was thought to be important for keeping flexible differentiations in farming strategies for mixed farmers.

Regarding equipment in the stables, five topics were mentioned persistently in the interviews:

- the floor: concrete, slatted, smooth or convex
- the ventilation system: mechanic, shaft, bunk feeder, or turbo ventilation
- the feedstuff supply equipment in the stables
- the walking distances for the farmer within and between stables
- the overview and control of the animals

The type of equipment farmers had, seemed mainly dependent on the farmers' interest in advanced investments and the advice of the general extension service (DLV) – which until 1990 was the government extension service. Entrepreneurs and craftsmen had advanced equipment, and they emphasised the importance of a short walking distances and a good control overview of the animals.

Inheritors and tenders had less advanced equipment (often due to a variety of older and new stables and equipment), longer walking distances and less overview of the animals. In connection to the different housing systems and stable equipment, the practices for animal care also differed substantially among the farmers.

Despite the considerable differences found in stables and equipment (and consequently in animal care), little variety was found in external feedstuff supply management. Farmers tended to have long-standing relations with the feedstuff companies. They trusted them to provide good and reliable feedstuff. They also expected the feedstuff companies to offer sound advice whenever a problem occurred related to nutrition – either an on-farm problem or one induced through government regulations on mineral and manure management.

As far as manure was concerned, all the farmers in the interviews were able to meet government regulations for manure disposal. Yet some of the farmers were unhappy with the regulations and strongly opposed them. They found them unfair, unpractical, not good for farm production and/or not good for the soil.

With regard to business and social networks, the farmers were very active. The business networks were farmers' organisations, study clubs, advice councils for farm research, animal breeding organisations, farm extension and regional and government policy developments. The social networks were school boards, church groups, neighbourhood organisations, political parties, nature conservation organisations, hunting clubs, sports clubs, etc. The main difference among styles of farming was that inheritors and tenders were involved in more and a greater variety of organisations.

Entrepreneurs and craftsmen were more involved in business-associated organisations and, particular for entrepreneurs, in influential positions (directive boards) and politics.

Switching between Styles of Farming

Farmers did not easily switch between styles of farming and switching is not a fast process. This was concluded from the initial study. Yet high-impact developments can incite farmers to switch their styles of farming – and styles of farming may change in appearance. The most favoured moment for switching styles of farming seems to be at the time of farm succession to the new generation. In the initial study three historical high-impact events were mentioned that were related to switches in styles of farming:

1. The invention of concrete and slatted floors in the 1960s allowed farmers to keep pigs without straw in hygienic conditions, which considerably reduced the amount and physical severity of the labour required.
2. Farm expansion and specialisation in the 1970s also reduced the workload and changed the type of work required. For a while some farmers were busier building stables and managing expansion than with farming.
3. A split is currently emerging between the mainstream group of farmers focussed on further specialisation and expansion, and an alternative group focussed on free range and organic farming and on-farm diversification of business activities (like farm sales and on-farm food processing, nature care, social care, and activities for tourism and recreation). Government regulations for manure management and animal welfare, as well as subsidies for diversification of farm activities and organic farming since the mid-1980s support this change in styles of farming.

Socio-Material Co-Production and Actor-Network Interrelations

In the current study the emphasis is on the scope of processes and the scope of constructions and not on the interrelations between processes and constructions. The scope of socio-material co-production is hardly covered, nor is the interrelation between farmers and the technical and administrative task environment (TATE). To extend this study to include these interrelations, an additional questionnaire would have to be developed. Questions would have to be included about the interactions between the farmer and the animals: how do farmers handle the animals in daily care taking activities, during the transfer from one housing system to another; how do the farmers assist in farrowing, how do they prepare the animals for transport etc. Additional questions would have to be asked about the attitude of the farmer with respect to the relation between pig production and other farm production branches. For example: if time management is a problem, which farm branch or which type of problems is given priority by the farmer? Questions would also have to be included about how much confidence the farmers have in indicators from the management support provider and about the value of the advice of the various extension services.

To extend the research to specifically include the interrelations with TATE, questions would have to be added related to the farmers' social networks. The networks would have to be identified, for example, determine the characteristics of the relations (trade, advice, support, control, subsidy, etc.), and the backgrounds of the contact persons (family, old schoolmates or other people who speak the same dialect, formal contacts with unfamiliar people, etc.).

It was decided that including these topics would be too much for one questionnaire. So the socio-material approach and the 'actor-network interrelations' can still be (hopefully) addressed in follow-up research.

1.3 Hypothesis

Styles of farming can be identified through a sociological analysis of contrasts in farming practices and perceptions about farming, and through a factor analysis of parameters. Which method is chosen depends on the methodological lay out of the research.

In qualitative research, farmers are interviewed about the relevant processes and constructions concerning the objective of the research. The answers are analysed for mutual contrasts. Based on these mutual contrasts farmers are positioned (depending on their goals) within a space created by Capacity, Technology and Business. Their positions in relation to orientations toward Technology or Business reveal interactions. These interactions are the ambitions and rationales of the styles of farming. This type of research can be supported by quantitative information, for example about Productivity, Intensity and Scale.

In a quantitative research farmers are confronted with questionnaires concerning the objective of the research, and requests for data about production results – particularly about Productivity, Intensity and Scale. Productivity, Intensity, Scale and interrelated parameters from the questionnaire are analysed for coherence in values through computerised analysis. In a factor analysis results in components reflect interactions between Intensity and Scale. These interactions are the ambitions and rationales, which can be related to differences in styles of farming. This type of research can be supported by qualitative information, for example about perceptions about farming.

The similarity between the research approaches is found in the similarity in the ambitions and rationales. The classification of specific farms might differ slightly, but the main characteristics of the styles of farming are similar in the two approaches.

Log-transformation of Productivity, Intensity and Scale simplifies measurements. After log-transformation deviations from the population average can be measured on straight lines. This also reduces the representation of ambitions and rationales to simple regressions.

The hypothesis for this study is that the presentation of styles of farming in a space defined by Capacity, Technology and Business is interchangeable with their representation in a system defined by Productivity, Intensity and Scale. Ambitions and rationales from the space defined by Capacity, Technology and Business can be transformed into similar formations of interactions in the system defined by Productivity, Intensity and/or Scale – and vice versa. The mathematical implications of the hypothesis are described in Appendix A.

The hypothesis is tested in this thesis. The initial study was a qualitative survey, with open interviews. Styles of farming were found by analysing contrasts in the answers of the farmers. The results led to the stylised space defined by contrasting styles of farming in the dimensions Technology and Business. Data about Productivity, Intensity and Scale of the farms supported the results.

In the subsequent study a survey was conducted based on questionnaires, which were designed for quantitative analysis. The preliminary analysis of the response, however, was done as a qualitative analysis, in order to compare its results with those of the initial study.

The factor analysis of the questionnaire focussed on Productivity, Intensity and Scale. In this analysis, ambition and rationale were specified in terms of interactions between Productivity, Intensity and/or Scale. Styles of farming were specified as contrasts in ambitions and rationales. Next, the styles of farming derived from the factor analysis were compared with the results of the preliminary analysis and the initial study. The classification of farms into styles of farming was supported by contrasting data on other parameters and by contrasts in farmers' comments.

For the evaluation of the hypothesis it is important that Productivity, Intensity and Scale are clearly defined, as presented below. In addition ambition and rationale are defined in terms of Productivity, Intensity and/or Scale.

1.3.1 Definition of Productivity, Intensity and Scale

The basic formula for Productivity (Figure 1.10; Hayami and Ruttan 1971) is:

'production per unit of labour = production per hectare* hectare per unit of labour', or: Productivity = Intensity * Scale.

Thus:

$$Y/L = Y/A * A/L \qquad (1)$$

Where:
Y = Production
L = Labour
A = Acreage (in hectares of farmland)
Y/L = Productivity
Y/A= Intensity
A/L = Scale

Since pig production in The Netherlands is independent of the available acreage of land, the formula is adjusted to (see also Chapter 2 and Appendix B):

$$Y/L = Y/N * N/L \qquad (2)$$

Where:
N = Sows (in number of productive animals)
In log-transformation the Productivity curve is a straight line (Figure 1.11):

$$\log(Y/L) = \log(Y/N) + \log(N/L) \qquad (3)$$

Productivity as the mathematical product of Intensity and Scale is thus a simple mathematical formula: $Y/L = Y/N * N/L$ or: $\log(Y/L) = \log(Y/N) + \log(N/L)$.

1.3.2 Interactions, Ambition and Rationale

There are three basic types of interactions possible between Productivity, Intensity and/or Scale:

1 Straight interaction between Intensity and Scale – reflecting dependency between the dimensions. This is the interaction within Productivity. It is shown as a linear regression of log (Intensity) to log (Scale).

2 Interactions between Productivity, Intensity and Scale reflecting different levels of Productivity. If shown in a figure, this interaction leads away from the productivity curve of the average population. If coherence between farm values of Productivity, Intensity and Scale can be revealed, this interaction can be shown. This interaction is called ambition in the system of Productivity, Intensity and Scale.

3 Interactions between Productivity, Intensity or Scale reflecting the same level of Productivity at different combinations of Intensity or Scale. If shown in a figure, this interaction leads along or parallel to the productivity curve of the average population. If coherence between farm values of Productivity, Intensity or Scale (but not both) can be revealed, this interaction can be shown. This interaction is called rationale in the system of Productivity, Intensity and Scale.

Figure 1.10 Theoretical example of a Productivity curve (Productivity = Intensity * Scale) represented as non-log-transformed average values of a population. The dot represents the population mean (Q) (source: Hayami and Ruttan 1971).

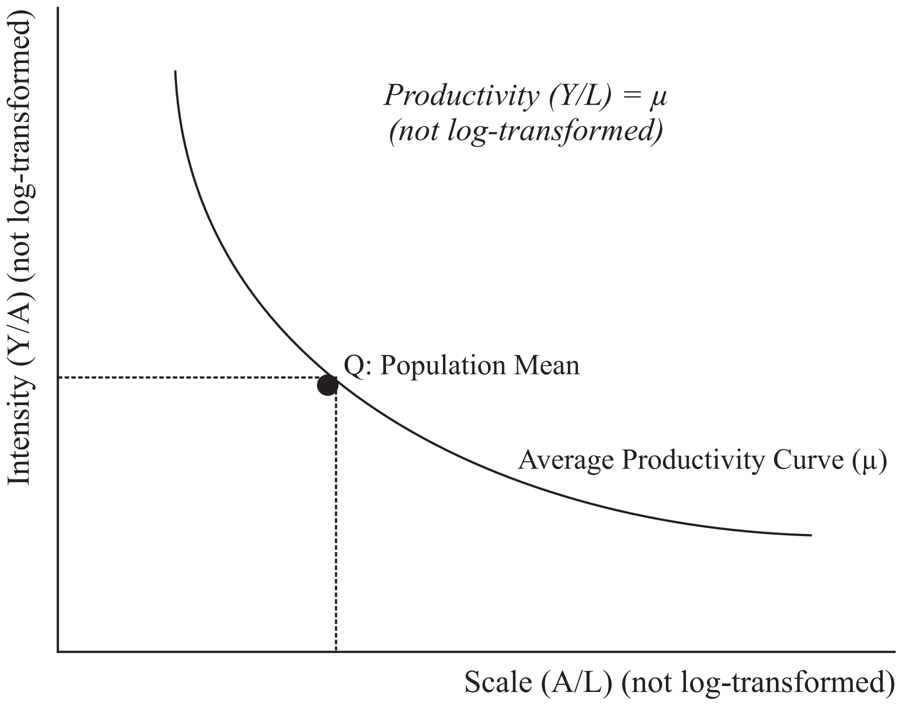
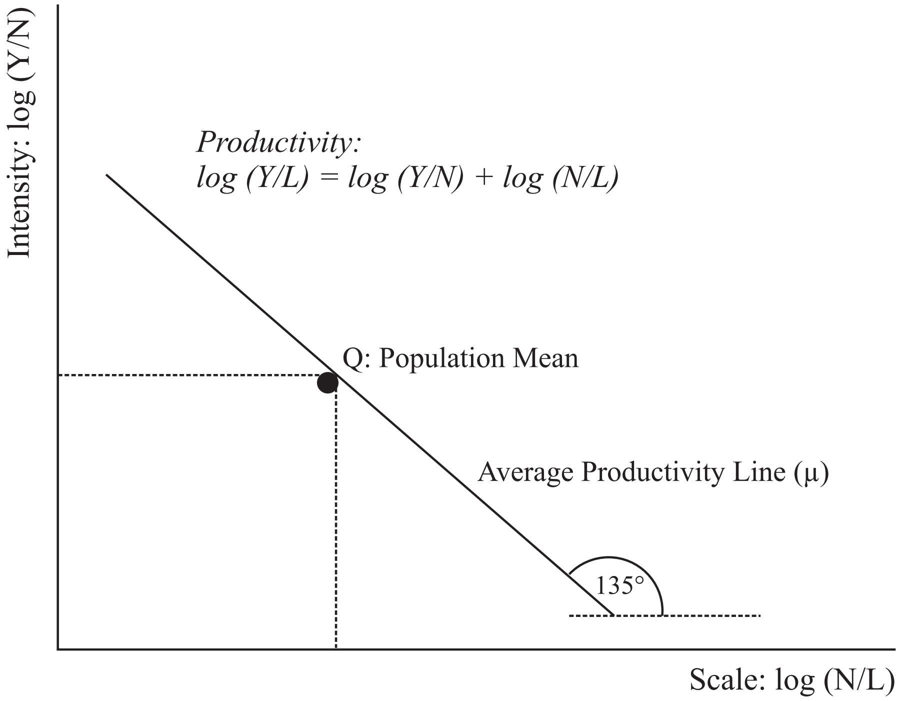


Figure 1.11 Theoretical example of a log Productivity line [log (Productivity) = log (Intensity) + log (Scale)] represented as average values of a population. The dot represents the population mean (Q).



For the variables there are a few possibilities (Figures 1.12 and 1.13):

(1) ambition: a coherence in parameters determining differences in Productivity in an angle away from the Productivity curve of the population average, through:
   a) positive relation involving both Intensity and Scale: I + S +
   b) negative relation involving both Intensity and Scale: I – S –
   This relation is called a relation to Productivity: Intensity and Scale

(2) rationale: a coherence in parameters determining Productivity at different levels of Intensity and Scale proceeding along or parallel to the Productivity curve of the population average, through:
   c) positive relation to Intensity and neutral or negative to Scale: I +S -/o
   d) neutral or negative relation to Intensity and positive to Scale: I -/o S +

This relation is called a relation to Productivity: Intensity or Scale.
Through log-transformations of Productivity, Intensity and Scale the measurements can be done on straight lines, drawn at 135^o and 45^o and to Intensity and Scale (Figure 1.13).

1.3.3 Parameters Related to Processes and Constructions

Processes emerge. They can be directed, supported, deviated, blocked, etc. They occur among distinct positions: for example among people on the farm, in the region, on a market, in a cultural perspective, etc.. And they are reflected in perceptions of processes. The current study included questions concerning pig production processes that were socially directed:

- on the farm
- in the regional and cultural environment
- in farmers' perceptions of pig production
- in a change in external circumstances.

Constructions can be identified. Constructions can be material, like buildings and machines, but also symbolic, like management structures on the farm and in the business network that surrounds the farming business. In addition constructions can be virtual, like definitions of notions and concepts, or specifications of indicators. Cultural constructions can be identified as repertory patterns. The current study included questions concerning constructions in pig production related to the following topics:

- buildings and equipment
- management networks and handling of feedstuff, breeding, manure and pig sales
- production and economic farm indicators
- farmers' attitudes to the data and their communication network for indicators

Figure 1.12 Theoretical example of a Productivity curve (Productivity = Intensity * Scale) represented as non-log-transformed average values of a population. The dot represents the population mean (Q). Ambition is the deviation from the productivity curve caused by parameters that are directly related to Productivity: Intensity <u>and</u> Scale. Rationale is the deviation along (or parallel to) the productivity curve caused by parameters that are directly related to Productivity: Intensity <u>or</u> Scale.

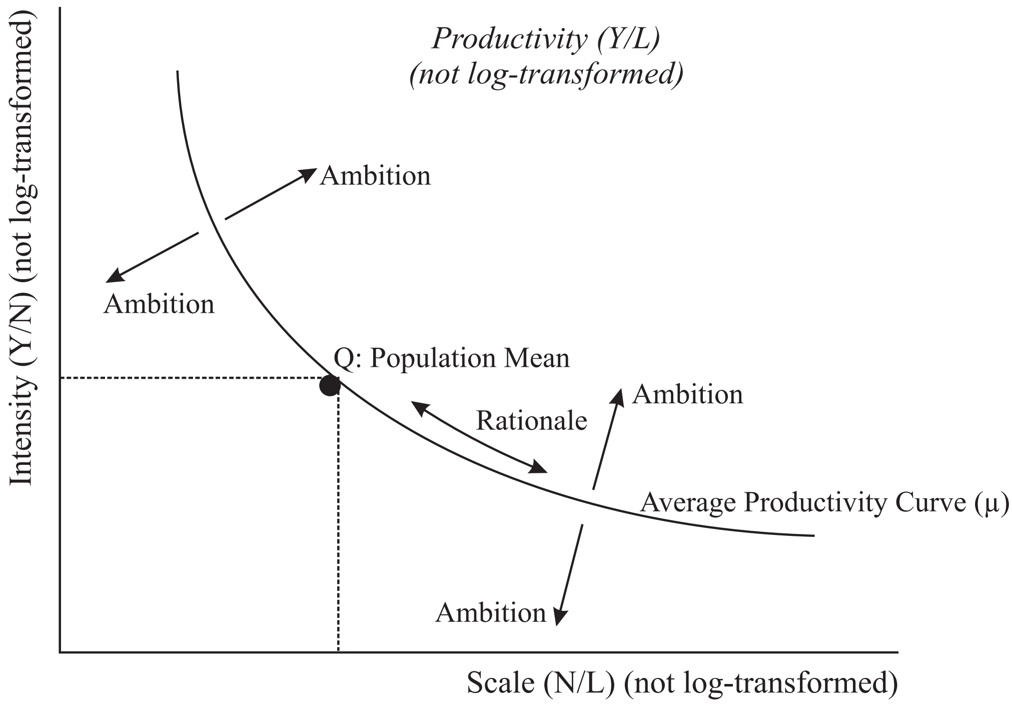
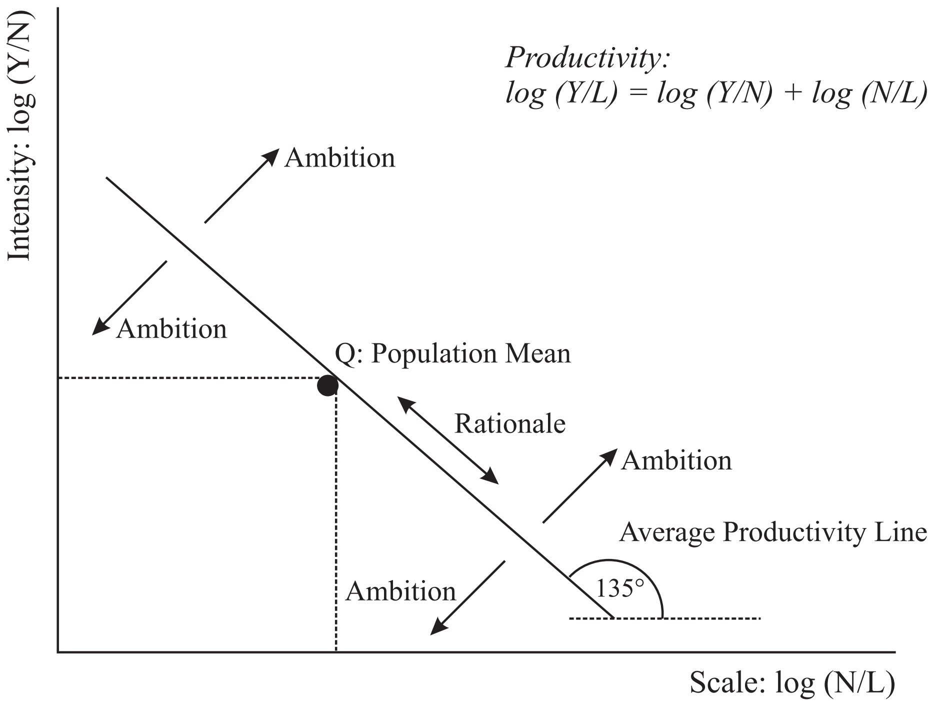


Figure 1.13 Theoretical example of a log Productivity line [log (Productivity) = log (Intensity) + log (Scale)] represented as average values of a population. The dot represents the population mean (Q). Ambition is the deviation from the productivity curve caused by parameters that are directly related to Productivity: Intensity <u>and</u> Scale. Rationale is the deviation along (or parallel to) the productivity curve caused by parameters that are directly related to Productivity: Intensity <u>or</u> Scale.



All these aspects had already been covered in the open interviews in the initial study, which served as a reference. Based on the initial interviews and farmers' responses, the questions for the questionnaire were constructed. It is assumed that together they form a balanced set of relevant questions covering pig production practices.

1.3.4 Classifying Styles of Farming

In a system of Productivity, Intensity and Scale styles of farming are found as classes of farms with similar values on specific combinations of components – in particular the components that reflect ambition(s) and rationale(s).

The basis for the classification of farms is to identify coherent practices in farming as a 'variety'. The current study was expected to give more detailed information on varieties in farming practices than the initial study on which it was based. It was not expected that it would add whole new varieties.

The criteria for classification were therefore:

1 contrasts in values on specific combinations of components

2 the outlines for styles of farming derived from the initial study

Outline of the Thesis

This thesis focusses primarily on the second, explanatory study, and it is organised as follows:

1 Introduction and Hypothesis

After the introduction, Chapter 1 presents a methodological hypothesis developed for the factor analysis of the classification of farms into styles of farming. In the factor analysis styles of farming were specified as differences in Productivity, Intensity and Scale, and other parameters correlated to Productivity, Intensity and/or Scale. These formed the frame of the criteria for classification. The frame consisted of two components: the ambition of farmers and their rationales.

2 Understanding Styles of Farming

The initial study introduced above is summarised in Chapter 2 to identify relevant aspects for the evaluative study. In particular, a motivation is given for including various questions in the questionnaire and for the division of issues into processes and constructions.

Literature of rural sociology provided a frame of styles of farming consisting of two components – ambitions and rationales. In the literature, support was found for the techno-sociological approach of the explanatory analysis in terms of processes and constructions.

3 Materials and Methods

The survey in the second, explanatory study focussed on the production of feeder pigs (25 kg) ready for fattening, as they are commercially available and priced on the standard bulk market in Europe. The survey was done on farms in the concentration area for pig farming in the east of The Netherlands: Twente and The Achterhoek. All selected farmers received regular management support service in the form of (at least) data information about production indicators. The farmers were approached with a questionnaire that was based on the open interviews in the initial study.

The answers in the questionnaire were transformed (as far as possible) into parameters for factor analysis. The components that resulted from the factor analysis were divided into three types. Those with correlations to Productivity, Intensity <u>and</u> Scale (ambition), those with correlations to Productivity, Intensity <u>or</u> Scale (rationales), and those without correlations to Productivity, Intensity and/or Scale.

Differences in farm values on the components for ambition and rationale (the frame) determined the specification of five styles of farming.

4 Classification and Identification

In the current study, farmers on 82 farms were interviewed based on a questionnaire. Management support data was made available for 70 of the farms.

From the preliminary analysis the following styles of farming were distinguished: entrepreneur, craftsman, inheritor, and shifter.

Correlations were found between the classifications defined in a preliminary analysis for styles of farming and in the factor analysis related to Productivity, Intensity and Scale.

In the evaluative study (after factor analysis) five styles of farming were specified: entrepreneur (E), craftsman (C), steward (W), stockman (K), and shifter (F). These styles of farming differed in the goals in farming, both in the goals in pig production and in the goals for farm continuity. These goals were embedded in the orientation on Technology and Business. In the orientation on Technology four different goals were found: (1) pigs as objectives, (2) pigs as objects of labour, (3) pig production as a means of existence in addition to other means, and (4) enjoyment of pig production. In the orientation on Business three goals were found: (1) farming as a means to other goals, (2) farm continuity, and (3) enjoyment of farm benefits.

5 Processes

The farming strategies for pig production are shown in the context of farm size, other activities on the farm, the formal farm organisation, labour organisation and income, and distribution of labour over family members.
Regional integration of the farmers is shown in the historical context of the farm, the farmers' satisfaction with the farm, the expected economic developments, their appreciation of the social community, the scenery and the infrastructure in the area, the societal values of the farm.
Cultural repertoires in pig production are shown through twelve sets of statements about issues concerning pig production. The issues that were covered by the statements were: the joy of pig farming, goals and strategies, farm automation, time and labour management, investments and labour inputs, entrepreneurship and craftsmanship, the position of women, the ownership of land, environmental protection and manure, farm hygiene, animal welfare and consumers.
The farmers' market outlook was studied through questions about fluctuations in the price of pigs – which had occurred since the end of the swine fever outbreak.

6 Constructions

Farmers' perspectives related to the supporting constructions, like housing and equipment in pig production are shown. The supporting constructions of management and networks are described through the feedstuff supply and manure disposal, the strategies in animal breeding and animal health care, and the market contacts.
The farmers' perspectives on production and farm economy are shown by analysing data on feeder pig production and production intensity, by the inputs and outputs for pig production and by the financial costs and balance. The trends and fluctuations over 1995 – 1997 are also discussed.
The farmers' motives for having management support are discussed, their perceptions of the values of the indicators, their participation in management support and the way they discuss the management support data.
The last section focusses on the principles of farmers in pig production. It covers the principles about health and hygiene, and about sow culling and replacement. In addition the role of religion in pig production is discussed

7 Summary and Conclusions

The main issues of the chapters are summarised and general conclusions are drawn about in the study: the methodology, foundation, ambition and rationale, the impact of the study. In addition some special issues of interest are summarised.

Appendixes

A mathematical implications of the hypothesis.
B This chapter also discusses the nature of Productivity, Intensity and Scale in terms of units. Productivity should actually be without a unit and express a balance between Intensity and Scale. This is explained against the background of pigs as the prime objects of labour – instead of land (acreage).
C The literature of livestock farming systems distinguishes between hard, soft and complex systems. The concept of styles of farming fits in with the approach of both soft and

complex systems. But the best fit was found with the approach of living systems.

Notes

1 Participatory study: study in which the researcher is involved with the target group for the implementation of changes on issues that are of concern to the target group.

2 It is notable that these scientists all had a degree in a technical field and a long-standing career before conducting their techno-sociological research, and that Wageningen University was able to facilitate these unconventional initiatives. Three research projects recently resulted in Ph.D.-theses. Gerritsen (2002) conducted research on farming and forest conservation in Mexico. Van den Dries (2002) completed a research project about farming and water irrigation in Portugal. Baars (2002) did research on the production of grassland and grass-clover mixtures in animal production systems in The Netherlands, in the ideology of biodynamic farming.

3 In Frouws *et al.* (1996) an overview is given of the government regulations that were considered by farmers to be threatening and inadequate.

4 Personal communication ir. Sjako Dekkers (1998) director of SIVA Software BV

5 In 1997/1998 there were 2,660 farms with pig production units in The Netherlands; 2,060 of these farms had both a pig production and a fattening unit ('closed farming systems') and 1,930 farms had only pig fattening units.(source: http://www.lei.dlo.nl/binternet/showtable.exe)

6 It would have been interesting to do the survey in two different areas, so that differences in regional culture could have been included in the study. But there were not enough funds available to conduct the survey in more than one area. Neither the Ministry of Agriculture nor the supply and marketing industries for pigs and pork provided a budget for this research. The research was found to be too unconventional and/or too fundamental to have direct practical implementations. The Rural Sociology Group of Wageningen University provided the funding required to conduct the interviews.

7 see: http://www.let.leidenuniv.nl/history/rtg/res1/mansholt.html

8 The most important regulation was the requirement of group housing for barren and gestating sows by the year 2008. In 2003 the period for the implementation of group housing was extended to 2013.

9 see: http://www.minlnv.nl/infomart/parlemnt/2002/par02400.htm

10 see: http://www.historischcentrumoverijssel.nl/overijssel/leenrep/inleiding/Ivb11.htm

11 'Industrialised farming' refers to farming in which the main resources for production (reproduction materials – plants and animals, animal feedstuff, etc.) are purchased at supply markets and are not produced on the farm.

12 see: http://www.meddo.net/Algemeen/geschiedenis.htm

13 W. Arthur Lewis (1954) is considered to be the founder of dynamic dualism. His work is still very topical (Van der Ploeg 1991, Hayami & Ruttan 1985).

14 Original lines by Hofstee (1946): '*Het is een bekend sociaal verschijnsel, dat wanneer in een bepaalde samenleving een zekere levensvorm door de heerschende groep is aanvaard, de rest zich hieraan, juist terwille van het sociale prestige, niet meer kan en wil onttrekken. Deze levensvorm krijgt dan een min of meer dwingend karakter, ze wordt een levensstijl. Ook het economisch leven, zelfs in onze zgn. individualistische maatschappij, onttrekt zich niet aan een dergelijke stijlvorming. In iedere min of meer samenhangende groep van personen, die eenzelfde bedrijf uitoefenen, ontstaat een algemeen als normaal aanvaarde opvatting over de wijze van bedrijfsvoering, er ontstaat, wat ik elders reeds eerder [in 1943, in een niet nader getraceerd stuk – mc] heb aangeduid als een bedrijfsstijl.* '

15 Hofstee uses one word in Dutch: *bedrijfsstijl (see also endnote 1)*

2 Understanding Styles of Farming

The objective of this chapter is to provide an understanding of the concept of styles of farming. It shows how the model for the current study was developed based on literature and the initial study (Section 2.1). Background literature is also given to position the study in line with approaches developed at the graduate schools of rural sociology and animal science at Wageningen University. In addition, the context is given for understanding the styles of farming, which involves on the one hand Productivity, Intensity and Scale, and on the other hand Capacity, Technology and Business (Section 2.2).

In developing the hypothesis of this thesis, I concentrated on linking the concept of styles of farming, as described by Hofstee and Van der Ploeg and others, to the production formula about farm economy developed by Hayami and Ruttan (Section 2.3). The hypothesis is also rooted in developments in farming systems approaches as recently overviewed by Van der Zijpp (2001). This linkage led to the distinction between processes and constructions in farming practices, for analysing problems in pig production.

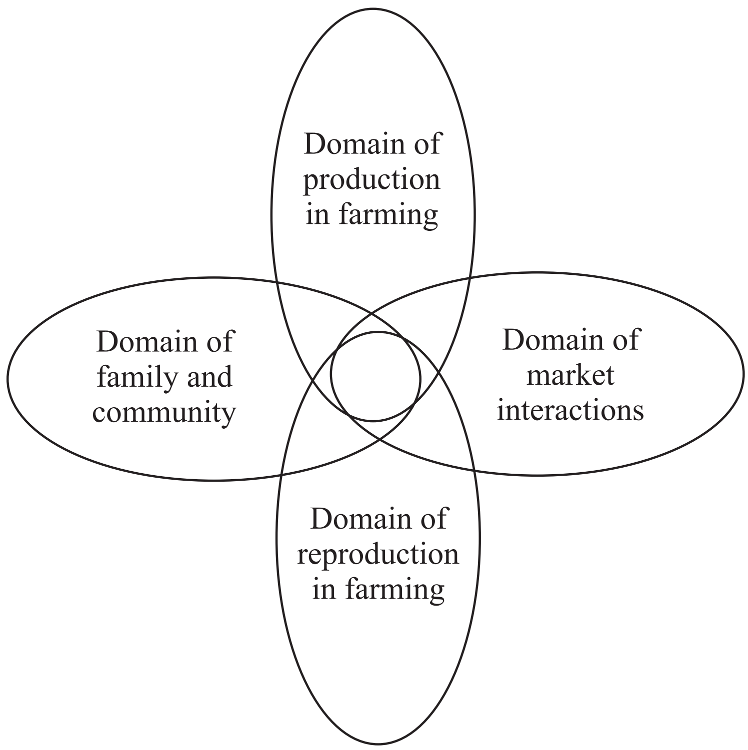
Productivity expresses a balance between Intensity and Scale (see Chapter 1). The fundamental characteristics of this balance will be also discussed in this chapter. One of these is the industrialisation of pig farming: the shift from using land as the object of labour to producing animals, and ultimately to using only animals as the objects of labour. (For a technical explanation see: Appendix B).

2.1 Context of the Model: Domains and Design

In my initial study conducted in 1996 (Commandeur 1998), 23 pig producers throughout the country were approached for open interviews. An important factor in selecting these particular farmers was that they were known to be able to express themselves well on the issue of their farming practices. Another selection criterion was that the whole variety of farming practices in Dutch pig production should be covered in the study. The farms varied from very small (30 sows) to very large (1500 sows), and from very intensive (25 feeder pigs per sow [per year]) to extensive in organic farming (19 feeder pigs per sow [per year]). The farmers also varied in their involvement with external activities, from having a very limited number of activities, to having a large variety of social activities including sports, church, culture and farmer and community organisations. The farms were headed by a husband or wife alone, by the couple as a team or by a family unit together.

The themes covered in the interviews were related to the four basic domains that are co-ordinated in (family) farming (Figure 2.1).

Figure 2.1 The four domains that are co-ordinated in (family) farming. (Source: Frouws and Van der Ploeg 1988)



In the open interviews, as much as possible, was recorded about the farmers' attitudes to farming practices. In reference to this model, the themes covered in the questions were about:

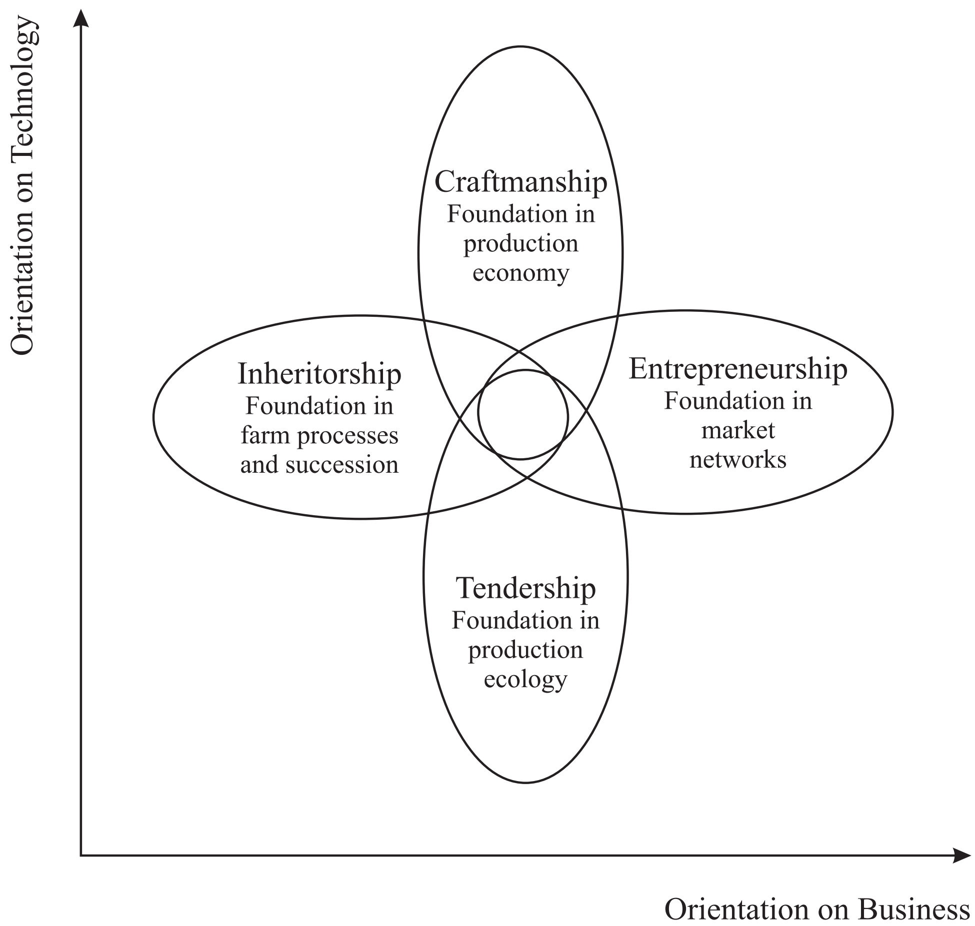
- farmers' perceptions of farming practices: their thoughts on how farming should be practised;
- insight into current farming practices: how it is done;
- orientation of the farmer with respect to network relations: family, institutions and markets;
- stage of succession of the present generation: young / older parents and children.

2.1.1 Domains and Capacities of Styles of Farming

In the initial study the four domains were further specified with respect to farming practices. In the domain of reproduction, the animal itself is put central and not the production of the animal. So the style of farming that used this domain as a foundation for farm activities emphasises animal care in contrast to styles of farming in the opposite domain who focus on production economy. Similarly, the domain of family and community is specified as the domain of farm labour organisation and succession. So a farmer in this domain would emphasise farm business succession rather than farm business success.

The combination of this model of domains and the orientations on Capacity, Technology and Business (see Section 1.1) led to the development of a hypothesis about four contrasting capacities (...*ships*) (Figure 2.2).

Figure 2.2 Four contrasting orientations of farmers in a space defined by Capacity, Technology and Business, leading to four fundamental capacities (...*ships*), for styles of farming



In relation to these basically contrasting capacities the metaphoric labels for four styles of farming were specified.

Entrepreneurship…

…is mainly the capacity to utilise external farm indicators and universal measures as a directive for farm development. … What does a farmer do as an entrepreneur? He will organise his farm in such a way (and that is an on-going process) that farm organisation and farming practices match with markets and existing balances and tendencies (translated from: Bolhuis and Van der Ploeg 1985/1988).

Craftsmanship…

…is the capacity to use internal farm indicators as normative guidelines for structuring labour and production, in which the individual actor co-ordinates the available 'space for interpretation' much more through his or her own experience, insights and perspectives than through universal blueprints. Craftsmanship is the concrete capacity to optimise production results per object of labour (per cow, per unit of land, per fruit tree, etc.) both in the short term and in the long term (translated from: Bolhuis and Van der Ploeg 1985/1988).

Inheritorship…

… is the capacity to build on a (family) agricultural heritage and give meaning to life as a farmer that is consistent with that heritage both for the farmer and for close relatives (family), and to use this as a directive for the acceptance of farm duties and investments (Commandeur 1998).

Tendership…

…is the capacity to see the needs and requirements of animals (to live their lives in a way that is suitable for their species) as a directive for the development of an integrated enterprise system of feeding, housing, keeping and tendering (Commandeur 1998).

The described capacities can be directed in different ways, depending on differences in the farmers' positions (their specific abilities) within the domains.

The 'foundation' of farming practices…

…is both the starting point and the ultimate goal for the co-ordination of farming practices. Foundations are found in the domains at positions from where processes in the co-ordination of farming practices are initiated, and where to goals of farming are headed. They are located within the context of domains for farming practices, and they correspond to the styles of farming identified in this study.

2.1.2 Issues and Contrasts in the Interviews

The interviews for the initial study were done in 1996. The first interview was conducted using key words. All other interviews were conducted using direct and open questions. The farmers preferred to respond to questions. The set of questions used was adjusted three times during the series of interviews. Thus the development of questions and answers was an interactive process between the farmers and the interviewer. Issues to address in the interviews were identified based on a variety of previous (technical) research projects about pig production, styles of farming, and governmental regulations, and political issues concerning pig production and/or rural development.

The following issues were covered in most of the open interviews:

- pig prices and qualities, producers and consumers, markets and future;
- views on family farms, division of tasks, role of women, farm successors;
- animal management and production, farm hygiene, working conditions;

- animal care and breeding, hygiene and vaccinations, preventive surgery, transport;
- neighbourhood organisations, farmers' organisation, study clubs;
- landscape, infrastructure, nature and wildlife, government restrictions;
- land availability, stables, feedstuff, manure management;
- communication in the market network, extension services.

The interviews were analysed for contrasts in the answers between different farmers. Three types of contrasts were found in how farmers co-ordinated their farming practices in all four domains. This led to the following organisation of the study.

In farmers' perceptions of the production process the focus was on:

- orientations with respect to animals and business – their ambitions and rationales.
- differences in approaches of each of the four domains
- coherence in the co-ordination of farm activities
- aspects of regional culture

In farmers' attitudes towards the construction in farming the focus was on:

- stables, equipment and other materials
- network constructions for supplies and knowledge
- indicators about Productivity, Intensity, Scale and related quantities

The diversity in co-ordinating activities in the four domains formed the basis for classification of farms into styles of farming. This classification led to the specification of two realms for contrasts: between spheres and between foundations beneath spheres. In the current study the contrasts between spheres are identified as contrasts in ambition. The contrasts between foundations beneath spheres are identified as contrasts in rationale.

2.1.3 Classification of Farms Based on Contrasts in the Initial Study

In the initial study styles of farming were classified based on coherence in answers concerning the following issues:

- the enjoyment of (pig) farming
- perceptions of entrepreneurship and craftsmanship
- specialisation versus mixed farming
- goals and strategies in farming practices.

A clear contrast was found among farmers in their enjoyment of pig farming. Some farmers mentioned farm management; others mentioned the freedom to be their own boss. Some farmers mostly enjoyed caring for new life, the piglets; others particularly enjoyed achieving good production results.

There were also contrasts among farmers in their perceptions of entrepreneurship and craftsmanship. Some farmers found entrepreneurship to be more important than craftsmanship, while others preferred it the other way around. The farmers associated entrepreneurship with investments, with following new developments, and with business organisation. Good business results were associated with good entrepreneurship. But poor business results were not necessarily associated with poor entrepreneurship. Craftsmanship was associated with animal health and welfare, farm hygiene and production results. Some farmers considered animal health and welfare to be more important than production results. Others considered hygiene and production results to be most important. In addition: animal health, animal welfare and animal production were different issues for some farmers. Those who put health and welfare first believed that healthy and well cared for animals will provide satisfactory production. Other farmers found that a good production level is a sign of good health and good welfare.

Another issue that showed considerably contrasts was specialisation versus mixed farming and diversification. Farmers who favoured specialisation emphasised the economy of specialisation. For some it was the economy of business expressed in monetary units (entrepreneurs), for others it was the economy of production expressed in numbers of feeder pigs per sow per year (craftsmen). Farmers who favoured mixed farming and diversification emphasised the certainty of farm continuity.

In the interviews farmers revealed a variety of goals and strategies. Some farmers had goals connected to production, like the number of piglets per sow (per year), or to farm efficiency – the financial balance. Other farmers had goals connected to farm continuity, to farming as a way of life (varied, with reasonable working hours), or to balancing economy and ecology. As for strategies, some farmers chose investments and farm expansion, whereas others chose cost reduction and economy in investments. Some pursued a more extensive way of farming, like free range and organic farming, to improve benefits per animal, while others pursued intensification, food safety production certificates (like IKB and Good Farming) or maiden sow production to improve benefits per animal. Some farmers preferred to spread risks through diversification, and some preferred specialisation. And both in the direction of intensive and extensive production there were farms that were creating their own market to improve the benefits per animal.

From the analysis of contrasts among domains, four styles of farming were specified according to the orientation of farmers on Capacity, Technology and Business: entrepreneur (E), craftsman (C), inheritor (H) and tender (T). In the initial study of 23 farmers, four farmers had been classified as entrepreneur, five as craftsman, ten as inheritor, and four as tender.

The coherence of contrasts among styles of farming was primarily a contrast in ambition. Entrepreneurs and craftsmen favoured competition, which they expressed in their perceptions of entrepreneurship and craftsmanship. They both enjoyed farm management as a way to improve the farm, but they differed in what they meant by ‘management’. Entrepreneurs meant farm and labour economy, while craftsmen meant management of production improvement. The goals and strategies of the entrepreneurs and craftsmen were in line with their perceptions of management. In line with their business attitude, they both preferred farm specialisation to mixed farming.

Inheritors and tenders favoured fulfilling requirements for family income and need for security, because they sought to spread risks. In line with this emphasis, most of them preferred mixed farming. The goals and strategies of these farmers focussed on farm continuity and spreading risks. They expressed their enjoyment in farming in terms of flexibility, like being free in time-management, or in terms of enjoyment of caring for new life, the piglets. Inheritors and tenders differed, though, in their foundation for co-ordinating farming practices. Inheritors based their activities on satisfying the family's needs, while tenders based their activities on the needs of the animals.

Contrasts among the styles of farming were not found at all levels. There were two spheres specified that reflected contrasting ambitions: the sphere of competition and the sphere of care. Entrepreneurs and craftsmen shared the sphere of competition; while inheritors and tenders shared the sphere of care. The styles of farming in each sphere were found to contrast in different ways (foundations) beneath these spheres. In the current study the contrasts within spheres are called differences in rationales. The differentiation in spheres and foundations led to the model shown in Figure 1.8 (Chapter 1).

2.1.4 Of Time and Enterprise

The distinction in ambitions and rationales in farming are comparable to differences in orientations on time and enterprise. The orientations on time and enterprise are extensively studied by Kahneman and Tversky (2000) and described by Bernstein (1996). In the following a comparison of the similarities is discussed.

Ambition

The model that was developed in the initial study was rather rigid. There were two ambition levels found and two contrasting rationales connected to each of them, relating thus to four styles of farming. Yet in other studies about styles of farming up to six different styles of farming were found (Van der Ploeg and Roep 1990). Even in the initial study there were indications that the actual number of styles of farming in pig production might be greater then four. So the model developed in the initial study had to be extended to include more styles of farming. In the literature about economic decision-making processes – in particular of Kahneman and Tverski (2000) and Bernstein (1996) the basis was found for such an extension.

Linking of styles of farming to the theory on economic decision making was made based on the following considerations: Ambition (*a*) and rationale (*j*) are always involved in decision making dilemmas. Motives are assumed to precede decisions, but it is consecutive decisions that reflect the coherence in motives.

With respect to decision making, 'time' is found in terms of chronology: 'time' is not gradual, but discrete. Basically there are three levels in time: past, present and future.[1] For every decision there is a chronological division into before, right at and after a specific moment: the moment at which a decision was taken or the moment at which a decision should (or should not) have been taken.

Making a decision implies a certain degree of uncertainty. Every decision involves accepting a risk of the consequences – including the risk of regretting a decision later on. The economic psychologists Kahneman and Tversky conducted an extensive study on accepting and avoiding risk. They showed that in facing uncertainty, most people behave depending on how they perceive the context of risk. In a context of expected profits, most people behave in a risk-avoiding way. In a context of expected losses most people behave in a risk-seeking way. In their work, Kahneman and Tversky (2000, 1984) focussed on discrepancies in the behaviour of the majority of a population. Bernstein (1996) gave a striking example of their work.[2]

Kahneman and Tversky concluded that there are actually three groups of people: a minority who are risk-avoiding under (nearly) all circumstances, another minority who are risk-seeking under (nearly) all circumstances, and a majority who behave depending on their perspective and context. According to Kahneman and Tversky (2000, 1984) and Tversky and Kahneman (1986) this principle is also applicable to the way people do business or run an operation.

What Kahneman and Tverski added to the notion of decision handling is that many people are guided in their decisions by how they perceive the context at a certain moment. This orientation on the actual perspective and context can be referred to as orientation on the present. In contrast, people who are less guided by the present context – they are guided by the perspective and context of either the past (risk avoiding) or the future (risk seeking). Based on this notion three basic spheres can also be specified for farmers' attitudes to farming, i.e. their levels of ambition (Table 2.1).

Table 2.1a and 2.1b Similarity between levels (spheres) of decision making, based on time and risk, and levels (spheres) of ambition, based on attitudes to farming.

	Context of Time and Risk	
Time frame (Risk frame)	*A person's attitude to Time and Risk as a basis for decision making*	*Sphere Labels*
Past (Avoiding risk)	Seeks security in traditions and conservation of available utilities	Composed
Present (Searching scope)	Bases decisions on information about the context	Pragmatic
Future (Seeking insurance)	Has confidence in development and change through calculations of risk	Challenged

	Context of Ambition	
Time frame (Risk frame)	*A Farmer's attitude to Farm Business as a basis for deciding on farming activities*	*Sphere Labels*
Past (Avoiding risk)	Sees farming as a means to independence	Autonomous
Present (Searching scope)	Sees farm continuity for the family as the highest priority	Participatory
Future (Seeking insurance)	Sees production and profits as the most important goal of farming	Competitive

The sphere of competition thus remains the same as in the initial study, but the sphere of care in the initial study can be split into a sphere of participation and a sphere of autonomy for the present study. This extension of the model allows for more diversity in styles of farming related to differences in ambition.

With respect to the model of domains (above) it was argued that different styles of farming had different foundations for co-ordinating farming practices. The expressions of the capacities that are required for each of the four domains depend on both these foundations and the ambition levels. So a combined model of domains and spheres leads to a theoretical model of various foundations for co-ordinating farming practices at three levels of ambition. (Figure 2.3).

Rationale

At any moment in time implicit or explicit decisions are made. In this perspective decisions can be seen as digital: yes or no – irrespective of whether no is a real 'no', or a 'not yet', or an 'I don't know'. Yet the importance of a specific decision does not depend on 'yes' or 'no' in itself, but on the relevance of the status quo. In that context it is useless to single out one decision. What is relevant is the coherence in a group of related decisions as a whole. So the issue of understanding decisions in farming is actually about understanding the key to the coherence in related decisions.

In the model of ambitions and domains (Figure 2.3) the rationale connects the ambition with the foundation, creating a logic whole in a sequence of decisions.

Approach to Issues

The initial study showed that farmers co-ordinated farming practices differently with respect to the four domains, thus allowing for their classification into styles of farming. The findings confirmed the theory (Frouws and Van der Ploeg 1988) that the various styles of farming should not be associated with one domain – they are present in all four domains. The difference among styles of farming is that they have different foundations in the domains, which define their reasoning for initiating farm business activities, as well as the goals: they reflect the rationale.

In the initial study styles of farming were classified based on coherence among answers to the interview questions. The contrasting groups of answers concerned issues about the domains oriented on animals and business. The differentiation in styles of farming was supported by differences in capacities: entrepreneurship, craftsmanship, inheritorship and tendership (Table 2.2). Farmers put different accents on the issues concerning the domains, which was shown by different approaches to the issues and variability in their answers to questions on the various issues.

Figure 2.3 Theoretical model for the variation in styles of farming. The model shows ambition levels in farming (in spheres) and coherence in the co-ordination of farming practices (in foundations), reflecting differences in rationales. The various rationales are related to the foundations for farming in the context of domains.

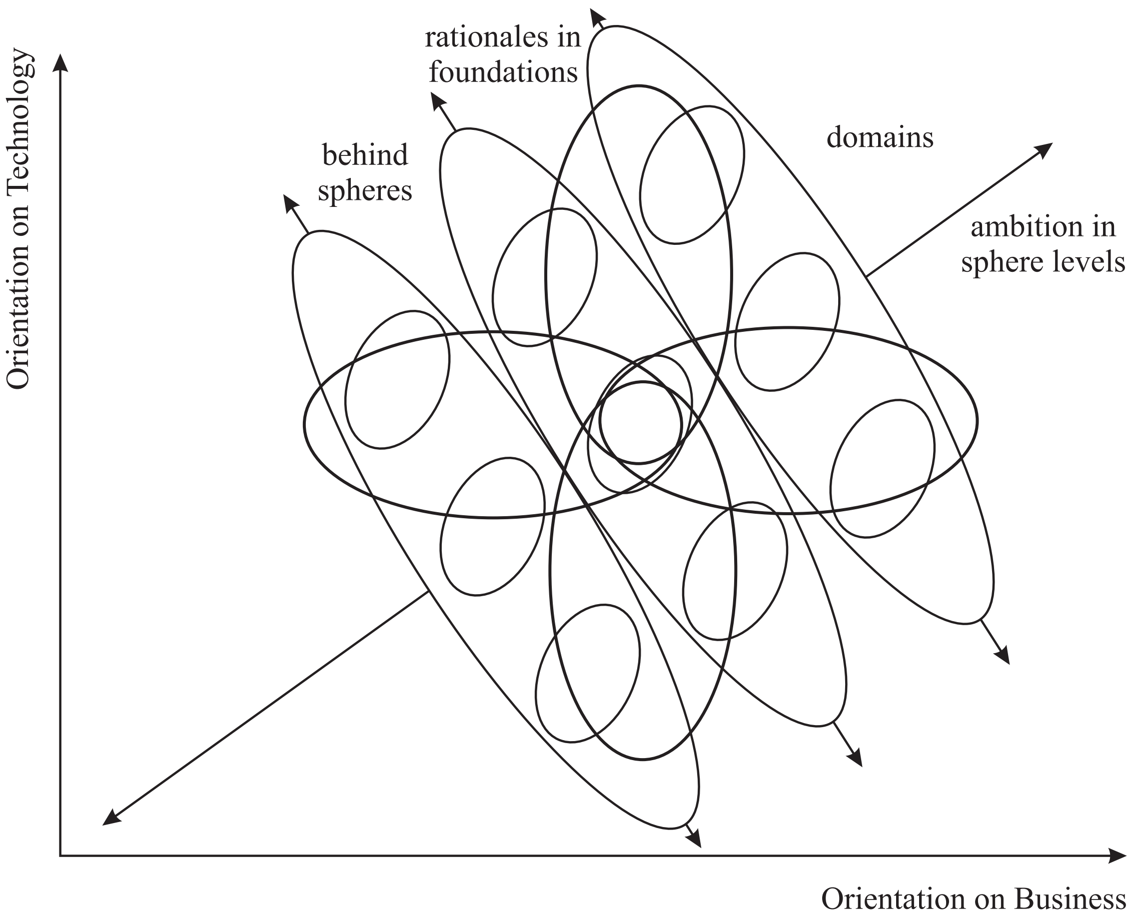


Table 2.2 Domains and the issues related to them that were approached differently by farmers in various styles of farming. The table is based on open interviews in 1996 with 23 pig producers in The Netherlands.

Domain	*Expression of capacity*	*Issues in farming practices related to diversity in approaches*
Business dimension:		*Emphasis on:*
Business networks	Entrepreneurship	Prices and quality, producers and consumers, markets and future
Farm succession	Inheritorship	Views on family farms, division of tasks, role of women, farm successors
Technology dimension:		*Emphasis on:*
Production economy	Craftsmanship	Animal management and production, farm hygiene, working conditions
Production ecology	Tendership	Animal care and breeding, hygiene balance, vaccination, transport, surgery

The relation between the issues listed in Table 2.2 and the styles of farming are clear:

- Entrepreneurs have their foundations in the ambition sphere of competition and in the domain of market networks. In the initial study the issues that were associated with their foundation were prices and quality, producers and consumers, markets and future perspectives. These issues are also associated with the time-and-risk sphere of being challenged. For these farmers the greatest challenge of farming was to optimise farming practices (with respect to the issues just mentioned) for the sake of making profits.
- Craftsmen were farmers who have their foundations in the ambition sphere of competition and in the domain of production economy. In the initial study the issues that were associated with their foundation were animal management and production, farm hygiene, and working conditions. These issues are also associated with the time-and-risk sphere of challenge. The challenge for these farmers was to compete with the top ten per cent of the pig producers in the country, for the largest number of feeder pigs per sow (per year).
- Inheritors were farmers who have their foundation in the domain of farm processes and succession. In the initial study issues found to be associated with their foundation were views on family farms, division of tasks, role of women, and farm successors. These issues are also associated with the time-and-risk sphere of pragmatism. These farmers concentrated particularly on farm continuity. This focus is associated with an ambition in the sphere of participation.
- Tenders were farmers whose foundation is in the domain of production ecology. In the initial study issues associated with their foundation were animal care and breeding, hygiene balance, vaccination, transport, and preventive surgery. These issues are also associated with the time-and-risk sphere of being composed. These farmers concentrated particularly on their independence. This focus is associated with an ambition in the sphere of autonomy.

The model that was developed above for allowing differentiation of a greater number of styles of farming revealed a further specification of inheritor and tender as separate styles of farming, positioning them in different spheres of ambition (participation and autonomy).

Factor Analysis

Decisions can be given digital values to express ‘yes’ or ‘no’. The coherence in sets of related decisions might be perceived as sets of correlation among digital values. In factor analysis the mutual correlations among the values of a set of parameters are combined in principal components. So these components can reveal the underlying coherence of a set of parameters (Nooij 1995), which in the current study reflects farming practices.

Whether the underlying coherence that the principal components reflect reveals valuable information depends on the selection criteria for the set of parameters used. In the current study parameters were selected in relation to the system of Productivity, Intensity and Scale. The principal components that resulted from the factor analysis determined ambition spheres and rationales of the styles of farming. These results were projected on orientations on Capacity, Technology and Business. The ambitions and rationales of the styles of farming were further analysed in the orientation on Capacity, Technology and Business. The hypothesis for this study is that the diversity in underlying coherence can be expressed in terms of ambition and rationale, which can be shown as the underlying components both in the system of Productivity, Intensity and Scale and in the orientation on Capacity, Technology and Business.

2.2 Styles of Farming as a Concept in Rural Sociology

There are a great many ways to farm, greater even, if that is possible, than the number of erudite models that have been devised for understanding, managing, and possibly neutralizing such diversity (Van der Ploeg 1996).

In this section scientific developments in sociology are discussed with respect to the concept of styles of farming.

The Early Concept of Styles of Farming

For nearly 60 years sociologists at Wageningen University have studied aspects of diversity in farm practices. Already in the early 1940s Hofstee introduced the idea of styles of farming. In his inauguration lecture professor Hofstee (1946) clarified how he approached the concept. In their work professor Hofstee and his co-workers were particularly interested in the causes of the diversity in styles of farming. In a detailed comparative field survey in different areas in the province of Groningen Hofstee closely analysed the similarities and differences in dominant styles of farming between two areas. The conditions for farming in the two areas were very similar. Yet arable crop farming was much more dominant than livestock farming in one area compared to the other. Hofstee concluded that there was no rational cause for this difference in dominance of arable crop growing. He hypothesised that the key cause for the difference in dominance of this style of farming was based on differences in the physical and cultural environment with respect to the societal prestige of being a crop farmer.[3] The societal prestige of crop farming was enhanced in one area in the survey, in contrast to the other area (Hofstee 1985 1946; Constandse 1954).

The Notion of TATE

In the late 1950s Benvenuti studied cultural change in the rural area around Winterswijk in the eastern part of the Netherlands.[4] He was searching for cultural factors that determine a difference between so-called ‘conservative’ and ‘progressive’ farmers. He concluded that the problem was far more complicated. Certain cultural aspects had variable impact on the farmers, depending on the context (Benvenuti 1961). Later Benvenuti focussed on the institutional environment. In the 1970s he introduced the notion of the paradigm of the Technological Administrative Task Environment (TATE; Benvenuti 1975). In his later work this notion was covered more extensively (Benvenuti 1991).[5] TATE served as…

> *'heuristic concept to analyse the strangulating impact of the institutional system surrounding and encapsulating farm holdings. TATE was considered to be the driving force behind the process of agricultural modernisation characterised by increasing standardisation'* (Benvenuti and Frouws 1999).

Benvenuti observed that the institutional integration affects the functional aspects of the farm operation. From the perspective of the farmer the farm forms the centre of an 'institutional cobweb'. The cobweb consists of consumers of products, suppliers of requirements, government institutions, financiers and other service suppliers. Those surrounding institutions all provide the requirements and services to facilitate the farming process. But at the same time these institutions confront the farmer with specific demands, prescriptions and sanctions. Benvenuti referred to the off-farm (external) set of integrated, farm-oriented institutional systems as TATE. TATE is precisely that part of the broad environment that has direct and modifying influence on a farm operation. Benvenuti showed that the 'capacity' in farming entrepreneurship, craftsmanship, etc.) is assessed from its functionality in the integration with external contacts. In line with this paradigm, Frouws (1993) focussed on the aspects of power among the participants in the TATE and particularly on the power of corporatist of interest groups and government agencies. Wagemans (1987) concentrated on the rationale of government extension in the interactions between government and farmers.

Styles of farming entail a specific ordering of interrelations between farms and TATE. This ordering is specific for each style of farming. This might implicate that styles of farming are dependent of TATE to the extent that switching from style A to B could be easier than switching from style B to A. If the TATE theory is combined with the so-called 'actor-oriented network approach', it could lead to hypothesis about matching the 'instrumental rationality' (which is typical for the economic-institutional task environment of the farmers) and the discursive rationality in which the activity of the actor could be founded. Such analysis of rationale allows for a more profound elaboration of the concept of styles of farming, because it enables the researcher to classify the interrelations with markets, technology and institutions. Like that a more profound layer is revealed behind the styles of farming (Benvenuti & Frouws 1999).

The Acting Agent in Styles of Farming

Long and his research group should also be mentioned in this context. Long related problems to the individual perspective instead of to the institutional focus. Two aspects of his work are important here. Long summarised the notions of actors, agency, discourses, domains, arenas, inter-individual interactions, livelihood strategies and agent networks as nine 'cornerstones entailing an actor-oriented approach' (Long 1997). The other aspect is the increasing commoditisation of labour (Long *et al.* 1986).

In the context of styles of farming it is important to note that the word 'farmer' does not necessarily refer to an individual person. 'Farmer' refers to the group of people who shape the practices on a particular farm, or in a particular style of farming. In other words: in terms of styles of farming the farmer is an abstract notion of the 'acting agent' on a farm or in a style of farming (see also: Barnes 2000; Van der Ploeg 1996).

Space to Manoeuvre, Styles of Farming and Risk

By the end of the 1980s rural sociologists began to discuss the notion of a socio-physical 'space to manoeuvre'[6] (Roep 2000; Van der Ploeg *et al.* 1990). The socio-physical space to manoeuvre was bounded by socio-economic force of prescriptions and sanctions created both by the cultural environment as described by Hofstee (1985) and the TATE as described by Benvenuti (1991). Within the boundaries of the socio-physical context there is a space to manoeuvre in which there is freedom of interpretation. This freedom of interpretation is bound by culture (Hofstee 1985, 1946), by prescriptions from the TATE (Benvenuti 1991), by institutionalisation of functions (Zijderveld 2000), by perception of risk (Bernstein 1996), and by the coherence in the co-ordination of consecutive decisions (Kahneman and Tversky; 2000) and of activities in farming (Van der Ploeg 1994). All these aspects lead to specific strategies within the space to manoeuvre.

Van der Ploeg and his research group (Van der Ploeg 1984) applied the notion of styles of farming to the diversity in farming practices they found within groups of farmers operating in the same area and the same branch of farming.[7] They maintained Hofstee's concept of 'styles of farming', because three of its core elements continued to be present in the new concept. Styles of farming (1) still represented a specific wholeness of farming practices, (2) still entailed specific structuralisations of the labour process, and (3) still represented specific connections between economic, social, political, ecological and technological 'dimensions' (Van der Ploeg 1984). In other literature the phenomenon is sometimes referred to as 'farm management styles' (Bennett 1982), or 'modes of ordering' (Long and Long 1992).

According to Van der Ploeg (1994) the new concept of styles of farming emerged from changing integration in markets and adaptations to new technological designs. They are the responses of farmers to national and international agrarian policies. Van der Ploeg (1994, p 18) wrote:

> *'...Since the structuralisation of markets and the orientation of technological development have become increasingly the object of agrarian policy, styles of farming have, to a large extent, consequently emerged as farmers' responses to national and international agrarian policies.'*

Policy measures have an effect on farm structures – the scale and intensity of farms, as well as on rural structures – and on the regional land use plan.

Bernstein (1996) in his analysis of risk had another approach to modern developments in doing business in general. He argued that doing business in a future perspective is less risky than it used to be, because of the increased predictability of processes. Based on models for predictability of events, an insurance industry has developed as a new business. The combination of increased predictability and insurance for events provides a basis for confidence and control over the future. This can also be seen as a broadening of the basis for developing styles of farming.

It has become easier to switch from doing business based on saving (security based on the past) to doing business based on loans and credit (security based on predictability of the future and insurance). It can be argued that during this period of change, the space to manoeuvre is being influenced. When the number of future-based businesses increases at the expense of savings-based businesses, the available capital is increased because both the savings from the past and the loans based on the future are available to fund farming practices. During this period special events may occur due to the excessive availability of funds. Conversely, when the number of savings-based businesses increases at the expense of future-based businesses, the available capital is decreased because the available income has to cover repayment of loans and credits and saving to increase security. In this period special events may occur cue to the deficiency of available funds.

Developments in Styles of Farming Research

Van der Ploeg and his research group studied the significance and impact of styles of farming on policies and farm development processes. Their emphasis was on new developments in the diversity of styles of farming within farm branches and within regions (Roep 2000; Wiskerke 1997; Wiskerke *et al.* 1994; Groen *et al.* 1993; Roep and Roex 1992; Van der Ploeg *et al.* 1992; Spaan and Van der Ploeg 1992; De Bruin and Van der Ploeg 1991; De Bruin *et al.* 1991; Roep *et al.* 1991; Van der Ploeg and Roep 1990). In these studies the researchers found empirical support for the concept of contemporary styles of farming. Some of the contemporary styles of farming seemed well equipped to deal with the contemporary goals in politics. This led to further studies about the specific relation between government, political instruments and farmers (Eshuis *et al.* 2001; Hees 2000; De Bruin 1997; Frouws *et al.* 1996; Hees 1995; Renting *et al.* 1994; Schuthof *et al.* 1994; Oostindië and Peters 1994; Hees *et al.* 1994; De Bruin 1993; Frouws 1993; Van der Ploeg 1993).

Some researchers abroad also worked with these concepts, for example Bennett (1982) in Canada. The popularity has been increasing in recent years in countries such as Italy (Ventura 2001; 1995), Spain (Van der Broek 1998; Remmers 1998), Portugal (Van den Dries and Portela 1995) Belgium (Kerkhove 1994), the USA (Hinrichs and Richard 2000) and Australia (Boonstra 2001; Vanclay *et al.* 1998). In each of these latter studies policy developments appeared to influence the farming practices.

In the last few years the accent of the studies in The Netherlands, as well as elsewhere in Europe, has shifted towards the diversity of on-farm business activities (multifunctionality) and to the opening of specific new market segments by farmers (special products) (Van der Meulen 2000; Broekhuizen *et al.* 1997; Broekhuizen and Van der Ploeg 1997; Kuit and Van der Meulen 1997; Oostindië and Van Broekhuizen 1997; De Bruin *et al.* 1997; Horlings 1996; De Vries 1995; Symes and Jansen 1994; Van der Ploeg and Ettema 1990). Besides there are specific studies of the role of women in farming (Bock 1998; De Rooij *et al.* 1995; Van der Burg and Endeveld 1994; De Rooij 1992). In most of these studies the term ‘style of operation’ or ‘style of farming’ is less frequently used. Expressions such as ‘countryside renewal’, ’multifunctionality’. ‘specific market segmentation’, ’novelty production’, or ‘on-farm innovation’ have recently grown more popular. The diversification of farm activities seems to be linked to the fact that farming itself no longer provides sufficient income security for families. The familiar forms of security in the past, like ownership of the objects of labour (land and animals), are largely gone, because security is now (partly or mainly) based on loans and credits. And these forms of security have not been replaced by the promise of a more secure future, because fluctuations in policy and market developments keep future perspectives unpredictable. In this context the diversification of farm activities can be seen as a new search for control and security.

Portraits of Styles of Farming in Literature and in the Initial Study

In work about styles of farming researchers have often made portraits to describe the rich multidisciplinary character of farming. Through the portraits of the styles of farming a differentiated image of the styles of farming is presented. In the initial study four styles of farming were specified, and a portrait of each was described. They were labelled ‘entrepreneur’, ‘craftsman’, ‘inheritor’, and ‘shifter’.

The portraits described in the initial study were similar to portraits found in other studies about styles of farming. In the majority of these studies it was chosen to refer to a style of farming in terms of the regional every day language. Therefore similar styles of farming in different studies were specified by different metaphors.

The ‘entrepreneur’ in the initial study had many similarities to portraits in previous studies. In Van der Ploeg *et al.* (1992) about dairy production in Friesland a similar style of farming was called the ‘big farmer’. Those farmers were said to have two major objectives: to increase rights (quota) for the production of milk and to fulfil their ambitions for the future. In De Bruin and Van der Ploeg (1991) this style of farming was called the ‘business farmer’. For the business farmer, business comes before farming. Their challenge is to produce cheaply by producing a large quantity. These farms were developed through leaps of investments. In Van der Ploeg and Roep (1990) dairy farming was studied in South Holland. In that work the similar style of farming was called the ‘optimal farmer’. The ‘optimal farmers’ were also referred to as ‘the managers’. They were striving to create intensive and especially large-scale farms.

The ‘craftsman’ found in the initial study, was also similar to portraits found in other studies. Similar characteristics were found, for example, in the ‘kilo farmer’ in Wiskerke (1997). In that study the ‘kilo farmer’ was an arable farmer in Zeeland who strived for high yields. High yields per hectare were most important, because it was assumed that economic profits would necessarily follow. In Van der Ploeg *et al.* (1992), Roep *et al.* (1991) and Van der Ploeg and Roep (1990) a similar style of farming was called the ‘dairyman’. In some areas ‘dairymen’ have large farms (Friesland), and in other areas their farms are average (South Holland). The farm size is not crucial to this style of farming, but the farm scale is; the farms of dairymen are smaller scale then those of entrepreneurs. The specific characteristic of ‘dairymen’ is the high milk production per cow.

The ‘inheritor’ in the initial study had many similarities to the ‘middle leveller’ in Spaan and Van der Ploeg (1991). In this study among greenhouse horticulturists there were three styles of farming: the ‘top-producers’ (entrepreneurs), the ‘real gardeners’ (who enjoy the gardening aspect of the business the most) and the ‘middle levellers’.

The middle levellers were presented as a very diverse group that is best described by what they were not. They were not large scale and not particularly keen on investments – in contrast to the entrepreneurs. And they were not particular about producing in real soil or about producing their own selection of product varieties – in contrast to the 'real gardeners'.

The 'inheritor' in the initial study also had similarities to the 'practical farmer' in Roep *et al.* (1991) among dairy farmers and mixed farmers in The Achterhoek. Just like the 'middle levellers' in Spaan and Van der Ploeg, the 'practical farmers' were best described by what they were not: extreme. They were less focussed on expansion than entrepreneurs, and less focussed on high production than 'dairymen' (craftsmen). They were not as keen on mechanisation as 'machine farmers' or 'technicians'. And they were not as focussed on economy of investments as farmers and inheritors in some other studies. In other words, for practical farmers pragmatism comes first.

The 'tender' in the initial study had many similarities to the 'organic farmer' in Wiskerke (1997), which was about arable production in the province of Zeeland. The major difference between these terms is that 'organic farmer' refers primarily to a farming system that is associated with a specific licence. The term 'tender' is broader in the sense that it refers to an attitude for production, regardless of whether the farmer is licensed for organic (or free range) production.

Besides the portraits found in the initial study, other portraits were found in the literature about styles of farming. Those styles of farming reflected emphasis on some other aspects in farming practices. Hinrichs and Richard (2000), for example, described vividly the style of farming 'bricoleur' in the Mid-West in the U.S.A. as idiosyncratic cobbling together of systems as part of *...the legendary ability and resourcefulness of the independent swine farmer*. This type of farmer is nearly self-sufficient. That does not exist in The Netherlands. Yet this type of independent (pig) farmer has similarities to the autonomy that is sometimes found with farmers in The Netherlands, particularly in the Gelderse Vallei and Veluwe areas in the central-east of the country. De Bruin *et al.* (1991) found in their study on small farms in the Gelderse Vallei a style of farming that came rather close, which they called 'puzzler'. This type of farming is often associated with (elderly) bachelor farmers, who have very little need for income, because they do not need to take care of anyone but themselves – and they do not need much. In the sphere of autonomy these farmers are somewhat comparable to the tenders in the initial study, but their rationale is different. And they are 'inheritors' to the extent that their means of existence is based on inheritance from their parents. But they are different from the inheritors specified in the initial study, because the farm is not meant to continue into the next generation.

The inheritors and tenders in the initial study were to a certain extent comparable to the 'economic farmer' in the study. The economic farmer was found among arable farmers in Zeeland (Wiskerke 1997), among dairy farmers in Friesland (Van der Ploeg *et al.* 1992) and among dairy farmers and mixed farmers in The Achterhoek (Roep *et al.* 1991). The economic farmer is characterised by economy of investments. The economic farmers try to do as much as possible on labour input and savings. New investments will not be done until the old equipment is finished. Investment patterns coincide to a large extent with the cycle of succession. Major investments are done at the moment of succession. Between successions the investments are merely adaptations. In the initial study the aspect of economic farming was found both with inheritors and with tenders.

Some styles of farming that were found in other studies were closely associated with the source of production: the soil, the plant or the animal species. Wiskerke found that 'plant growers' (1997) and 'crop farmers' (et al. 1994) in his studies among arable farmers were attached to the soil and the species itself. Spaan and Van der Ploeg (1991) found 'real gardeners' among greenhouse horticulturists. The major interest of these farmers was working with the soil, independent of the amount of production. This was distinct from 'seed specialists' (Wiskerke 1997) and 'breeders' (Van der Ploeg *et al.* 1992; De Bruin and Van der Ploeg 1991) who focussed on the genetic improvement of the species. The typical interest of these farmers was to produce a high quality and scarce product with a high economic value. In the current study the aspect of breeding, for the production of maiden sows for replacement, is hardly included. The study is exclusively focussed on the production of feeder pigs with a standard economic value.

There were also some other styles of farming found in various studies that deliberately reflected mixed farming or differentiation of farm products. Traditionally well known in dairy farming was the 'dual-purpose farmer', as was found in Roep *et al.* (1991) in The Achterhoek and in Van der Ploeg and Roep (1990) in South Holland.[8] Dual-purpose cows are both good for milk production and meat production. Another specific type of mixed farmer found in South Holland was the 'pioneer' (Van der Ploeg and Roep 1990). These were young farmers who tried to spread risk and reduce investments by building up a mixture of farm activities.

In an early study about contemporary styles of farming Roep (1988), elaborated on the issue that styles of farming were determined by components that appeared in pairs. Roep distinguished four styles of farming. He argued that combinations of components were necessarily paired:

I-type:	intensive and craftsman
E-type:	extensive and entrepreneur
L-type:	leader and manager
M-type	marginalist and autonomist.

The literature about styles of farming in The Netherlands suggests that in farming in The Netherlands there is an overrepresentation of a few styles of farming. Most portraits reflect styles of farming that are competitive and challenging in ambition and have a rationale that is oriented on intensity (craftsman) or on both scale and intensity (entrepreneur). Besides, there are many metaphors reflecting a participatory and pragmatic sphere as well (Table 2.3).

Table 2.3 also shows that, in terms of the farmers' emphasis on either competition, participation or autonomy, the styles of farming found most often in the studies (which were conducted predominantly in The Netherlands) were associated with competition and participation. This lack of autonomy could be related to the extensive government policy regulations for farming in The Netherlands: it would be hard for a farmer to be really autonomous in this overcrowded and extensively regulated country. It should be noted though that farmers with ambition for autonomy are harder to include in a survey than farmers with other ambitions. So the research material on which this table is based may be biased in that perspective. In addition, no styles of farming were found that were exclusively oriented on Scale. This is logical because in a country where land is so scarce extensive production cannot be made profitable. Agricultural production without land requires massive investments in stables and equipment, which can only be earned back through intensive production. On the other hand, intensive farming apparently requires a certain minimum scale. So for international comparison it is important to bear in mind that the average farm in The Netherlands is intensive and productive. This is in line with the farming culture that Hayami and Ruttan (1985) described as the 'European path'. Based on the model described in Section 2.1, the various styles of farming can be plotted as shown in Figure 2.4.

Table 2.3 Overview of the styles of farming found in various literature resources, charted according to their orientations.

	Sphere		*Orientation*		
Time	*Risk*	*Ambition*	*Technology*	*Capacity Technology + Business*	*Business*
			Intensity	*Productivity Scale + Intensity*	*Scale*
				Style of farming	
Risk-analysis, Chances and Future	Challenged	Competitive	Craftsman Bulk farmer Dairyman Multiplier	Entrepreneur Big farmer Business farmer Optimal farmer	Rancher
Perspective, Context and Present	Pragmatic	Participatory	Puzzler	Inheritor Middle leveller Real farmer Practical farmer	Technician
Tradition, Security and Past	Composed	Autonomous	Hobby farmer	Economic farmer Bricoleur Composed farmer	Ranger

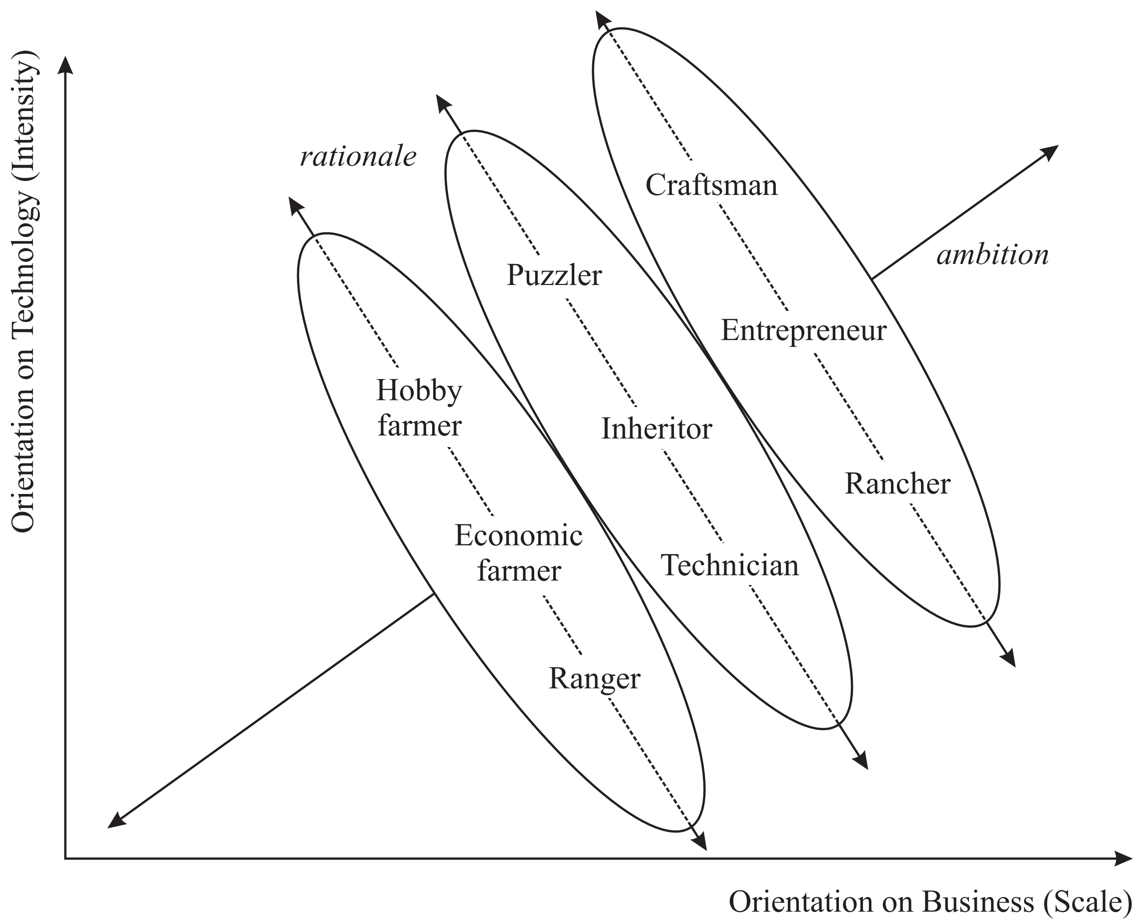
Comparing Table 2.3 and Figure 2.4 shows that the spheres are positioned at an angle from the axes. They represent the ambition levels and the various rationales for the styles of farming.

Specific styles of farming are defined here as deviations from the population average. In The Netherlands the total number of farms is rapidly declining.[9] This decline is related to a large capital outflow in the farm sectors. Since the 1970s the financial resources for farm production have been decreasingly based on savings and increasingly based on bank loans. At the same time, the pressure to improve efficiency on farmers has increased through policy and market developments.

2.3 Styles of Farming, Economy and Markets

In literature about farm economics, styles of farming are not extensively addressed. Baltussen (1992) searched for the additive value of using styles of farming as criteria for classification of farms in research on farm economics. He saw styles of farming as *…a way of introducing objectives of farmers in technical-economic research.* He expected that the existing relations between the objectives of farmers and their farm structure would prevent a high additional value of the additional knowledge of farmers' objectives. Besides he doubted the predictable value of farmers' objectives, because he expected farmers to change their objectives in connection to the developments in government regulations.

Figure 2.4 Theoretical model for the variation in styles of farming. The model shows ambition levels in farming (in spheres) and coherence in the co-ordination of farming practices, reflecting differences in rationales. The various rationales are related to the home bases for farming in the context of domains.



In Van der Ploeg *et al.* (1996) the database on dairy farms of the national farm-economic institute (LEI-DLO) was evaluated for styles of farming. They found various contrasting styles of farming. They recommended that styles of farming receive more attention in farm-economic research, through the addition of indicators for the classification of farms.

Verstegen (1998) compared in his research on indicators for pig production the 'farm-economic management level approach' with the 'sociological styles of farming approach'. The criterion for comparing these approaches was the value for explaining differences among farms in the profitability of sow-herd management information systems (MIS). In his study the farm-economic management level approach proved to explain the profitability of MIS better than the sociological styles of farming approach.

In all these approaches the value of the concept of styles of farming was evaluated as additive to farm-economics. In the current study the approach is the opposite. The concept of styles of farming is used as a foundation for farm-economics. Productivity, Intensity and Scale are specified in relation to the physical transformation processes in pig production practices. Differences in Productivity, Intensity, Scale and related parameters are the basis for the classification of farms in styles of farming (see also Appendix B).

The Eonomy of Productivity

In his work Van der Ploeg emphasised often the importance of the work of Hayami and Ruttan for the development of the concept of styles of farming. Yet, like Beckford (1984) and Bennett (1982), he also had criticism with respect to the economy of Productivity (Van der Ploeg 1991). The criticism is focussed on the fact that capital is not made explicit in the formula.

Van der Ploeg (1991) explained that the model of Hayami and Ruttan was essentially based on a conventional theory about resource allocation, as part of a ruling theory about the 'behaviour' of enterprises. *Critical to the model is the existence of competitive conditions along with profit-maximising behaviour of decision makers* (Beckford 1984:76). The criticism of Beckford is that farmers in developing countries are not exclusively oriented on profit-maximisation:

> *'Profits from farm production are only one element (though a major one) in the matrix of their objectives. Considerations such as family security, social status, and risk minimalisation all enter the picture, depending on the particular institutional environmen'* (Beckford 1984:77).

Secondly, there is criticism of the implicit assumption that any increase in productivity is identified with development. The model ignores that balances of power and politico-economics have more impact on welfare and development than productivity (Beckford 1984:80). Thirdly, there is doubt about the extent to which the relative prices of factors (land, labour and capital) really reflect the balance of physical scarcity. Very often the relative prices of factors are a 'distortion' compared to the real balance of physical scarcity. Actually the relative prices of factors are often a reflection of a balance of power, especially in 'open economies like propagated by Hayami and Ruttan' (Van der Ploeg 1991). The theory ignores an independent interlocking[10] of power, prices of factors and technological development. A fourth issue of criticism concerns aggregation. One aspect of the issue of aggregation is that in many countries it is disputable to what extent a coherent agricultural sector with common interests really exists. The existence of diversity in farming practices in otherwise homogenous regions is a frequent observation. Another aspect of aggregation is the assumption that a summation of micro-economic behaviour is representative for macro-economic behaviour. According to Van der Ploeg (1991) this is disputable too.

The criticism that is given here is closely associated to the meaning that the critics apply to the phenomenon 'Productivity'. Productivity is associated with economy and capital. It is the common assumption in addressing the issue of Productivity. Yet it may be disputed whether this common perception of the meaning of Productivity is correct.

For example, when Van der Ploeg (1991) concluded that *...the relative prices of factors are a 'distortion' compared to the real balance of physical scarcity* (above) he illustrated this with an example about land claim in the USA. Cynically he stated that scale increase in the USA was not primarily facilitated by a low factor price of land: *'...What used to be cheap in the USA were the bullets to chase the indigenous people away'.* Despite the vivid image, Van der Ploeg undoubtedly did not mean that the price of bullets (or even the price of land) was the principal issue at stake – that those prices should have been higher. A discussion about the balance between costs and profits of bullets – or land – would not have settled the issue that was at stake. What he meant to dispute was the justification and the social legitimacy of the land claim in the first place.

The point is that Productivity is (or should be) the outcome of a mathematical equation resulting in a plain value – without a unit. There is (or should be) neither a financial unit (like € or $), nor a physical one (like kg or lb) involved. Productivity is (or should be) a plain figure, representing just balance – a relative value.

In Appendix B the implications of the fact that Productivity should have the character of a plain balance are covered. Appendix B shows what types of physical units are involved in pig production practices and how these units are related to monetary units. In order for Productivity to be a real balance there are special conditions should be met in terms of undoing the intertwining of physical and monetary units.

These conditions are not met in the current study. Therefore a distorted representation of Productivity is suggested. This is shown directly through the fact that in the current study Productivity is expressed in the unit: 'produced feeder pigs per input hour of labour (per week) in pig production'. Appendix B discusses the process that led to the decision to specify Productivity in this way.

Farm Feed Production Versus Supply Markets in Styles of Farming

The industrialisation of the object of labour in livestock farming has emerged in the last few decades. In the 1950s through 1970s the concept of a so-called Green Revolution became popular. This revolution aimed to industrialise agriculture to such an extent that the increasing world population could be fed. Nutritional food requirements were calculated in industrial quantities of staple food, animal protein, etc.. In the process, the agricultural objects of labour, land and livestock were downgraded to elementary producers of essential nutritional products. Since the 1980s the intrinsic values of livestock have been discussed in ethical disputes. (Zijpp 2001; Constanza 2000; Grommers and Vorstenbosch 1995; Visser and Grommers 1988).

The switch from land to livestock implies a different structure of costs for the object of labour. The market for land and the market for productive animals are independent. History has shown in The Netherlands that favourable prices on the international supply market have boosted the industrialisation of agriculture. The industrialisation of pig farming capitalised on the low cost of grain substitutes to be used as feedstuff. The grain substitutes (mainly tapioca from Thailand and soya from South America) entered in bulk loads through the port of Rotterdam, when the European Union (EU) created artificially high grain prices in the 1960s. Thus livestock, and in particular pigs and chicken turned into agro-industrialised objects of labour. Since the MacSharry agreement[11] of the EU (1994), prices for concentrated feedstuff gradually became more balanced in Europe. Since then, foreign competition has been increasing for the Dutch pig farming industry.[12]

A major feature of the industrialisation of farming is the reduction of dependency on land for feed production. For the evaluation of styles of farming with respect to Productivity, Intensity and Scale, there is an extra complicating factor: the unit for 'object of labour' (see also Appendix B). If land is the basic object of labour, then the unit is acreage. If livestock would be the only bases for 'objects of labour', then the unit would be 'numbers' of animals. But there is a fundamental problem for the evaluation of Productivity if part of the feed production is done at the farm (acreage), and part is bought from supply companies – meaning that to a certain extent the livestock (numbers) are the basic objects of labour. Evaluation of the interacting agricultural objects of labour, land and livestock, implies a technical problem: surface (A in: ha) and size (N in: numbers) cannot be added up. This problem has arisen in several other studies about styles of farming as well.

In the research of Roep (1988) about dairy farming, the collected data were adjusted for dependency of supply markets on feedstuff, before they were analysed in a factor analysis. Wiskerke (1997) in his work on arable farming in The Netherlands and Boonstra (2001) in his work in Australia both created an extra dimension: a dimension for mobilisation of supplies. The dimension for mobilisation of supplies was needed in their studies to deal with the range of opportunities for farmers in entering or avoiding supply markets. By creating this extra dimension, integration strategies for supply market became a selection criterion for style of farming. Gerritsen (1995), who conducted his work in a nature conservation area in Mexico, found two dimensions in determining a regional style of farming. In his selection criteria the access to grazing land for cattle was crucial.

In the current study this aspect was deliberately avoided by choosing a completely industrialised farm branch.[13] Therefore an extra dimension for the difference between farm production of feedstuff versus market mobilisation was not required: All pig farmers in the study were completely (and therefore to an even extent) integrated in supply markets[14] for feedstuff.[15]

In the Context of Markets for Pigs

The concept of styles is a multidimensional concept. With respect to farming, the concept of styles entails the whole of farming practices, including strategies on labour, scale and intensity, recruitment of supplies and sales of commodities. In Hofstee's research work (1985, 1946), styles of farming were related to the production of commodities in different production branches and in different areas: dairy production versus arable farm production. In this perception of styles by Hofstee, the agricultural branch specialisation and the type of market integration were all incorporated in the contrasts among styles of farming. In the research work of Van der Ploeg and his group, the concept of styles was often studied within a specific agricultural branch and within a certain type of market integration. They often focussed specifically on the process of farm production practices within a certain commodity branch in reflection to labour, scale and intensity, just like in the current study.

Farm production may consist of a variety of commodities. In farm diversification (or specialisation) different levels of strategies can be distinguished:

1. Mixing farm activities and non-farm activities or off-farm business activities, like for instance including agro-tourism, sales on farm, social care, organisation of events, nature management, off-farm jobs, etc.
2. Having mixed farms: a combination of the type of crops and/or animals.
3. Having a multi-purpose farm branch: the type of products from one source (crop or animal), for example by keeping dual-purpose dairy cows (milk and meat).
4. Focussing on niche market production: specialising in types of qualities of a farm product, for example turning to production of bacon.
5. Creating varieties in market presentation: varying in type of processing of a specific quality product, for instance through mediation of special slaughterhouses or butchers.

At these levels styles of farming might be distinguished, in relation to the diversity or specificity of the market products that are involved for study. In previous studies about styles of farming, portraits often referred to differences in types of market integration. Labels like 'dual-purpose farmer' (Roep *et al.* 1991; Van der Ploeg and Roep 1990), 'small-and-mixed farms' versus 'large-and-mixed farms' (De Bruin 1991), and 'diversification strategy' versus 'niche production strategy' (Boonstra 2001) point in such a direction. Styles are sometimes also influenced by regional differences, which may also be reflected in their labels. Regional differences were very pronounced at the time that Hofstee did his research (Hofstee 1985, 1946). According to both Hofstee and Van der Ploeg (Van der Ploeg 1991) these differences are fading now. Nevertheless, in comparing different studies on styles of farming in various regions, regional differences should still be taken into account (Wiskerke 1997; Wiskerke *et al.* 1994; Van der Ploeg *et al.* 1992; De Bruin and Van der Ploeg 1991; De Bruin *et al.* 1991; Roep *et al.* 1991; Van der Ploeg and Roep 1990). In the initial study it was shown that there were regional differences between the pig production area in the south and in the east.

Though the current study was focussed on the specialised bulk production of feeder pigs, on several farms there were mixed activities on the other strategic levels that were described. These mixed activities and the styles of farming that might be related to these mixed activities could have interfered with the classification of styles of farming in the current study.

Additional farm activities concerning niche market production and variety in market presentation could also influence the classification of farms in styles of farming. It appeared that some slight deviations from bulk production are inevitable in this research. In the initial study some pig breeders appeared who reared maiden sows for their own farm and for sale to other farms. On those farms all female piglets of the right breeding type were reared as maiden sows, and a minority finished as feeder pigs. The rearing of maiden sows involves extra work compared to rearing feeder pigs – for example by protecting the teats of the young females. But some of these females would get sold later as feeder pigs anyway if their quality was insufficient for sale as maiden sows. So these feeder pigs were reared more labour-intensively than feeder pigs from ordinary pig producers.

There were also some pig producers in the initial study who produced animals for a speciality market, such as boars destined to finish as bacon pigs on the British market[16]. Those boars were better priced than ordinary feeder pigs. Some of the organic pig breeders in the initial study produced feeder pigs in regional specialities markets. In the current study there were also some pig producers who reared maiden sows. There was one farm that produced for the bacon market.

Economy in the Standardised Pig Production Branch

Pig farms in The Netherlands are family based and from a social perspective to a large extent comparable to dairy farms and arable farms. Actually pig breeding is quite often a second (and equally important) branch on dairy farms and arable farms – especially in the study area. The strengths of the Dutch pig farming business are the low costs and high efficiency of production (Wijffels 2001; Kearney 1994). This is facilitated by the integration of a chain of production operations. Based on contemporary science, the qualities and quantities of pig food are conditioned, resulting in optimal animal growth and health and, together with the modern housing and selection of breeding types, in pork qualities that match consumer demands. So the pork production process is optimised in standardisation (Moughan and Verstegen 2000; Van der Poel *et al.* 1999; Verstegen *et al.* 1998; Moughan *et al.* 1995; Verstegen and Henken 1987; Verstegen 1971; Tielen 1987; Tielen 1977; Dommerhold and Grashuis 1968/1967).

From the 1980s onward farm economics scientists created relevant farm management indicators. The indicators were used in the development of farm management support systems. The development of farm management support systems was related to current concepts in farm economics about efficiency in bulk production of piglets and pork (Backus 1991; 1988; Huirne 1990; ATC 1996). Since the early 1990s, the popularity of the regular supply of data from these key indicators for management purposes grew rapidly in pig husbandry (Verstegen 1998). By the mid-1990s almost 75-80 per cent of the Dutch pig producers received these computerised indicators monthly from one of the commercial suppliers, and this percentage is still growing (about 85 percent in 2003), although the number of pig production farms is decreasing (Agrovision 2003[17] Kleinreesink 1997; Bens *et al.* 1995). Since 2002 these indicators are available through the Internet and commonly used for optimising farming practices and farm economy. For the current study the development, specification and farm implementation of these indicators were important for the assessment of the styles of farming. In this study key data from the management indicators were collected and used in factor analysis for the classification of styles of farming.

Notes

1 In this context both 'past' and 'future' might be further subdivided in chronological terms – in stages of relevance. But there is no indication that such subdivisions are relevant in the context of this study.

2 Bernstein (1996) described the following experiment by Kahneman and Tversky (1984):

To one group of respondents the following case was given:

Imagine an outbreak of a serious epidemic, which will probably kill about 600 people. To tackle the threat there is a choice of two programs. *In program A 200 people will surely be saved.* In program B there is a 33 per cent chance that all will be saved and a 67 per cent chance that all 600 will die. In this experiment 72 per cent of the respondents chose program A – in favour of avoiding risks.

To another group of respondents the following case was given:

Imagine an outbreak of a serious epidemic, which will probably kill about 600 people. To tackle the threat there is a choice of two programs. *In program A 400 people will die for sure.* In program B there is a 33 per cent chance that all will be saved and a 67 per cent chance that all 600 will die. In this experiment 78 per cent of the respondents chose program B – in favour of seeking risks.

3 In his inauguration speech, Hofstee emphasised his interest in the causes by these lines. Het is wel duidelijk, dat een dergelijk nieuw groepsideaal en een daarmee verband houdende nieuwe bedrijfsstijl niet uit de lucht komen vallen en volledigheidshalve is het van belang om na te speuren, waarin deze verandering haar oorsprong vindt.

The hypothesis he comes up with starts at the farms along the coast. These farms had increased in scale through land reclamation. It was necessary and rational for these farmers to use the reclaimed land as arable land. Due to agreeable price levels it also became sensible to switch to arable farming for the farmers nearby in the peat district. In the areas in the survey it was neither rational nor irrational to switch as well. One of the areas in the survey was situated near the peat district (Westerwold area) and the other was not. According to Hofstee the trigger to switch was societal prestige related to the shift towards arable crop farming: *Groote- en rijke-boer werden daar dus min of meer identiek met bouwboer.* The shift was further facilitated by the growing knowledge among the farmers in the nearby peat district of how to shift from livestock farming to crop farming. The presence of this knowledge reduced the natural human resistance of the farmers against radical changes. As a result, the difference in pasture land between the areas in the survey was 13 per cent against 76 per cent by 1938.

4 The surroundings of Winterswijk were also part of the study area for the current study.

5 Benvenuti wrote most of his work in Italian. In 1991 a transcript in Dutch was made of some of his most important writings (Benvenuti 1991).

6 Roep uses the phrase ‘socio-material’ space to manoeuvre; I prefer to speak of ‘socio-physical’, because the constructions related to the space to manoeuvre might be ‘actual’ or ‘virtual’, like network constructions and production indicators. The English term ‘space to manoeuvre’ is suggested by N. Long.

7 On page 18 Van der Ploeg (1994) explains: They have become the (intra-regional) responses adopted by farmers to technology and the markets.

8 The dual-purpose farmer has a dual-purpose cow breed: a breed that is good for milk production and meat production. From Dutch tradition the most appropriate dual-purpose cow breed was the red-and-white Maas-Rijn-IJssel (MRIJ) breed that traditionally dominated the areas in the south and the east near the big rivers Meuse, Rhine and IJssel. In contrast, the black-and-white Friesian-Holland breed was a typical dairy breed and traditionally dominated in the north and western coastal areas.

9 see: http://www.lei.nl/lei_engels/HTML/home.htm and click on ‘statistics’

10 the word ‘interlocking’ is suggested by Long and Long (1992).

11 In the Uruguay-round (1988 – 1998) of the international General Agreement on Traffic and Trade (GATT) many subsidies and protective measures for agriculture were diminished or cancelled within the European Union (EU) in the so-called MacSharry-agreement (1994). In 1998 the GATT was substituted by the World Trade Organization (WTO).

12 A similar situation occurred in the greenhouse sector. Because natural gas is found in The Netherlands, the greenhouse sector has been able to profit from low gas prices. Thus greenhouse farmers were able to compete internationally with their products. Neither of these developments had anything to do with prices for agricultural land in The Netherlands.

13 In the current study the term ‘industrialisation of farms’ is used to express the extent of independence of farm feed production for keeping livestock.

14 In the survey there were some incidental cases of farmers who produced a few hectares of grain for their pigs on their own arable farm unit.

15 The independence of acreage is from the perspective of the farmer. From a broader perspective there is somewhere – of course – land in use to produce these supplies directly or indirectly (as a side product).

16 In standard pig production all male piglets are castrated within a few days of their lives. Otherwise they cannot be marketed. This rule was created to prevent boars from developing a ‘boar scent’ that could ruin large amounts of pork by the penetrative smell. This boar scent might develop (in only few animals) from the age of adolescence – about eight months. Bacon pigs are finished at an age of about four months and a body weight of 60 kg so they are too young to be able to spread the typical boar scent. Boars bring a better price because their feed conversion is more economic than that of castrates. It may be noted that castration is nowadays also in dispute for the bulk market feeder pigs. Due to increasing conversion rates for feed stuff the fattening pigs are ready for slaughter at an age of about 6 months. This is also still about two months before the age of adolescence.

17 See: http://www.agrovision.nl/

3 Materials and Methods

This chapter presents the classification of farmers into styles of farming in order to analyse diversity in processes and technical constructions in pig production practices. Two methods were incorporated in the study to identify styles of farming. The first was a subjective method used in an initial study, conducted in 1996. In this study pig production farms throughout the country were classified into styles of farming based on technology and business dimensions. The second was a computerised method, in which styles of farming were identified according to their relation to Productivity, Intensity and Scale. Information for this classification was collected through a survey conducted in 1998 in Twente and The Achterhoek. The relevant issues to be addressed in the survey were identified in the initial study.

The investigation thus consisted of three steps:

1 *An initial study*: Exploration of the diversity in pig production practices in the Netherlands and relevant questions for evaluating diversity (based on interviews with farmers throughout the Netherlands).
2 *An evaluative study*: Evaluation of variety in pig production in Twente and The Achterhoek (which included a survey, a preliminary subjective analysis and a computerised analysis of the survey results).
3 *An explanatory analysis*: Profile of processes and technical constructions in pig production in Twente and The Achterhoek.

This chapter is organised as follows.

Section 3.1 reviews the issues of interest identified in the initial study (Commandeur 1998), which were incorporated in the questionnaire for the evaluative study.

Section 3.2 outlines the survey methodology and identifies the styles of farming initially found in the survey material.

Section 3.3 presents the calibration scales[1] of Productivity, Intensity and Scale used in the computer analysis. The terms components, frames, ambition and rationale are also specified.

Section 3.4 summarises the various steps taken to classify the farmers into styles of farming.

Section 3.5 presents an analysis of issues related to pig production in terms of constructions and processes.

3.1 Issues for the Questionnaires

In the initial study open interviews were done according to the methodology of Emans (1985). From the interviews in the initial study, issues of interest were identified for use in a questionnaire for the evaluative study. I chose to focus on issues related to the processes and supporting constructions of pig production.

The initial study revealed a broad variety of topics related to the processes and technical constructions of pig production. Some topics are associated with all styles of farming, while others are particularly significant for specific styles of farming. The most important topics involved:

- prices, providers and consumers, markets and future
- views on family farms, division of tasks, role of women, farm successors
- animal management and production, farm hygiene, working conditions
- animal care and breeding, health and vaccinations, animal transport
- neighbourhood organisations, farmers' organisation, study clubs
- landscape, infrastructure, nature and wildlife, government restrictions
- availability and use of land, stables, feedstuff, manure, extension services.

Special attention in the questionnaire was given to perceptions of farmers about the following aspects, because questions about these aspects resulted in clear contrasts between styles of farming in the initial study:

- farm objectives and strategies
- ambitions of farmers in pig production (commercial, farm continuity, etc.)
- perceptions of entrepreneurship and craftsmanship
- rationale of farmers in reference to their fun of being a pig producer
- perceptions of goals in pig production
- animal care practices and ethical principals about animal welfare

Based on these subjects, questions were formulated covering processes in pig production or technical constructions in the pig production field (Table 3.1).

The questions were developed in such a way that answers could be given in one of the following forms:

- a number – involving for instance size, age or management support data
- a choice from suggested answers – prepared from responses in the initial study
- an explanation – for instance about breeding qualities of sows, or
- a comment – to clarify perceptions and points of view.

Numerical answers, choices from fixed answers, and explanations were used as parameters in systematic computer analysis – or transformed into such parameters. The open comments were collected and used as illustrations of the results of the systematic analysis.

Table 3.1 Issues and questions addressed in the survey of pig producers in Twente and The Achterhoek (These issues and questions are discussed in detail in Chapters 5 and 6).

Section	*Topics*	*Questions related to*
	Processes	
5.1	Farm strategies in connection to pig production practices	Farm size, other farm activities, the formal organisation of the farm, farm succession labour input, farm income, labour division in the pig production section of the farm
5.2	Regional integration of the farm	History of the farm, satisfaction with the farm, expected developments in the next 10 years, investments in the next three years, regional culture in pig production, appreciation of the area – contacts and clubs, scenic value and infrastructure, societal values of the farm,
5.3	Perceptions about farming practices	Reflection on perceptions of farmers: entrepreneurship and craftsmanship, the enjoyment of pig farming, objectives and strategies, automation, time and labour management, labour inputs, position of women, availability and use of land, manure management, farm hygiene, animal welfare, consumer markets
5.4	Developments in pig prices	Current topic: price drop in 1998
	Constructions	
6.1	Housing, equipment, and management constructions	Housing and mechanisation, feedstuff supply, manure, rearing and selective breeding, animal health, market management
6.2	Management indicators	Technical farm management indicators, indicators about inputs and outputs, costs, returns and economic balance, trends and fluctuations over the last few years
6.3	Perceptions about management indicators	Purpose of management support, economic principles, participation in management support, validation of indicators
6.4	Principles	Health strategies, cull principles and religion

3.2 Materials and Preliminary Analysis

A survey was conducted using the outlines of Nooij (1990). In the survey conducted in 1998, 82 pig producers in Twente and The Achterhoek were interviewed at their farms by means of a questionnaire. In the questionnaire farmers were invited to choose from suggested answers adopted from information obtained in the initial study (conducted in 1996). Some questions were also accompanied by a request for extra comments. All interviewed farmers received management support from a management support provider[2]. Copies of the yearly overviews conducted by the management support provider were requested for the years 1995 through 1997.

There was a lot of preparation work done for the questionnaire. There had been an initial study to raise the interesting subjects to talk about and to see how they were discussed. In the questionnaire those subjects and issues were transferred in questions with fixed answers. The questionnaire should not be too long and yet it should cover all aspects of farming practices. At the end when the questionnaires were filled in farmers were invited to comment on the interview. Some farmers liked to talk or to reflect on the issues that were raised. Some expressed it like this:

<W147>[3] *I didn't know what to expect of this interview. It gives food for thought.*

<C008> This interview sharpens the mind. Actually we should discuss these issues more in study groups.

I was happy that these farmers thought the interview valuable. Some farmers though had different expectations from the interview. Here are some comments:

<K317> I thought that this interview would be more about dealing with pigs and treating them.

The farmer that gave this comment was classified in the study as stockman. A major characteristic of stockmen is that they enjoyed caring for pigs. So that was a subject that he (or she) would like to talk about. Another farmer commented to the interview:

<E250> I had expected that the interview would be more directed towards entrepreneurship en future market relations – also in relation to cost prices, the World Trade Organisation and society that changes demands and that doesn't bear industrial pig production anymore in 20 to 25 years. And also the strategy: producing is one thing, selling is something else. The image, what is the appearance. We have to learn about that.

This farmer was classified in the study as entrepreneur. One of the characteristics of entrepreneurs is the emphasis on markets. So, although I should try to improve the communication about the intentions of the interview next time, it was striking that styles of farming were so obviously reflected in some of the spontaneous comments.

Of the professional interviewers that were hired to do the questionnaires none had any specific knowledge about (pig) farming. Some farmers disliked the lack of specific knowledge about the subject. One farmer said:

<U068> We are astonished that Wageningen University has send interviewers who don't know anything about pig farming.

Some other farmers found it challenging however, to clarify their views to somebody who was not familiar with the farm branch. Most farmers in the survey were looking forward to the results. One of them commented:

<U039> I hope something good shall come off the research results.

But I had to warn the farmers that it would take a while before the results would be available. (I didn't know then that it would take about four and a half years).

After the survey was done, a preliminary analysis was done similar to the analysis conducted in the initial study, to bridge methodologies in identifying styles of farming.

This analysis was followed by a systemised computer analysis based on calibration scales of Productivity, Intensity and Scale (Section 3.3).

3.2.1 Set up of the Survey

The survey was conducted only among farmers who participated in a management support programme in Twente and The Achterhoek. About 75–80 per cent of all pig producers in the research area participated in such a programme in 1998. Initially it was hoped that at least 100 farmers would participate in the survey. However, it became clear that this number could only be reached with much more effort (time-input) than was planned for. When the number of 82 farms reached the interviewing was ended. Management support information was available for 70 of these farms.

The management support providers assisted in making the initial approaches to the farmers. The providers selected 412 users in the area, tried to contact them by phone, and asked those who could be reached whether they were in principle willing to participate in the study. About 300 farms were initially reached by telephone. The initial response was positive, as 132 farmers gave permission to be contacted[4].

An interview bureau hired by Wageningen University contacted the 132 farmers to make specific appointments. Interviewers then visited 82 farms (62 per cent of the initially positive respondents). The study area (Twente and The Achterhoek) is rather extensive and it was thus difficult to make schedules for farm visits that suited both the interviewers and interviewees[5].

Professional interviewers filled in the questionnaires during their farm visits. As the principal researcher, I conducted 29 of the 82 farm visits myself to get a clear understanding of the responses. The interviews lasted usually about 1¼ hours, but ranged in some cases from 45 minutes to as long as 3 hours.

The survey consisted of two parts. Part I was the actual questionnaire, with a list of questions respondents were invited to answer during the farm visits. Part II consisted of overviews of farm data about management support for the years 1995, 1996 and 1997. Some farmers were not willing (in one case) or able (in several cases) to provide the interviewer with overviews of management support data. At the farmers' request, management support providers assisted in providing the information in various cases. In the end, 12 (of 82: 15 per cent) questionnaires lacked information about management support; 70 farmers provided overviews of data for 1997 (Table 3.2); variable numbers of additional data were provided for the years 1996 and 1995, and about inputs and outputs and economical indicators.

3.2.2 Preliminary Analysis and First Classification of Farmers

The survey results were first analysed according to the same method I used in the initial study (Commandeur 1998). The aim of this exercise was to determine to what extent the survey methodologies lead to comparable results in terms of styles of farming. It was thus necessary to bridge the identification of styles of farming in the methodology of the initial explorative study with the methodology of the evaluative study.

Table 3.2 Results of attempts to contact pig producers in Twente and The Achterhoek in 1998 for participation in the survey

Management support program		*Comzog*	*CBK*	*ZAP*	*Total*
Random list of potential participants		191	186	35	412
Actually contacted by telephone?	no	31			
	yes	160			
Willing to participate?	not clear	30			
	no	77			
	yes	53	69	10	132
Actually visited?	no	61	29	5	50
	yes	37	40	5	82
Presentation of management data?	no	8	3	1	12
	yes	29	37	4	70

In the initial study, I identified styles of farming on the basis of responses to questions concerning a whole range of issues related to farming practices. Two aspects of this methodology are important when comparing its results with those of the questionnaire. First, in the open interviews a farmer was free to answer questions in his or her own words. Second, a farmer's response was not only compared to the responses of others, but also judged according to how much it said about a certain issue. In the initial study, farmers were thus free to not (or only superficially) comment on a subject. In contrast, in the questionnaire the farmers were encouraged to answer all of the questions through a series of suggested answers. In addition, the suggested answers were always to a certain extent directive, because some of these answers they would not necessarily think of themselves if asked the same question in an open interview. This shift in methodology for obtaining data has an impact on the applicability of analytical methods.

The analysis of the data obtained in the survey according to the methodology used in the initial study is an intermediate step. It is not the best analytical method for the material, but there were several reasons to do this preliminary exercise:

1 to help the researcher become familiar with the raw data and information
2 to alert the researcher to features that could result from analysis
3 to alert the researcher to the number of styles of farming that may be present in the material.

For the preliminary analysis only the information obtained from the questionnaire (Part I) was used, to keep the method comparable to that used in the initial study. As in the initial study, questionnaires were read and questions or groups of questions that resulted in contrasting answers were identified. Based on the contrasts that were found in the survey material, farmers were classified into groups. The groups were given metaphoric labels for reference.

The labels were given based on a specific, summarising characteristic of the group. In the initial study summarising characteristics for some styles of farming were already defined: entrepreneurship (E), craftsmanship (C), inheritorship (H), and tendership (T). No farmers in the evaluative study were found to match the definition of tendership, but there was a need to define a summarising characteristic for (at least one) additional group. That was for the group of farmers who were shifting (or had already shifted) their attention to other activities. Pig production had a low priority on these farms. This had an impact on answers to questions about the pig production practices. This group was referred to as 'shiftership' (F).

> '*Shiftership*'…
> … is an umbrella term for farmers who may still be active in pig farming, though their main focus of attention is shifting or has already shifted to other (farm or off-farm) activities. Some shifters will continue in other branches of farming, and others will stop farming completely. What shifters have in common is that they decide whether or not to continue investing in the (pig) farm unit based on developments in other activities.

'Shiftership' thus differs from all other styles of farming because activities other than pig production determine what happens in the pig production unit of the farm. So whether or not the results in the pig unit of the farm are poor, other activities will receive priority attention from the farmer.

The preliminary analysis led to a classification of the 82 farms in the survey into the following styles of farming: entrepreneur (E), craftsman (C), inheritor (H), and shifter (S). The descriptions of the classified farms indicated that the farming style labelled inheritor could be split further into two distinct categories. The summarising characteristics of these styles of farming should refer either to the providers of labour in the farming family ('steward') or to the objects of labour – in this case pigs ('stock'). Stewards fit the image of the cultural tradition of the region (mixed family farms):

> *Stewardship*…
> … is the tendency of farmers to base their identity and satisfaction and those of their families on the continuation of their inherited way of life (farming), and to use the desire for family succession of the farm as the basis for entering into obligations concerning the farm.

Within the category inheritorship, there are thus different perspectives on farming. One perspective, which I call stewardship, emphasises heritage and succession in family farming. Stewardship particularly emphasises the social aspects of farming: flexibility and the family's enjoyment of being farmers. From this perspective farming is seen as an inherited way of life that will be passed on to the next generation. The other perspective within inheritorship, which I call stockmanship, emphasises not just heritage continuation but heritage continuation in pig farming. The self-image of stewards is primarily specified in social terms, while the self-image of stockmen is connected specifically to pig farming, as farm branch.

> *Stockmanship*…
> …is the tendency to enjoy the housing, keeping and caring of animals (in this case pigs) and to use this enjoyment of practical farm management as the basis for the development of an integrated enterprise system of feeding, housing, keeping and caring.

Stockmanship contrasts with craftsmanship to the extent that it is the animal (pig) itself and not the production of the animals that is the key to the stockman's rationale in being a farmer. But stockmanship also contrasts with tendership to the extent that dealing with the animal (keeping and caring) is the most important element. So in stockmanship, the farmer is egocentric: the farmer's interests are dominant. In tendership the welfare of the animal is dominant: *...the needs and requirements of animals (pigs) to live their lives in the way that is specific to their species* (Section 2.1).

3.3 Computerised Analysis

3.3.1 Calibration Scales of Productivity, Intensity and Scale

There are no standards for specifying Productivity, Intensity and Scale. Standardisation would be complicated, because calibration scales (of production, size, and labour input) are open to multiple interpretations. In the following, the calibration scales of Productivity, Intensity and Scale are specified for the computer analysis of this study. Interpretations of differences among Productivity, Intensity and Scale were mainly based on information in the questionnaires.

Production

The 1997 data derived from the management support overviews were used in all calculations involving production. In the analysis, production was specified as the production of reared feeder pigs of about 25 kg body weight, ready for fattening.

Size

Size was specified as the farm size during the interviews in 1998. The size of the pig production unit of the farm was specified as the average number of sows on that farm. In management support indicators involving size, the farm size in 1997 was used as derived from management support overviews.

Labour Input

The specification of labour input was derived from the completed questionnaires. Farmers who worked 'full time' on their farm claimed to work 40 to 90 hours a week. This is a huge difference in farmers' perceptions of 'full time'. The labour input was therefore specified as the number of working hours invested per week in the pig production unit of the farm – with a maximum of 55 hours per individual per week.

To compare the farms, the number of working hours in the feeder pig production unit of the farm was calculated for each farm. The calculation was done using the following guidelines:

1 The maximum number of working hours per adult was 55 hours per week.
2 Working hours of children under 18 years of age were taken as ¾ hours.

3 On specialised pig farms with a combination of pig production steps, including fattening, 70 per cent of the working hours were assumed to be spent in the pig production unit (unless stated otherwise by the farmer).
4 On specialised pig farms with a combination of maiden sow[6] production, pig production and fattening, 55 per cent of the working hours were assumed to be spent in the pig production unit (unless stated otherwise by the farmer).
5 On a mixed farm with dairy cattle, 50 per cent of the working hours were assumed to be spent in the pig production unit (unless stated otherwise by the farmer).
6 Working hours contributed by people who were on the farm for social reasons were not taken into account.

Intensity

The 1997 data derived from the management support overviews were used in all calculations involving Intensity. Intensity was specified as the number of reared feeder pigs (about 25 kg) per sow (er year)

The Intensity of pig production should also be based on piglet growth and the sow replacement ratio. That was not done in this study as explained in Appendix B. In this study, piglet growth and the sow replacement ratio are discussed separately in the results (Section 6.1).

Scale

Scale was specified as the number of sows present in 1998 divided by the total number of working hours per week spent in the pig production unit as reported in the interviews of 1998.

Productivity

Productivity was specified as follows:

[Intensity] = [Y/N] = [feeder pig production (about 25kg) per sow (per year) in 1997]

[Scale] = [N/L] = [sows on the farm per working hour (per week) in 1998]

[Productivity] = [Y/L] = [Intensity * Scale]

Log10 Transformation

There are two principal reasons for log-transformation of Productivity, Intensity, and Scale:

1 The graphic curves of Productivity, Intensity and Scale are exponential. Log-transformation creates a normal distribution.
2 The Productivity curve is complicated. Log-transformation creates a straight line, making analysis much easier.

All calculations were done with the log10 value of these quantities, unless stated otherwise. The same holds for farm size. So the notation of the formula should be:

log10 (Productivity) = log10 (Intensity) + log10 (Scale)

In this study when Productivity, Intensity and Scale are mentioned the log-transformations are meant. It is specified as follows:

Productivity = Intensity + Scale (note: log-transformed)

and:

[Productivity] = [Intensity * Scale] (note: between [ ] means not log-transformed)

3.3.2 Specification of Frame, Component, Ambition and Rationale

In the computer analysis parameters reflecting farming practices were related to Productivity, Intensity and/or Scale. Intensity and Scale were used as a system of square dimensions with interactions. Parameters reflecting farming practices with correlations to Productivity, Intensity and/or Scale were specified as the frame for further analysis.

Principal component analysis of the frame led to sets of coherent correlations (components) in different directions: with Intensity and Scale, with Intensity or Scale, and without correlations to Productivity, Intensity and/or Scale. In the two-dimensional system of Intensity and Scale the most important components based on the frame appear as ambition (related to Intensity and Scale) and rationale (related to Intensity or Scale).

In summary the specifications are:

Frame

The frame of farming practices is the construction of ambition(s) and rationale(s). In a system of Productivity, Intensity and Scale the frame consists of components that represent the coherence in the values of Productivity, Intensity, Scale and parameters that reflect farming practices with correlations to Productivity, Intensity and/or Scale.

Component

The components of the frame of farming practices are the results of the factor analysis. They represent the variety in ways in which coherence in mutual correlations of the values of parameters is established through principal component factor analysis.

Since Productivity, Intensity and Scale are among the parameters for analysis, components can be classified as ‘related to Productivity, Intensity and Scale’, ‘related to Productivity, Intensity or Scale’, and ‘unrelated to Productivity, Intensity and/or Scale’.

Ambition

The ambition is the component (or the combination of components) that is classified as ‘related to Productivity, Intensity and Scale. It represents the deviation from the average Productivity-curve to a different curve.

Rationale

The rationale is the component (or combination of components) that is classified as related to Productivity, Intensity or Scale. It represents the deviation from the average combination of Intensity and Scale on the same Productivity-curve. The rationale connects the ambition to the foundation (see Section 2.1). The rationale can be specified at different levels of ambition: average, at the level of competition, and at the level of participation and autonomy.

In the current study ambition at the level of competition is sometimes referred to as ‘high ambition’. At the level of participation and autonomy it is sometimes referred to as ‘low ambition’. Note that ‘high’ and ‘low’ are arbitrarily chosen. The terms are used to express contrasts. They are not qualifications, and could be used reversibly as well.

3.3.3 Specification of Styles of Farming

For the evaluative study styles of farming were specified through chosen combinations of components, which resulted from principal component factor analysis of the selected frame. In the factor analysis farmers received individual values on each of the components. Several components from the factor analysis were used to specify styles of farming. The farmers were classified from values on the chosen combination of components.

Group-averages of the values of parameters from the questionnaire were calculated for the classified farmers. These group-averages identified the styles of farming. They were checked for relevant deviations from the population average. The in-group deviations from the population average reflected the contrasts among styles of farming. Overviews of the group-averages and the in-group deviations from the population average resulted in portraits of the styles of farming.

Next the issues identified in the questionnaires were divided into issues concerning constructions or processes in pig production practices. The issues were analysed using styles of farming.

3.4 Classification of Farmers

3.4.1 Preparation of the Questionnaire Data

The first step was to check the raw data from the survey and transform it into parameters. For the evaluative analysis 70 questionnaires were used, for which both the answers to the questionnaires and the management support data were available. This information resulted in about 850 parameters. The list of parameters was checked for missing values and for numbers of odd responses (how many “yes” compared to “no” answers). After removal of parameters with missing values or with less than 7 (10 per cent) odd responses there were about 500 parameters remaining. The 500 available parameters were checked individually for correlations to Productivity, Intensity and/or Scale. Five frames of parameters were selected for the principal component factor analysis: *(1)* correlations between parameters and Productivity, Intensity and/or Scale: ($p<.1$); *(2)*: ($p<.05$); *(3)*: ($p<.01$); *(4)*: ($p<.005$); *(5)*: ($p<.001$).

3.4.2 Estimation of Ambition and Rationale

Principal component factor analysis was applied after the methodology described by Nooij (1995). The factor analysis was done on the five frames to search for the frame that would best reveal ambition, rationale and styles of farming in the components. The criteria specified to select one frame for further analysis were:

- number of selected parameters in the analysis
- variation in the issues covered by the selected parameters
- number and position of relevant components: with correlation to Productivity, Intensity and/or Scale
- percentage of variance explained by relevant components
- correlation between relevant components and Productivity, Intensity and/or Scale.

The resulting components from the chosen frame were checked in terms of being either related to Productivity, Intensity and/or Scale. The first component that was related to Productivity, Intensity and Scale determined ambition (*a*). The first component that was related to Productivity, Intensity or Scale determined rationale (*j*). Subsequent components were also checked for relations to Productivity, Intensity and/or Scale.

Ambition and rationale were estimated from the regression of farmers' values on the components of Productivity (see: Section 3.4.2). Productivity at high ambition was estimated from the values of all farmers with positive values the related to Productivity, Intensity and Scale component. Productivity at low ambition was estimated from the values of all farmers with negative values on the related to Productivity, Intensity and Scale component. Rationale at high ambition was calculated as the regression to Productivity at high ambition. Rationale at low ambition was estimated from the regression to Productivity at low ambition.

3.4.3 Styles of Farming, Classification and Identification

After determination of ambition and rationale of the farmers at different levels (average, high and low), they were classified into styles of farming based on the following criteria:

- differences in component values of the farmers
- correlation between relevant components that resulted from the factor analysis and the selected parameters
- definitions of metaphors of styles of farming
- results from the preliminary analysis.

Based on these criteria four styles of farming were found that are connected to the components which determined ambition and rationale

entrepreneur (E) and craftsman (C):	high ambition, and contrasting rationale
stockman (K) and shifter (F):	low ambition, and contrasting rationale.

The stewardship (W) style of farming was not found from the components that determined ambition and rationale of the other styles of farming. Close study of the frame of parameters in relation to the other components that resulted from the factor analysis revealed that stewardship was reflected in other components. These were other components resulting from the factor analysis that were also related to Productivity, Intensity or Scale: other rationales. Stewardship was found as a combination of those rationales.

This classification of farmers was correlated with the results of the preliminary analysis. In the third, explanatory, step of the study, styles of farming were identified as the group-averages of the classified farms. This final step is described in the following section.

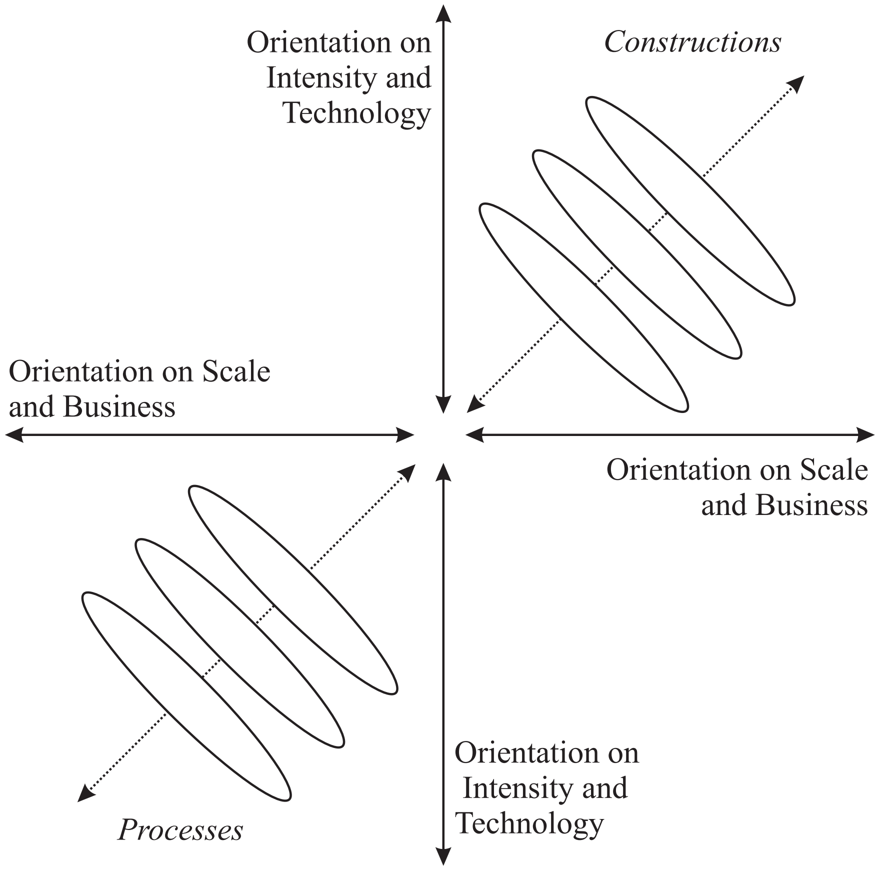
3.5 Issues in Terms of Constructions and Processes

The key quality of styles of farming is the coherence of a great number of characteristics, which form an intrinsically logical whole of farming practices, and which contrast with other farming practices. Farmers in this survey were classified in styles of farming based on differences in Productivity, Intensity, Scale and parameters that were related to Productivity, Intensity and/or Scale. Portraits of these styles of farming were created using the farmers' responses to the questionnaire. These portraits reflected deviations of the styles of farming from the population average. Together the portraits also revealed contrasts among styles of farming. These contrasts showed that the various styles of farming represent different goals in farming. Every style of farming entailed a combination of two types of goals: a goal related to Technology and a goal related to Business.

If the system on Productivity, Intensity and Scale and the orientation on Capacity, Technology, and Business are combined a four-dimensional whole occurs. This whole can be studied in three-dimensional (spacial) sections. This can be imagined as follows. If a one-dimensional line is cut and flipped backwards, two dots appear in view. If a two-dimensional square is torn and flipped backwards, two parallel lines appear in view. If a three-dimensional space is broken and flipped backwards, two mirrorwise complementary squares appear in view. Likewise, if a four-dimensional whole of space-and-time is split and flipped backwards, two complementary spaces appear in view. This is the image of the division of the information from the survey into processes and constructions (Figure 3.1).

Processes are factors of farming in which one can become involved. They can be influenced, led, guided, controlled, or even blocked. The division of tasks on a farm is considered a process, as well as the social interactions in the region or a person's thoughts. In contrast, constructions are supports. They are factors that can be created, defined, specified, reconstructed or destroyed. Constructions can be material, like buildings and equipment. But management constructions for farm work or for network contacts are also constructions. The definition and specification of farm indicators are also constructions.

Figure 3.1 Image of the spaces of processes and constructions in a four-dimensional whole defined by both the dimensions Intensity and Scale and the dimensions Technology and Business



Processes in Pig Production

Parameters concerning the processes in pig production were divided into different environmental levels:

- pig production practices on the farm
- pig production temporal and regional perspective
- perceptions of matters concerning pig farming
- current developments in pig prices

Through the farmers' responses to questions in the survey, relevant problems involving processes in the pig production branch at each environmental level in Twente and The Achterhoek were identified and qualified.

Constructions in Pig Production

Parameters concerning the constructions in pig production were divided into different technological levels:

- housing and equipment
- management constructions and networks
- indicators reflecting pig production

- attitudes towards the indicators
- principles about animal health and cull

Through the farmers' responses problems at the various technological levels related to constructions in the pig production branch in Twente and The Achterhoek were identified and qualified.

Notes

[1] Calibration scale: scale on the axis of a dimension. The term calibration scale is used to distinguish the term from the notion of farm Scale – the number of sows per working hour (per week).

2 Farmers had one of three management support programmes: CBK or ZAP (of SIVA BV), or Comzog (of Comvee BV)

3 <X024> is a code for a farmer. The letter <X> stands for the classification of the farm (Chapter 5).

4 The farmers who did not participate gave one or more of the following reasons:

- *no interest*
- *in the process of stopping pig production*
- *too busy with the corn harvest and/or with building renovation* [it was autumn - MC]
- *away on holiday*
- *family circumstances (marriage, disease, death)*
- *had already received too many requests for interviews / too much research is currently being conducted*
- *management data are incomplete*
- *unwilling to present figures / had doubts about privacy protection*
- *the government will use the information against farmers*
- *the reward for participation (i.e. the book Gesloten Bedrijven) is not enough / payment for time input is required, because there are no direct farm benefits expected from the research*
- *things are still too emotional after the 1997/1998 Swine Fever crisis* [In this area no farms culled, but at some locations transport had been blocked for some weeks – MC]

5 At this stage it was sparsely recorded why appointments could not be made. The major reasons seemed to be both the same as those given by the farmers who were not willing to participate in the first place. In addition there were practical problems concerning scheduling. The route planned by the interview organisation and the schedules of the farmers were difficult to match.

6 Maiden sow: young sow or gilt that has not yet been in gestation (pregnant)

4 Classification and Identification

The aim of this chapter is to use the methods described in Chapter 3 to connect farmers (and thus farms) to styles of farming. This chapter contains the following sections:

Section 4.1 compares the results of the various steps involved in the study.
Section 4.2 elaborates on the results in terms of ambition, rationale and styles of farming.
Section 4.3 presents portraits of and contrasts between the various styles of farming.

4.1 Comparison of Study Results

In the preliminary analysis, farms were classified according to the farmers' answers to questions in the survey, which revealed contrasts. After classifying farms into styles of farming based on these contrasts, the farmers' answers were compared for correlation ($p<.05$) with the classes and for correlation with Productivity, Intensity and/or Scale. As a follow up, the results from this preliminary analysis were compared to the classification of farms in styles of farming using the factor analysis.

4.1.1 Styles of Farming in the Preliminary Analysis

Important contrasts were found in answers concerning the following subjects: farm size, production safety and hygiene, attitudes regarding stable equipment, use of management support information, attitudes regarding production indicators, validation of management support indicators, recent farm developments, and future perspectives for the farm. Answers concerning these subjects were selected to classify the farms. The farms were classified into four groups: entrepreneur (E), craftsman (C), inheritor (H), and shifter (F). Next, the correlations between the selected answers and the classes of farms were checked: 27 specific answers were correlated to the classes of farms (Table 4.1).

The classified farms and the corresponding answers reflected the image represented by the metaphoric labels. Entrepreneurs had large pig farms, and were focussed on the (labour) economy of farming practices. Craftsmen were focussed on pig production efficiency. Inheritors were less interested in economic and technical efficiency. Shifters had a small pig production unit on the farm and had low interest in investments.

Table 4.1 Correlations (p<.05) between styles of farming and responses to questionnaire as evaluated in the preliminary analysis. Parameters from the questionnaire are given in sequence of correlation.

N 82	Styles of farming (prelim. analysis)	*Specific combinations of questions and answers with correlations (p<.05) to styles of farming*	
		Positive	*Negative*
17	*Entrepre-neur*	Every investment should be completely economic. Log10 (Farm Size in no. of sows in 1998). At the end of the day it is the profit that counts. The joy of pig farming is the management. My view on animal welfare is not covered in suggested answers. Purpose of management support is economic improvement. The most important factor of stables is labour efficiency. Efficiency is more important than keeping every single piglet alive. Supermarkets should do their business, like we do ours.	The purpose of management support is technical improvement. We like to keep up with average farm size growth.
14	*Crafts-man*	Efficient manure management is best for the environment. IKB+ or Good Farming Crown label. We like to keep up with average farm size growth. Farrow index might be a reason for extra caution.	We would rather have (or keep) a mixed farm. The joy of pig farming is the experience of seeing new life. IKB or Good Farming Label (plain). Selection of boar type at request of fattener.
35	*Inheritor*	The purpose of management support is technical improvement. Selection of boar type at request of fattener. Percentage of re-inseminations might be a reason for extra caution. The joy of pig farming is the experience of seeing new life.	Every investment should be completely economic. Selection of boar type: personal considerations. At the end of the day it is the profit that counts.
16	*Shifter*	The woman should work in the house, the man on the farm. We would rather have (or keep) a mixed farm. The pig farm is too small for complete automation. When the results are good animal welfare must be good. The most important factor of stables is low investments. No considerations for selecting sow type.	Log10 (Farm Size in no. of sows in 1998). It is not important for a pig farmer to own land. Pig farming is a suitable business for a woman.

4.1.2 Comparing the Preliminary Analysis and the Initial Study

The portraits of styles of farming that emerged from the preliminary analysis were compared with the portraits created in the initial study (Table 4.1).

Entrepreneur

In the portraits of the initial study entrepreneurs were characterised by intensive and large-scale farming. They were focussed on financial balance with reference to labour and investments. This is confirmed in the preliminary analysis, through, for example, the choice of the statement '*Every investment should be completely economic*', the correlation with farm size, and the choice of the statement '*At the end of the day it is the profit that counts*'.

In the initial study entrepreneurs found *'...the taking of ventures* [to be] *the most interesting and pleasurable aspect of sow keeping'*. Regarding the enjoyment of pig farming, entrepreneurs classified in the preliminary analysis often agreed with the statement *'...the enjoyment of pig farming is in the management'*. In the initial study it was found that for entrepreneurs efficiency of labour input was more important than efficiency of sow use or production. In the preliminary analysis of the evaluative study entrepreneurs often chose *'...efficiency is more important than keeping every last piglet alive'*.

Craftsman

In the initial study craftsmen were portrayed as being keen on efficiency of production. This was confirmed in the evaluative study through manure management efficiency and attention to the production process, reflected in attention to the farrow index. In the initial study it was said of craftsmen that they had an affinity for pigs. In the preliminary analysis of the evaluative study two features were revealed: On the one hand, animal selection is not a simple practice for craftsmen; they have outspoken ideas about breeding. On the other hand, caring for new life (the piglets), is not a special enjoyment for craftsmen. In the initial study craftsmen appeared to be keen on production results and animal health. In the preliminary analysis of the evaluative study craftsmen had high standard labels for food safety (IKB^+ or Good Farming Crown[1]).

Inheritor

In the initial study it was emphasised that the aims and goals of inheritors were clearly distinct from those of entrepreneurs and craftsmen. This was confirmed in the preliminary analysis of the evaluative study. Inheritors did not think that every investment should be completely economic. And they did not agree that at the end of the day it was only profits that counted. Nor did they have a specific interest in the aspect of breeding; for instance they did not have personal considerations for selecting boars.

In the initial study inheritors were positively identified through the aim of their venture, namely to proceed with scale enlargement in order to maintain the required contribution to the family income. This aim seemed hidden in the outcome of the preliminary analysis of the evaluative study. What did come out after studying correlations were contrasts to craftsmen, in the enjoyment of having pigs and in production management. Inheritors often chose the statement that caring for new life (the piglets), were their enjoyment in farming. Concerning technical management, inheritors were focussed on re-inseminations and not on animal selection. This finding suggested that inheritors might consist of two subgroups of styles of farming:

- stewards, who were more focussed on the social aspects and status of 'being a farmer' and 'having a family farm'
- stockmen, who were more focussed on 'keeping pigs as such' and 'being specifically a pig producer'.

Shifter

Shifters were not found in the initial study. Shifters were defined by the fact that their attention was shifting to other activities, either on the farm or elsewhere. Perceptions about division of labour between men and women may play a role in the shifting.

4.1.3 Introduction of Productivity, Intensity and Scale in Computerised Analysis

The variables Productivity, Intensity and Scale, as well as management indicators were not taken into account in the preliminary analysis, for the purpose of comparability with the initial study. After the preliminary analysis, Productivity, Intensity and Scale were estimated as described in Chapter 3. Next the classes of farming styles identified in the preliminary analysis were related to Productivity, Intensity and/or Scale (Table 4.2).

Table 4.2 Correlations between Productivity, Intensity and Scale and the classification of farms derived in the preliminary analysis.

Results of Preliminary analysis:	*N*	*Log10 (Productivity)*	*log10 (Intensity)*	*log10 (Scale)*
Entrepreneur	17	.512***[1]	.293*	.474***
Craftsman	14		.260*	
Inheritor	35	-.291*		-.290**
Shifter	16	-.300*	-.349***	-.236*
ΣN	70			

[1] Notation of correlation (r) and significance (Pearson, 2-tailed):
r*: p<.05; r**: p<.01; r***: p<.005; only significant correlations are shown

The class identified as entrepreneurs in the preliminary analysis was positively correlated to Productivity, Intensity and Scale (Productivity, Intensity and Scale). In contrast, the class of shifters was negatively correlated to Productivity, Intensity and Scale. This suggested that the styles of farming called entrepreneurs and shifters were connected through a strong contrast.

The class of craftsman was positively correlated to Intensity and was indifferent to Productivity and Scale. In contrast, inheritors were negatively correlated to Productivity and Scale and indifferent to intensity. This suggested that there were two contrasts involved: a contrast involving Intensity and a contrast involving Productivity and Scale.

4.2 Elaboration of Results in Terms of Ambition, Rationale and Styles of Farming

4.2.1 Correlation between Parameters

All parameters derived from the questionnaire were checked for correlation to Productivity, Intensity, and Scale. Most parameters correlated either to Productivity and/or Scale (Productivity and/or Scale), or to Intensity (Table 4.3).

Productivity, Intensity and Scale were also checked for mutual correlation. Scale appeared more correlated (.985) to Productivity than Intensity (.432). This means that farms with different Scales usually had similar differences in Productivity. It was less usual for farms with differences in Intensity to have similar differences in Productivity. Intensity and Scale also had a mutual correlation (.270). This means that Intensity and Scale were not statistically independent.

Other parameters that were correlated to Productivity, Intensity and Scale were mainly related to farm size. Parameters that were correlated to Productivity and/or Scale were mainly related to farm economy and market aspects of the farming practices. Parameters that were correlated to Intensity were mainly related to technological aspects of the farming practices.

Results of Principal Component Factor Analysis

Principal component factor analysis is a procedure that reflects hidden coherence among parameters. In farming practices this coherence is created by styles of farming. In the current study it is assumed that those styles of farming are directly and indirectly related to Productivity, Intensity and/or Scale.

In performing principal component factor analysis Productivity, Intensity and Scale were first included on the list to facilitate the reading of the results. Next other parameters were included from the questionnaire with correlation to Productivity, Intensity and/or Scale (Productivity, Intensity and/or Scale). Factor analyses were performed five times, each time with data from parameters at an increased level of significance to Productivity, Intensity and/or Scale going from selection *(1)* ($p<.1$) through *(5)* ($p<.001$) (Table 4.4).

Table 4.3 Parameters with (p<.005) correlation to Productivity, Intensity and/or Scale

Parameter[1]	*P*	*I*	*S*
Scale	.985***	.270*	
Intensity	.432***		
Related to Productivity, Intensity and Scale			
Log10 (Farm size) in: number of sows in 1998	.676***	.477***	.630***
Log10 (Farm size) in: number of sows per family in 1998	.602***	.425***	.561***
Log10 (Farm size) in: number of sows in 1997	.588***	.456***	.541***
Automatic mechanical feedstuff supply	.418***	.340***	.381***
1997 Number of days lost per culled sow	*-.425****	*-.518****	*-.354****
Related to Productivity and Scale			
Management support includes economic data	.422***		.411***
The most important factor for stables is labour efficiency	.375***		.370***
The destination of feeder pigs is another farm in the area	.362***	.245*	.340***
Turbo ventilation in stables	.335***		.342***
Various family members are involved in building maintenance	*-.440****		*-.444****
The wife is responsible for the tax administration	*-.375****		*-.355****
This farm is too small for complete automation	*-.337****		*-.347****
Related to Scale			
The prime duty of the feed company is providing cheap feedstuff	*-.325***		*-.336****
Related to Productivity and Intensity			
1997 Number of weaners per sow [per year]	.392***	.855***	.255*
Preferred type of sow: advice breeding company	*-.347****	*-.342****	*-.304**
1997 Duration of nursing period	*-.344****	*-.342****	*-.302**
Related to Intensity			
1997 Number of weaners per litter	.290*	.684***	
1997 Farrow index	.268*	.626***	
1997 Number of piglets born alive per litter		.566***	
1997 Percentage farrows of first inseminations		.420***	
Pigs are important for the economy of the area		.400***	
Log10 (total number of working hours in pig production)		.364***	
Management support programme CBK	.277*	.347***	
Data comparison with the national top ten percent		.340***	
Contact with a study club in the area		.332***	
1997 Interval weaning to first insemination	*-.236**	*-.460****	
We would rather have (or keep) a mixed farm		*-.429****	
No considerations for selecting sow type		*-.369****	
1997 Interval first to last insemination		*-.345****	
The enjoyment of pig farming is caring for new life; the piglets	*-.249**	*-.344****	
The farm is a personal enterprise of the husband		*-.342****	
Number of social activities mentioned by the farmer	*-.268**	*-.340****	
1997 Percentage first farrows (by maiden sows)		*-.333****	
The most important indicators are about sow replacement		*-.333****	
Related to Productivity			
Preferred sow type: common crossbred (NL x GY)	.335***		.313**
Data are discussed in the study club	.334***		.321**
Management support programme: Comzog	*-.341****	*-.332***	*-.301**

[1] Negative correlations are given in *Italics.* Notation of correlation (r) and significance (Pearson, 2-tailed): r*: $p < .05$; r**: $p < .01$; r***: $p < .005$; only significant correlations are shown

Table 4.4 Correlations between Productivity, Intensity and Scale and the first five components, resulting from five consecutive principal component factor analyses. Factor analysis was done on five groups of parameters including Productivity, Intensity, Scale and other parameters with *(1)* (p<.1); *(2)* (p<.05); *(3)* (p<.01); *(4)* (p<.005); *(5)* (p<.001) correlation to Productivity, Intensity and/or Scale. Parameters derived from 70 questionnaires among pig producers in 1998 in Twente and The Achterhoek.

Component:	*1*	*2*	*3*	*4*	*5*
Group *(1)*: p<.1[1]					
% of variance	12.1	5.4	4.5	4.2	3.8
(n = 130)					
Productivity	**.717**[2]	**-.376**	.043	**-.279**	**-.239**
Intensity	**.722**	**.312**	.247	.217	-.082
Scale	**.627**	**-.462**	-.001	**-.340**	**-.239**
Other parameters …	p.m.	p.m.	p.m.	p.m.	p.m.
Group *(2)*: p<.05					
% of variance	14.7	5.9	4.7	4.6	4.2
(n = 93)					
Productivity	**.745**	**-.339**	-.228	**-.294**	-.082
Intensity	**.730**	**.480**	.083	-.115	-.114
Scale	**.655**	**-.455**	**-.260**	**-.292**	-.066
Other parameters…	p.m.	p.m.	p.m.	p.m.	p.m.
Group *(3)*: p<.01					
% of variance	22.6	8.6	6.3	5.8	4.6
(n = 47)					
Productivity	**.700**	**.371**	**-.442**	**-.268**	-.074
Intensity	**.771**	**-.457**	-.001	-.226	.035
Scale	**.599**	**.484**	**-.472**	**-.243**	-.086
Other parameters…	p.m.	p.m.	p.m.	p.m.	p.m.
Group *(4)*: p<.005					
% of variance	24.7	9.4	6.8	6.4	5.1
(n = 40)					
Productivity	**.705**	**.384**	**.277**	**-.415**	-.021
Intensity	**.773**	**-.442**	-.105	-.201	.044
Scale	**.604**	**.496**	**.316**	**-.404**	-.031
Other parameters…	p.m.	p.m.	p.m.	p.m.	p.m.
Group*(5)*: p<.001					
% of variance	38.8	15.9	8.1	7.7	6.7
(n = 18)					
Productivity	**.740**	**-.385**	.211	**-.311**	.177
Intensity	**.793**	**.397**	.176	.067	-.174
Scale	**.638**	**-.487**	.015	**-.345**	.222
Other parameters…	p.m.	p.m.	p.m.	p.m.	p.m.

[1] Group *(x)*: Variables of original data in the questionnaire that correlate (p<as indicated) to Productivity, Intensity and/or Scale.

[2] If correlations between Productivity, Intensity and/or Scale and Components (the first five from every factor analysis) are significant (at least p<.05), they are printed in bold.

The correlations between the first component resulting from the factor analyses and Productivity, Intensity and Scale were the same for the five groups: from 0.7 for Productivity and Intensity to 0.6 for Scale. The correlations between the other components resulting from the five groups and Productivity, Intensity or Scale varied. In group *(1)* components two through five were related to Productivity, Intensity or Scale; in groups *(2), (3),* and *(4)* components two through four were related to Productivity, Intensity or Scale; in group *(5)* only components two and four were related to Productivity, Intensity or Scale. This suggested that Productivity, Intensity and/or Scale might not be the only factor for coherence among the selected parameters. Aspects of regional culture probably caused the additional coherence. This additional coherence interfered particularly with the coherence among the parameters connected to Scale.

The best group for further analysis was neither group *(1),* nor group *(5)*. In group *(1)* the coherence related to Productivity, Intensity or Scale among the parameters was spread out over four components, and the percentage of variance that was explained was low (12.1 per cent). In group *(5)* the number of parameters involved was low (18 parameters). Among the remaining groups *(2), (3),* and *(4),* group *(4)* was chosen as the frame of parameters for further analysis. A substantial number of parameters were involved (40) in this group. Three components were related to Productivity, Intensity or Scale: 2, 3 and 4. In component 2 the coherence between the parameters was related to Intensity and explained 9.4 per cent of the variance. In components 3 and 4 the coherence between parameters is related to Scale, though the orientation was in the opposite direction (positive versus negative correlation). Components 3 and 4 explained equal (6.8 per cent and 6.4 per cent) percentages of the variance.

4.2.2 Projection of the Chosen Frame in Intensity and Scale

Group *(4)* represents a selection of parameters from the questionnaires including Productivity, Intensity, Scale and 37 other parameters with a correlation ($p<.005$) to Productivity, Intensity and/or Scale. The factor analysis resulted in twelve components, of which the first four were related to Productivity, Intensity and/or Scale.

Components 1 (24.7 per cent) and 2 (9.4 per cent) of group *(4)* (Table 4.4, Table 4.5) explained together 34.1 per cent of the variance.

The first two components from the factor analysis of this group determined ambition *(a)* and rationale *(j)*:

- *ambition* stands for the coherence in farming practices, related to differences in Productivity, Intensity and Scale; in the current analysis: component 1
- *rationale* stands for the coherence in farming practices, related to differences in Productivity, Intensity or Scale; in the current analysis: component 2.

The percentage of variance explained by component 1 was much higher than by component 2. This indicated that diversity in ambition among farmers is much more pronounced than contrasts in rationale.

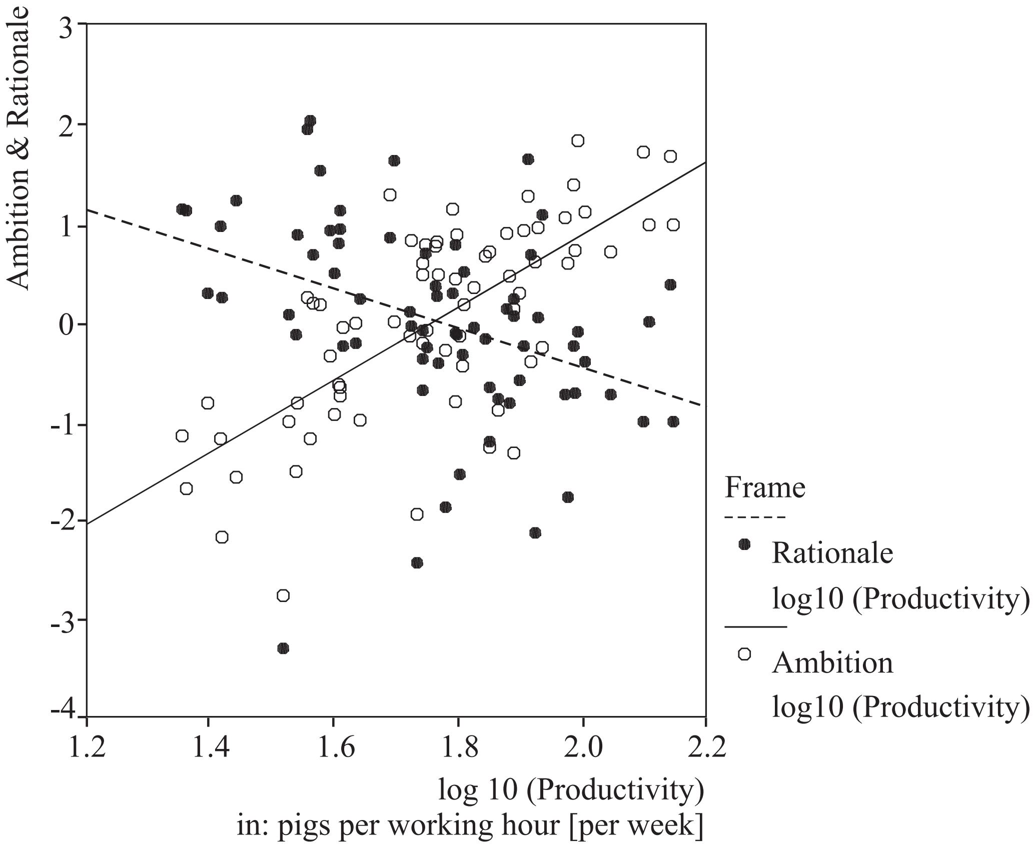
Table 4.5 Results of a principal component factor analysis of the selected group *(no. 4)* of parameters with (p<.005) correlation to Productivity, Intensity and/or Scale

Component % Of variance explained % Cumulative	1 24.7 24.7	2 9.4 34.1	3 6.8 40.8	4 6.4 47.2	5 5.1 52.3
Log 10 (Productivity) in: feeder pigs per working hour [per week]	*.705*	*.384*	*.277*	*-.415*	-.021
Log10 (Intensity) in: feeder pigs per sow [per year]	*.773*	*-.442*	-.105	-.201	.044
Log10 (Scale) in: sows per working hour [per week]	*.604*	*.496*	*.316*	*-.404*	-.031
Log10 (Farm Size) in: number of sows present (end 1998)	*.822*	*.422*	*-.268*	-.013	-.022
[02xp] The farm is the personal enterprise of the husband	-.177	*.418*	*.337*	*-.255*	-.086
[0404l] Log 10 (number of sows per family)	*.769*	*.393*	*-.270*	.021	.052
[09x2l] Log 10 (total number of working hours in pig breeding)	*.501*	.088	*-.631*	*.353*	.000
[16kv] The wife is responsible for the tax administration	*-.286*	-.007	*-.297*	*.241*	.191
[16pf] Various family: building maintenance	*-.296*	*-.391*	.001	.178	*.237*
[36b] Number of social activities mentionend	*-.238*	.105	.020	*.465*	.022
[38a] Contact with a study club in the area	*.422*	-.015	.024	*.226*	.103
[42a] Pigs are important for the economy of the area	.179	*-.329*	-.040	*-.530*	-.132
[61a2] The enjoyment of pig farming is caring for new life	*-.346*	.052	.123	*.279*	-.097
[61d6] We would rather have (or keep) a mixed farm	*-.454*	.130	*.426*	.075	.158
[61e2] This farm is too small for complete automation	*-.373*	*-.313*	*-.254*	-.162	.127
[14d2] Preference for type of sow: common crossbred (NL x GY)	*.418*	.199	-.021	-.083	.015
[14d6] Preference for type of sow: advise breeding company	*-.436*	-.010	.053	.113	*-.454*
[14e0] No considerations for selecting sow type	*-.376*	*.244*	*.437*	-.033	-.121
[19x1] Automatic mechanical feedstuff supply	.610	.139	-.253	.179	.108
[19x8] Turbo ventilation in the stables	.267	.102	.061	-.204	.236
[22x1] The prime duty of the feed company is to supply cheap food	-.131	-.143	-.455	.296	.020
[24x3] The destination of feeder pigs is another farm in the area	.474	.276	.011	.136	.356
[50y2] The most important factor for stables is labour efficiency	.310	.446	-.075	-.003	-.101
[001l] 1997 Log10 (farm size) in: number of sows	.760	.406	-.357	-.062	-.057
[003]1997 Farrow index	.661	-.430	.045	.200	-.357
[005] 1997 Number of weaners per sow [per year]	.741	-.503	.026	-.164	.124
[006] 1997 Number of piglets born alive per litter	.432	-.501	.271	-.160	.399
[009] 1997 Number of weaners per litter	.529	-.415	.057	-.281	.497
[011] 1997 Duration of nursing period (in days)	-.532	-.173	.274	-.018	.343
[012] 1997 Interval weaning to first insemination	-.418	.311	-.054	.138	.529
[013] 1997 Interval first to last insemination	-.473	.244	-.368	-.275	.301
[014] 1997 Days lost per culled sow	-.722	.117	-.246	-.196	.175
[017] 1997 Percentage first farrows (of maiden sows)	-.070	.444	.259	.393	.219
[019] 1997 Percentage farrows of first inseminations	.488	-.465	.334	.324	-.101
[15a2] Management support including economic data	.508	.150	.321	.164	-.195
[15a3a] Management support programme: Comzog	-.568	-.077	-.290	-.483	-.107
[15a3b] Management supprt programme: CBK	.513	-.045	.332	.459	.221
[51y2] The most important indicators are about sow replacement	-.288	.391	.082	-.088	.308
[56a3] Data comparison to the national top ten percent	.367	-.126	-.042	.081	.267
[57x5] The data are discussed in the study club	.354	.096	.262	.029	.139

Extraction Method: Principal Component Analysis; 12 components extracted.

The regression of component 1 (ambition; *a*) to Productivity is ($\beta = .705$). This means that the angle of the regression line of ambition was 45^o to Productivity. The regression of component 2 (rationale; *j*) to Productivity is ($\beta = -.384$)[2]. This means that the angle of the regression line of rationale was -23^o to Productivity (Figure 4.1). The angle between the line of ambition and the line of rationale was 68^o.

Figure 4.1] Overlay graph of the regressions of the projections of ambition (*a*) and rationale (*j*) on log10 (Productivity) of 70 pig producers in Twente and The Achterhoek (in 1998).



Ambition (*a*) and rationale (*j*) form together the frame of the self-images related to the classification of farms

Rationale at High and Low Ambition Level

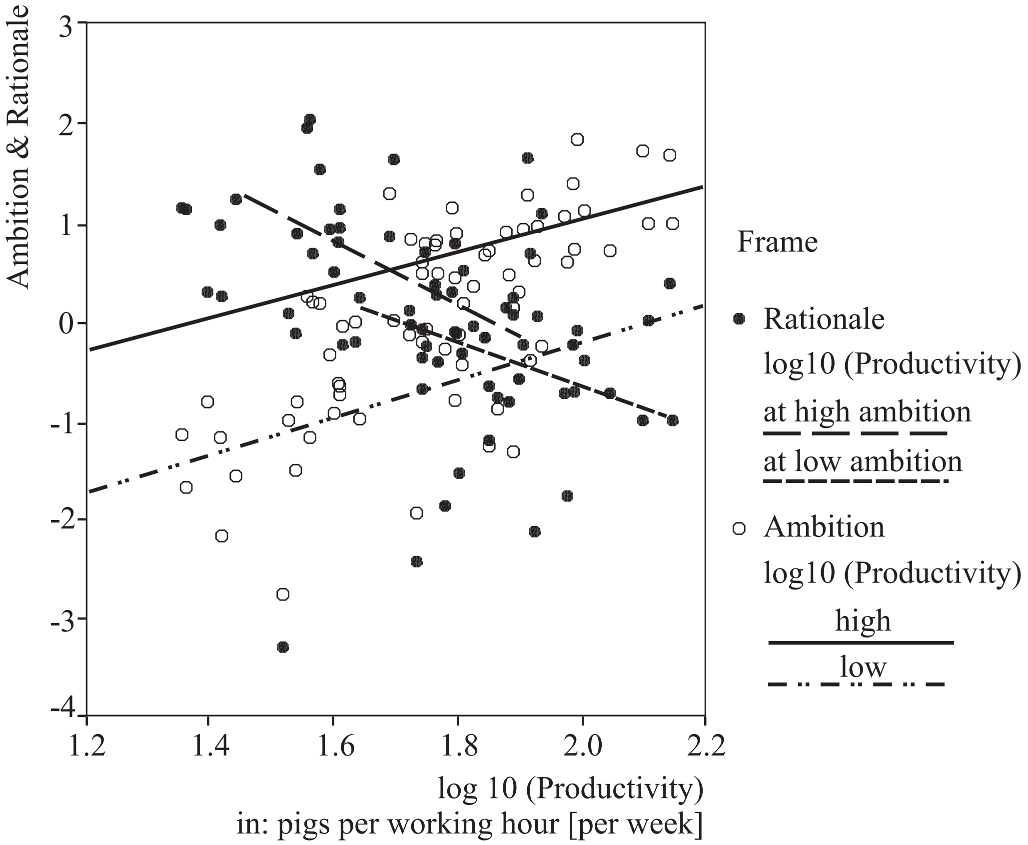
In the current study the correlation between the first component and Productivity, Intensity and Scale was found to be positive. This was incidental: it could have been negative as well.[3] For convenience, positive values of farms on the first component were interpreted as 'high ambition' and negative values as 'low ambition'. So in this study 'high ambition' stands for ambition at the level of competition, and 'low ambition' stands for ambition at the level of participation and autonomy. The terms 'high' and 'low' are not qualifications.

Rationale might be different at high levels of ambition in contrast to low levels of ambition. Therefore the regressions of the components were re-calculated using:

a high ambition: farms (37) with positive values ($a > 0$) on component 1

b low ambition: farms (33) with negative values (a<0) on component 1
The angles of the regression line of ambition (a) at high and low ambition were both different from the population average (45°). They were 32° for high ambition and 34° for low ambition. This indicated that the regression of ambition is not linear in the population (Figure 4.2).

Figure 4.2 Overlay graph of the regressions of the projections of rationale (j) at high and low ambition (a) on log10 (Productivity) of 70 pig producers in Twente and The Achterhoek (in 1998).



The angles of the lines of rationale (j) were slightly steeper than the population average (- 23°; see above) on both levels (-31° for high ambition and -26° for low ambition). This indicated that the difference between the angles of ambition and rationale at high ambition (63°) and low ambition (60°) were hardly different from the population average (68°).

Productivity at High and Low Ambition Levels

For the farms with a positive score on component 1 (related to Productivity, Intensity and Scale) in the principal component factor analysis, the average Productivity at high ambition was calculated. Likewise, for the farms with a negative score on component 1 in the principal component factor analysis, the average Productivity at low ambition was calculated.

The average Productivity at high ambition (73.5 feeder pigs per working hour [per week]) was 17.2 feeder pigs more (30 per cent) than for the population average

(Productivity: 56.2). The average Productivity at low ambition (44.1) was 12.1 feeder pigs less (22 per cent) than for the population average (Fig. 4.3; Supplement Table 4a).

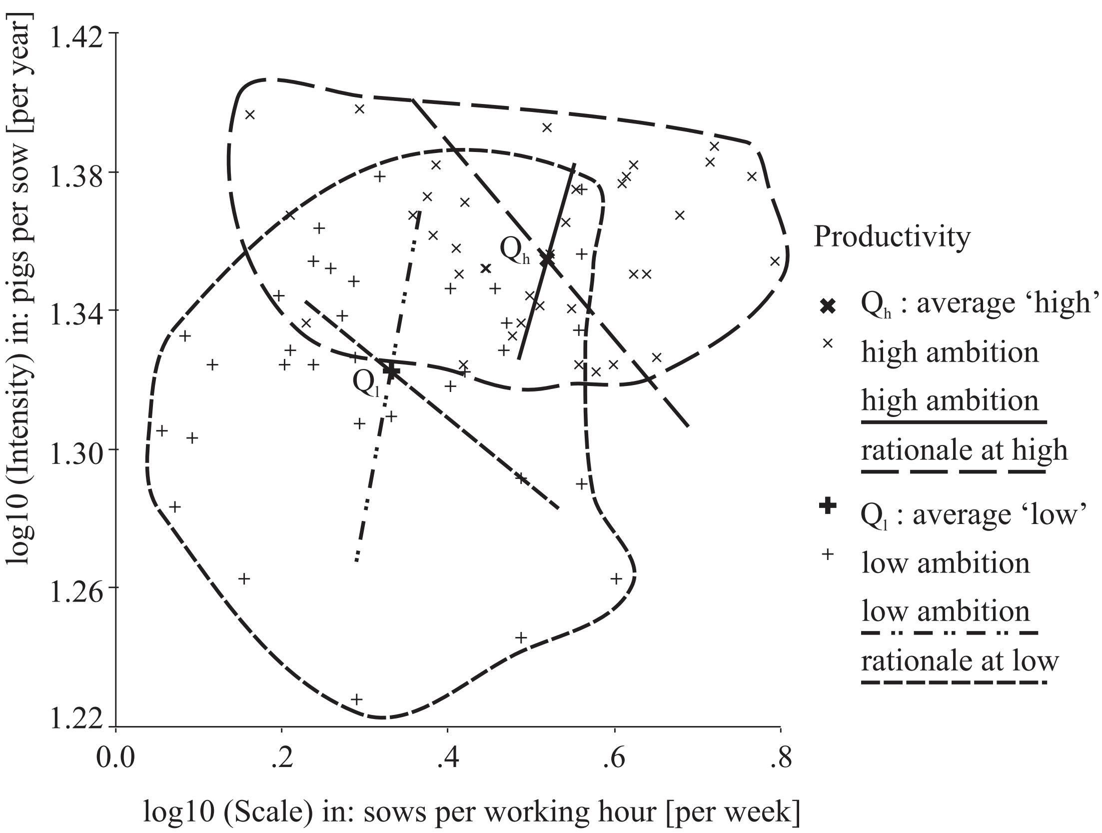
The farm values connected to high ambition were more condensed than the farm values connected to low ambition. The large spread of values at low ambition suggested that there might be two levels of low ambition. For this survey farms were selected from address files of management support providers. This ensured that data for Intensity were available and measured according to standard rules. But this also meant that the about 20 per cent of the pig production farms in the study area that were not related to any management support provider were not approached for the survey. It is likely that these excluded farms are predominantly small scale and low intensity. Therefore the level of low ambition in Productivity found in the survey might be a combination of two levels of ambition: a slightly low level and a very low level of ambition.

In the evaluative study only two levels of ambition can be distinguished:

- high: Productivity is 30 per cent above average
- low: Productivity is 22 per cent below average

The high level is similar to the sphere of competition. The low level is similar to a combination of the sphere of participation and autonomy (see: Chapters 1 and 2).

Figure 4.3 Log10 (Productivity) of farms, classified in high or low ambition levels, based on farm values on a component that resulted from principal component factor analysis.



4.2.3 Identification of Styles of Farming Using Group Averages

Styles of farming were defined based on combinations of values on various components. Subsequently, group averages of the styles of farming were used to reveal differences in Productivity, Intensity and/or Scale. Farms with positive values on component 1 (high ambition) were classified as entrepreneurs (E) and craftsmen (C). The contrast between these two groups is that entrepreneurs also had positive values on component 2 (rationale), while craftsmen had negative values on component 2. Farms with negative values on component 1 (low ambition) were classified as stockmen (K) and shifters (F). Stockmen had positive values on component 2 (rationale), while Shifters had negative values on both components 1 and 2. Stewards were specified as farmers with positive values on both components 3 and 4, regardless of their values on components 1 and 2. This implies that the rationale of stewards is related to Productivity and/or Scale, and not to Intensity – like with the other styles of farming.

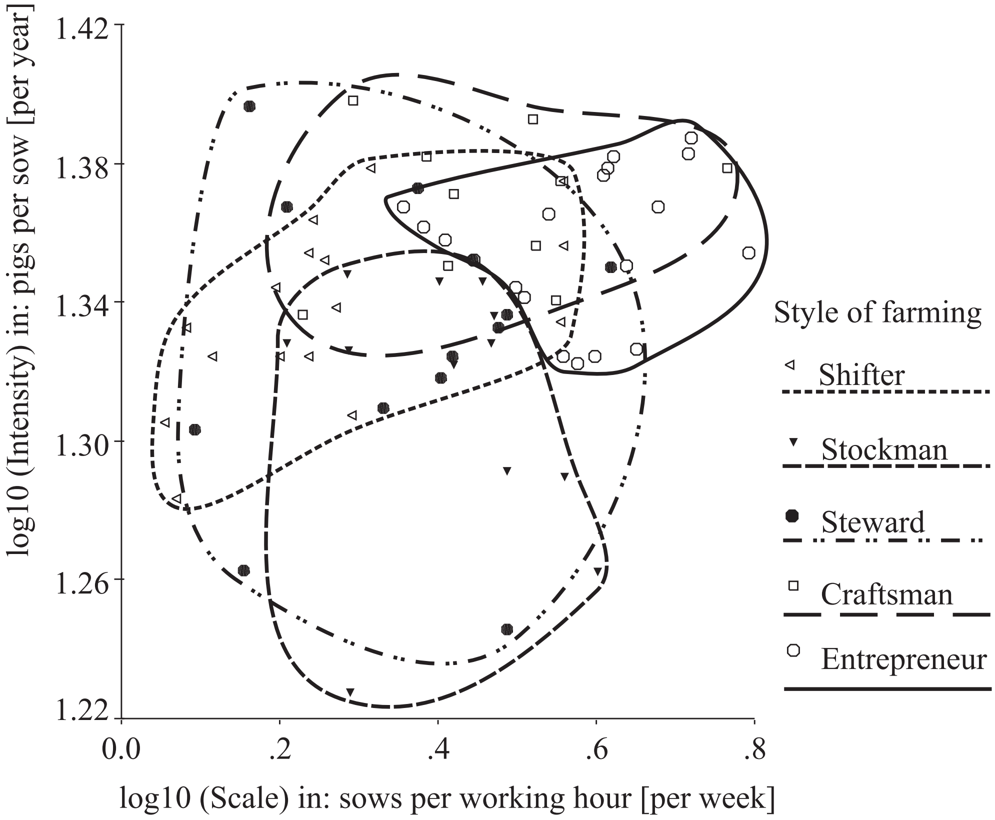
In other words:

- Stewards were farmers whose ambitions varied as far as Productivity, Intensity and Scale were concerned. But the rationale in farming was primarily related to Productivity and/or Scale: whether Productivity and Scale are enough to support the family. In other words, to farm continuity.
- Entrepreneurs were farmers with high ambitions for Productivity, Intensity and Scale: they wanted to be up front in the competition for increasing Productivity. The rationale of entrepreneurs was more related to Scale than to Intensity.
- Craftsmen were farmers with high ambitions for Productivity, Intensity and Scale): they also wanted to be up front in the competition for increasing Productivity, but the rationale of craftsmen was based on Intensity.
- Stockmen were farmers with average or low ambitions for Productivity, Intensity and Scale: their ambition was focussed on participation in pig production. The rationale was more related to Scale than to Intensity: based on an affinity for pigs.
- Shifters were farmers with average or low ambitions for Productivity, Intensity and Scale: their ambition was focussed on autonomy in farming. Their rationale was based on Intensity in pig production: as an income-generating activity.

In this classification system there is overlap in Productivity of the styles of farming (Figure 4.4).

The farms of both entrepreneurs and craftsmen were more Productive, large-Scale, and Intensive than those of the population average. Stewards, stockmen and shifters had average or less than average levels of Productivity, Intensity and Scale. Entrepreneurs contrasted most with shifters in Productivity and Scale. Craftsmen contrasted most with stockmen in Intensity. The Productivity, Intensity and Scale of stewards were comparable to those of the population average (Figure 4.4).

Figure 4.4 Log10 (Productivity) of farms, classified in styles of farming. Farms were classified based on coherence of parameters with Productivity, Intensity, and/or Scale.



The Productivity of entrepreneurs was expressed as 88.6 feeder pigs per working hour (per week). This figure represented the mathematical product of the number of feeder pigs per sow (per year) and the number of working hours per week (per sow). The Productivity of entrepreneurs was greater than the productivity of craftsmen (72.2 feeder pigs per working hour [per week]). The Scale of farms of entrepreneurs (3.89 sows per working hour [per week]) was also greater than the Scale of craftsmen (3.09 sows per working hour [per week]). But farms of craftsmen (23.4 pigs per sow [per year]) were more intensive than farms of entrepreneurs (22.7 pigs per sow [per year]) (Table 4.6).

The Productivity of stewards (51.9 feeder pigs per working hour [per week]) and of stockmen (54.8 feeder pigs per working hour [per week]) were comparable to the population average (63.4 feeder pigs per working hour [per week]). The average Scale of stewards (2.43 sows per working hour [per week]) and stockmen (2.67 sows per working hour [per week]) were also comparable to the population average (2.79 sows per working hour [per week]). The Intensity of farms of stewards (21.4 pigs per sow [per year]) was comparable to the population average (22.0 pigs per sow [per year]), but stockmen had less intensive farms (20.6 pigs per sow [per year]). The spread of data of stewards was larger than that of other styles of farming (Figure 4.4, Table 4.7).

Table 4.6 Identification of styles of farming in terms of Productivity, Intensity and Scale. Figures are group averages of farms classified as styles of farming

Variable[1]		N	<E>	<C>	<W>	<K>	<F>	<U>	<Q>
N			19	10	13	12	16	12	N
	[2]								
[Y/L] Productivity in pigs per working hour [per week]	μ σ r	70	88.6 25.2 .561**	72.2 28.0	51.9 18.7 $-.201^{+}$	54.8 13.7	43.8 20.4 -.389**	n.a.[3]	63.4 27.6
log10 (Productivity) [4]	μ σ r	70	1.93 .12 .541**	1.83 .16	1.69 .16	1.72 .12	1.60 .18 -.449**	n.a.	1.76 .19
[Y/N] 1997 Intensity in feeder pigs per sow [per year]	μ σ r	70	22.7 1.1 .267*	23.4 1.1 .332**	21.4 2.1	20.6 1.7 -.371**	21.8 1.3	n.a.	22.0 1.7
log10 (1997 Intensity)	μ σ r	70	1.356 .021 .269*	1.368 .021 .321**	1.329 .042	1.313 .038 -.372**	1.337 .026	n.a.	1.341 .035
[N/L] 1998 Scale in sows per working hour [per week]	μ σ r	82	3.89 1.04 .546**	3.09 1.16	2.43 .85	2.67 .72	1.99 .86 -.412**	2.38 .88	2.79 1.13
log10 (1998 Scale)	μ σ r	82	.575 .119 .526**	.465 .151	.359 .159	.412 .120	.266 .165 -.469**	.345 .184	.409 .181

[1] <E>: Entrepreneur, <C>: Craftsman, <W>: Steward, <K>: Stockman, <F>: Shifter, <U>: Unclassified, <Q>: All (population average).

[2] μ = mean, σ = standard deviation, r = correlation; only (nearly) significant correlations are given; notation of correlation (r) and significance (Pearson, 2-tailed): r^{+}: p<.1; r*: p<.05; r**: p<.01.

[3] n.a.: not available

[4] Variable descriptions:

bold variable is used in the final principal component factor analysis

regular variable is not used in the final factor analysis, for arguments motivated in the text

The Productivity of shifters (43.8 feeder pigs per working hour [per week]) was lower than the population average (63.4 feeder pigs per working hour [per week]). The Scale of shifters (1.99 sows per working hour [per week]) was also below the population average (2.79 sows per working hour [per week]). Farms of shifters (21.8 feeder pigs per sow [per year]) had a comparable Intensity to stewards (21.4 feeder pigs per sow [per year]) and to the population average (22.0 feeder pigs per sow [per year]) (Table 4.6). So styles of farming differed not just in level of Productivity, but also in balance between Intensity and Scale.

Differences between the Preliminary Analysis and the Computer Analysis

In the preliminary analysis, farms were classified according to different criteria than in the computer analysis. In the preliminary analysis, the farmers' comments could be taken into account. In the computer analysis, the comments were ignored because only numerical parameters could be considered. On the other hand, additional information about Productivity, Intensity, Scale and management support indicators left out of the preliminary analysis were available for use in the computer analysis.

In the preliminary analysis 17 farms were classified as entrepreneurs, while 19 were classified as such in the computer analysis. Yet only 10 farms overlapped between both analyses. Among craftsmen only 5 farms overlapped between the preliminary analysis (n = 14) and the computer analysis (n = 10) (Table 4.7).

Table 4.7 Distribution of the classification of farms in styles of farming in the computer analysis and in the preliminary analysis.

		computer analysis					
Variable		*Entre-preneur*	*Crafts-man*	*Steward*	*Stock-man*	*Shifter*	*Unclas-sified*
Number (n) Correlation (r) [1]	N	n r	N R	n r	N R	n r	N
N		19	10	13	12	16	12
Preliminary analysis: Entrepreneur	17	10 .498***	1	1	1	1	3
Preliminary analysis: Craftsman	14	5	5 .330**	1	0 -.217$^+$	2	1
Preliminary analysis: Inheritor	34	4 -.252*	4	10 .344**	7	4	5
Preliminary analysis: Shifter	17	0 -.305*	0 -.204$^+$	1	4	9 .493***	3
Preliminary analysis: Unclassified	0	0	0	0	0	0	12
∑ N	82	19	10	13	12	16	12

[1] Notation of correlation (r) and significance (Pearson, 2-tailed):
r$^+$: p<.1; **r***: p<.05; **r****: p<.01; **r*****: p<.005; only significant correlations are shown

As Table 4.8 shows, a steward is usually an inheritor (n = 10 of n = 13) – though not every inheritor is a steward (n = 10 of n = 34). A stockman is often an inheritor too (n = 7 of n = 12), though stockmen were most pronounced in contrast to craftsmen (n = 0 of n = 12). Of the shifters in the preliminary analysis (n = 17), 9 appeared also as shifters in the computer analysis (n = 16). So the classification of farms in the two analyses were largely similar, but not the same.

The farms were classified differently in the preliminary analysis than in the computer analysis, because the selection criteria were different. In the styles of farming identified using the second classification method, the key characteristics of the foundations of the styles of farming could still be recognised (Table 4.8).

Comparison of Table 4.8 and Table 4.1 revealed the similarities and differences between the preliminary analysis and the computer analysis. The most important features of the two types of analysis are compared in Table 4.9.

Although the selection criteria were slightly different for the two types of analysis, the most important characteristics of the styles of farming were similar. The following features characterise the styles of farming identified in both analyses:

Entrepreneur:	large size of the pig production unit of the farm, mechanisation and labour efficiency, emphasis on data – especially economic data, specialised farms
Craftsman:	emphasis on production data and also farm size
Steward:	interest in data and in mixed farming; low interest in farm size
Stockman:	low interest in technical data and high interest in pigs
Shifter:	little attention is given to the pig production unit of the farm, and the pig unit is small

Table 4.8 Parameters from the chosen frame and correlations to styles of farming. Parameters are given in sequence of correlation.

N 82	*Style of farming (computer analysis)*	*Parameters from the frame with correlations to styles of farming*	
		Positive	*Negative*
19	Entrepre-neur	Log10 (Farm Size in no. of sows in 1998). Log10 (Farm Size in no. of sows in 1997). Log10 (Farm Size in no. of sows per family in 1998). Automatic mechanical feedstuff supply. Log10 (no. of working hours in pig production). Destination of pigs: another farm in the neighbourhood. The most important factor of stables is labour efficiency. Management support programme: CBK. Farm data were discussed with study club members. Management support includes economic indicators. Turbo ventilation system. 1997 No. of weaners per sow (per year). Contacts with study club in the area.	The pig farm is too small for complete automation. 1997 Duration of the nursing period. We would rather have (or keep) a mixed farm. Management support programme: Comzog. The enjoyment of pig farming is caring for new life; the piglets. 1997 Days lost per culled sow. Preferred sow type: (NL x GY). Preferred sow type: advice of breeding company. Various family members: building maintenance.
10	*Crafts-man*	1997 Piglets born alive per litter. 1997 Weaners per sow (per year). 1997 No. of weaners per litter. Log10 (Farm Size in no. of sows per	1997 Days lost per culled sow. Preferred sow type: advise breeding company. We would rather have (or keep) a

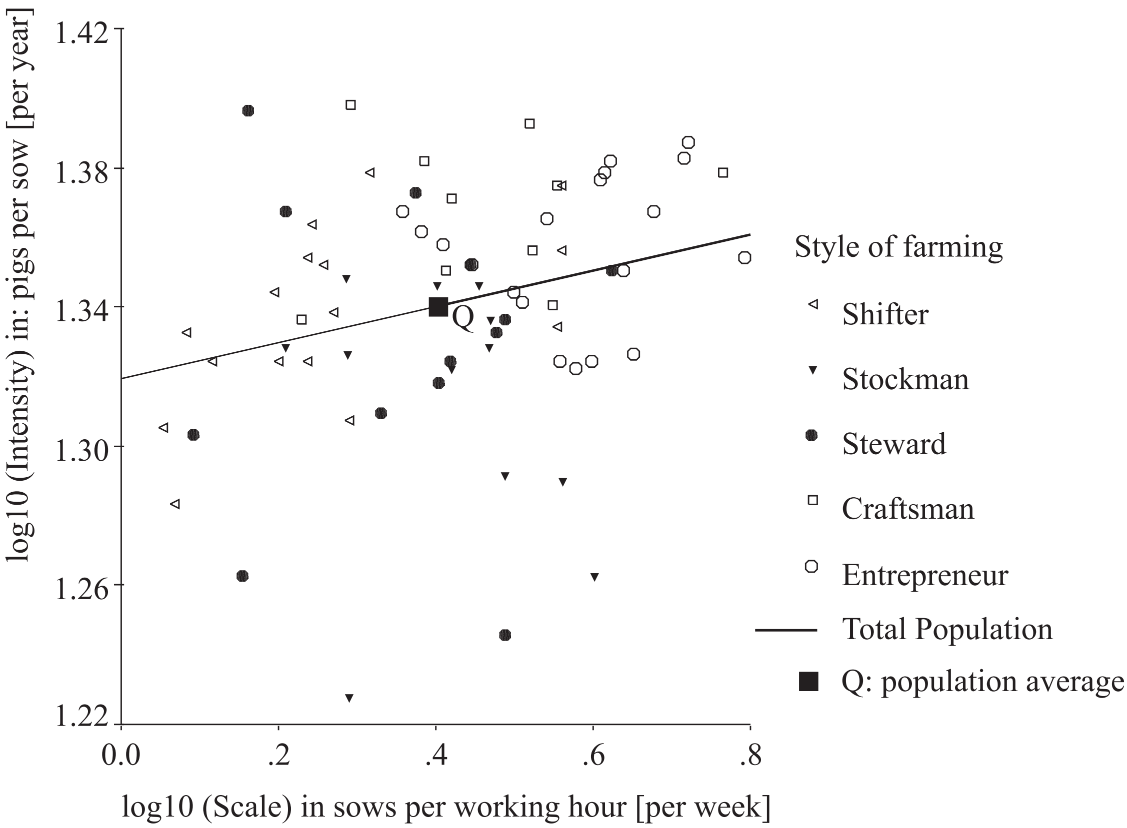
		family in 1998). Preferred sow type: (NL x GY). Automatic mechanical feedstuff supply. Log10 (Farm Size in no. of sows in 1998). Log10 (No. of working hours in pig production). Management support includes economic indicators. 1997 Farrow index. Log10 (Farm Size in no. of sows in 1997). 1997 Percentage farrows of first inseminations. Data comparison to top 10%.	mixed farm. Interval weaning to first new insemination.
13	*Steward*	Management support programme: CBK. We would rather have (or keep) a mixed farm. 1997 Percentage first farrows. 1997 Percentage farrows of first inseminations. Management support includes economic indicators.	Pigs are important for the economy of the area. Management support programme: Comzog. Log10 (Farm Size in no. of sows in 1997). Log10 (Farm Size in no. of sows in 1998). Log10 (Farm Size in no. of sows per family in 1998). 1997 interval first to last insemination. The most important factor of stables is labour efficiency.
12	*Stockman*	1997 Interval first to last insemination. Farm is a personal enterprise of the man. The enjoyment of pig farming is caring for new life; the piglets.	1997 Percentage farrows of first inseminations. 1997 Weaners per sow (per year). 1997 No. of weaners per litter. 1997 Piglets born alive per litter. 1997 Farrow index. Management support programme: CBK. 1997 Days lost per culled sow. Management support includes economic indicators. Data comparison to top 10%.
16	*Shifter*	Management support programme: Comzog. The pig farm is too small for complete automation. 1997 Duration of the nursing period. 1997 Days lost per culled sow. Preferred sow type: advise breeding company. Various family members: building maintenance.	Log10 (Farm Size in no. of sows per family in 1998). Log10 (Farm Size in no. of sows in 1998). Log10 (Farm Size in no. of sows in 1997). Management support includes economic indicators. Management support programme: CBK. Destination pigs: another farm in the neighbourhood. Most important factor of stables is labour efficiency. Automatic mechanical feedstuff

			supply. 1997 Percentage first farrows. Farm data are discussed in the study club. Contacts with study club in the area. Log10 (no. of working hours in pig production).

Table 4.9 Similarities and differences between farming styles in the preliminary analysis and the computer analysis

	Principal features of farming styles in preliminary analysis		*Principal features of farming styles in computer analysis*
Entrepreneur	Emphasis on farm size, labour efficiency, and farm economy	*Entrepreneur*	Emphasis on farm size, labour efficiency, and mechanisation
Craftsman	Indirect indications for production efficiency through manure, food safety and breeding selection criteria for boars	*Craftsman*	Indirect and direct indications for production efficiency: efficient production and rearing of piglets, breeding selection criteria for sows and farm size
Inheritor	Characterised by contrasts to other styles of farming	*Steward*	Mixed farms, (relatively) small farm sizes
		Stockman	Low emphasis on production indicators
Shifter	Not specified	*Shifter*	Small farm sizes, low attention to pig production

Figure 4.5 Curve of log10 (Productivity) expressed as regression of log10 (Intensity) and log10 (Scale). Farms were classified as styles of farming based on coherence of parameter values with Productivity, Intensity, and/or Scale.



Styles of Farming Compared to the Population Average

Following the methodology in Chapter 3, five styles of farming were defined based on principal component factor analysis of Productivity, Intensity, Scale and 37 other parameters from the questionnaires: entrepreneur, craftsman, steward, stockman, and shifter. Differences in Productivity between the styles of farming were expressed as differences in Intensity (I) and Scale (S) or as differences in ambition (a_x) and rationale (j_x) (Figure 4.5; Figure 4.6; Supplement Table 4b).

The population average in Productivity (A) was 56.2 feeder pigs per working hour (per week). This figure represented the mathematical product of the number of feeder pigs per sow (per year) and the number of working hours per week (per sow). Entrepreneurs and craftsmen had a higher Productivity than the population average, while stewards, stockmen and shifters had lower Productivity than average. How much the Productivity of the various styles of farming differ from the population average could be expressed in various ways:

- the plain difference in data
- the difference in data projected on the regression of Intensity (I) to Scale (S)
- the difference in data projected on ambition (a) and rationale (j).

The best way of expressing the difference in Productivity among styles of farming would depend on whether the purpose is an economic evaluation or insight in different patterns in farming practices. In the current study insight in the farming practices is required, so the focus is on the projection of Productivity on the regression in the values of Productivity, ambition (a) and rationale (j).

The regression in values of Productivity in the population (the regression of Intensity on Scale) was ($\beta = .270$). So the angle of the line of Productivity is 16^o in a system of Intensity and Scale (Figure 4.5). Since the regression of the average ambition on Productivity was 45^o and the average regression of rationale was -23^o (see above), the Productivity of the styles of farming can now be estimated in terms of ambition and rationale (Figure 4.6).

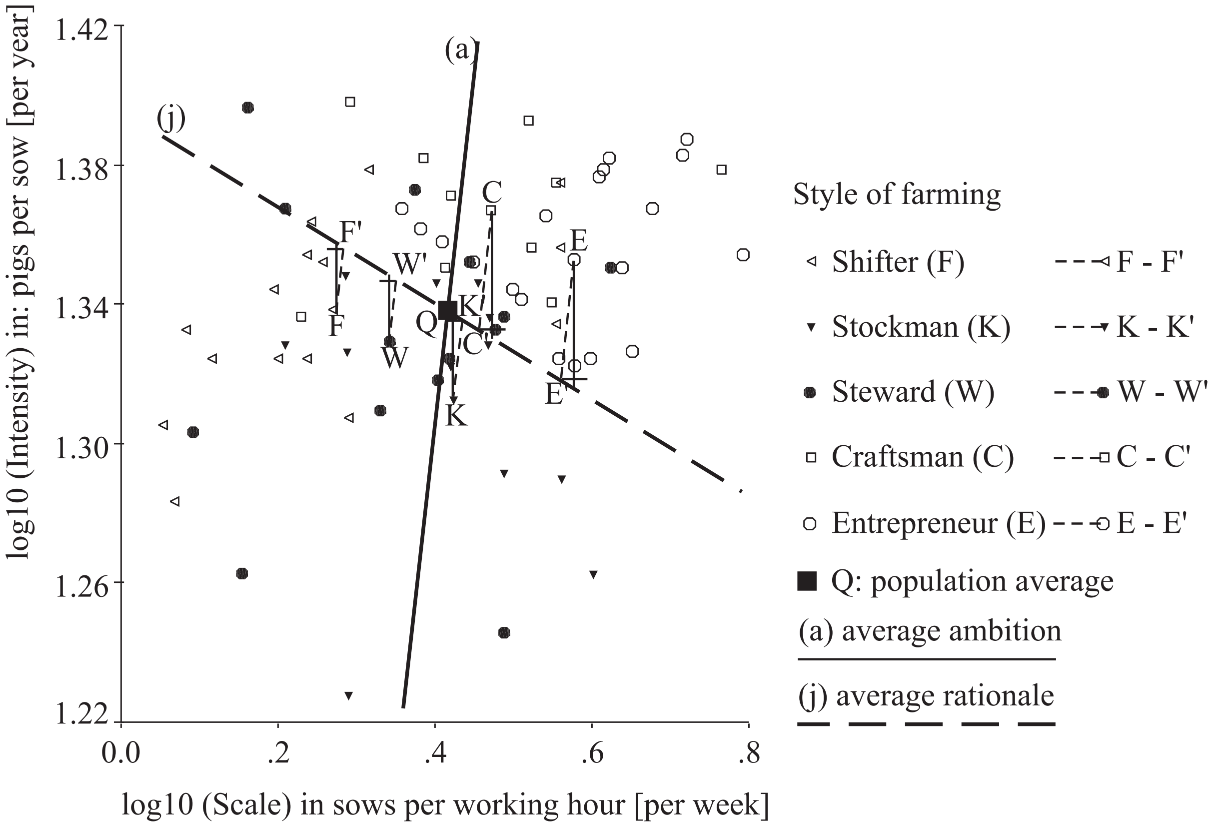
Figure 4.6 shows that the Productivity of entrepreneurs (E) and craftsmen (C) was above average and the Productivity of stewards (W), stockmen (K) and shifters (F) was below average. These findings were consistent with the specification that entrepreneurs and craftsmen had high ambition and stockmen and shifters had low ambition.

For entrepreneurs, craftsmen and stewards the difference between their Productivity and the population average seemed more due to Intensity than to Scale. For stockmen it seemed more due to Scale and for shifters it seemed due to both Intensity and Scale. However, these findings may be questionable, as different ambition levels related to entrepreneurs and craftsmen on the one hand, and stockmen and shifters on the other hand, may influence the relative importance of Intensity and Scale. The findings support the argument that the rationales of entrepreneurs and craftsmen would be better evaluated at high ambition and the rationales of stewards, stockmen and shifters would be better evaluated at low ambition (see below).

Rationale of the Styles of Farming with High and Low Ambition

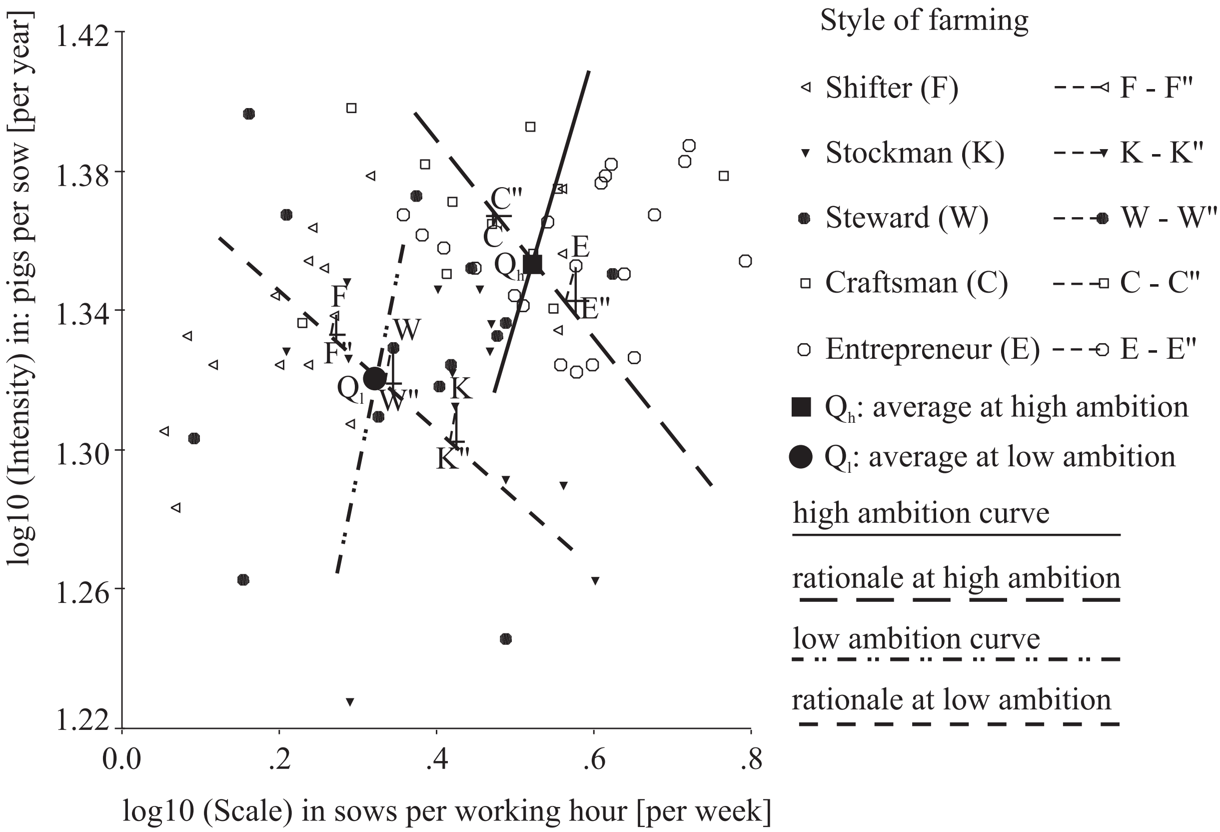
Styles of farming showed very different values for ambition compared to the population average. Each style had either a higher ambition than average (entrepreneurs and craftsmen), or a lower ambition than average (stockmen, shifters and stewards). Productivity was 30 per cent more than the population average for farms with a positive score on ambition. Productivity was 22 per cent lower than the population average for farms with a negative score on ambition. The average Productivity at high ambition was 73.5 feeder pigs per working hour (per week). The average Productivity at low ambition was 44.1 feeder pigs per working hour (per week). These figures were the mathematical product of the number of feeder pigs per sow (per year) and the number of working hours per week (per sow) (Figure 4.7; Supplement Table 4c).

Figure 4.6 Log10 (Productivity in pigs per working hour (per week)) of farms, classified in styles of farming. Group averages of the classified farms were projected on rationale (*j*) at average ambition (*a*).



At a high level of ambition the difference in Productivity between entrepreneurs, craftsmen and the average were equally due to differences in Intensity and Scale. So the Productivity of entrepreneurs and craftsmen was balanced in comparison to the level of high ambition. At a low level of ambition the difference in Productivity between stewards, stockmen and shifters and the average were also equally due to differences in Intensity and Scale. So the Productivity of stewards, stockmen and shifters were similarly balanced in comparison to the level of low ambition. Compared to the population average, the difference in Productivity at both high and low ambition seemed more due to Intensity than to Scale. These supports the finding that ambition is more focussed on Scale than on Intensity.

Figure 4.7 Log10 (Productivity in pigs per working hour (per week)) of farms, classified in styles of farming. Group averages of the classified farms were projected on rationale (*j*) at high and low ambition (*a*).



log10 (Intensity) in: pigs per sow [per year]
1.42
1.38
1.34
1.30
1.26
1.22
0.0
.2
.4
.6
.8
log10 (Scale) in sows per working hour [per week]
C''
C
Qh
E
E''
F
F''
W
Ql
W''
K
K''
Style of farming
Shifter (F)
F - F''
Stockman (K)
K - K''
Steward (W)
W - W''
Craftsman (C)
C - C''
Entrepreneur (E)
E - E''
Qh: average at high ambition
Ql: average at low ambition
high ambition curve
rationale at high ambition
low ambition curve
rationale at low ambition

Conclusion

Styles of farming are not randomly comparable:

- contrasts between entrepreneurs (stewards) and shifters refer to Scale
- contrasts between craftsmen (stewards) and stockmen refer to Intensity
- contrasts between entrepreneurs and craftsmen versus (stewards) stockmen and shifters refer to ambition
- contrasts between entrepreneurs and craftsmen refer to rationale at high ambition
- contrasts between (stewards) stockmen and shifters refer to rationale at low ambition
- contrasts between stewards and all other styles of farming refer to cultural traditions

4.3 Typing Styles of Farming

4.3.1 Portraits of Styles of Farming

Different combinations of the components from principal component factor analysis created the classification of farms in five styles of farming in the system of Intensity and Scale: entrepreneur, craftsman, steward, stockman and shifter. Farmers that belong to various styles of farming gave answers in the questionnaire that differed from the population average. From the diversity in answers, portraits of the styles of farming were created (see also: Supplement Tables to Chapters 5 and 6).

Entrepreneur

Entrepreneurs perceive their business in a sphere of competition. They approach pig production as a challenge for managing farm economy and labour efficiency.

Entrepreneurs have large-size and large-scale farms – and many animals per owner-family. The farms of entrepreneurs are often specialised. On average over 80 per cent of all working hours are spent in the pig production section of the farm. The farms were usually already larger than average at the moment of succession by the present generation. Most entrepreneurs make use of hired labour. Compared to the population average there are more than an average number of working hours spent by hired farm hands. Entrepreneurs have a relatively higher income from their farm than farmers who apply other styles of farming. Most entrepreneurs are satisfied with the average income level of their farm.

Though most farmers in the survey originated from the area, the few exceptions in the survey appear to be mainly among the entrepreneurs. The labour division among family members and farm hands is principally not different from other styles of farming. The male owner of the farm is usually not just a manager – even if there are many farm hands present. He does not exclude himself from the daily farm work like feeding the animals and checking the sows. Besides hired labour for farm work, there is often additional ‘hired labour’ for specific tasks, for example building maintenance. This type of work is usually not done by the farming family. An accountant often does all or part of the administration.

For entrepreneurs the enjoyment of pig production is in the management. They try to create an economic balance between fixed planning and flexible solutions to occasional events. Entrepreneurs usually do not favour a mixed farm. Hygiene is considered very important.

Many entrepreneurs have problems with their present locations because of the vicinity of other pig farms – especially because they are focussed on farm expansion. In their investment patterns entrepreneurs concentrate on farm modernisation. As far as stable equipment is concerned, entrepreneurs are well equipped. They have an automatic mechanical feedstuff supply, turbo ventilation and a sensor and time-directed light system. Entrepreneurs consider labour efficiency to be the most important aspect of stable equipment. They trust new technologies to solve the manure problems. They expect to adapt in time to the new government regulations on group housing (to be implemented ultimately in 2008). Though all but one of the farmers in the study have a certificate for food safety (IKB), more than an average number of entrepreneurs have the IKB$^+$-label (for extra safety).

Entrepreneurs keep contacts with other pig producers, both locally in study clubs and nation-wide. They consider the culture or business climate in this area to be different from other areas, especially from the concentration area in the south of the country. They find that in general the farmers in the south are better entrepreneurs. The feeder pigs of the farms of the entrepreneurs do not usually stay on the same farm, but go to a fattener in the neighbourhood. This connected fattener might well be another independent farm belonging to the same owner. Entrepreneurs do not think that combining piglet production and fattening on one farm is important for disease prevention. But in the next ten years many entrepreneurs will combine pig production with fattening ('closed farming') on the same farm because of new government regulations.

Entrepreneurs believe it is important to have both production indicators and economic indicators to support their management. Entrepreneurs work actively with their data. They all compare these data in their local study club. And they discuss the data with a large variety of people who are directly or indirectly involved with the farm.

Craftsman

Craftsmen also perceive their business in a sphere of competition, but the type of competition they feel is different from that of entrepreneurs. For craftsmen the challenge is in the production levels, not in the labour economy. The farms of craftsmen are characterised by intensive production.

The farms of craftsmen are larger-size and larger-scale than the population average. Though these farms are often mixed with fattening pigs or with arable production, on average 80 per cent of the working hours on these farms are spent in pig production.

The women on these farms spend about twice as many hours working on the farms than the women in the population average. The labour workers are selected by means of job applications. The labour division on these farms between men, women, successors, other family members and hired labour is not principally different from other styles of farming.

Craftsmen are dependent on pig production for their incomes – they hardly have other on-farm activities or off-farm jobs. The income levels are higher than average. Craftsmen are satisfied with the size of their farms. Craftsmen are interested in the scenic environment of the farm. The attractiveness of the farm itself is considered to be its yard and garden. Craftsmen dislike the idea of a mixed farm. Craftsmen like to plan their work rather strictly and to work hygienically.

Craftsmen have specific ideas about pig breed types, both for sows and boars. They rely on their own judgement in these matters and do not leave the issue to the advice of the breeding company. In the survey there was a specific preference for the (NL x GY) crossbreed as sow type.

Most craftsmen have their barren and gestating sows housed in individual boxes. Craftsmen prefer individual housing systems because they offer better animal health control. The stables of craftsmen are rather well equipped to facilitate convenient and efficient labour, for example by means of an automatic mechanical feedstuff supply. In the survey, craftsmen often mentioned the importance of labour efficiency in stables, but seldom noted other factors, such as a stable climate. It can be assumed that many craftsmen find a good stable climate *too obvious to mention.*

Though craftsmen consider economic data important in their management support, indicators about production per sow are considered to be the most important indicators in their business. They use these data for technical improvements on their farm. Craftsmen compare their data to the top 10 per cent of farms in the country. They want to belong to that group. As a partner in discussions about the data, the veterinarian is more important to craftsmen than to farmers in other styles of farming.

Steward

Stewards perceive their business in a sphere of participation. Their attitude towards pig production is pragmatic – with respect to the needs of the animals, the market demands, and government regulations. Stewards are characterised by their view of the farm as a source of work and income for members of a family. The focus on family is essential. There is no (or hardly any) hired labour on the farms of stewards, and even specific activities, like building maintenance and farm administration are often done by family members.

The pig production section on the farm of stewards is generally smaller that in other styles of farming. This is because nearly all stewards have mixed farms – in this survey they are most often mixed with a dairy cattle branch. A resulting advantage for stewards compared to the population average is that more than 50 per cent of the pig manure can stay on the farms. Of the available working hours on the farm, less than 70 per cent is spent in pig production. In addition, compared to other styles of farming a significantly higher number of working hours is spent in off-farm jobs. As a result, compared to other styles of farming the family is less dependent on the farm for its income – and definitely less dependent on pig production. The estimated income from pig production is significantly less for stewards compared to the population average.

In the next ten years most stewards have no plans to change the mixed character of their farms. Nor do they plan to combine pig production and fattening. They have an average level of investments in stables and equipment. Among the stewards there is great doubt about how to continue with pig production in the future. There is low enthusiasm to adapt to new government regulations. For several stewards the obligation of creating group housing (effective ultimately in 2008) is a boundary they do not want to cross.

Stewards try to work hygienically on their farms, but they are not keen on reducing contacts between the farm and the immediate surroundings (for example wildlife). According to stewards, the most important measure for disease prevention is reducing the number of trade contacts.

In general stewards prefer to follow the advice of the breeding company in the choice for sow types. Stewards are keen on checking the data from both technical and economic management support indicators.

Stockman

Stockmen perceive their business in a sphere of participation and autonomy. They are characterised by their enjoyment in having pigs as objects of labour. They enjoy witnessing the wonder of new life – the piglets.

The pig production section of stockmen is average size and average scale compared to the population average, but the production intensity is reduced. The labour division is not very different from other styles of farming though there seems to be more labour division between men and women. On average the male owner of the farm is more involved in the physical work and the female owner is more involved in the administration. Stockmen are not satisfied with the income from their farms.

Though stockmen believe that group housing on straw beds is better for the animals, their interest in investing in such farm adaptation is not (yet) developed. Actually, future plans and investments are not pronounced at all in this style of farming. Stockmen try to be as economic as possible with investments in stables and mechanisation. To them the most important factor involving stable equipment is low investment. Most of them have the barren and gestating sows still at a girth tether. But it is interesting to see that the stockmen who have invested recently in their stables, have invested in group housing. Stockmen also have a higher than average interest in the developments in free range and organic farming.

Stockmen have relatively extensive pig farms. Production data are low compared to the population average. Stockmen often think about hygiene in terms of balance. Except for cleaning and disinfecting the means of transport, stockmen do not believe in excessive hygienic measures. Stockmen do have the food safety certificate IKB or Good Farming, though only a few have the IKB$^+$ or Good Farming Crown label, because meeting these advanced safety requirements does not fit with their ideas about management.

Stockmen have a reduced interest in technical and economic farm data. To them the information is just a tool to keep a general overview of the farm. The farm management support is not intensely studied and discussed.

Shifter

Shifters perceive their business merely in the sphere of autonomy. Their attitude towards pig production is composed. Shifters are characterised by a shifting focus from pig production – towards either other on-farm activities or off-farm jobs.

Shifters have small-size and small-scale pig production units. The farms of shifters are thus usually small and situated in one location. Because of the small farm size there is pressure to initiate new income-generating activities, either on the farm or in off-farm jobs. The farms of shifters are usually mixed. The other farm branches are often increasingly important on the farm at the expense of the pig production section. In the survey the amount of labour input – as well as the farmer's dependency on the pig production section for family income – is about 50 per cent. The farms of shifters are often in the process of turnover to the farm successor. The successor (generally the farmer's son) contributes substantially to the amount of working hours on the farm and has taken over all or part of the physical labour on the farm.

Shifters think that the culture and business climate in this area is as good as in any other area. They choose to stay and invest in this area for infrastructure reasons, not for social reasons. But they have no intention of investing in the pig production section. The farm management is rather flexible: the weekly work schedule is not followed very strictly.

In contrast to all the other groups of farmers, there is no shifter in the survey who produces maiden sows for sow replacement. This activity would require specific attention and advanced skills. At the same time, shifters have more often than average a fattening unit on the farm. This indicates that the process of shifting may not be easy. The decision to stop with pig production would have a direct implication for the pig fattening section. Just like stockmen, shifters leave the technical details of breeding – selection of boars (sperm) and type of sow – to the breeding company. Shifters lag "behind" in their investments in stable automation. This relates to their doubts about whether to continue pig farming.

Shifters believe that too much hygiene disturbs the bacterial balance. The number of trade contacts is considered relatively unimportant compared to other measures, e.g. disinfection of the means of transport. Other aspects that shifters find less important are the 'clean way / dirty way principle' and vaccinations.

Though the focus of the farm is not on pig production, the production results on the farms of shifters are average – not below average like those of stockmen. So production results are nevertheless important for shifters.

Shifters are interested in the technical indicators for management support, but not in economic indicators. They are not (or no longer) interested in contacts with a study club. They seem to be hardly interested in discussing their data at all. They are clearly not focussed on improvement of the pig production section.

Unclassified

The group of unclassified farms is in no way different from the averages of the described styles of farming. The farms are unclassified because information about the farm management indicators was not available for this research. The farmers could not find the overviews, or they were not willing or able for other reasons to provide the information (see Chapter 3). There was just one aspect that these farms clearly shared in contrast to all described styles of farming. The majority of the unclassified farmers said that they hardly compared their management data with other sources and that they had little interest in discussing the data with people outside the farm.

4.3.2 Contrasts between Styles of Farming

The portraits of the styles of farming were found through the correlations between parameters from the questionnaires and the styles of farming. Portraits were found as contrasts to the population average. Sometimes the contrast between one style of farming and the population average was the opposite of the contrast between another style of farming and the population average. Together these findings reveal contrasts between styles of farming.

The contrasts between styles of farming provide insight into the contrasts in goals that the various styles of farming have. The goals determine the (qualitative) calibration scales[4] of the projection of styles of farming in a two-dimensional orientation on Technology and Business.

Entrepreneurs and craftsmen manage their businesses at high ambition level. They perceive pig production in a sphere of (international) competition. To them pig production is a bulk production market. Producing pigs for that market entails the challenge of making a better profit than one's competitors. But there is a slight difference in the goals of these two styles of farming.

Entrepreneurs perceive pig production as a competition for benefits: the balance between costs and profits. Pig production is a mean to achieve business benefits. The focus of entrepreneurs is not on cost reduction in itself, but on cost reduction in relation to profits. This focus leads to mechanisation and the reduction of labour costs. Entrepreneurs have very modern ideas about entrepreneurship and management. Often they are young farmers, with young families. For their future perspective it is important for entrepreneurs to keep focussed on market and farm expansion.

Craftsmen are experts in the quantitative and qualitative production of pigs – particularly in bulk production, since bulk production fits with fixed production procedures. This type of expertise requires a lot of experience. This is illustrated by the finding in the survey that the majority of craftsmen are elderly farmers. For their future perspective it is important for craftsmen to benefit from good pig prices. It is likely that some craftsmen will try and switch to higher-value life material, like the production of maiden sows.

There are three styles of farming at low ambition level – in the sphere of participation and autonomy. These styles of farming have in common that they are socially and physically integrated in the environment. The social integration is demonstrated by the links with the regional farming culture. The physical integration is demonstrated by – their concern for balance in interactions with the surroundings (like landscape value, wildlife and birds). The major contrast between farming in the sphere of participation and autonomy and farming in the sphere of competition is that for the first group the status of being a farmer and the goal of continuity are more important than being successful in the competition for production and benefits. Especially for stewards and stockman, farm continuity is more important then anything else. This illustrates that having a profitable farm in terms of production and benefits is a different goal than having a farm that is most suited for farm continuity through family succession.

Stewards are an exception compared to all other styles of farming, because the family members provide (nearly) all the labour. So stewardship is primarily about family and succession and not about Productivity. The contrast in dealing with labour is most extreme between stewards and entrepreneurs: entrepreneurs use the most hired and external labour and stewards use (practically) none. It is remarkable that the family income from the pig production unit of the farm is highest among entrepreneurs and lowest among stewards. Stewards are primarily committed to people: they create labour and income for the family, based on the available capacities and qualities. This approach makes this farming style flexible and suited to the modern trend of renewing the countryside and increasing creativity in farm activities.

Stockmen and shifters contrast in their orientation towards the object of labour. Stockmen are predominantly oriented towards pigs as objects of labour in their farm business; shifters are predominantly oriented towards other objects of labour – instead of pigs. So for shifters farming is a means of existence and pig production is one means of practising it.

Stockmen differ from craftsmen in production intensity. What these styles of farming share is affection for pigs as objects of labour. But where craftsmen are focussed on the efficiency of the production, stockmen are focussed on the objects of labour themselves. They feel affinity for caring new life (the piglets). In the survey the stockmen showed little interest in production intensity. This coincided with their low interest in investments. Craftsmen were interested in investments for production efficiency, whereas stockmen wanted in keeping investments as low as possible.

Shifters contrast with entrepreneurs in their long-term views. Both styles of farming focus on labour efficiency. The contrast is that entrepreneurs seek a future in pig production and the shifters seek it primarily in other activities.

4.4 Methodological Features

4.4.1 Calibration Scales of Orientation on Technology and Business

The summary of the contrasts between styles of farming shows qualitative calibration scales in the orientation on Technology and Business. In this context the ambition (a_x) and rationale (j_x) of the styles of farming were expressed in terms of ‘spheres’ and ‘foundations’. Entrepreneurs and craftsmen were situated in a ‘sphere of competition’. Stewards, stockmen and shifters were situated in a ‘sphere of participation and autonomy’. Beneath these spheres, styles of farming were present in contrasting foundations – representing contrasting rationales. Beneath the sphere of competition entrepreneurs contrasted with craftsmen in that their rationale was based on benefits rather than production. Beneath the sphere of participation stewards contrasted with stockmen in that their rationale was based on social aspects rather than animal-related aspects. These contrasts determined the calibration scales of the dimensions Technology and Business.

In the direction of Technology, the qualification progresses from pigs as objectives (tenders – in initial study), through pigs as objects of labour (stockmen), pig production as a means for labour orientation (shifters, stewards, and entrepreneurs), and finally to pig production as a goal (craftsmen). In the direction of Business, the qualification progresses from farms as the means for income (shifter), through farms as a goal for farm continuity (stockmen, stewards, and partly craftsmen), to farms as a goal for benefits (partly craftsmen and entrepreneurs) (Figure 4.8).

Figure 4.8 Identification of styles of farming in a context of Technology and Business. Farms were placed in spheres and foundations after analysis of the contrasts between them.

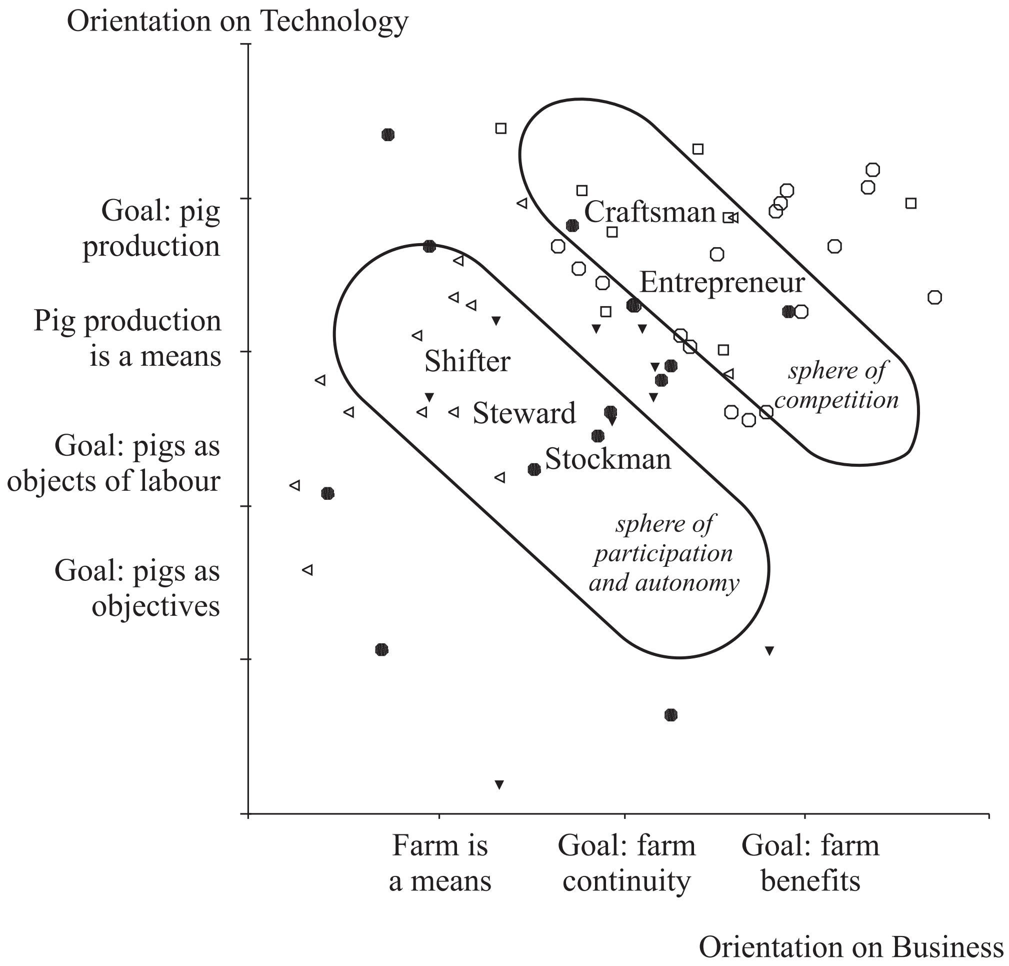


Figure 4.8 shows that the deviations of the styles of farming from the population average in the space defined by the orientation on Technology and Business is comparable to the positions of these styles of farming in the system of Productivity, Intensity and Scale.

4.4.2 Implications of Initial Analysis Versus Computerised Analysis

The methodology that was used in the initial study was heuristic – designed for finding contrasts among the styles of farming. Phrases from interviews were meticulously analysed for similarities and contrasts on relevant issues. From this exercise I obtained ideas about contrasts in farming practices, and chose on four contrasting groups in farming practices.

Based on these contrasts in the initial study, farms were divided over the four groups, according to the criteria. Four styles of farming implied a division of the farmers accordingly. So every farmer 'received' a style of farming for classification. This qualitative methodology implies for example that if afterwards an extra farm would be added to the study, the farm could get a classification within the system based on the used criteria. That is not so obvious in the computerised analysis.

In the computerised analysis of the current study it was first shown that the findings in the initial study were correlated to Productivity, Intensity and/or Scale. In the current study the criteria for classification were derived form Productivity, Intensity and Scale and parameters that were connected to Productivity, Intensity and/or Scale. The components resulting from the factor analysis reflect the coherence in farming practices in relation to Productivity, Intensity and Scale. Yet these components did not determine straightforwardly how styles of farming should be specified. The components just revealed the diversity in ambitions and rationales. The styles of farming were found as specific combinations of the components.

Based on knowledge from the initial study and the preliminary analysis of the current survey material, I decided how the components should be combined to create criteria for the classification of styles of farming. The choice of stewards was based on their values on components 3 and 4. In addition, the other four styles of farming were found as combinations of components 1 and 2.

Farms were put into groups according to these created criteria for styles of farming. Next, information about individual farms was used to create group averages that portrayed the styles of farming, and to illustrate the styles. In effect, the used methodology meant that styles of farming were specified as 'subgroup averages' deviating from the population average. This quantitative methodology implies that if afterwards an extra farm would be added to the survey, this farm could not be classified. That is because every participating farm is part of the system: every farm contributes to the population average and to the deviations form the average. So an additional farm could only be incorporated if that farm could also contribute to the population average and the factor analysis. So if an additional farm were to be added, the whole analysis would have to be done all over again to determine the styles of farming from a new classification of all farms.

An advantage of the computerised analysis was that a hypothesis for the relation between the parameters and Productivity, Intensity and Scale was required. The search for the characteristic of the relation between parameters and Productivity, Intensity and Scale led to a hypothesis about ambition, rationales and foundations. The analysis of the survey suggested – among other things – that insufficient information was gathered from farms with low Productivity, low Intensity and small Scale. This confirmed a bias in the selection of farms for the survey: only farms with a relation to a management support provider were included, because data for Productivity, Intensity and Scale would only be available for such farms. So about 20 percent of the actual population of pig producers – which predominantly had low Productivity, low Intensity and small Scale, was excluded from the survey. And this omission was reflected in the results.

An additional advantage of the computerised analysis was that a theorem was required about the relation between the system of Productivity, Intensity and Scale, and the orientation on Capacity, Technology and Business. This requirement led to the further analysis of the economy of pig production practices.

4.4.3 *Selected Parameters, Processes and Constructions*

In this study the frame of the styles of farming consisted of 40 parameters: Productivity, Intensity, Scale and 37 interrelated parameters that were selected from the answers from a questionnaire in 1998 to pig producers in Twente and The Achterhoek. The 37 other parameters in the frame of the classification were selected only for their correlation to Productivity, Intensity and/or Scale ($p<.005$). It appeared that these parameters originated from a variety of questions that were asked in the questionnaires. Of the selected questions 12 parameters were about processes related to pig farming and 25 about constructions for pig production (Table 4.10).

Table 4.10 shows that the selected parameters were related to all aspects of farming. With respect to the processes in connection to pig farming they were related to the pig production processes at farm level, to the temporal and regional perspective of farming, and to the farmers' perceptions of farming practices. With respect to the constructions for pig production the selected parameters were related to the technical constructions for pig production (housing and equipment), the indicators for pig production management, and the farmers' attitudes towards the indicators.

Table 4.10 Distribution of the parameters selected for the classification in styles of farming over the issues: processes in pig farming and supporting constructions.

In Section:		
		Issues concerning processes
	5.1	*Processes in pig production at farm level*
(1)		Log10 (Farm size) in: number of sows in 1998
(2)		Log10 (Farm size) in: number of sows per family in 1998
(3)		Log10 (total number of working hours in pig production)
(4)		The farm is a personal enterprise of the husband
(5)		The wife is responsible for the tax administration
(6)		Various family members are involved in building maintenance
	5.2	*Pig production in temporal and regional perspective*
(7)		Number of social activities mentioned by the farmer
(8)		Contact with a study club in the area
(9)		Underline the statement: ‘Pigs are important for the economy of the area’
	5.3	*Perceptions of farming practices*
(10)		The enjoyment of pig farming is caring for the new life; the piglets
(11)		We would rather have (or keep) a mixed farm
(12)		This farm is too small for complete automation
		Issues concerning constructions
	6.1	*Technical constructions in feeder pig production*
(13)		No considerations for selecting sow type
(14)		Preferred sow type: common crossbreed (NL x GY)
(15)		Preferred type of sow: advice breeding company
(16)		The most important factor for stables is labour efficiency
(17)		Automatic mechanical feedstuff supply
(18)		Turbo ventilation in stables
(19)		The prime duty of the feed company is to provide cheap feedstuff
(20)		The destination of feeder pigs is another farm in the area
	6.2	*Indicators for pig production management*
(21)		Log10 (Farm size) in: number of sows in 1997
(22)		1997 Farrow index
(23)		1997 Number of weaners per sow (per year)
(24)		1997 Number of piglets born alive per litter
(25)		1997 Number of weaners per litter
(26)		1997 Duration of nursing period
(27)		1997 Interval weaning to first insemination
(28)		1997 Interval first to last insemination
(29)		1997 Number of days lost per culled sow
(30)		1997 Percentage first farrows (by maiden sows)
(31)		1997 Percentage farrows of first inseminations
	6.3	*Attitudes towards the indicators*
(32)		Management support includes economic data
(33)		Management support programme CBK
(34)		Management support programme: Comzog
(35)		The most important indicators are about sow replacement
(36)		Data comparison with the national top 10%
(37)		Data are discussed in the study club

Notes

1 IKB: Certificate for integrated farm control for aspects of safety in the food chain. The plus sign ($^{+}$) refers to advanced control. For participants in the food chain programme of Dumeco, certificates for similar conditions were developed called Good Farming and Good Farming Crown.

2 Note that the correlation of component 2 to Productivity was negative. Therefore the reverse of the individual values was taken to estimate the regression.

3 Whether the correlation between a component from the factor analysis and Productivity, Intensity and/or Scale is positive or negative depends on whether there is a difference in the fit of all parameters in the analysis.

4 Calibration scale: scale on the axis of a dimension. The term calibration scale is used to distinguish the term from the notion of farm Scale – the number of sows per working hour (per week).

5 Processes

5.1 Processes in Pig Production at Farm Level

In Twente and The Achterhoek most farms are not exclusively specialised in pig production. Some farms are mixed with dairy cattle production or arable farming. Some farms include pig fattening or maiden sow production as well as pig production. Some farms also include unrelated activities, like home sale of products, or nature management. And some farmers have off-farm jobs. All these other activities contribute to the income of the farmer. In this section the relative importance of pig production among all these activities is specified for the various styles of farming. The differences between styles of farming are discussed. In addition, income from the pig production unit of the farm is discussed, as well as the labour division between the family members and hired farm hands.

Most technical data used in this research cover 1997 or extend over the period 1995 – 1997. In those years there were about 15 million pigs in The Netherlands, of which about 1.2 million were sows (served or with piglets).[1]

5.1.1 Farm Size

Farm size is actually both a construction and a process. Knowledge about farm size is important for understanding farm processes and activities. Several issues were involved in investigating farm size:

1 Many farms in the study were mixed farms in which the activities of pig production were embedded in a range of activities involving other on-farm and off-farm activities (the type and amount of other activities varied among styles of farming). Occasionally the demands of these other activities conflicted with pig production.

2 Labour input, ambition and income together determined the farm size. All varied among styles of farming. For the division of labour on the farm the following issues were important: the input of successors, the input of women, hired labour, help from various family members, and assistance in farm administration.

Size of Pig Production Units

Pig production farms in the eastern part of The Netherlands are on average somewhat smaller than in the south of the country. Data produced by SIVA software BV showed that in 1997 the pig production unit on an average farm in the north and east of the country had an average of 177.4 sows (Table 5.1), compared to 189.9 sows in the south of the country. On the other hand, in the east as well as in the rest of the country more farms are mixed than in the south.

The 82 farms in this survey had in 1998 a population average of 166 sows (Supplement Table 5a). This was similar to the numbers that were expected based on the data of SIVA. The farm sizes in the survey varied from 40 to 800 sows (Figure 5.1).

Table 5.1.Summary of regional data in the pig production unit of farms in The Netherlands[1]

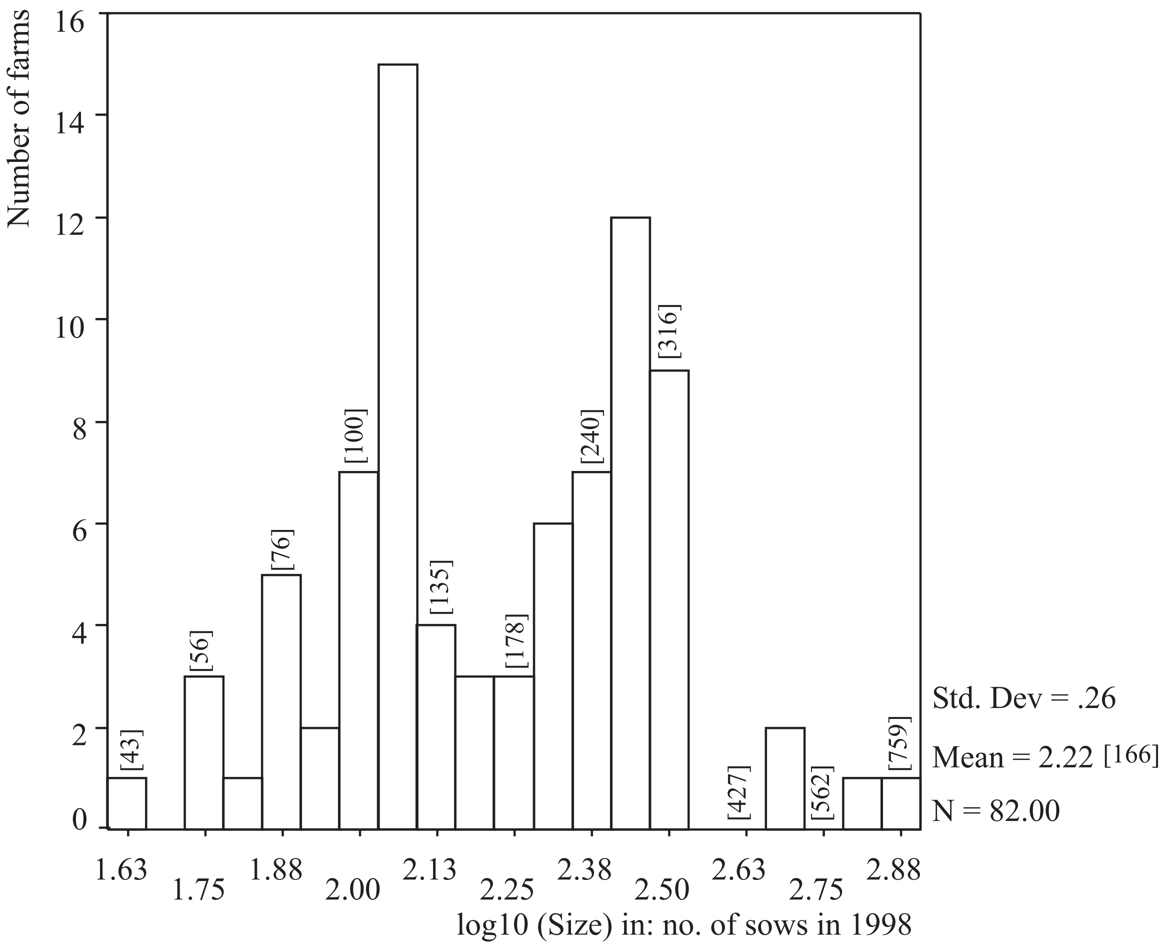
Region	*North, East & West 2000*	*South 2000*	*North, East & West 1997*	*South 1997*	*North, East & West 1996*	*South (excl. Limburg) 1996*
No. of participants	173	288	339	264	352	301
Average no. of sows	236.0	236.7	177.4	189.9	152.9	177.9
Average no. of maiden sows	20.2	20.6	13.5	12.1	11.8	11.4
Average no. of fattening pigs	5.3	4.1	5.4	10.1	4.7	6.2
Average farrow index	2.34	2.34	2.28	2.20	2.27	2.28
Average no. of piglets born alive per ltr	11.4	11.3	11.0	10.8	11.0	10.9
Average no. of piglets born dead per ltr	0.9	0.9	0.8	0.8	0.7	0.7
Percentage of piglet mortality	13.7	13.3	13.4	13.7	13.2	13.1
Average no. of weaners per litter	9.8	9.8	9.6	9.3	9.6	9.5
Weaners per sow [per year]	23.0	22.9	21.8	20.6	21.8	21.8
Feeder pigs per sow [per year]	22.7	22.5	21.8	21.2	21.6	21.3
Percentage of introduced maiden sows	41	45	44	33	46	47
Percentage of culled sows	41	44	38	28	41	43
Average weight of the feeder pigs	25.0	25.8	25.6	25.7	25.0	25.8
Average growth of feeder pigs (g/day)	324	333	324	334	322	328
Kg piglet feed per produced feeder pig	28	30	30	32	29	30
Kg sow feed per sow	1128	1133	1103	1065	1112	1086
Energy Value (EV) sow feed per sow	1154	1159	1113	1073	1120	1092
Selling price per feeder pig	98.50	96.09	114.99	108.98	116.98	116.64
Price of piglet feed p. 100 kg feedstuff	60.40	55.72	65.22	58.63	64.34	66.61
Price sow feed per 100 kg feedstuff	36.65	37.04	42.18	41.57	41.93	42.35
Price sow feed per 100 EV	35.52	36.23	41.65	41.16	41.56	42.63
Costs piglet feed per piglet	17.12	16.58	19.56	18.92	18.48	18.69
Cost piglet feed per kg piglet growth	0.72	0.68	0.80	0.78	0.78	0.76
Returns on piglets per sow	2233	2162	2506	2304	2531	2468
Costs of culling sows per sow	122	129	119	77	147	152
Calculated costs per trial per sow	221	227	267	190	272	267
Accretion per sow	17	18	25	-20	29	29
Total bonus per sow	0	5	1	1	4	1
Total costs sow feed + other feed stuff	408	417	460	437	463	457
Costs of piglet feed per sow	403	384	432	407	404	404
Turnover + accretion – feed costs/sow	1342	1281	1492	1327	1572	1540
Costs interest on livestock per sow	45	45	49	49	49	49
General costs per sow	105	105	60	60	60	60
Costs for health care per sow	88	90	85	80	83	81
Costs for heating per sow	59	62	60	55	66	64
Various additional costs per sow	57	57	42	45	41	46
Cost of artificial insemin. (AI) per sow	47	42	40	42	41	36
Total of various costs per sow	399	397	333	326	340	334
Financial balance per sow	943	883	1158	1001	1232	1206

[1] Translated reproduction of: Bedrijfsvergelijking Siva Software BV 2000, 1997 & 1996

Figure 5.1 suggests two peaks: one around the farm size of 125 sows and one around the farm size of 250 sows. In most cases, farms that have about 125 sows also have an equal size of another farm branch present – usually dairy cattle. When the farm size is about 250 sows or more, there is usually no other branch or only a small other farm branch present.

In the survey, the pig production units of entrepreneurs (310 sows) and craftsmen (253 sows) were bigger than average (166 sows).[2] Stewards (134 sows) and shifters (95 sows) had pig production unit sizes smaller than average and stockmen (153 sows) had an average number of pigs. The farm size in sows does not necessarily reflect the farm size as a whole. The difference between the big farms (entrepreneurs and craftsmen) and the average and small farms (stewards, stockmen and shifters) primarily reflects a difference in specialisation. Entrepreneurs and craftsmen are more likely than the average to have specialised farms.

Figure 5.1 Number of sows on the surveyed farms in 1998. Both the log10 values and the total number of sows [in brackets] are given.



Due to the combination of on-going farm expansion and environmental regulations many pig farms in The Netherlands are divided over more than one location. In the survey, 32 of 82 farms (39%) had two (26 farms), three (5 farms) or even five (1 farm) locations. Among entrepreneurs (9 of 19) and craftsmen (6 of 10) more farms than average had more than one location, while only 3 (of 13) stewards, 4 (of 12) stockmen and 2 (of 16) shifters had multiple locations (Supplement Table 5a). Some entrepreneurs also had more than one formally independent farm.

In The Netherlands pig feed is no longer produced on farms. Pig farms get (nearly) all the feedstuff from the compound feed industry. The size of a pig production unit on a farm is therefore independent of availability of land. The allocation of feedstuff for pigs is practically unlimited. So in that aspect there is no limitation to farm growth.

Income and Labour as the Determining Factors for Size

Yet in practice farms do not grow endlessly large. The reason became clear from comments in the survey. Farmers in The Netherlands are focussed on family farming. Their farms should in principle cover their families' needs for income and the available family labour to do farm work. In general these two factors, income and labour, determine the farm size much more than any other factors. This is illustrated by the following comments recorded in the study:

> *<U212>*[3] *If the income were sufficient we would definitely not grow bigger. But there has to be a basis for a living. The farm size or manner of farming is less important. It could just as well be free-range farming. The market has to decide that. We have had very good years when we had only 150 sows. But nowadays that is not nearly enough.*

> *<W205> If the prices were right, I would not need a larger farm. It is not about the size.*

Farmers who act in the sphere of participation made these comments. Their ambition is limited to farm continuity. This is different from farmers who act in the sphere of competition. Entrepreneurs are far more focussed on expansion:

> *<E167> 250 sows are actually a good number. If we could start building all over again, we could take 300 - or 600 - and take on a farm hand. The walking distances for work would be smaller and the sows would be in individual pens.*

For other farmers hired labour is not even considered – or at least not preferred. This is particularly so for stewards:

> *<W024> If this farm was bigger, we would not be able to handle the work. Now we just have enough manpower to do the work.*

> *<W240> I would rather have a slightly larger farm. But 300-400 sows are really the limit. Beyond that external labour is required. That is not my style.*

> *<W166> Other pig breeders grow often, but I have no interest in having an empire.*

These three comments illustrate that for stewards the desired farm size is limited to whatever the family can handle. But even for farmers who have created an 'empire' – in the eyes of these colleagues – farm growth is not unlimited. Ultimately the desire for farm continuity often limits farm growth:

> *<K323> I am not satisfied with the income I get from the business. I have invested so much, because I think I need this size. Soon I will have the biggest farm here in the neighbourhood. But that is necessary. In the future, most farms will be this large. Now there should be a 100 per cent effort towards automation. With good automation, good animal welfare can also be incorporated in the work. ... This farm should not grow any larger though. If it grew any more, it would later be impossible for the children to take it over.*

From these comments it is clear that styles of farming have similarities and differences in their general business objectives. The similarity is that the strategy of all styles of farming is to ensure family income and farm continuity. The differences are in the strategies for using family or other labour, in the desired farm size with respect to succession (minimum or maximum size) and the required level of family income.

5.1.2 Farm Activities

Combinations of Branches

In the past the expression 'mixed farm' was traditionally reserved for mixtures of arable production and livestock. In this farming system residuals from arable production were used as feedstuff for the animals. This system no longer exists in The Netherlands. Nowadays the expression 'mixed farm' is given to any farm with arable production and livestock, or with two or more different species of livestock. Mixed farms and farms integrated in a variety of production markets should be perceived as a sign of inheritorship (initial study).[4] Of 82 farms in the survey 55 (67%) were mixed farms in the sense that the farm entailed two or more agricultural branches (Supplement Table 5a).

Mixed farms were found among all styles of farming in the survey, though there were more mixed farms in the sphere of participation and autonomy (stewards, stockmen and shifters), than in the sphere of competition (entrepreneurs and craftsmen). Mixed farms were particularly present with shifters (14 of 16). This was no surprise, as shifters were shifting their interests from pig production to other activities on the farm or to off-farm jobs. So the presence of other activities was expected.

In the eastern part of the country the combination of (often equal sizes of) dairy cattle production and pigs is common. In the survey, combinations with dairy cattle were found in 41 of 82 (50%) farms, particularly among shifters (11 of 16) and stewards (8 of 13). The strategy of mixing two different equal-sized (in labour and income) farm branches ensures better continuity for smaller farms. Smaller farms have less opportunity than bigger farms to anticipate price fluctuations. But if prices are low in one branch the other farm branch might secure an income.

Dairy cattle are a good basis for securing income for small farmers. Throughout recent history milk prices have fluctuated only very little. There is also a social aspect: dairy farming has more status than pig farming. So the point of departure for these farms was the continuation of the dairy unit. If the opportunities for dairy farm expansion were limited (by the lack of available land) farmers decided to take on a pig farming branch in addition to the dairy farm unit. The choice was to take on either a pig production unit or a fattening unit in addition to the dairy farm unit – because taking on both pig production and fattening would make each unit too small. Pig fattening requires less labour input than pig production, but the demand for capital investments is much higher. So when enough labour was available on the farm a pig production unit was preferred. At the time that these farms were expanding (in the 1970s), it was also much easier to get a licence under the Nuisance Act[5] for pig production than for pig fattening because a pig production unit involves much fewer animals. Later, in the 1980s, further expansion in the pig farming branch was blocked for many farms by new government regulations for environmental care – particularly with regard to ammonia and phosphate emissions.[6]

Of 82 pig farms in the survey, 16 were mixed with arable crop production. These farms were not a mixture in a traditional sense. There were no notable volumes of animal feed produced. The arable crop production was usually a much smaller farm branch (in labour and income) than the pig production branch. Some farms in the survey had a small side branch of sheep (14), or other livestock, like chickens or horses. In addition to the given variation in farm activities, two farms had commercial non-agrarian activities located on the premises – one had a dancing school and another a farm shop.

A few farmers gave extra comments on the issue of mixed farming. The comments show that the problem with mixed farming is the labour requirements of the various activities:

> *<W060> In the past I used to have a small-scale camping ground. But it didn't suit me. People always demand time.*

> *<E167> Arable farming and pig production do not match if arable farming is the main branch on the farm.*

> *<K547> We have invested in a mixed farm and so we are stuck with it. But three branches are unpractical. They require too many hours of labour per week.*

> *<F070> I would rather have more dairy cows, and no pigs. One branch is a lot easier to handle.*

Whether a mixture of pig production and dairy cattle production is a good idea or not is always controversial:

> *<U004> If I had a choice I would rather have some dairy cattle in addition to the pigs. But for now it is not practicable, because it would require external labour and new investments.*

The advantage of having two branches is that if prices are low in one branch (as they were during the interviews in 1998) the other branch can still provide an income, as one farmer explained:

> *<W631> The contribution to the income of the sow branch varies. If things go well in the dairy branch the ratio is 60 per cent to 40 per cent. If things go well in the pig*

branch it is the other way around. That is not separated. For private purposes it is even; it is all one and the same.

There is no chance for survival for this farm with just sows. It might look more economical, but it isn't. The work is more unpractical, but it is necessary to keep the dairy cows as well.

From some comments the image of a certain style of living stands out vividly. The following comment reflects this:

<W060> I don't have any side jobs, but I do have irregular sources of extra income. I don't need much income. I do all the work myself on the farm. In the past I attended a horticultural school and then a technical school. Consequently, I can do a lot myself.

In this case there is no specific strategy for two or more branches, but a strategy for having a variety of options to get (additional) income – described as '*bricoleur*ship' by Hinrichs and Richard (2000). There is also a strategy for keeping investments low – i.e. low input farming or 'economic farmership' as described by Roep *et al.* (1991) among others. In this study the styles '*bricoleur*' and 'economic farmer' were not specified. These styles of farming fit in with stewardship and stockmanship.

The average acreage involved with the 82 farms in the survey was 13.7 ha (σ=11.8)[7]. This land was mainly used as pasture for dairy cattle, and in some cases as arable land. Only an average of about 0.6 ha (σ=2.1) was in use to provide pig feedstuff or stable bedding. No land was used to provide pasture for the pigs. There has been no relation found between acreage and number of sows on the farms.

Combinations of Production Types within the Pig Branch

Pig production farming in The Netherlands is very specialised. Usually four levels can be distinguished:

1 First there is top breeding for the production of hybrids and brands of pig types. This is done only in one co-operative and in a few (international) private companies.
2 Sub-breeding is done on some specialised farms connected to the top-breeding companies. The sub-breeders provide the next generation of maiden sows to the (ordinary) breeders.
3 Feeder pig production refers to the multiplication of piglets, reared to a body weight of about 25 kg.
4 At this time they are ready for the final level, which is fattening.

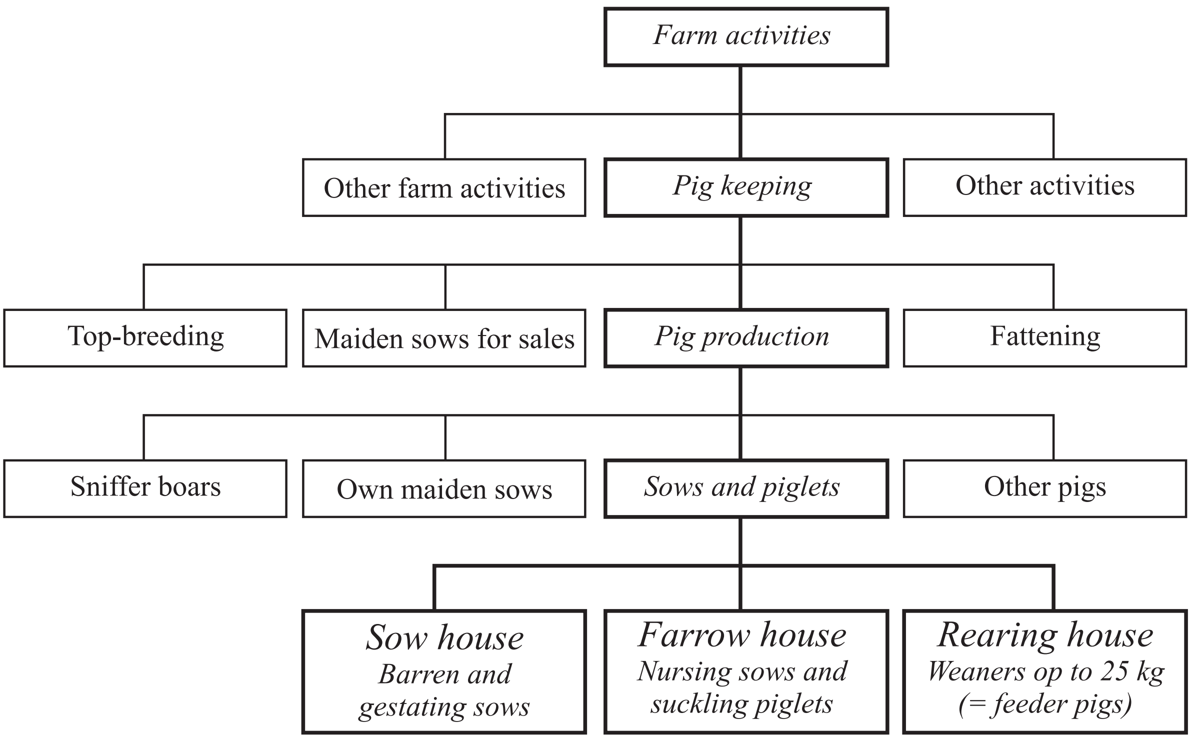
The focus of this study is restricted to the pig production unit of the farm for the multiplication of piglets (Figure 5.2).

As Figure 5.2 shows, the pig production division entails three different housing systems. In the sow house both (purchased) maiden sows before their first service (from about 6 to 7 months of age) and barren and gestating sows at different parities are housed together. The sows with suckling piglets are kept in a different housing system: the farrow house. After the piglets have been weaned (at a minimum age of about 3½ to 4 weeks), the sows return to the sow house. The weaned piglets (or weaners) are transferred to the rearing house until they reach a body weight of 25 kg. Next the reared piglets (or feeder pigs) are either sold or transferred to the fattening division of the farm.

Eleven farms in the survey also had a sub-breeding division. In the sub-breeding division female piglets are reared to become maiden sows for replacement. This specific aspect of this additional division was excluded from the focus in the survey, because these maiden sows represent a different market value. Also excluded were fattening divisions on farms: 33 farms had a fattening division, 19 of which were completely “closed” – that is, all of the pigs born and reared on these farms were also fattened there. It should be noted that fattening on the same farm does not necessarily mean at the same location.

It has become common practice in The Netherlands in recent years to have a farm with facilities at different locations. That is the consequence of the ongoing enlargements of farms through purchases of existing farms, combined with specific regulations on polluting emissions from animal excretions connected to locations. 32 farms in the survey (39%) had more than one location: 26 farms had two locations, 5 farms had three locations and 1 farm had five locations. Among Shifters it is common to have only one location (14 of 16) (Supplement Table 5a). Entrepreneurs (9 of 19) and craftsmen (6 of 10) often had more than one farm location – in the case of entrepreneurs the number might even be higher if we consider the possession of more than one farm by the same farm owner.

Figure 5.2 Position of feeder pig production in farm activities



During the outbreak of swine fever in the south in 1997, farms with widespread locations were significantly more handicapped than others by the ban on animal transport. Many gestating sows and newborn piglets were destroyed due to lack of housing space at a specific location. After the outbreak some farmers tried to reduce the number of spread locations according to new government regulations on epidemic prevention.

5.1.3 Formal Organisation and Succession

Traditionally Dutch farms were a personal enterprise of the male head of a household. According to the law of community property, women received estate ownership of their share by virtue of their marriage to the male owners. In the 1970s the general practice of marrying under the community property law was often replaced by marriage with a prenuptial agreement.[8] In addition, new partnership agreements were developed to handle the legitimate claims of the wives (and moreover of the intended successor to the farm). The most common formal farm organisation in the survey is 'husband & wife partnership" (37 of 81: 45%), followed by 'parent(s) & child partnership' (28 of 81: 35%) (Supplement Table 5a). Only 10 farms in the survey (12%) were a personal enterprise of the husband. This feature was part of the frame of classification, since it was negatively correlated to Intensity (chapter 3). These 10 farms were owned mainly by stockmen (5 of 12). This factor appeared to be related to the presence of a successor on the farm.

Perspectives for farm succession are limited in The Netherlands, particularly on smaller farms. It is increasingly difficult to get sufficient income from a farm, and for most farms there are no opportunities for expansion, because of government regulations about environmental pollution. Yet on most farms there is a desire for continuity. Nowadays decisions about farm succession are not made until the children reach an age at which they are capable of making such decisions. Then it depends very much on the opportunities for continuation of the farm, as well as the personal interests of the children[9].

A successor was present on 34 of 81 farms (42%) in the survey. On 23 farms (28%) the time was not (yet) ripe for discussions about succession. On 25 farms (30%) there was no successor willing or able to take over the farm, or there were no opportunities for a successor to continue the business in the future. Though on 25 farms there was no successor, most farmers did not expect to stop soon.[10] Only one farmer was planning to reduce – and subsequently stop farming within 10 years, since the farm was too small to continue. Nine farmers expected to stop in about 10 years or more. They were still trying to keep their options open and they were making various plans related to farm expansion or reduction.

The following age differences were found between the oldest and youngest partners (or successor) on the farms in the survey:

- In 43 cases there was an average age difference of 2.3 years (usually involving married couples).

- In 37 cases there was an average age difference of 30.7 years (usually involving two generations).
- In 1 case there was an age difference of 61 years (three generations of partners).
- One farmer was a bachelor without children.

On 10 of the 82 farms (12%) in the survey there were 2 families (different households) involved in one farm. Sometimes they were the families of two brothers running the farm. Occasionally they were two generations living independently, each running an independent household. The farms headed by two households were not predominantly connected to any specific style of farming.

5.1.4 Availability of Labour

Number of Working Hours on the Farm

The average available work force on Dutch pig production farms is 1.5 to 1.6 Agricultural Work Units (AWU: a measure of comparable numbers of full time working people).[11] Each AWU works an average of about 2,300 hours per year. This comes to (1.5 to 1.6 * 2,300) 3,450 to 3,680 working hours per year (per farm).

To find out whether the available work force on the farms in the survey was similar to these general data, the information that was obtained through the questionnaire was evaluated. This was complicated, because there is no standard reference for working hours of family members on farms.

Of the 92 families heading the 82 farms in the survey, 85 men worked full time on the farm, five men worked part time (20 to 30 hours), one man rarely worked on the farm, and on one farm there was no father: the farm was managed by a widow. The men who were working full time on the farms claimed to work between 40 and 90 hours a week on the farm. The large difference is related to the men's varying perceptions of 'working'. While some men considered (nearly) every waking hour on the farm to be a working hour, since the farm business was on their minds all the time; other men only estimated the hours that they spent inside the stables. There was no reference in the questionnaire for standardisation of the number of working hours on qualitative grounds.

The average number of working hours claimed by the men on the farms was 60 hours per week (σ=8); (Supplement Table 5a).

In the survey, 74 of the 91 women (owners) were involved in farm work. The involvement varied from 1 to 60 hours per week, though a part-time involvement of 22 hours per week (σ=12) was average. In the number of hours spent by women, most farmers included a number of hours for administration. Some farmers included hours for doing the farm laundry and even cooking, while others only included the number of hours the women spent in the stables. No relationship was found between the number of hours the men worked on the farm and the number of hours that the women worked on the farm.

On 33 of 82 farms (40%) other family members (often children, sometimes elderly parents) were also involved in the farm work, contributing mainly part-time. The number of other family members involved varied from one to three. Those family members contributed between one and 100 working hours per week. At five farms in the survey extra individuals worked on the farm for social reasons.[12]

On 37 of the 82 farms (45%) there was also hired labour involved – on 30 farms the hired labour consisted of only (one or more) men, on three farms it was only (one or more) women and on four farms it consisted of both men and women.

In 27 of the 37 cases in which hired labour was involved, the contribution was part time (up to 30 hours). Hired labour was usually obtained through the official technical care service (STAB)[13] or through selection in a formal application procedure. Personnel selection through personal contacts or direct contacts with an agricultural school was less common. Calculations in this section referring to total farm labour include the contributions of hired labour.

For comparison between farms, the number of working hours in the feeder pig production unit of the farm was calculated for each farm, according to the guidelines outlined in Chapter 3.

The standardised population mean (μ) of number of working hours on farms in the survey was 94 (log10: 1.973; σ=.160). This represented 1.7 full-time working family members and/or hired labourers. Of the total number of working hours spent on the farms in the survey, 73 per cent (σ=22%) was spent in the pig production unit. Converted into working hours this represented about 69 working hours per week per farm or about 3,500 hours per year. The number of working hours spent by farmers (i.e. owners, family members and hired labour) in the survey was thus comparable to the average of Dutch pig production farms.

Working Hours in Pig Production and Styles of Farming

The number of hours spent on the farms differed between styles of farming. Though entrepreneurs had the biggest farms in terms of size, craftsmen had the biggest farms in terms of the number of working hours spent on the farm (115; σ=38). The smallest farms in terms of working hours per week were owned by stockmen (81; σ=30). The difference between entrepreneurs and craftsmen indicated that for entrepreneurs the labour input per sow is less (efficiency is higher) than for craftsmen. The contrast between craftsmen and stockmen is not just a difference of focus (pig production versus pigs as objects of labour), but also in the total number of working hours spent on the farm.

The average number of working hours claimed by the male owners of the farms was 60 hours per week (σ=8). On farms of craftsmen the men spent on average 63 hours a week (σ=23), and on farms of stockmen the men spent on average 55 hours per week (σ=11). The involvement of the wives on farms of craftsmen was remarkable in comparison to the population average. Without exception, on the farms of craftsmen the women were involved in all aspects of the farm work – including all work in the stables. The women on farms of craftsmen also worked more hours per week (31; σ=20) than the population average for women on the farms (19 hours per week; σ=14); (Supplement Table 5a).

On farms of entrepreneurs 83 hours per farm were spent per week in the pig production unit (σ=28; 82%). On farms of craftsmen 91 hours were spent per farm [per week] (σ=34; 80%). On these farms more time per week was spent in the pig production unit than average. Stewards (56 hours per farm per week; σ=22; 69%) and shifters (54 hours per farm per week; σ=17; 53%) spent less than average. This indicated that the farms of entrepreneurs and craftsmen were more specialised in pig production than other styles of farming.

On the farms of shifters there were more often than average other family members involved with the farm work (on 10 of 16 farms usually elderly persons or children helped out). Those family members also spent more working hours on the farm (39; σ=26) than the population average (35; σ=25) for other family members. The finding demonstrated that change in farming practices often coincides with extra input of family labour on a farm.

From among the 92 families involved in the survey, 37 people (13 husbands, 22 wives, and 2 other family members) on 30 different farms were involved in external jobs for providing extra income to the family. They worked from 3 to 40 hours per week on these jobs, with an average of 19 hours per week (σ=9). Involvement in external labour was not evenly distributed among the styles of farming. More people on farms of stewards (10 of 13), stockmen (7 of 12) and shifters (10 of 16), than at farms of entrepreneurs (6 of 19) and craftsmen (1 of 10), had jobs off the farm. The number of working hours that people spent on external jobs was also higher than average on farms of stewards (23; σ=8) and stockmen (26; σ=11); (Supplement Table 5a). Again this indicates a difference in specialisation between styles of farming in the sphere of competition (entrepreneurs and craftsmen) and styles of farming in the sphere of participation and autonomy (stewards, stockmen and shifters). These findings were consistent with the initial study.

5.1.5 Income from Pig Production

Based on the findings in the initial study entrepreneurs and craftsmen were expected to have more income than farmers practising other styles of farming. Inheritors (stewards and stockmen) were expected to prefer and continue farming even if the revenues for the household were low. The assumption was that higher levels of Productivity would result in higher profits and thus higher income for entrepreneurs and craftsmen.

In the questionnaire, the farmers were asked how much money per year they had withdrawn from the farm revenues (on average over the last three years) to use as income for private expenses of the family. In this study this is called ‘income’. The farmers were also asked to what extent they were dependent on income from the pig production unit. The study focussed on the part of the income that was assumed to be contributed by the pig production unit.

The population average for withdrawal of money for private purposes (income) over the last three years was about € 21,400 per farm [per year] (of 76 farms) and about € 16,300 per family per year. This was the income from both the pig production unit and the other farm units, excluding the income from external jobs. These data were more or less similar to a calculated national average of entrepreneurial income at pig production farms of € 18,630 in the period between May 1994 and May 1998.[14]

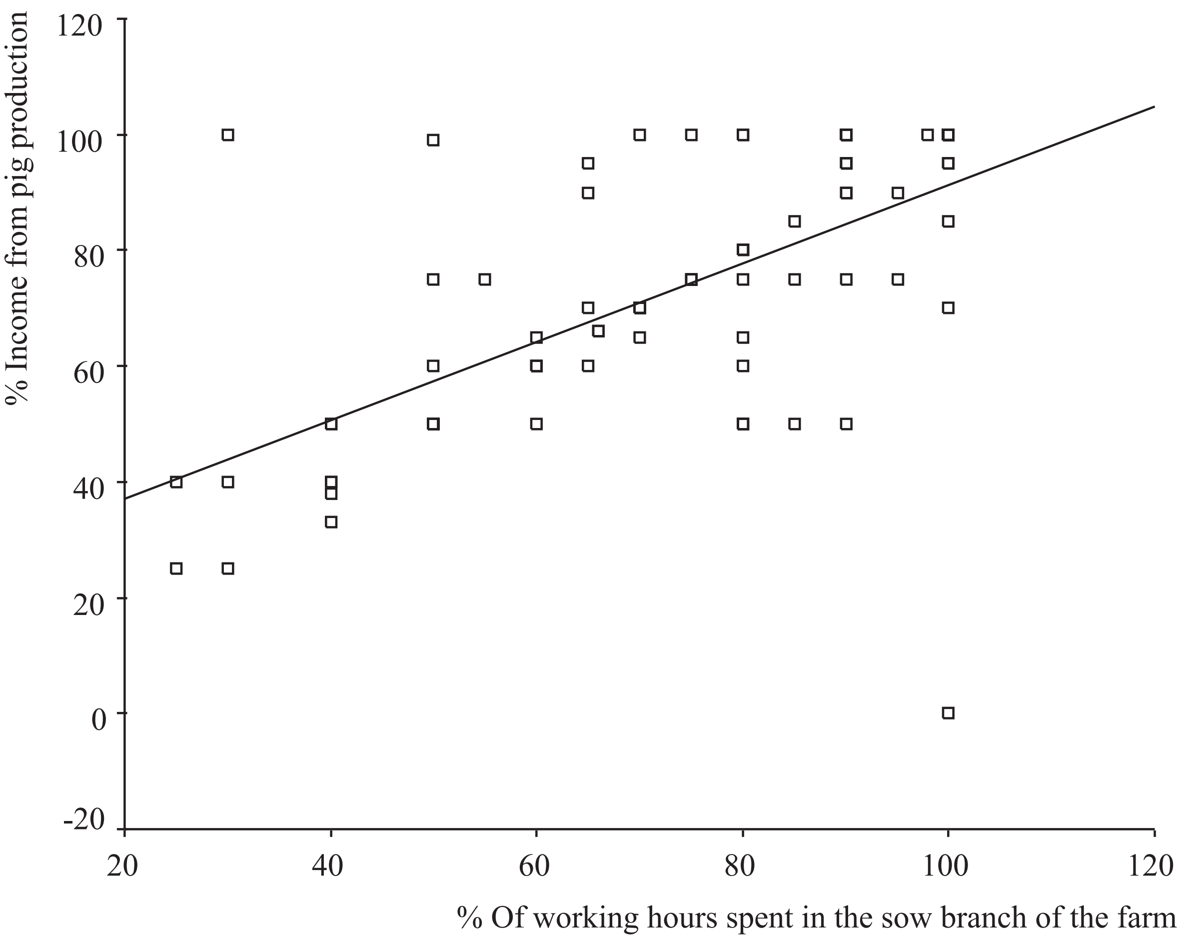
The estimated annual income specifically from the pig production unit of the farms in the current survey was as follows:

66 cases of 1-family farms: average was € 14,500 (σ=7,200)

6 cases of 1-family farms: missing values

10 cases of 2-family farms: average per family was € 13,900 (σ=9,000)

Figure 5.3 Relation between the percentage of working hours spent on the pig production branch of the farm and the dependency on this branch for income



On average the farming families were 73 per cent (σ=24) dependent on pig production for family income. This coincides remarkably with the 73 per cent of the number of working hours on the farm spent in pig production. There is thus a strong link (regression (β)=.641***) between the percentage dependency on pig production for income and the percentage of working hours spent in pig production (Figure 5.3).

Entrepreneurs and craftsmen receive 88 per cent of their income from the pig production unit. The other styles of farming were much less dependent on pig production for generating the family income: stewards 68 per cent (σ=21), stockmen 65 per cent (σ=30) and shifters 53 per cent (σ=18); (Supplement Table 5a).

The capital withdrawal from the farm that constituted income from the pig production unit differed among styles of farming. The capital withdrawal (income) was high for entrepreneurs (€ 24,000) and low for stewards (€ 11,000), stockmen (€ 11,000) and shifters (€ 12,000). When the data were transformed into specific income per working hour on pig production on the farm, the differences remained. The income of entrepreneurs per working hour (€ 6.81; σ=3.01) was highest whereas, for example, the income per hour of stewards was lowest (€ 4.35; σ=1.78). The population average was (€ 5.28; σ=3.40). So styles of farming in the sphere of competition (entrepreneurs and craftsmen) are also specialised in their dependency on pig production for income.

The differences in income among styles of farming could be explained by the differences in specialisation. The regression (β) between the log10 (income) per working hour in the pig production unit and log10 (Productivity in pig production per working hour [per week]) was 4.90 ($p < .001$) (Figure 5.4).

The regression was exactly the same as the regression (β) between log10 (income) per working hour in the pig production unit and log 10 (Scale in sows per working hour [week]): 4.90 ($P < .001$). So the higher the Productivity and the larger the Scale of a farm (in sows per working hour [per week]), the higher the income for family members (in €[15] per working hour [per week]) is. This is straightforward labour efficiency. So it was not surprising that entrepreneurs had the highest scores. This finding supports the suggestion that Productivity is a proxy for income (Van der Ploeg 1991). At the same time there was no regression between the difference in income per hour of work by family members and the Intensity of the farms.

Since the difference in income was related to Productivity and Scale the variation among styles of farming might also be explained by differences in farm size as such. The regression (β) between farm size in number of sows and log10 transformed family income (in €) per working hour in pig production done by family members is .237 ($p <.05$). This is excluding the wages for hired labour, since the estimates were based on the amount of capital that the family withdrew from the farm as income, and the number of working hours by family members only. The conclusion is that Productivity and Scale seemed to provide a better explanation for family income than farm size.

In the analysis, the income per working hour of family members (excluding hired labour) was next corrected for Productivity level. After correction the income per working hour of stewards was still less (€4.12) than the population average in income (€5.17). This suggests that there may be other factors besides productivity that determine the income.

5.1.6 Labour Divisions in the Pig Production Unit

Weekly Schedules

The breeding and life cycles of sows and the growth of piglets largely determine the work in the feeder pig production division of the farm (Figure 5.5).

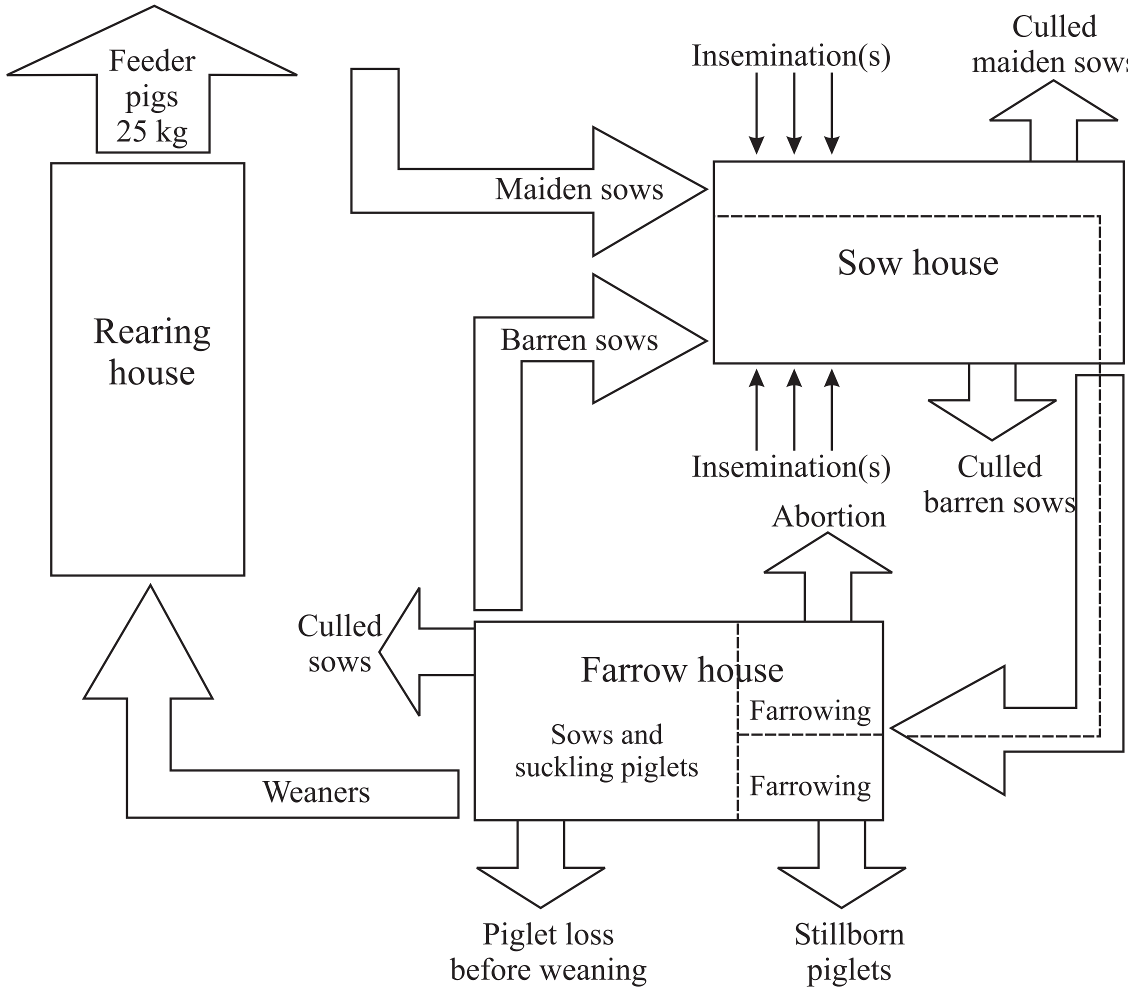
The cycle starts in the sow house. Maiden sows of 6-8 months of age first enter the sow house to acclimatise in the breeding division. Incidentally a maiden sow is already culled before they reach the desired age for first insemination. The maiden sows usually get their first insemination when they are about 8 months old. They are mixed with the barren sows, returning from the farrow house. Most barren sows returned from the farrow house return in oestrus within a few days and receive their first insemination about 4-6 days after weaning the piglets. Though mating by boars still occurs in The Netherlands, artificial insemination (AI) using fresh (cooled and diluted) sperm is now the dominant practice in pig production.

Figure 5.4 Relation between log10 (income) per working hour for family members on the farm and log10 (Productivity) in produced pigs per working hour (per week) for pig producers in Twente and The Achterhoek.

The oestrus cycle of sows is three weeks. Three weeks after the first insemination the sows are inspected for return in oestrus. If necessary the sows are re-inseminated. About 12 per cent of the sows require an extra service before getting pregnant. Sows and maiden sows that keep returning in oestrus are culled.

The gestation of a sow takes about three months, three weeks and three days. Near the end of the gestation the sows are transferred to the farrow house (delivery house). In the farrow house the sows deliver a litter of about 8-16 piglets. Litter size depends on age, breed and other circumstances. Young sows (first or second farrow) and old sows (after about 8 farrows) usually have smaller litters than sows at peak production age. Of these piglets a varying number may be stillborn[16] – an average of 5-15 per cent stillborn piglets is considered normal. Since most sow udders have 12 (sometimes 14) healthy teats, piglets from large litters are cross fostered by other nursing sows.

Figure 5.5 Production cycle of sows and the corresponding housing systems. Sows enter the production cycle as maiden or barren sows in the housing system for barren and gestating sows. After insemination the gestating sows remain in that housing system until a few days before farrowing. Then they are moved to the housing system for sows with nursing piglets. After the piglets are weaned, the sows return to the housing for barren and gestating sows – or get culled. The piglets are moved to the housing system for weaners until they are ready as feeder pigs at a body weight of 25 kg.



The young piglets stay with the sow to suckle for a period of three to five weeks. Before weaning, piglet loss may be substantial (sometimes up to 20 per cent), mainly due to infant weakness. After weaning the piglet loss is usually reduced to 1-2 per cent.

After weaning the piglets are called weaners. The weaners are transferred to the rearing house and reared for another eight weeks until a bodyweight of about 25 kg is reached. The reared piglets of about 25 kg are now called feeder pigs. They are sold or transferred to the fattening unit or piggery.

In the meantime the barren sows are selected for the next cycle or culled. The selected sows usually return in oestrus 3-4 days after weaning. This concludes the production cycle.

Depending on the length of the nursing period and the required amount of re-inseminations, a sow can go through 2 to almost 2.5 production cycles a year. A healthy sow usually produces 8 to 10 farrows, before being culled for lack of production. Occasionally highly productive sows are kept until a farrow number that may even reach 16 or more.

The work schedule in the pig production unit of farms is divided in cycles of one or three weeks. It is connected to the western (Christian) week cycle of seven days, and fits with the oestrus cycle of sows (three weeks) and the average time lapse between weaning and first new oestrus (1 week). Consistently other activities in the breeding division are fit in a weekly schedule, like weaning and the sale of reared piglets. Sows who are in oestrus during the same week share a compartment in the sow house. The work in this compartment is synchronised. Most sow houses are therefore basically divided into three compartments.

When this survey was done (1998) most farms kept sows single ranged – in individual boxes or on a girth tether. New government regulations prescribe group housing to be introduced before the year 2008, as a means to improve animal welfare.

In preparing to meet the new requirements, many farmers are shifting to a three-week cycle system. The system also has the advantage of making it easier to meet new government regulations on animal transport. The system entails giving sows hormone treatments to synchronise oestrus. But increasing hormone treatments is a disputed farming practice. So government regulations to reduce one disputed practice (related to housing or transport) may cause an increase of another disputed practice (hormones). (See also Sections 5.2 and 6.2).

The most important labour activities in the pig production unit are feeding, supplying water, re-housing and transport of animals, showering sows, oestrus control, health care and treatment of piglets (medication, castration, grinding teeth), and cleaning housing pens. These activities require a fixed weekly schedule (Table 5.2).[17]

The schedule is made in such way that a minimum of farm work is done on Sundays. It is assumed that most farmers prefer to have a day of rest on Sunday. When asked whether religion played a role in farm management, only eight farmers gave a positive answer, reflecting the way they handle the animals. A few farmers added a comment about rest on Sunday:

> *<W140> Being a Catholic I do not favour the 24-hour society. I think that Sunday should remain a day of rest.*

It is assumed that most farmers did not mention the issue of rest on Sunday, because to them it is probably too obvious to mention.

The planning of a weekly cycle is primarily determined by the weaning day. This is preferably Thursday or Friday, because the weaning day determines the day that most barren sows come in oestrus after weaning. Since oestrus control and artificial insemination involve specialised labour, the weekends are preferably avoided for conducting these activities.

The farrow pen division is the most expensive housing system on a feeder pig production farm. It is economical to use these pens as efficiently as possible. It is most efficient to clean the farrow pens as soon as possible after emptying a unit of the farrow house (weaning piglets and transferring weaners and barren sows).

In turn, weaning day is dependent on the day that the feeder pigs leave the pig production unit for fattening. The weekday on which feeder pigs are sold and removed is usually also fixed. After cleaning the rearing pens a new group of weaners can enter.

Table 5.2[1] Example of the weekly schedule of routines in a pig production operation. The schedule is based on the weekly sales or removal of feeder pigs. The rest of the routines in the schedule are planned in connection to this day.

Part of the day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning	Daily check and feeding procedure Re-housing sows in late gestation to farrow house	Daily check and feeding procedure Removal of feeder pigs for sales Soaking of rearing pens	Daily check and feeding procedure Castrate piglets	Daily check and feeding procedure Pregnancy tests	Daily check and feeding procedure	Daily check and feeding procedure Weaning and re-housing piglets and barren sows	Daily check and feeding procedure
Afternoon	Afternoon feeding	Cleaning the rearing pens Afternoon feeding	Stable maintenance and AI Afternoon feeding	Oestrus tests and insem. (AI) Afternoon feeding	Castrate piglets Afternoon feeding	Cleaning of farrow pens Afternoon feeding	Afternoon feeding
Evening	Evening check	Evening check	Evening check	Evening check	Evening check	Evening check	Evening check

[1]Modified from Handbook for the Varkenshouderij(1993) p. 86

How the weekly schedule is matched depends to a large extent on how much time is allowed for cleaning. Some farmers clean heavily using high-pressure water. Some of them also disinfect and/or allow the compartment to dry. Other farmer dry sweep the compartments or have other procedures. Depending on the procedures, cleaning of compartments takes from a few hours to two days.

As indicated already in Section 4.2 there are differences among styles of farming in the nursing period: entrepreneurs allow 26 days and shifters 28.0 days – while the population average is 26.8 days. The small differences in the duration of the nursing period suggest differences in the number of days (hours) that stables are empty between production cycles. These differences are related to farmers' practices in farm hygiene (wet cleaning, dry cleaning or non-cleaning), and to practical implications for the weekly schedule. These differences among styles of farming are discussed in connection to farm hygiene in section 6.1.

In between the fixed activities, incidental activities must also be planned, like building repairs and renovations, administration, etc. In addition, activities related to pig production must practically coincide with the activities related to other farming branches that are also present on the farm (see also: IKC Veehouderij 1993).

There were no further specific questions in the questionnaire about the weekly schedule. So it is not possible to elaborate extensively on differences among styles of farming related to this aspect, beyond the noted differences in hygiene.

Labour Division among Family Members and Hired Labour

In the survey, interviewees were asked to specify who on the farm performed particular activities in the feeder pig production division. For the most part, the men aged between 30 and 60 were involved with all aspects of farming practices. Most women in this age group were also involved with the farming practices, though usually part-time and often for specific tasks (like administration) (Table 5.3).

The questionnaire did not ask for the ages of children living on the farm. But in relation to the work of women, information about the ages of the children would have been interesting. It seemed that in families with young children the women spent fewer hours in farm work and performed activities that were relatively easy to combine with childcare (like administration). This was consistent among all styles of farming. In households with older children the role of the women varied, and differences among styles of farming were more evident.

The farm activities performed by women on some farms were generally the same activities performed by hired labour on other farms. This is particularly the case with regard to feeding and cleaning activities (done by women and/or hired labour), and administration of manure and tax declaration (done by women and/or external services). The exceptions to this rule are management administration and building maintenance. Management administration is often done by women, but seldom by hired labour. Building maintenance is rarely done by women, though often through external input. If a decision making process is strictly technical – like the choice of a boar for AI, the choice is often made by the husband on his own. If a decision concerns the whole farm as an enterprise, the husband seldom makes a decision alone. His wife is often involved in the decision making process, and usually also other people concerned

– other family members and sometimes even hired labour workers. If a decision concerns the whole farm, external advice is often consulted.

Table 5.3a and 5.3b Frequencies in labour division of activities on pig production farms in Twente and The Achterhoek (in 1998)

Frequency table farm activities	*Feeding sows*	*Feeding piglets*	*Choice of boar*	*Insem. (AI) service*	*Assist sows at farrow*	*Trade contacts*	*Other farm contacts*	*Manage -ment adminis -tration*	*Farm economy adminis-tration*
Man (prime generation)	38	41	59	51	42	52	48	50	35
Woman (wife)	8	13	1	3	5	10	4	11	19
Man & wife	8	5	1	2	10	4	14	9	12
Son or father	6	4	3	5	5	8	3	6	2
Man & son or father	4	5	3	1	6	2	7	5	3
Man & various family members	2	1	1	4	0	0	1	1	4
Hired labour worker	2	1	0	0	5	0	0	0	0
Man & hired labour worker	4	3	0	2	3	2	1	0	0
Different combination or extern	9	8	5	13	5	1	4	0	7
Unknown or irrelevant	1	1	9	1	1	3	0	0	0
Total (N)	82	82	82	82	82	82	82	82	82

Frequency table farm activities	*Manure mineral adminis-tration*	*Tax adminis-tration*	*Pig pro-duction study club*	*Technical courses*	*Cleaning pens*	*Yard mainte-nance*	*Building mainte-nance*	*Farm decision making*
Man (prime generation)	38	16	47	43	27	22	33	5
Woman (wife)	7	5	1	4	27	5	0	2
Man & wife	8	5	6	8	11	19	8	25
Son or father	4	3	6	7	3	5	1	0
Man & son or father	1	3	4	3	1	6	7	3
Man & various family members	1	0	1	1	1	12	10	9
Hired labour worker	0	0	0	0	4	2	3	0
Man & hired labour worker	0	0	1	1	1	2	0	2
Different combination or extern	23	50	2	1	5	9	20	6
Unknown or irrelevant	0	0	14	14	2	0	0	30
Total (N)	82	82	82	82	82	82	82	82

To examine the activities of the family members and others more closely in relation to styles of farming, the involvement of each one in specific activities was described. The division of activities among family members and other labourers was only slightly different among the various styles of farming (Supplement Table 5a).

This was even the case involving activities with a close correlation to Productivity, Intensity and/or Scale, like tax administration and building maintenance. The survey results were closely examined for combinations of the distribution of labour and activities on the farms. This examination revealed that farms could be categorised into four general groups:

(1) A child (usually a son) of the farmer is in the process of taking over the farm (succession). The father and the son do (nearly) all the physical farm work together, since these two people are capable of handling it without a problem. They feed the sows and piglets, choose boars, apply inseminations, assist at farrowing, meet service people, do farm administration (or have it done externally), and do the cleaning of the pen and the yard maintenance. There is little involvement of hired farm hands or of the wife/mother in the physical daily work, though she is often involved in making decisions.

(2) The farmer is also a manager. He does both the management and part of the physical work in the stables – assisted by significant contributions from hired labour. The hired labourers perform predominantly the daily and weekly routines, like feeding the sows and piglets, applying inseminations, assisting at farrowing, meeting service people, and cleaning of pens. There is little involvement of the farmer's wife or any other family members in the farm work.

(3) The farm work is done by a variety of family members – including the farmer's wife, and often with the assistance of a part-time farm hand. There is usually a clear task division, especially for those who participate only a few hours per day or per week in the work, for instance in feeding, cleaning or administration.

(4) The farmer's wife is well involved in all the farm work, participating in a variety of farm tasks, including administration and participation in study clubs and courses. The farm is usually run by the husband and wife together, with minor involvement of other family members and (usually) without assistance from hired farm hands.

The four groups, described as (1) to (4), are associated with styles of farming and with family stages in the cycle of succession and continuity.

Group (1) is clearly connected to the stage of succession and transmission. The stage of a farm enterprise with respect to transmission is not a style of farming in itself. But – especially the transmission stage – can have substantial influence on the style. Bennett (1982) identifies this stage of the enterprise as one of four major influences on the farm management style. The other major influences are mode of production, general economic conditions and support load of the enterprise.

When farms are taken over the son has usually been prepared to run the business through home learning from practice and formal education at an agricultural school.

Being prepared in such a manner makes taking over the farm seem like a natural way to ensure continuity over the next generation.[18] Some farmers, like the one quoted below, dispute the implicit presumptions regarding continuity of farming:

> *<W188> I don't think it is a disadvantage that I haven't had an agrarian education. It is better to get there through independent courses. Farmers increase the social boundaries of their children by sending them to such schools. It is no good to have your own farming schools. You have to become a farmer because you want to, not because there is a farm available.*

The fact that the wife on the farm, other family members and hired farm hands are hardly involved in pig production during the period of succession is explained by the fact that in the transmission stage there is temporarily a surplus in the availability of labour. In that period there are two families available to do the work: the elder and the younger generation – and both families require an income from the farm. Both before and after the period of succession there is one family involved. Therefore in this stage the more flexible family members focus on other activities. In this respect the women are particularly important. Nowadays the women often take advantage of the period of succession by developing new farm activities, like home sales of farm products, home processing of farm products, starting a camping ground, etc.

Group (2) is characterised by the significant presence of hired labour. Hired labour costs money by the hour and should therefore be used as economically as possible. In the survey, entrepreneurs had the most hired labour and stewards had none. If there is a lot of hired labour, the farm is not always a mutual family interest. Family members may well have off-farm interests and jobs.

When a lot of hired labour is present, the farmer often sets criteria for the skills of the hired labour workers:

> *<K323> I have my criteria for hiring personnel. I don't want a young person. I want somebody who is independent, flexible and stress resistant.*

Though this practice may emphasise entrepreneurship it is not connected exclusively to entrepreneurs as a style of farming. As was shown in Section 5.1, all styles of farming found in the survey had selective hiring of personnel. This is one aspect of the labour division between family members and the minority of hired labour. Contrary to hired help, a family member cannot be 'fired' from the family. They are not selected but more or less elected or nominated to do certain tasks and thus contribute to the evolution of the work.

Group (3) is associated with the typical Dutch tradition. The farm is the family's collective interest and the centre of its existence. This group of farms is associated with inheritorship and in particular with stewardship. There is little or no external labour involved in this group. It is also on these farms that an extended relative or individual from the village may be accepted as an extra hand on the farm for social reasons only.

Group (4): the equal involvement of men and women is associated with craftsmanship and stewardship. Women with interest in physical farm work are often keen craftsmen.[19] The reverse is not always the case: farms with keen craftsmanship can exist without the specific involvement of the women. On farms with a particular involvement of women, there is sometimes reluctance to hire external labour. This reluctance to hire labour is associated with women in both craftsmanship and stewardship styles of farming:

> *<W631> If there were hired labour here I wouldn't have to work as much. But then we wouldn't discuss that much either about all that happens.*

In summary, there are differences among styles of farming concerning both the role of hired labour and the role of various family members – particularly the women on the farm. The differences are partly linked to the situation concerning farm succession ('styles' in the terms of Bennett 1982). The differences are also linked to styles of farming as described in the current study. The presence of hired labour is directly linked to perceptions about family farming. Perceptions about the role and position of women are linked to a variety of principles and issues of personal interest. Though the role of women differs among styles of farming, the most striking aspect about the role of women is its flexibility.

5.1.7 Conclusion: The Relation between Pig Production Processes and Productivity

Section 5.1 has shown that pig production is embedded differently in farm activities in the various styles of farming. First there is the issue of farm size. Styles of farming influence farm sizes, by defining certain limits. A desire for work and income, as well as a desire to create a good farm size for succession and continuity determine these limits – and not the physical (or sustainable) carrying capacity of the environment.

The variation in size was also determined by the differences in ambition (sphere of competition for entrepreneurs and craftsmen versus the sphere of participation and autonomy for stewards, stockmen and shifters).

Craftsmen and particularly entrepreneurs have bigger farms than stewards, stockmen and shifters. Entrepreneurs prefer their farms to be as big as possible (maximum) because the bigger the farm, the more efficient the production and the better the income can be. Their restriction in farm size growth is that family succession should still be possible. Stewards and stockmen prefer moderate or even minimum farm size growth – to the extent that farm succession is still possible. For stewards the desire to make minimum use of hired labour and other external assistance is important.

Entrepreneurs and craftsmen are also more specialised in pig production and more dependent on pig production for their incomes than stewards, stockmen and shifters. Their strategy is the economy of specialisation. Stewards, stockmen and shifters ensure income security by diversifying sources of income: mixed farms, extra farm activities (like home sale of farm products) and additional off-farm jobs.

Labour division on the farms depends on two things: the age of the children and the availability of hired labour. The role of the men on the farm is connected to the availability of hired labour: the more hired labour, the more the men become farm managers. The role of women on the farm is primarily connected to the age of their children. Women with young children perform farm activities that can be more easily combined with childcare. The role of women who are less occupied with young children varies among styles of farming. On farms of stewards, and particularly of craftsmen, women are very involved in all aspects of the farm work. At the time of succession, it is often the women who initiate extra farm activities.

Farm income is directly related to Productivity, Scale and farm size. After correction for Productivity, the income per hour of work input of family members is evenly distributed over the styles of farming with the exception of stewards. The income of stewards is less than the population average irrespective of the Productivity level.

5.2 Pig Production in Temporal and Regional Perspective

Time, place and the combination of activities determine pig production on a farm. Pig production is embedded in historical possibilities and future perspectives; and it is shaped by the physical, social and cultural context of the region. In this section, the contexts of time and place are discussed. The impact of historical possibilities and future perspectives, as well as of the physical and social environment s not the same for all farms. This section investigates the variations in this impact among styles of farming.

As was shown in Section 4.3, styles of farming are related to social activities of farmers in their area and how important these farmers believe farming is for the local economy. In this section much attention will be paid to the perceptions of farmers regarding government regulations and societal demands. In particular, their attitudes towards investments for group housing of barren and gestating sows (currently a hot topic) are discussed.

This section also focuses on the regional cultural repertoire. In addition to classifying styles of farming, the study investigated whether farmers believed the culture of their own area differs from what they perceive to be the culture of other regions. Not surprisingly, many farmers reflected on what they perceived as cultural contrasts to farmers and farming practices in the other pig farming concentration areas in the southern part of the country (east Brabant and northern Limburg).

Finally, the appreciation of the environment is discussed, both in terms of social contacts and of scenic appreciation and other validations of the area.

Interview Setting

The questionnaires in this study were completed during face-to-face interviews on the farms. It was expected that more accurate information would be obtained through personal contact than through a more distant communication method (telephone or writing). The interviewees were assumed to represent the farming family. The interviewer had no particular interest in differences between family members, though occasionally different answers from family members were noted.

On the farms the husband (43 times), wife (4 times) or both (26 times) were present to answer to the questions. Sometimes the son (5 times) or another family member involved with the farm (4 times) was present. There were no differences among styles of farming with respect to the people who were present for the interview.

The questionnaires were filled in at the farmhouse. I conducted 29 of the 82 (35%) interviews, and professional interviewers carried out the rest (Supplement Table 5b).

Farm buildings where pigs were kept were rarely visited during the farm visits. Information was thus collected through the questionnaire, and not through personal observations. This procedure was convenient for the farmers, as it is not common for Dutch pig producers to allow visitors to enter their pig stables, except for a special purpose and then only after taking hygiene measures.

5.2.1 History of the Farms

Succession

In Twente and The Achterhoek most farms have existed for many generations, and have usually been passed down from father to son. Historically most farms were mixed, containing dairy cows, pigs, poultry, (sometimes sheep), arable farming and horses for the farm work. Starting in the 1960s, farms expanded and became more specialised. This development created a mixture of farm types, which were turned over to the current generation at the most recent succession of the farms. Depending on the date of this last succession, either the present farmers or their families, or their parents (or both generations together) implemented the modern developments that define the current situation on the farms.

Usually both the men and the women surveyed (71 of 82 farms: 87%) were born and raised in the area. Most of the men were born on the farm where the interview took place. The few farmers who came from elsewhere were entrepreneurs and craftsmen (Supplement Table 5b).

In many cases the farm had been in the possession of the family for many generations. In 36 cases (44%), the farmers' ancestors had founded the farms before the year 1900. 71 farms (87%) were founded before 1960, and none of the farms was founded after 1986.

Only three farms in the survey were founded, or bought by the current owners. The 79 others were taken over through succession since 1960. On average the current farmers had been owners for 16 years (σ=10) at the time of the interviews (1998).

If succession had been consistent throughout history, the succession interval could be estimated as twice the number of years (2*16=32 years) that the current owner was present. This figure is almost similar to the 30.7 years of age difference between two generations succession (section 5.1). If the possibility of succession would be decreasing (like it seems to be), than the observations should be divided into farms with (possible) successors, and farms without successors.

There was no difference among the styles of farming concerning the duration of present ownership, except for craftsmen. The craftsmen possessed their farms at the time of the survey on average seven years (σ=12) longer than the others. The reason for this difference was not clear, because the questionnaires were not specific enough on this point. Craftsmen in the survey were on average not older than the general population of farmers in the study (see also Section 5.1).

When possession of the farms was turned over to the current owners, the farm sizes of farms of entrepreneurs was enlarged (153 sows; σ=108) compared to the population average (96 sows; σ=83). At the time of the last succession 71 of the 82 farms (87%) were mixed. At the time of the interview (1998) 55 (67%) were still mixed (see also Section 5.1). Some farmers told the story of their farm's history vividly and extensively:

> *<U034> In 1906 the old farm burnt down. Afterwards it was rebuilt ... In 1965 I took over the farm from my father. Then there were 15 sows and a few piglets. Already then it was a specialised farm and not a mixed farm.*

This situation of a specialised farm in 1965 was uncommon. Most likely it was not the desire of the father to have a specialised farm, but a matter of poverty. The family probably did not have any farmland to build up a farm including dairy cows – which was the desired farming system in the area. By 1998 it was unthinkable that a specialised farm of 15 sows could provide sufficient income for a family. It would have to be at least 10–15 times larger. This farm had grown in the meantime to hold 140 sows; but this farmer had managed to continue operating his relatively small business up to 1998, whereas many others – with more income security from a dairy unit – had failed. Many farmers expressed the difficulty of keeping a farm profitable:

> *<K317> In 20 years time we have expanded this farm ten times to consolidate our income. The ratio of profits to costs is largely reduced {...}.*

> *<W188> In the past ten years I invested about € 0.5 million*[20] *in the farm: in milk production rights and in land. It has become uncertain to what extent these investments will be profitable.*

These farmers expanded their farms out of necessity. In between answering questions about farm history, some farmers expressed their frustration about developments with respect to security of succession and continuity:

> *<C008> This business has been built up over a period of 100 years from generation to generation. And now the Minister of Agriculture is taking it away.*

This farmer did not feel personally responsible for farm expansion and the problems related to farm succession – nor did he blame intangible factors like international market developments and globalisation. He pointed directly to national policies, personified by the Minister. This tendency was observed frequently in the interviews. Farmers, particularly in the sphere of participation and autonomy (stewards, stockmen and shifters), hold the national government directly responsible for the developments in farming.

Investment Patterns in Recent History

From the initial study it was expected that there would be a difference in investment patterns between styles of farming. Entrepreneurs were expected to invest frequently in their farms, while inheritors (stewards and stockmen, and some shifters) were expected to invest less frequently or at least more gradually and at lower costs. Though a tendency may be detectable (Supplement Table 5b), such a pattern was not clearly confirmed in the current study.

A major investment in modernisation is common on all farms at the time of succession. Subsequent investments were expected to be gradual (inheritors), or frequent (entrepreneurs). The questionnaire revealed that further major investments were made after succession in 48 of the 82 cases (59%) and gradual smaller investments were made in 23 of 82 cases (28%). This was far more than expected, probably caused by the turbulent times. Many government regulations came into effect that forced farmers to make new investments at times when improvements would not otherwise have been necessary in line with previous investments (Frouws *et al.* 1996). This affected particularly the styles of farming in the sphere of participation (stewards and stockmen), which maintain a strategy of keeping investments levels low. At the same time some stockmen and particularly shifters avoided the required investments, because they were in a process of shifting to other activities. Without additional information about the type of investments, the level of investments in pig production on the farm is not very informative.

The fact that craftsmen have the longest interval between investments (10 years; σ=7) may not be caused by delay in investments. It is most likely related to the fact that they have been owners the longest as well. One farmer commented on the issue of investments:

> *<C107> Over here farms develop by stages, not by abrupt investments. But still we are punished as badly as in Brabant. An unnecessary number of farms have to stop.*

Apparently this farmer regarded the regulations of the national government related to manure management and environmental pollution as a punishment of farmers for having done something wrong: investing in industrialisation. This feeling of having done something wrong is common among farmers in The Netherlands and was encouraged by government slogans, like *'...the polluter should pay!'* The comment suggests that the farmer did not disagree with the principle of punishment. He (or she) apparently disagreed with the distribution of the punishment. In Twente and The Achterhoek farmers had been less eager to invest, expand, and industrialise than for example in Brabant. This farmer apparently felt that the government regulations for manure management and environmental pollution (the punishment) should be in line with the amount of pollution, and not – as was the case – be imposed as a generic measure to all farms. Two aspects of this debate should be kept in mind when reviewing these comments:

a) Some farmers think of the government measures for environmental pollution in terms of a punishment for having done something wrong in the past, and they expect the measures to be directed towards improvement, i.e. doing something better in future. In this case, improvement would logically be discontinuation of further farm industrialisation. For these farmers it is thus incomprehensible that the government allows its measures to (directly or indirectly) stimulate further industrialisation, by forcing uneconomic investments.[21]

b) The government presented its measures as being ‘fair’, because they were imposed on all farms; but the farmers involved perceived them as unfair, because the measures were not (directly) related to the level of pollution of the farms. If the latter had been the case, farmers in Twente and The Achterhoek would have been less affected by the government measures than for example in Brabant.

In this aspect there was a contrast between entrepreneurs and craftsmen. Entrepreneurs saw farm expansion and industrialisation primarily as an (indirect) international market development, in which governments play a role. Craftsmen were more focussed on the role of the government, because they had higher expectations regarding the directive powers of the government in market developments.

5.2.2 Satisfaction with the Farm

Most farmers in the survey were satisfied with their farms in general, and 68 (83 per cent) of the 82 farmers were satisfied with the current farm structure. Most (70) farmers were also satisfied with the modernity of their farms. There is no difference in this aspect among styles of farming (Supplement Table 5b).

Shifters were less satisfied with their present farm branches (11 of 16) than the population average ($p < .1$). This was expected from the specification of shifters. Shifters were in a process of shifting to other farm branches or activities. It would be surprising if they would do so if they were satisfied with the present branches.

Farmers in the survey were on average somewhat less satisfied with their farm size: 57 of 82 (70%). Yet all craftsmen (10) were satisfied with the size. This differs from all other styles of farming ($p < .05$).

At the time the interviews were conducted in 1998, the prices for pigs had dropped dramatically due to the swine fever crisis that started in 1997. In the questionnaire the farmers were asked not to focus on the present price level for pigs, but to reflect on their satisfaction over the past three years with the income from the farm. Most farmers were satisfied with the income: 62 of 82 (76%). This was particularly so with entrepreneurs (18 of 19), and least so with stockmen (6 of 12). One farmer in the survey expressed his frustration about farm income in the following way:

> *<U313> In the past ten years we would have been better off if we had not been independent but in salaried employment.*

Except for this comment, the questions about current satisfaction with the farm did not lead to extensive comments – and particularly not many extensive negative comments. This is surprising in view of the negative societal image of pig farming in relation to environmental pollution and animal welfare. It is also surprising in view of the economic situation of the farm branch – as government regulations and low prices have forced many farms to reconsider the advantages and disadvantages of continuity.

The finding might be explained by the fact that the current satisfaction reflects the farmers' perceptions of the past. Over the last twenty years pig production has been a profitable business, in which developments in hygiene and automation improved labour conditions for the farmers enormously.

The farmers' dissatisfaction may have more to do with future concerns than with the present situation. Another explanation might be that farmers consider the present situation to be a result of their own consecutive farm decisions in the past. There is an element of free choice. Lack of satisfaction in a context of free choice could be considered as one's own fault.

5.2.3 Desired and Expected Developments in the next 10 Years

In Section 4.3 it was shown that styles of farming have various combinations of goals (or objectives) concerning both the farm processes and the farm constructions. Different combinations of goals specified the various styles of farming. In the questionnaire there were several questions about desired future developments over the next 10 years. The major issues discussed were farm expansion, specialisation and adjustments in mixed farm branches combining pig production and fattening. An issue for only a few farms was free-range farming or organic farming. Nearly all farmers discussed the issue of group housing vividly in their comments, because a government regulation had just been passed, obliging all farms to have group housing systems for barren and gestating sows by 2008.[22] The economic sustainability of the farms – which was already under pressure by the market situation and government regulations related to environmental pollution, was further threatened by the perspective of group housing. Economic sustainability received therefore specific attention in the questionnaire.

The different approaches of farm objectives by the various styles of farming are illustrated by the comments that the farmers gave in the interviews.

Mixed Farming versus Specialisation

Of 82 farms 27 (33%) had no plans to change farm branches. Particularly many stewards (9 of 13) were interested in adjusting the farm branches and activities (Supplement Table 5b). When changing farm branches was discussed, specialisation was mentioned most often:

> *<E141> In future we would like to specialise to become a pure pig farm. My son doesn't care for horses and other animals, the way I do.*
>
> *<W138> I would like to specialise to continue only with pigs.*
>
> *<W205> Until last year we had a mixed farm. But now we have done away with the dairy cattle and we are expanding the sow branch.*

<K508> We now have dairy cows, pigs and chickens. I would prefer to specialise, either to stop with the pigs and expand to 30,000 chickens, or to stop with the chickens and go to 300 sows. I would prefer to continue with sows.

A farmer in the Netherlands cannot just simply choose to specialise in pig farming. There are various government regulations restricting the expansion of pig production, in order to protect nature reserves, limit smell pollution in urban areas, decrease environmental pollution through manure and mineral emissions, etc. This was also expressed in the comments:

<W140> We want to expand in the dairy cow branch, because expansion of pig farming is restricted here.

Some farmers elaborated extensively on the issue of expansion, mixed farming and specialisation. The following comment is a clear demonstration of the farm objectives of stewards. The connection between farm size and availability of labour within the family is explained in a perspective of succession. The pollution problem and the desire to expand in order to maintain farm continuity and family income is expressed in the dilemma about farm branches (dairy cattle or pigs):

<W631> The farm size cannot grow anymore, because we have enough work as it is. My father is now 75 years old and he doesn't work anymore. And I, the son, am still young. So now one family is doing the work that should be done by two families. Sows and dairy cattle are not a good combination. In the morning you have to milk the cows, but you have to feed the pigs too.

Combining Pig Production and Fattening: a 'Closed Farming System'

Since the last swine fever outbreak in 1997 the government stimulated the discussion about combining (or recombining) pig production and fattening on single farm locations. In new government regulations regarding farmers' responsibility for pathogen transfer risk, such an adjustment was encouraged. Therefore it was asked in the survey whether combining pig production and fattening would be one of the farm branch adjustments made in the future.

Only 21 of 82 farms (26%) considered the option of combining pig production and fattening. This perspective differed among styles of farming. Though most stewards considered adjusting the present farm branches, none of them considered combining production and fattening. The most likely setback was the investment costs. For many stewards the high investment costs had already been reason in the past for not starting a fattening unit in the first place. The required costs had in the meantime only increased, because a new fattening unit would require production rights for pig manure. These would have to be purchased from other farms that were stopping with the production of pigs.

Eight of the 19 entrepreneurs in the survey considered the option of combining production and fattening. This was higher than average ($p < .05$).

<E147> For the future I would prefer to stop with the dairy cows and specialise in pigs. I would prefer a combination of breeding and fattening.

And although it was not specified explicitly in the questionnaire, there could be a good reason for the willingness of some entrepreneurs to combine pig production and fattening. More entrepreneurs (and craftsmen) had multiple farms or farm locations (see section 5.1) than the other types of farmers. Combining pig production and fattening on one farm location would mean for some of these farmers that they would have to reorganise how the farm is divided into its various locations. Yet that may not always be possible because of the government regulations on environmental pollution to an individual location. However, some farmers did see clear opportunities:

<C221> We would like to expand in the fattening business. We want to be less dependent on other fatteners in the area. People around here are behind in their farm structures. Somebody has to pick that up.

As already mentioned in Section 5.1 farm expansion and government regulations on environmental pollution are often incompatible. This is illustrated by the following comments:

<E066> I would prefer to expand some more and take on extra personnel ...I would like very much to put a stable for 2000 fattening pigs on this location. But that is now impossible.

<C107> In future we would like to have a combined system of pig production and fattening. But it is still very unsure whether that will be possible here.... Perhaps I will take another job on the side.

Another way out of the dilemma of trying to create a closed farming system is to combine pig production with the previous step in the production line: rearing maiden sows:

<K323> In future we would like to stop purchasing sows from elsewhere and keep maiden sow rearing to ourselves. It costs less in view of the new regulation for animal levying.

Some farmers consider the option of free-range pig farming or organic pig production as an alternative way out of the dilemma. In that case a closed farming system can be created with a smaller number of animals, because the revenues for free range and organic pig farming are higher:

<K142> This farm is worn out. And we cannot meet the obligations of the new animal welfare regulations. So now we are considering shifting to free-range farming ...We would prefer to have 65 sows and 430 fattening pigs. All together the number has to be less than 500, because we live too close to our neighbour.

Not surprisingly, this comment comes from a stockman. Stockmen have affection for pigs and are not particularly focussed on high production levels. Besides, many stockmen are in a process of reorienting farm investments, because stables and equipment are getting old (see Section 6.1). One of the unclassified farmers was also involved in this process:

<U246> At the moment I am rather satisfied with the farm size. But I have my doubts about the future – especially concerning the environmental care. There is a risk that we will be blocked in the developments that we wish to pursue. On the other hand, it may turn into an advantage too, for instance if we consider producing organic meat. … For the future I am thinking about selling my own meat products in the region. … In a number of ways we have an advantage in regional competition, but not on the international level.

Specification of the Expansion in Farm Size

Farm expansion is an important issue in the desired and expected farm developments for the next ten years. Of the 82 farms 56 (68%) expected to expand in the next ten years. This expectancy was found among all styles of farming. Only one farmer in the survey said that he expected to reduce the farm size – and subsequently stop farming within a few years, before the time that the new regulations on group housing have to be implemented in 2008:

<E172> We will continue until 2008 and then we will quit. This farm is too small for renovation.

Nine other farmers also expected to stop ultimately within ten years. But for the coming few years they planned to try and keep various options open. Some would prefer to continue and prolong the process of stopping, while others would prefer to stop as soon as possible:

<W060> On this farm we are not investing anymore for continuation. I would rather continue as a farmer for another 15 years, until I am 65 years of age. But the bank or the government may force me to quit earlier.

<F017> If I would have the chance to stop farming I would do so. But there is no chance. There are no buyers.

The government also noted the fact that for some farms there were no buyers, especially while the pig prices were so low in 1998. In 2000 an option was introduced[23] that farmers could sell their farms to the government. This was done in the context of the government's efforts to reduce environmental pollution. Yet the majority of the farms were focussed on further expansion:

<E066> We want our farm to grow continuously. Every year we want to add about 50 sows.

<F073> In future this farm has to grow so that two families can live off of it.

For some farmers expansion had many other implications. Some farmers even considered moving the whole farm elsewhere:

<C127> It is impossible to expand any further here. So we may go elsewhere … In the year 2000 there will be a general reduction in the rights to keep pigs. But then we will still be ok. We already had been searching for a bigger farm. The size is now big enough to survive.

This farmer did not specify where 'elsewhere' would be. There are several popular options. Some farmers move elsewhere within The Netherlands, or go abroad to nearby countries, like Germany or Denmark, or even further away. Central Europe, Spain and Canada are also popular destinations. Some farmers in the survey took the time to elaborate extensively on the whole scope of their future plans. Entrepreneurs in particular often had detailed plans:

<E306> On this location the estate value is not suitable for expansion. But I do want to expand to 2000 sows. I will do that in Germany. ... The adjustment of the stable equipment to group housing for the sows and more space for the piglets will cost at this farm about € 230,000.[24] *But it can wait for the replacement investments. ... We want to be up front in stable-modernisation. This farm will probably be the first one to have both group housing and a slop feed installation. ... Actually this farm is constantly for sale. If anybody would come to offer me a good price for it, then I would sell. Compliance with the new government regulations cannot be efficiently written off as a deduction any more. Thanks to these new regulations, pig farming in the Netherlands in no longer enjoyable. The development of costs makes it too difficult. That is why I am so busy in Germany. ... The project in Germany is in full development now. But because of the current low prices I feel reluctant to invest. If I can earn enough money here in The Netherlands from selling production rights, I may continue there. ... I share the arable farm machines with two other farmers in Germany. We want to develop this to one united arable farm unit to serve three farms. ... Nevertheless, I prefer to continue living here in this area, even if the farm moves to Germany. At the age of 55 I will quit. If the children want to take it over then they will get full responsibility.*

In this story, the farmer revealed many options that he is keeping open. The story was not just about expansion and investments. The strategies included developments in view of new government regulations – on animal welfare (group housing), and new developments, and in the supply markets – new insights about feed (slop feed). It is characteristically 'entrepreneur-like' that the farm is constantly for sale. Apparently the farmer does not have a strong desire to continue farming on the same location – as most farmers do in other styles of farming. Yet the farmer is attached to the area as a place to live. The farmer also does not appear to be emotionally attached to the idea of succession. The emotion may be there, but viability of the business is not a worry for continuity. It is up to the children to take the decision as a business choice.

Among the entrepreneurs, several farmers expressed that the future looked bright:

<E250> For entrepreneurship the future is more challenging and exciting. I feel restricted in my entrepreneurship now. If there were space, I would create a big farm and co-operate with others. I would take care of a sustainable enterprise: ecological, economical and veterinary. And I would fit it in the landscape. ... I think this farm is economically sustainable, because the production factors are handled in the right way, profits are made and there is re-investment in the farm.

Among other styles of farming the undertone is often more cynical. Yet some of them seemed to be able to take advantage of the disadvantages:

<W147> Due to all the opposition to our expansion plans, the reconstruction of our farm has been postponed a few times. But now this may even be an advantage, because now we can adapt to the new welfare regulations without destruction of capital.

Group Housing

The years 2003 and 2008 are special reference years for new farm regulations. In 2003 farmers should meet new government regulations on environmental pollution. In farmers 2008 should meet the latest regulations on animal welfare.[25] For many farmers these regulations imply massive investments – often to replace current equipment that will not yet be written off as a deduction by then. When asked whether they would adapt to the new regulations of 2008 eight farmers said ‘no’. These farmers were all stewards (4), stockmen (2) or shifters (2) (Supplement Table 5b).

Currently the most important issue for farm adjustment is demand for group housing of barren and gestating sows by 2008. Many farms have (nearly) finished making farm adjustments for meeting environmental pollution regulations by improving manure management. Another issue for investment discussions at the moment is the obligation to take hygiene measures, like creating an on-farm wash place for means of transport.

Of 82 farms in the survey 45 (55%) were sure that they would make the required investments for group housing within the next ten years. The highest proportion of these farmers were entrepreneurs (14 of 19). Yet all farmers complained about the burden of these investments:

<U212> Concerning future adaptations, we have to renovate to group housing and improve the wash place. That will cost about € 140,000. This will be written off as a deduction by about € 30,000 per year.[26] *In 2008 the costs will increase quickly. Then the issue will be to increase scale or quit.*

On some farms these sacrifices were not just financial sacrifices. In some cases it also put a burden on getting extra family income from external sources:

<K317> If we didn’t have to, we wouldn’t change the stable equipment that much. But the government enforces these measures. The write offs as a deduction and the renovations are piling up! ... We want to build new stables. But that is only possible if my wife continues in salaried employment and my son takes a salaried job for five more years. The present housing is not suitable for the required renovations. It is not affordable in any other way.

For some farms the investments create a risk for farm continuity because of unforeseen excessive capital destruction:

<E167> Our farm is economically not sustainable. If we adjust to the new regulations, we would suffer enormous capital destruction. A substantial part of our stables has the Green Label certificate for environmental management. The sows are

kept in individual pens. It was all just renovated in 1997. And now this system is only allowed to continue until 2008. … Or actually to 2002: in a small part of the stables the sows are still single ranged by a girth tether. And that is only allowed until 2002. So now, if we want to change anything in the current situation, we have to make it all meet the regulations for 2008. It is suddenly not allowed to make partial renovations. So in due course we would have to sell the land that we own, in order to cover the destruction of capital.

The big question is whether we should invest at all. If we continue with this farm for another seven years until I am 58 years of age, then what? Will I have a farm for sale by then that anybody would want to buy for continuation? If so, I would rather continue. But I doubt it. And if not, I should quit now. But if I quit now, then what else am I going to do for a living?

This farmer is in a difficult position. Apparently he has invested in the recent past to get a Green Label certificate for environmental care. Such a certificate is not easy to get, and it implies extensive investments. The government had made the Green Label certificate as indemnification for further investments in environmental care within ten years. It was intended, as a reassurance for farmers who feared capital destruction would result from new developments in government regulations.

Undoubtedly the farmer was aware that there were still some investments to be made for the division with the girth equipment before 2002. But in itself that would have been a relatively minor investment. There was no way that this farmer could have expected that he would be forced to make major investments before 2008. But suddenly in 1998 the government announced that the Green Label certificate of indemnification for further investments in environmental care was limited to farm adaptations for environmental care only. If a farmer still had to make farm adjustments for animal welfare, for instance removing girth tether equipment, then the whole farm would at once be expected to meet the regulations of 2008, without compensation for capital destruction.

So to this farmer the government was clearly unfair and unreliable. The issue of pressing government regulations was already covered in an earlier study (Frouws et. al 1996). The example here does not indicate improvement in the reliability of the government.

The unpredictability in the developments of government regulations does not only create victims. Some farmers happened to be lucky in their farm adjustments:

<U212> In 1992 we already wanted group housing. But at that time we were fiercely advised against it. So we equipped the stables in such way that we would still be able to change to group housing in the future. Now we can adapt to the regulations of 2008 without many investments.

There was no way that this farmer could foresee in 1992 how the government regulations would develop with respect to animal welfare. In 1992 the discussions were still very premature.

As far as farmers themselves were concerned, the perception of what group housing would entail varied a lot. At the time of the interviews many details about the new regulations on welfare in pig keeping were still unclear. This confusion contributed to the variety in comments reported in the study. Most comments were not typical for any particular style of farming.

In the following comments the confusion about how to approach the issue is often expressed. For example, one farmer believed that anyone who does not personally keep pigs is not qualified to participate in the discussion:

> *<K317> After all these years we know what is best for the animals.*

Another farmer sounded less arrogant, by expressing willingness to think in the direction of more welfare. Yet he disqualified consumers from the discussion:

> *<K323> What attracts me more is a waterbed for pigs - and in addition 'welfare food'. That is better. The consumer would prefer more, but they are technically incompetent to see the consequences.*

Other farmers did not disqualify anyone, but nevertheless expressed founded doubts about the value of group housing. Some based their opinions on expert knowledge, for instance on their own experience:

> *<C008> Ten years ago we started with group housing. Three years ago we discontinued it again, because it didn't suit us. It increased the loss of sows due to leg problems, and the animals made lots of noise. Now the stables are more peaceful. And now the government is forcing everybody to start group housing.*

Others felt supported by expert knowledge from experiences in research stations:

> *<C107> Group housing has lots of negative aspects. At the experimental farm in Raalte they have had negative experiences. Twelve years ago we had group housing here. It didn't suit us. ... Besides, the control of mineral waste is severe: group housing causes an increase of mineral emissions. And it is also harder to find animals with health problems, when something is wrong.*

Sometimes farmers referred to expert experience, but did not make it clear what the expert basis actually was:

> *<K002> Group housing is useless. The pigs really kill each other. I would really rather have them in individual pens. Pigs are ferocious fighters.*

In this comment the farmer made an interesting point: pigs really can be ferocious fighters – especially when they are not used to group housing (Olsson *et al.* 1999; Schouten 1985) The point is how to look for a solution. Animal welfare experts do not think that what an animal can handle based on its upbringing, what an animal is used to, should influence the standard for how animals should be kept (De Jonge and Goewie 2000). So on farms, temporarily increased animal cull rates might be necessary to handle the problem of animal fights.

Group housing will be implemented for barren and gestating sows; not for sows with piglets. It is natural that a sow with young piglets prefers to be alone. Individual housing systems are suitable for that condition. From the comments it can be noted that this was not (yet) completely clear to all farmers in the survey:

> *<W147> I would rather keep the sows single ranged in the farrow house. That is best for them. Not for the barren and gestating sows, but for the sows with piglets.*

> *<F052> I have my doubts about group housing. Sows prefer an individual pen for themselves. They like to be a bit separated.*

The possibility of conflicting interests between improvement of animal welfare on the one hand and animal health or environmental care on the other hand was also a concern expressed by some farmers:

> *<W166> In future there should be a distinction between straw and free ranging versus the rest. Unfortunately there is a contradiction between animal welfare and environmental care, which is expressed in ammoniac emission.*

> *<K323> Thinking of straw, people visualise large amounts. I disagree with that. Large amounts of straw increases infections, doubles ammoniac emissions and generates heat. But a bit of straw and a straw feeder I can approve of. ... In free-range housing you get problems with worms and salmonella. With these numbers of animals it cannot be kept under control. ...*

Some farmers were mainly concerned with the extra work that group housing would involve:

> *<W188> Group housing is a process of learning. There is a lot of handwork involved.*

Another farmer implied that he did not consider group housing to be an animal welfare problem, but a societal problem – for which society should pay:

> *<U016> Keeping pigs on straw is fine, but the extra labour should be paid for.*

Other farmers were less specific and emphasised for example the administrative side of the new government measures:

> *<F063> The administration on pig farms is increasingly complicated with respect to the manure and the housing, etc.*

The majority of the comments made by the farmers on the issue of group housing were made from the perspective of farmers – regarding their concern with consumers, society, and government regulations – and not from a perspective of empathy with the animals. The issue of animal welfare seems to be brought to the attention of farmers indirectly: not through the animals themselves. Apparently farmers in the survey perceive animal welfare in a different way than the government, consumers, society and animal welfare researchers do.

In animal welfare research animal wellbeing and behavioural satisfaction are studied, from an empathic point of view. Animal welfare scientists often study the behaviour and physiological constitution of animals under unrestricted ('wild') conditions and compare that to animals under restricted (housed) conditions, (De Jonge & Goewie 2000). This research is usually done under the assumption of a basic physical health status of the animals. In contrast, farmers often describe animal welfare first of all in terms of physical health and production stamina (initial study). Animal wellbeing and behavioural satisfaction are of a lesser concern to most farmers. Yet in the initial study there was one style of farming in which farmers went to quite an extent to approach animal welfare from an empathic perspective: tendership. Tenders are farmers with free-range and organic farms. In the late 1990s there were only about 100 to 150 tenders throughout the country. Most tenders had small farms and were not connected to a management support provider. Therefore the style tenders was not found in the current study.

Economic Sustainability

Of 82 farms in the survey, 62 (76%) were considered by the farmers to be sustainable. They were expected to have enough economic strength to exist for at least another ten years. Doubts about economic sustainability are higher than average among shifters: only 8 (of 16) considered their farms to be economically sustainable (Supplement Table 5b).

Among the farmers, 33 (40%) did not expect that their income level would change much in the next few years. Of those who did expect a change in income level, 12 expected an increase and 15 expected a decrease. The rest of the farmers did not have a clear view of what might happen to their income in the future. There was no difference among styles of farming about expectancy in income developments. Shifters were no exception in that respect. Several shifters expected additional income from new activities.

With regard to economic sustainability, farm expansion is an important subject. Some farmers felt squeezed by not being able to expand. They fear for farm continuity if expansion is blocked, for example by specific government regulations:

> *<062> The government frustrates us. For five years we have been trying to expand our farm, but it is not allowed because of the nearby nature area. But there is no compensation for it either. The government says that this farm has to leave the area in ten years. But what are we supposed to do in the meantime? One cannot quit temporarily!*

The dilemma for the farmer is that one day, in ten years, the government will be willing to buy the farm. Then the farmer can decide what to do next: continue on another location or quit altogether. In the meantime, the farm cannot expand at the current location due to government regulations on environmental care for nature protection. Yet ongoing farm expansion is required for the conservation of the desired income level and the perspective of farm continuity.

The ongoing pressure of farm expansion for the conservation of the desired income level and the perspective of farm continuity is in itself an issue. Some farmers believed that this pressure comes directly from the government. According to the following farmer, the challenge for farmers is to deal sensibly with this pressure:

<F052> I am satisfied with the farm size, but the government is not. I am forced to expand. But if you grow too fast, you grow yourself broke.

Sometimes the production chain industries and even farmers' organisations were blamed for the pressure on farm expansion:

<F052> I am not caught in a fix, but I haven't expanded either. I don't feel guilty about that. I don't need such a big size. But even the farmers' organisation LTO thinks a farm is never big enough. I would like to have more land. But I don't want to move.

This farmer had 115 sows and 14 ha of land for dairy farming. That is smaller than average, but not extremely small in the current perception in The Netherlands. But without further expansion or additional sources of income the continuity of this farm is unsure.

5.2.4 Investments in the Next Three Years

The expected development over the next ten years is a hypothetical projection. Investments refer to concrete steps. Farmers were asked about their expected investments for the next three years to get insight into what will actually be done in the near future.

Of 82 farmers, 19 (23%) did not expect to invest anything in pig farming in the next three years. Shifters were particularly uninterested in investing in pig farming (8 of 16) compared to the population average ($p < .005$). This can be explained by the fact that they are shifting to other activities. Among the 63 farmers who did consider investing, the expected investment levels differed greatly. This was illustrated by the high standard deviations for investments (Supplement Table 5b).

Calculated through log10-transformation of the expected investments, the 63 farmers expected to invest on average € 95,000. Compared to the population average, entrepreneurs had slightly higher ($p<.1$) investment levels (about € 154,000). Shifters who expected to invest still expected the population average styles of farming (about € 44,000).

The most important reason expressed for the investments in the next three year was to meet government regulations for animal welfare, 42 of 63 investing farms (67%), followed by modernisation and expansion, both 29 of 63 investing farms (46%). Environmental care was mentioned much less as a reason for investments: 15 of 63 investing farms (24%). Most farmers have probably already made the required investments for manure management in the past. There was little enthusiasm for investments in organic farming. Only one farmer (a stockman) expected to invest in that direction. Among some other farmers there was interest in organic farming for the more distant future. The year 2008 was mentioned a few times as reference, because by then the new regulations for group housing will have gone into effect. So investments in the farm structure will be necessary by then anyway.

Of the 82 farmers, 21 (26%) said they may have difficulty finding the money required to make the desired investments (Supplement Table 5b). Some farmers were confused by the question regarding finding money for investments. Who was supposed to find the financial position a problem – the bank, or the farmers? Some farmers noted that perceptions could differ:

> *<W140> I think my asset position is a problem for investments. But the bank has a different view. They would like me to invest.*

The various styles of farming approach the issue of investments differently. Entrepreneurs and craftsmen have ambitions for competing in farming. They produce at a high level of investment – and receive high returns on their investments. Stewards, stockmen and shifters have ambition with respect to participation and autonomy. They prefer a low level of investment and more security against income fluctuations.

5.2.5 Regional Culture in Pig Production

The region Twente and The Achterhoek is the second of the two most important regions for pig farming in The Netherlands. The most productive region is in the south, covering the eastern part of the province Brabant and the northern part of the province Limburg. Pig farming in Twente and The Achterhoek has regionally specific aspects, which distinguish it from other regions – in particular from the competing area in the south.

Of the 82 farmers in the survey, 61 (74%) believed that pig farming is important for the region. With this statement the farmers referred more to the economic importance of pig farming in the region than to the importance of the traditional culture. Traditionally, pig production was a side activity for farmers who derived their status from dairy farming. The positive response to the statement ‘pig farming is important for the region’ was correlated to Intensity ($p < .005$), so it was one of the parameters that were used in the factor analysis (Section 4.3). Yet, the view that pig farming is important was shared by all styles of farming, though less so among stewards (6 of 13) (Supplement Table 5b). According to these stewards, pig farming could just as well be replaced by other activities.

General Reflections on Developments in Pig Farming

When the issue of future perspectives over the next ten years was raised, several farmers commented on rural developments in general in the area. The comments were not specific for styles of farming. Together they provided interesting insights into how the pig producers in the study area perceive their businesses, within the Netherlands and within the global context:

> *<F052> I don’t know where we are heading in this country. If you see what is happening in Canada and in Central Europe, then we cannot compete. You won’t get an allowance for that over here.*

This farmer reflected on what is allowed in other countries in terms of production intensity and manure management compared to what is allowed in The Netherlands, where regulations have become very strict. Another farmer reflected on changes from a regional perspective:

> *<E162> The impact of the current reform will be greatest in this area because of the small scale of the businesses. There are many mixed farms here, within which each branch is too small; but together they provide a fair income. If one of the branches collapses, the whole farm collapses.*

This comment implies that this farmer did not see alternatives for the pig production section of mixed farms. Consequently, a collapse of pig production would also impact other fields of production in the area, like dairy.

Some pig farmers reflected on the perceived cultural differences between this region and the pig production region in the south of the country in terms of religion. The majority of people living in Twente and The Achterhoek have a Protestant background, while, traditionally the inhabitants of Brabant and Limburg were Roman Catholic:

> *<W240> Nobody stops farming here. In this area people tend to continue longer for survival. Farmers are more reluctant as well, particularly with respect to investments. That is why you don't see many big pig farms here. Perhaps it has to do with the difference between the Reformed and Catholic churches.*[27]

Other farmers reflected on how outsiders view the situation:

> *<K317> There is a lot of misunderstanding that farmers want to expand no matter how bad the circumstances are.*

What all these reflections have in common is the perception of a downward spiral for farming in the area in general and for pig farming specifically. A sense of loss and sadness can be detected in most comments. Occasionally farmers were less defensive and more self-critical:

> *<C226> The disadvantage of this area is that people think too small for survival. Farms here have little future perspective.*

This comment is harsh in its criticism of fellow farmers in the area for 'thinking too small' – as if they deserved to have little future perspective.

This tendency to downgrade the area apparently affected the area's social atmosphere. One woman among the farmers in the survey planned to take steps to improve the atmosphere:

> *<C107> I intend to initiate an assertive group of women to improve the area.*

According to her, women are more sensitive to general moods and easier to activate to change the social atmosphere than men are.

Reflections with Respect to Other Regions

In the questionnaire the farmers were asked to compare the culture for farming and pig production in this area to other areas.

Of 82 farmers, 41 (50%) found that this area (Twente and/or The Achterhoek) was distinct from other areas, especially from the south of the country (Brabant and/or Limburg). This was particularly expressed by entrepreneurs (13 of 19) and by stewards (8 of 13). Farmers of these styles of farming were more preoccupied with comparing themselves with farmers in other regions. The subject was of much less interest to shifters. Only 4 (of 16) shifters felt that pig farming in this area was different than in other areas (Supplement Table 5b).

Some farmers reflected on the issue of differences between areas in general terms.

A farmer who did not see a difference commented:

> *<E141> I don't know whether farmers over here differ from elsewhere. I seldom speak to others.*

Yet the issue elicited many comments. In general, farmers appreciated the preponderance of family farms in this area:

> *<E172> This area is small scale compared to elsewhere. And there are more family farms here.*

> *<U039> The difference between here and elsewhere is that there are only few hired farm hands. Farms over here are real family farms.*

Another general comment was about the character of the people:

> *<U313> Farmers here are more composed, genial and relaxed. But they are good entrepreneurs: they don't complain much.*

It is remarkable that the above farmer referred to the relaxed approach as being characteristic of 'good entrepreneurs'. Though the current study refrains from judging entrepreneurship in terms of 'good' and 'bad', entrepreneurship is clearly associated with ambitions for competition, characteristics that would appear to be incongruous with 'relaxed'.

Most farmers reflected on the issue with a comment on the differences between their area and Brabant.

In the survey, there appeared to be a consensus that pig farming in the south (Brabant) is not the same as in the survey area, but there were differences in how much farmers appreciated their own area in comparison with Brabant. Entrepreneurs (and to a lesser extent craftsmen) tended to be more positive about pig farming in Brabant than other styles of farming, though some entrepreneurs as well as other types of farmers gave very negative judgements.

> *<E617> People over here obey the rules better than in Brabant. There are more one-family farms here. Things are not as massive.*

> *<E306> Pig keepers are more conservative here. They are more interested in security compared to Brabant. Socially there is a difference too. People in Brabant get to know you quicker, but they forget you just as fast. Here people get to know you slower, but they remember you longer.*

<W140> Though it differs among farmers, I think that over here people have more feeling for their animals than in the south.

<K508> In the south the farms are really big. I don't call them farmers anymore. A farmer has to deal with the animals himself.

<F052> In the south they are much ruder than here. They never have enough.

<E106> People in Brabant have big farms. And they don't obey the rules very much.

<U212> Here we have pigs, in the south they have numbers of heads.

But not everybody expressed differences in terms of right and wrong:

<C008> Many people look at the Brabanders and say, 'they are the ones who have done it all wrong'. I don't share that opinion. But the farmers over here are easier satisfied and more fraternal.

From these comments a self-image emerges of the farmers in Twente and The Achterhoek, who have smaller farms in a smaller scale landscape than in the south. They think they are less aggressive in business, that they give more individual attention to the animals and that they value long-term social attachments better than in the south. Other farmers, who expressed themselves more factually, diplomatically or from a different perspective, confirmed this image:

<K180> Farms here are more small-scale than in Brabant.

<E250> Compared to the southerners the people here are more relaxed and patient.

<U185> In Brabant developments go faster. Here people are more reluctant to try new things.

<K317> People in The Achterhoek are more concerned with the animals than the people in Brabant. The Brabanders have a more economic attitude.

<K002> The differences between The Achterhoek and Brabant are large. Over there farms are just factories. Over there they all work with external personnel. If those kinds of stables had been built here, it wouldn't be as beautiful here any more.

<K142> The farms here in The Achterhoek are small scaled compared to in Brabant. People here are well aware of costs, but they don't go to the limit. The technical farm results are better here in The Achterhoek, though economically they do better in Brabant.

<W147> Farmers in Limburg and The Achterhoek are alike. They are more reluctant. People in Brabant are more fanatic in business. But we are faster in other things, like in the campaign against the disease of Aujeszky.[28]

<C127> The difference between here and the south is the small scale and the mixed farm character. Farm structure is a disadvantage here.

Some farmers, however, preferred to identify themselves with 'the others from the south' rather than with farmers in their own region:

<W197> This area is smaller scale than in the south. Farmers here are more resigned and do not adapt to new developments very quickly. The neighbours around us give us meaningful looks because they disapprove of our advanced stable renovations.

The comments show that there is little difference in the perception of the self-image of the farmers in the east. There is just a difference in the way of expressing the image. In addition, there seems to be a difference in emphasis. Entrepreneurs and craftsmen emphasised more the conditions for economic and efficient production, whereas stewards, stockmen and shifters reflected more on characteristics in farming cultures.

Whether or not other people (for example the farmers in the south) agree with the self-image of the pig producers in Twente and The Achterhoek and with the reflected contrast in images has not been an issue for research in this study. Yet what can be stated from the findings is that there appears to be a regional cultural repertoire.

Regional differences in styles of farming were not the focus of this study. However, in other studies about styles of farming the regional culture was sometimes the central issue. Gerritsen (2002) recently described the regional culture in styles of farming in a nature management area in Mexico. Ventura (2001) and Van der Meulen (2000) described the regional culture in farming and regional processing of farm products. Hofstee (1985) described extensively the differences in regional culture in farming in the north of the Netherlands (Groningen). Regional culture can lead to important differences in production practices and processing of farm products (Van der Ploeg *et al.* 2002; Miele 2001), and they are found in descriptions of country life in documentary novels (Mak 2001; Berger 1979). Regional differences in farming practices may have an impact on the productivity of the farms in the study area. Regions with comparable conditions for production may therefore still differ in productivity. Styles of farming that are determined in connection to productivity should therefore be specified within cultural regions.

5.2.6 Social Appreciation of the Study Area

Social appreciation of the study area involves getting along with others in the study area and participating in clubs and social activities. Contact within the food supply chain between farms, supply industries and the marketing sector is covered in reference to constructions in Section 6.1.

These aspects are clearly part of the regional culture of farming. Differences in views among farmers were mostly not specific for any styles of farming.

Life in the Study Area

The farmers in the survey made several comments about the social atmosphere in the area:[29]

<U185> The attractiveness of this area is its informal geniality.

<U313> Groenlo is a very nice town. It is lively and pleasant until late at night.

<E617> People are pleasant here, and easy to get along with.

<C226> The attractiveness of this area is mainly its congenial social character. People respect each other. The infrastructure is also good.

<C107> The most attractive aspect of this region is its geniality, the beautiful environment and the tolerance of the people.

<W138> The difference with other areas is in the social aspect. It is cosy here. People are sympathetic. We know each other. People are not so hard on each other. They care about each other.

<K508> Life is pleasant here. There are no big farms. The farmers do all the work themselves.

<U039> The attractiveness of this region is its beauty and quietness. Everyone knows each other. There is good social behaviour and not much crime.

These comments were in line with the comments that were given about the culture in the area for farming. The farmers not only expressed characteristics of the social environment, they also seemed happy to live in such an environment. This was expressed in the way they talked about the area, by emphasising the geniality, the cosiness and the caring for each other. Yet not all farmers shared that satisfaction. Some farmers did not feel very attached to the social environment:

<E239> I don't feel attached to my area. In the south farmers are much more fanatic. Here people are more genial and lazy.

<K323> I am not from this area, but I like the environment here. But the people are relaxed and conservative here, and I am not. Pig keepers here are narrow-minded and short-sighted. They have no guts.

When the farmers in the survey reflected on their social environment they usually meant other farmers, and not, for example, the villagers. When neighbouring villagers were included in the topic of discussion, the farmers' comments were different. Inhabitants of neighbouring villages and non-farming rural residents were mainly mentioned in connection to complications in farm developments due to government regulations on smell and ammonia emissions. There are different levels of tolerance for emissions to farming versus non-farming neighbours. Therefore farmers were sometimes weary of non-farming rural residents. This resulted in defensive comments:

<W060> The current neighbours do not complain, but the new housing development is approaching. My attitude is 'I was here first, so they have to adapt to me'.

<E195> Residents in rural areas should adapt to the farmers with respect to smell and other inconveniences.

<C008> We live here very nicely next to the river Yssel, close to the city where there are schools and jobs. There are not many pig farms in the neighbourhood. The disadvantage is, of course, that we are here amidst non-farmers. And there is not enough land in the neighbourhood for the manure.

Participation in Social Organisations

Dutch people are notorious for their involvement in numerous social organisations – both formal and informal – and for organising social events for families and neighbourhoods. Among the 82 farmers in the study, 65 (79%) reported that they were active in social organisations in the area (Supplement Table 5b).[30] Most farmers were active in one (14 farmers), two (19) or three or more (18) organisations. The following types of organisations were mentioned:

- farmers' organisation (LTO and/or union of pig farmers)
- neighbourhood improvement (both social and material – e.g. infrastructure)
- cultural (music, theatre and particularly sports clubs)
- education (school board)

Involvement with culture and education was mentioned the most: 39 of 65 (60%).

The average number of social activities per farmer was among the criteria for classification of styles of farming (Section 4.3). The number of social activities is negatively correlated with Intensity ($p < .005$). From the initial study it was expected that the integration in social organisations would differ among styles of farming. Craftsmen were expected to be less involved in social activities than other styles of farming and stewards were expected to be more involved. But this expectation was not confirmed by the results. Craftsmen appeared to have the highest average number of social activities, even though craftsmanship was positively linked to Intensity and the number of social activities was negatively linked to Intensity (Supplement Table 5b). The explanation for this discrepancy is that an unknown number of farmers included contacts with the study club in their answers. The social contacts should have been better specified between:

- social contacts directly linked to the farm production activities
- other social contacts in the neighbourhood

Study Clubs

Nearly all farmers in The Netherlands are organised in study clubs. Study clubs are successful tools in Dutch farm management communication. They are key instruments in the extension of technical knowledge (Oerlemans *et al.* 1997; Proost & Vogelzang 1996; Santen 1965). In the study clubs farmers discuss technical aspects of pig production. Often they also visit each other's farms for study purposes. An extension worker from the feed industry, from the general extension organisation, leads the study club or the study club is led by one of the farmers. In specific government projects project managers use study clubs to extend their project goals.

Whether farms were connected to study clubs was one of the parameters that were used in the factor analysis (Section 4.3), for its correlation to Intensity ($p < .005$). Of 82 farmers in the survey, 67 (82%) were connected to a local study club for pig producers. Among shifters the number (10 of 16) was less than average ($p < .05$), probably due to the fact that they are shifting to other farm activities. These findings are related: shifters are less intensive than other styles of farming.

Some women participate in study clubs, though they are a minority. Most often it is just men who participate, especially because the issues for study are often technical in nature. Until 1990 extension workers of the Ministry of Agriculture led all study clubs. After privatisation in 1990 the service of the new independent extension service had to be paid for. Since then, extension workers from the production chain industry – particularly the feedstuff industry – have been taking over the service. As a result the study subjects have tended to become even more technical and specialised.

At the same time there are increasing numbers of projects initiated by the government, in which the project managers try to use study clubs to extend the project goals. These projects concern revisions in land use planning, stimulation of regional developments, improvement in gender issues, etc. These project goals are usually not directly incorporated in the study club programmes. The chairmanship of the organisation is used to invite the members of the study club to come and discuss whatever the project is. [31] The involvement of those projects is sometimes very appreciated. One farmer (a woman) commented:

> *<C107> The other day there was a special day for farm women at the experimental station in Raalte. In recent years we have been ignored in discussions about nature management and environmental care. We are generally not heard.*

Farm Visits

Among pig farmers and pig farming experts there is an ongoing discussion about farm visitors. From the viewpoint of the possibility of pathogen transfer the number of farm visitors, especially from other pig farms, should be reduced as much as possible. But frequent visits to pig farms are inevitable for many ‘high risk visitors’: veterinarians, transport personnel for feed and animals, inseminators, etc. Besides, visits of relatives (often also pig farmers) and family members who work at different farms are difficult to avoid. So what serious risk could visits of study club members, schoolchildren or other individuals add to the risk of pathogen transfer? Since the outbreak of swine fever in 1997 the discussion is very much alive again in the area (see also: Section 6.1).

In the study, farmers were asked whether they opened their farms at least once per year for visits by other pig farmers (for instance from the study club). A positive response was received from 33 of 82 farmers (40%), although the rate was much lower than average ($p < .05$) among shifters (2 of 16) (Supplement Table 5b). This is no surprise, since shifters are shifting their attention away from pig production. So there is little reason for them to go through the effort of inviting visitors. Besides, shifters were less involved with study clubs (see above).

The enthusiasm of farmers to open their gates to the general public (e.g. school classes) has been decreasing in recent years, even though such groups form the smallest risk factor of all farm visitors. In the survey 18 of 82 (22%) farms were opened at least once a year for visits from the general public. No difference was found among styles of farming.

The following comments illustrate the contrasts in farmers' views on opening the farm to the general public:

> *<W147> I think that the consumer ought to get a better image of pig production. I am thinking about involving schools with my farm: to have somewhat older children come here to do some of the farm activities. The farmers' organisations should pay more attention to those things.*

This farmer emphasised the importance of visits for educational purposes. Another farmer saw no need for this:

> *<K317> We have no need for visitors at our farm. We do not have an extension farm.*

This farmer was apparently quite blunt, and this trait could help explain his or her reluctance to allowing visits from the general public. Good communication skills are required to educate farm visitors and such skills have nothing to do with the skills required for farming and farm production.

5.2.7 Appreciation of Scenic and Structural Aspects of the Area

The material environment of the farm has both scenic and functional values. The scenic values involve the beauty of the landscape, features of nature, and the farm within the landscape. The functional values involve the infrastructure for transport and the network for pig production. Nearly all farmers in the survey appreciated the scenic aspect of the environment very much. The appreciation of the infrastructure differed somewhat among the farmers, depending on individual circumstances. The appreciation of features of nature also differed: though some farmers had an eye for nature there were often disadvantages mentioned in connection to farm developments. The appreciation of the area was largely consistent among styles of farming.

Appreciation of the Landscape

In the questionnaire the farmers were asked about their appreciation of the area's scenic value. Most farmers appeared to appreciate the environment and some were clearly very enthusiastic:

> *<E306> The attractiveness of this area is due to the natural environment. And socially it is nice too. There are no threats. You have lots of contacts. And there is a high level of facilities.*

Some farmers specified their appreciation of scenic elements:

> *<W197> What attracts me the most in this area is the diversity in the environment, and the farms – and the peace.*

Other farmers made implicit comparisons with the south of the country. As already indicated above, farmers in the study area appreciated the smaller-scale structure in this area compared to the south:

> *<F070> The attractiveness of farms in this area is that they are small scale and not so factory-like.*

<W060> No doubt it is nice to live somewhere else as well, but I do not favour large-scale landscapes.

So the appreciation of the landscape in the area is very similar to the appreciation of farming in the area. The small-scale, genial and pleasant aspects of the social environment are just as much appreciated as similar characteristics in the landscape.

However, as mentioned above, the social environment was too small scale for some farmers, particularly for some entrepreneurs. This negative view of the social environment was reflected in a limited appreciation of the landscape:

<E106> Nature here is beautiful. And it is pleasant here and quite – too quite sometimes.

<E217> The environment here is beautiful. It is all small scale – too small scale perhaps. And the people are more conservative in financing and in doing things. As a result it is so beautiful here.

Some farmers answered with a reserve in connection to government regulations:

<E172> We live here in a beautiful environment. Unfortunately, it is too beautiful for pig keeping. If the new Reconstruction law takes effect, it will no longer be possible to keep pigs here.

This farmer was referring to a new land planning law, which the Dutch government has been working on since the outbreak of swine fever in 1997. The Reconstruction law is an attempt to combine goals for the reduction of ammonia emission into nature areas with the prevention of the spread of diseases in case of an outbreak. The combined government goals are expected to lead to a plan for clustering farms in specific locations and for removing pig farms from stretches of land that surround nature protection areas.[32]

Not surprisingly, it was entrepreneurs who made these reserved comments on the intrinsic value of the local scenery. Entrepreneurs have ambitions to expand their farming practices. They perceive farming in a sphere of competition. The scenery in the study area might be beautiful, but it is not supportive of competitive production.

Several farmers emphasised that the government was not supportive in their appreciation of the landscape:

<U004> The attractive aspect of this area is that it is small scale. Unfortunately, you are forced to work with increasing scales. That is bad for the rural area. In The Hague [the government – MC] they are not aware of that.

This farmer referred to an important issue of dispute that was already raised a few times in this thesis (Section 5.1): the issue of farm expansion. For the conservation of income level and for maintaining perspective for farm continuity farmers feel forced to keep increasing productivity, intensity and scale. Consequently problems arise, like environmental pollution (manure and minerals) and landscape destruction. The government has taken strict measures to alleviate some of these problems (like environmental pollution), but it has shown little interest in other problems (like landscape destruction). Some farmers in the study held the government responsible for creating the problems in the first place by allowing increasing pressure on productivity, intensity and scale. Other farmers just mentioned government regulations, implying but not specifying them as being disadvantageous, though it is clear from the context that they feel government regulations are disadvantageous:

<E250> If I were to give a figure for suitability of this area for keeping pigs on a scale from one to ten, I would give a seven. The disadvantage is the pressure on diseases, due to the livestock density. And an increasing amount of manure has to be transported to increasing distances. Besides, it is close to a part of the Nature Infrastructure.[33]

According to the regulations for creating a Nature Infrastructure, a farmer cannot be forced by the government to leave the area. The regulations facilitate the 'voluntary' sale of land and farms to the government, allowing the eventual development of a nature infrastructure. In the meantime government regulations restrict farm expansion to reduce the release of emissions and minerals. The future is unsure for these farms from a perspective of continuity. If the purchase by the government is delayed, the farm may become too small to serve as a basis for a new start elsewhere.

The regulations for creating a Nature Infrastructure are fundamentally different from the new regulations in the Reconstruction Law. The Reconstruction Law allows active removal or relocation of farms from certain locations.

Landscape and Infrastructure

When questioned about their appreciation of the landscape, some farmers gave a practical answer:

<E141> Infrastructure is very important. People who have moved to the north have experienced difficulty.

This farmer made an important point. The infrastructure for pig farming in the area of the survey as well as in the south of the country is better than in other areas of the country. The infrastructure for the transport of cheap feedstuff from all over the world is facilitated by the structure of the Dutch rivers. The waterway infrastructure allows for bulk feedstuff transport by cargo boat. This was very important in the 1960s when the European Union had regulated a relatively high price for grain. Through the import of soya and tapioca from all over the world, the Dutch feedstuff industry could create cheaper pig feed than other European feed companies who had to buy grain as a feedstuff base. Consequently, a sufficient network of production emerged in those areas, including slaughterhouses, extension services, etc. In addition to the waterway infrastructure, road infrastructures were developed. And due to the density of pig farms, the network infrastructure of supply and market industries and extension developed into to an efficient network.

When the European Union stopped keeping grain prices high (through the MacSharry agreement in the 1990s) the established network infrastructure for the pig industry remained an advantage for Dutch pig producers. The improvement of the infrastructure had an effect on the landscape though:

> *<E162> Living in this area is mainly so good because of the mentality of the people. The landscape is nice as well – except for the highway here.*

> *<E066> The scenery is nice here, but that is not particularly good for pig farming. But the infrastructure is all right.*

Farming Versus Nature

The Dutch government's policy toward farms located where infrastructural improvements are planned to take place is straightforward: the government actively buys those farms, so the farmer can start anew at a new location. The government policy regarding farming and nature conservation is less straightforward. The sale of a farm to the government is 'voluntary' and subject to negotiation. In the view of the Dutch government, agriculture (and in particular pig and poultry farming) and nature are hard to combine. This is related to the industrialised way in which pig and poultry farming is carried out following modern farming practices. Particularly for the creation of a Nature Infrastructure pig farms have to be closed or relocated.

For some farmers the pressure to relocate comes from various laws at the same time:

> *<C226> We don't want to leave here, but we will be forced to. This location is threatened by the building of the Betuwe railroad. On top of that, this place is located in the so-called Nature Infrastructure, which makes it hard for us to stay. And it is very likely that we have to leave here also because of the clustering related to the Reconstruction Law, which is now coming up.*

Some farmers praised the scenic beauty of the countryside and expressed a clear opinion about the integration of (pig) farming and nature:

> *<E315> Agriculture is the creator of the rural environment. And pig keeping belongs to it.*

> *<F196> This farm is very close to a nature area. Farms and nature belong together.*

> *<K190> Actually every farm should have as much buildings as forest.*

> *<F017> I would rather have more nature in the environment. Pig production and nature should combine well.*

These comments illustrate that many farmers think that – in principle – (pig) farming and nature belong together. They consider the discrepancy in interests between farming and nature not to be a natural discrepancy, but a contrived one. The forces of government policies and the modern market economy impose the discrepancy of interests between farming and nature on the farmers.

Some farmers appeared to disregard the connection between farming and nature:

> *<K317> I don't notice the scenic attractiveness of the environment anymore. But my wife likes to walk in the woods. And I do appreciate that it is nice and quiet here.*

5.2.8 Societal Values of the Farm

The farm itself, as an element in the landscape that has a function in society was explicitly incorporated in the questionnaire. Farmers were asked to comment on:

- the scenic value of the farm (landscape value, historical value, attractiveness)
- the environmental value of the farm and the value for tourism and recreation
- the functional value of the farm for pig production.

There were some differences among styles of farming in how the farmers' perceived the attractiveness of the farms. However, diversity in the farmers' perceptions of the farms' functional value were more pronounced (Supplement Table 5b).

Scenic and Historical Values of the Farm

Of 82 farmers in the survey 67 (73%) felt that their farms had landscape value. Among styles of farming there were no differences on this issue. In addition 21 farmers (26%) thought that their farms also had historical value.

> *<F055> Our farm belongs to the culture of this area, so it has landscape value.*

> *<K323> I think that my farm has landscape value, but the people don't agree. In future I will certainly put a good windshield of trees around it.*

It was not clear in the preceding comment what caused the discrepancy between the opinion of the farmers and the opinions of other people.

Some farmers did not perceive their pig farms (or the pig production units of their farms) as attractive, because the pigs were kept in stables:

> *<K142> Pig farms have no landscape value.*

> *<E141> Our horses and sheep give a contribution to the landscape. Not the pigs; they are kept inside.*

Environmental Value

In the questionnaire a distinction was made between the landscape attractiveness of farms and the value of the farm with respect to environmental protection. Of the 82 farmers, 53 (65%) thought that their farms contributed to nature. This opinion was shared less by craftsmen (only 3 of 10), especially with reference to the protection of streams and woods, and the conservation of birds and wildlife (2 of 10). Craftsmen were apparently more preoccupied with production than with contribution to the unproductive values of the area. The interest of other farmers in contributing to nature conservation was illustrated by some comments:

> *<W166> Nature is my hobby. I have sown barley to attract pheasants. In the spring I always care about protecting birds' nests in the field.*

> *<F052> Around this farm you can find twenty different species of wildlife. There are abundant partridges. And there is a pond for frogs. I have sown a mixture of herbs around it. Every year I plant one or two trees. Unfortunately this is used against me, like with the pollard willows.*

The latter comment ended with an implicit expression of frustration about government regulations for nature conservation. In this case it is about government regulations against cutting trees. The government does not allow trees to be cut without special permission. This policy does not consider the plans of the farmers themselves regarding the planting of trees. The motivation of the government is to conserve trees and allow them to grow old. Farmers often feel it is an injustice that if they make an effort to plant trees, they still cannot remove the ones that would block for example new farm developments. They feel they are being unfairly treated, because with this policy they would have been better off if they had not planted trees at all in the first place.

With respect to the environmental value of the farm, some farmers made a distinction between the value of the pig section and the value of the rest of the farm:

> *<K323> This farm has no environmental value. I am more concerned with reducing the emission of ammoniac and phosphate. I specialise in that. But for my arable farm I do have a kind of nature management agreement: a farm birds agreement. Those kinds of things are evident for me.*

This comment referred to a farm birds agreement. This is a government regulation in The Netherlands in which farmers receive a subsidy for adjusting their farm management to include farm bird protection. The most common measures are not mowing the pastures before a certain date in spring, to protect birds' nests.

Attractiveness of the Farm

About half of the farmers in the survey thought that their farms were attractive:

- because of its position and shape in the landscape (37 of 82: 45%)
- because of its yard and garden (42 of 82: 51%)
- because it is clean and neat (38 of 82: 46%).

Especially in the third category, there is a difference among styles of farming. Craftsmen (7 of 10) mention 'neat and clean' relatively often, whereas stewards (1 of 13) hardly mention this as an attractive element of the farm. This does not necessarily mean that the farms of stewards are dirty, but it might indicate that sterwards have a different perception about hygiene (see also Chapter 6). The response indicates a difference in what people perceived as important to mention in terms of farm attractiveness.

From the results it is clear that craftsmen have a specific perception of what an attractive farm is. To them an attractive farm is not so much a farm that contributes to environmental value, but a farm that is neat and clean. This perception underpins the rationale of high production under hygienic conditions.

Other farmers specified various aspects of what they considered to be an attractive farm:

> *<E066> I think that the appearance of a farm is important. You have to keep your farm nice and neat.*

<C021> We have a good windbreak and plenty of planting in the yard. In the summer it is also neat and clean.

<F017> The landscape value of my farm is in the range of colours. I make sure that all the colours I use fit with each other and with the landscape. That brings scenic balance.

So in these comments three aspects of farm attractiveness were emphasised: neatness and cleanliness, the planting in the yard and harmony in colours.[34]

Suitability for Pig Production

Of the 82 farms in the survey a high number of farmers, 64 (78%), thought that the farm's location was suitable for pig production. This was consistent among styles of farming (Supplement Table 5b). It should be noted that the question was whether the farmers themselves thought the location was suitable for pig production and not whether the government agreed with that.

Yet several farmers encountered specific problems with their current farm location, especially with respect to government regulations. Most problems (24 of 82: 29%) involved the distance between the farm and a nature conservation area. These farms were more restricted in the level of mineral emissions they were allowed and in their possibilities to expand. A relatively high number of stewards (7 of 13) were affected by this regulation. Stewards were located more often than average in the vicinity of nature conservation areas.

Other farms were restricted due to the vicinity of other buildings, especially the houses of non-farming neighbours. Such circumstances increase restrictions for mineral emission and the output of smell. This problem was felt more by entrepreneurs (7 of 19) and craftsmen (4 of 10) than by farmers of other styles of farming. A particular problem that appeared to occur most among entrepreneurs (5 of 12), as opposed to 10 of 82 (12%) among the study population, was the vicinity of other pig farms, restricting the possibilities to expand in the area.

The question may be raised whether these extra problems experienced by entrepreneurs and craftsmen were purely the result of their locations or whether they were caused by the ambition of entrepreneurs and craftsmen for expanding their farms.

The infrastructure for pig production is better in Twente and The Achterhoek, as well as in the pig farming concentration area in the south of the country, than in other parts of the country. Yet for 18 farms in the survey (22%) the specific local infrastructure caused problems. In the survey stockmen (6 of 12) had more problems with the infrastructure than average. This may be one of the reasons that stockmen were more interested in shifting to free-range or organic production than in further expansion.

Of the 82 farms only 13 (16%) had a location problem with respect to manure disposal. This problem did not differ among the styles of farming. This indicates that there is nearly enough farmland on the farms and in the neighbourhood to absorb the pig manure that is produced in the area (see also Section 6.1).

Conclusion

Among the styles of farming there were specific differences in location problems. In line with the styles of farming, different solutions were likely. It can be expected that entrepreneurs were more focussed on finding other locations, away from the nearby buildings and pig farms. Stewards were faced with the dilemma of either moving away from the nearby nature conservation area or taking advantage of the location, for instance by shifting to other income-generating activities (for example the tourism and recreation business). Stockmen were facing an infrastructure problem. Their dilemma was whether or not to start a new farming activity, with or without pigs, that is less dependant on the infrastructure.

5.2.9 Conclusion: Regionality and Styles of Farming

The same families have owned most farms in Twente and The Achterhoek for many generations. The pig production farms are often mixed farms. The most common structure is the mix of a dairy cattle unit and a pig production unit. This farm structure has an historical background. Since farm expansion in land was problematic, farms expanded in the 1960s and 1970s by adding a unit of industrialised pig farming to the existing dairy farm. Pig production requires less capital investments than pig fattening, though the required labour investments are higher. On the farms in the survey the decision had been made in favour of pig production.

For future perspective some farms considered specialisation to one branch, others preferred to stay mixed. The most important options for the future were shifting to a closed farming system, ongoing expansion, and group housing. The options differed for the various styles of farming. Shifting to a closed farming system was not an option for most farmers, even if they had more than one farm location, because of government regulations for environmental protection. The farmers who considered switching to a closed farming system were mainly entrepreneurs (and some craftsmen). They considered recombining units from different farms. Entrepreneurs and craftsmen were more often specialised in pig production than stewards, stockmen and shifters. They also had more plans for further farm expansion, and expected to invest more in expansion than stewards, stockmen and shifters. The new government regulations for group housing were very much under dispute. Most farmers did not consider the regulations to be good for the animals, but as something that was being imposed based on government and public opinion. Among the farmers there was much discussion about the capital destruction that resulted from the new regulations for group housing, particularly for some farmers who had recently made major investments in measures for environmental care. Several farmers – mainly stewards and shifters, considered quitting pig production because of the investment requirements of these new regulations. Some stockmen considered switching altogether to free-range farming or organic farming.

According to the farmers in the survey, the area of Twente and The Achterhoek has a scenic, small-scale landscape; a genial, relaxed and pleasant atmosphere, and a vital social life both in local and regional organisations and informally. Farmers of all styles of farming appreciated the area, though some entrepreneurs had different thoughts about the geniality and relaxed way of conducting farm business in the area. In comparison to other areas, particularly in the south, pig production in Twente and The Achterhoek is more often mixed and smaller scale. According to the farmers, the southerners are also less genial and relaxed (more aggressive and enterprising).

Many farmers in Twente and The Achterhoek find their farms attractive because of their positions in and contributions to the landscape, because of their yards and gardens, and because they are clean and neat. The perception of nature and wildlife differs among styles of farming. Stewards, stockmen and shifters have more interest in preserving nature and wildlife on the farm than entrepreneurs and craftsmen. Most farmers think that their current farm locations are suitable for pig production even though the government often disagrees because of the vicinity of nature conservation areas or other buildings. There are differences among styles of farming in the problems they encounter related to farm location. Stewards have more problems with nature conservation areas than the other groups. Entrepreneurs and craftsmen have more problems with surrounding buildings (houses and other farms); and stockmen have more problems with the infrastructure.

5.3 Perceptions of Farming Practices

In the initial study the classification of farms was based on contrasts in farmers' opinions about farming practices. In the evaluative study the classification of farms was based on computer analysis of parameters: Productivity, Intensity, Scale and parameters that were correlated to Productivity, Intensity and/or Scale. For the evaluative study the contrasts in farmers' opinions about farming practices found in the initial study were summarised in 57 statements, divided into twelve sets – covering twelve issues in pig production practices. Yet in the computer analysis of the evaluative study only three parameters evolved from those statements. The statements 'The enjoyment of pig production is caring for the new life: the piglets' and 'We would rather have (or keep) a mixed farm' were negatively correlated to Intensity. The statement 'This farm is too small for complete automation' was negatively correlated to Productivity and Scale (Section 4.3).

Each of the three statements was part of a different set. The statement 'The enjoyment of pig production is caring for the new life; the piglets' was incorporated in the issue about the enjoyment of pig production. The statement 'We would rather have (or keep) a mixed farm' was incorporated in the issue about goals and strategies. The statement 'This farm is too small for complete automation' was incorporated in the issue about strategies for automation (Supplement Table 5c).

Although most statements were not part of the classification criteria for styles of farming, the opinions of the farmers were often supportive of the various styles of farming. The farmers tended to give comments to support or differentiate their choices among the statements. These comments cannot be caught in parameters. The plain choices among the parameters are therefore less indicative of the styles of farming than the combinations of choices and comments. This is illustrated in this section (5.3).

5.3.1 Creating Sets

Based on the open interviews in the initial study as well as other studies about styles of farming, twelve sets of statements were created. The sets covered the following issues:

- the enjoyment of pig production
- goals and strategies in pig production
- strategies in automation
- time and labour management
- investments and labour inputs
- entrepreneurship and craftsmanship
- position of women
- availability and ownership of land
- environmental care and manure
- farm hygiene
- animal welfare
- consumer markets

Each statement was directly derived from something a farmer had actually expressed in an open interview or a comment in previous research about styles of farming. The sets of statements expressed the variation in farmers' perceptions about these issues. The criterion for using a statement that a farmer had expressed in previous research was that it denoted a contrast. Whether a statement was derived from just one style of farming or just one farmer, or expressed frequently by various farmers was not a criterion for selection. As a result, each set consisted of four to six statements, expressing contrasting opinions about an issue. When asked which statement in a set they agreed with, farmers could make a choice and add a comment if they wished, or give a different statement of their own.

5.3.2 Farmers' Responses

Most farmers did not find it easy to choose among the statements. Often they thought that their own opinions were more balanced and within the proper perspective than those suggested by the statements. Consequently quite often farmers tried to rephrase a statement to make it express their own opinions somewhat better. And although the farmers were asked in the survey to pick one statement as a response, sometimes farmers picked more than one. This was often because the interview was conducted with a farming couple or father-son team together, rather than just with the husband, wife, or son separately. These family members sometimes chose different responses. In such cases both responses were noted, so these double responses within farms contributed to the overall results. However, the double responses hardly influenced the classification of farms into styles of farming, because eventually only three statements contributed to the classification.

The Enjoyment of Pig Production

It was expected that what farmers would call 'the enjoyment of pig production' was related to the ambitions of the farmers. In the questionnaire there were five statements given about the enjoyment of being a (pig) farmer. Entrepreneurs and craftsmen were expected to refer to management and production. Stewards, stockmen and shifters were expected to emphasise for example the freedom of being a farmer. And especially stockmen were expected to refer to caring for the new life, the piglets.

The enjoyment of pig production is….:

- *the farm management*
- *caring for the new life; the piglets*
- *the competition for production results*
- *the freedom of time management*
- *in the technical development of equipment*
- *none of the above*

The 82 farmers in the survey gave 87 responses to this set of statements. The response 'The enjoyment of pig production is the freedom of time management was chosen most often (29 of 87: 33%) in the survey. This was twice as much as for example the choice for 'the enjoyment of pig production is the farm management' (15 of 87: 17%). The statement 'The enjoyment of pig production is the freedom of time management', was chosen by farmers in all styles of farming. The statement 'The enjoyment of pig production is the farm management', was chosen more than average (15 of 87 responses on 82 farms: 17%) by entrepreneurs (7 of 19).

The response 'The enjoyment of pig production is caring for the new life; the piglets' was given 26 times (30%). Among these responses, the differences were striking between entrepreneurs (2 of 19 [farms]) and craftsmen (1 of 10 [farms]) on the one hand, and stewards (6 of 13 [farms]), stockmen (7 of 15 responses on 12 farms) and shifters (6 of 17 responses on 16 farms) on the other hand.[35] This response clearly reflected a difference in rationale between entrepreneurs and craftsmen on the one hand and stewards, stockmen and shifters on the other hand.

The farmers who added explanatory comments about the enjoyment of pig production presented a more vivid image of the styles of farming. For example:

> *<E306> The enjoyment of farming is that I can judge my own work, to decide for myself. … When I started I found the process of delivering piglets a great enjoyment too. Due to the structural developments I have become more and more an employee of my own farm.*

This comment reflected the management aspect of farming, which entrepreneurs find very important. In the survey craftsmen explained their opinions in a different way:

> *<C226> The enjoyment of being a pig producer is versatility: animal health and feeding, but also the societal problems.*

<C139> The enjoyment of being a pig producer is that farmers are free people. But secondly it is the game of competition: to improve each year, to exceed beyond yourself with respect to the technical farm results.

The comments of these craftsmen illustrated that for some it was difficult to choose just one statement. Several statements appealed to them and to a certain extent the final choice between the statements was a bit arbitrary. It was the farmers' additional comments that put the statements into the perspective of craftsmen. This shows that even though the choice among statements is illustrative of styles of farming, caution should be taken in using these statements as criteria for classification of the farms.

Some of the comments of other farmers were exemplary for stewards, stockmen and shifters:

<U212> This is not a profession you choose; you receive it. Farming is an emotional happening between man, animals and nature.

<K025> Being a farmer is a way of life. It is something you are not something you do. As a farmer you are free and involved with animals.

These comments have in common that they present being a farmer as a way of life. The enjoyment of being a (pig) farmer is living that life. So these were expressions in support of their ambition in the sphere of participation. In that sphere farmers were critical of the pressure on farm expansion:

<W188> The enjoyment of being a pig farmer is that I can decide myself what happens on the farm. Though I think it is sad that it is supposed to be bigger and bigger all the time.

Farmers in the sphere of participation often perceived the enjoyment of farming as a kind of right. Some feel frustrated, because they hold the government responsible for not granting them that right:

<F073> Government regulations have removed the joyful aspects of farming. ... If I could get rid of the sows I would certainly do so.

Some farmers commented on the issue in a more technical and practical way:

<F077> The enjoyment of being a farmer is to have a closed farming system.

<K547> The enjoyment of pig farming has an economic reason for me: one can get an income from pig farming.

Conclusion

For stewards, stockmen and shifters the enjoyment of pig farming has to do with this way of life. The enjoyment is in the sphere of participation in the business. Often they express an emotional attachment to the way of life, and to the animals – particularly the piglets. Entrepreneurs and craftsmen have other ambitions: for efficiency and production. Their enjoyment is expressed in a sphere of competition: they want to compare themselves with others in terms of management and production.

Goals and Strategies in Pig Production

In the goals and strategies issue, a distinction was expected between farmers who preferred specialised farms (entrepreneurs and craftsmen) and those who preferred mixed farms. In addition, statements were added to this issue about farm economy, farm expansion, and future perspectives.

Goals and strategies:
- *Every investment should be completely economic.*
- *I don't mind working an extraordinary number of hours per week.*
- *We would like to keep up with the average size farm growth.*
- *We are in the process of stopping farming.*
- *We hate to depend on others (the bank) for financial resources.*
- *We would rather have (or keep) a mixed farm.*
- *None of the above.*

The 82 farmers in the survey provided 85 responses to this issue. The statement 'We would rather have (or keep) a mixed farm' was chosen 19 times (of 85: 22%). Only one (of 19) entrepreneurs chose this statement and none of (the 10) craftsmen chose it. In contrast, it was chosen by 7 (of 13) stewards, by 5 stockmen (of 13 responses on 12 farms) and by 5 shifters (of 17 F responses on 16 farms). So this response was a clear indication of the difference in ambition between entrepreneurs and craftsmen on the one hand and stewards, stockmen and shifters on the other hand (Supplement Table 5c).

Some farmers added comments to their choice of this statement to better illustrative their ambitions:

> *<K508> The mixed farm is what I like. I like milking cows. But there is nothing I like doing all day.*

But through some comments that farmers made to explain this choice, a different perspective appeared. For example:

> *<F055> I would rather keep a mixed farm, but that would not be interesting in connection to investments. There is increasing pressure to enlarge groups – to 200 pigs – for transport.*

This farmer was referring to new government regulations on hygiene in animal transport. That prohibits transport companies from cross loading feeder pigs from different farms and farm locations in order to prevent the spread of diseases. . Now farmers are encouraged to create sales groups of pigs to fill a whole truckload at once. These regulations made mixed farming more complicated, because on such farms it is harder to create large groups. Specialisation, on the other hand, is a way to achieve that goal. Another solution might be shifting to a 3-week production schedule (see also Sections 5.2 and 6.1).

Another differentiated perspective was revealed by comments about a mixed farming system. Some farmers did not prefer a mixed farming system but a closed farming system (including both pig production and fattening). But that was not among the choices of statements. A farmer commented:

> *<K323> We would rather keep a closed farming system. The business has to be flexible, but continue to grow. And it has to stay profitable.*

Another farmer found it problematic to choose the statement about the mixed farm because he had one, but that was not his preference:

> *<F073> I would rather specialise, but I can't. The government forces me to keep a mixed farm.*

What the farmer meant is that government regulations on manure and mineral emissions prevented him from expanding in the pig farming branch.

Among the statements about goals and strategies, 'Every investment should be completely economic' was chosen most often (23 of 85: 27%). A relatively high number of entrepreneurs chose this statement (9 of 19). This was expected, because entrepreneurs focus particularly on the farm economy, but the high score in the population was not specifically expected. The comments regarding this issue provided by farmers of other styles of farming revealed some differentiation of opinion among those who chose this statement:

> *<W147> Every investment should be profitable in the long run. You have to be able to get a good income in an acceptable number of working hours.*

> *<W188> I think that all investments should give returns within a reasonable time.*

> *<F063> Every investment should be economic, but hired labour is not required.*

These comments were typical illustrations of the ambitions of stewards, stockmen and shifters in the sphere of participation and autonomy. They reflect the desire for continuity more than the desire for economy. The desire to keep hired labour at a low level is also an element of that ambition.

The set of statements about this issue did not include a statement that expressed the plain goal of farm continuity. Some farmers of all styles of farming preferred to mention that in this context:

> *<E633> Our aim is to continue farming together for many years to come. Our strategy is to create animal housing where it is nice for us work and where the animals feel fine.*

> *<C008> We want to be farmers and stay farmers.*

> *<K317> The aim and strategy at the moment is to turn a profitable farm over to our son. If our son doesn't want to continue the farm then we will finish farming.*

Some farmers found it difficult to decide which statement to choose. This was not because of the available choices, but because of the uncertain perspective for the pig production sector due to the government regulations:

> *<E167> Through the uncertainty about the future – due to government regulations – the aim of our business has become uncertain as well.*

For other farmers it was hard to choose from the given statements simply because they did not support any of them:

<K526> None of the given goals and strategies appeal to me. I just don't know.

Conclusion

There was a clear distinction between the choices of farmers whose ambitions lie in the sphere of competition (entrepreneurs and craftsmen), who preferred specialised farms, and those whose ambitions lie in the sphere of participation and autonomy (stewards, stockmen and shifters), who preferred mixed farms. Entrepreneurs chose relatively often for economy of investments, whereas craftsmen made various different choices.

Strategies in Automation

It was expected that the strategies in automation would depend on two aspects. On the one hand it would depend on the willingness of the farmer to invest in automation. It was expected that such willingness would be higher for entrepreneurs and craftsmen than for stewards, stockmen and shifters. On the other hand, it would depend on the size of the farm – whether it would be worth while to make investments in automation.

Strategies in automation:
- *Automation should be implemented as much as possible.*
- *This farm is too small for complete automation.*
- *A good farmer always pays attention to the figures.*
- *I don't need a computer to see how my animals are doing.*
- *None of the above.*

In this set, the statement 'A good farmer always pays attention to the figures' was chosen the most (40 of 83 responses on 82 farms; 48%). This statement was chosen equally by farmers of all styles of farming, except stockmen (only 2 of 13 responses on 12 farms). This is in line with what was expected for stockmen. Stockmen are interested in having pigs and not particularly in the production level of the sows.

The statement 'This farm is too small for automation' was chosen 17 times. Yet none (of 19) entrepreneurs chose this statement and only one (of 10) craftsmen. This finding supports the difference between the ambition of entrepreneurs and craftsmen on the one hand and the ambition of stewards, stockmen and shifters on the other hand. Entrepreneurs and craftsmen have higher ambitions for farm expansion, so it would be unlikely for their farms to be too small for automation.

In this case, the entrepreneurs and craftsmen contrasted with shifters (8 of 16) and stockmen (4 of 13 responses on 12 farms) but not with stewards (1 of 13).

These responses were in line with the responses to the statement 'We would rather have (or keep) a mixed farm' (above). Both these statements were part of the parameters that were used in the factor analysis (Section 4.2). The difference is that 'We would rather have (or keep) a mixed farm' was correlated to Intensity ($p < .001$) and 'This farm is too small for complete automation' was correlated to Productivity and Scale. This difference was reflected in the fact that for stewards the score for 'We would rather have (or keep) a mixed farm' was high, and the score for 'This farm is too small for automation' was low. But it cannot be concluded from this information that the farms of stewards were not small – on the contrary they were smaller than average (see Section 5.1). The stewards just preferred to choose different statements in the set about strategies – 'A good farmer always pays attention to the figures'.

A relatively high number of entrepreneurs (5 of 19) said that their views were 'none of the above'. This is illustrated by the following comments from entrepreneurs and unclassified farmers:

> *<U246> Automation is important, because that results in extra time for improvement of control. And that leads to better results.*

> *<E061> A good farm uses automation. That leaves time for attention to the animals.*

> *E617> Thanks to automation I have more time for control and attention for the animals.*

> *<E633> A good farmer always attends the animals, then the good figures will come as a result.*

> *<U212> Everything that you can automate, from feeding to housing, you should automate. Then there will be more time for caring. You cannot automate caring.*

> *<U040> Animal welfare is important. Therefore automation is required.*

All these comments link automation to animal control. Without automation there would be less control of the animals. This indicates that for these farmers there is no implicit minimum level of animal care and control as a criterion for farm size and scale.

The comments of farmers of other styles of farming referred to the labour requirements in connection to automation:

> *<W140> Automation is necessary to keep labour requirements under your own control.*

> *<U067> With automation the farm should be organised to require less work.*

> *<C221> Automation is a tool. The most important thing is that you keep control yourself.*

Apparently automation is considered among all styles of farming to be the technical solution to the problem of increasing scale. Some farmers emphasised that automation was a means to a goal:

> *<E250> Automation should be a tool, not an aim in itself.*

> *<K180> Our policy is to expand and automate.*

> *<W147> With automation you should actually make the farm so that you only need to check the animals.*

Conclusion

Farmers whose ambitions lie in the sphere of participation and autonomy (stewards, stockmen and shifters) had farms that were often too small for automation. Farmers whose ambitions lie in the sphere of competition (entrepreneurs and craftsmen) had farms that were big enough for automation. Within these differences stewards preferred to choose the statement ‘A good farmer always pays attention to the figures’. Entrepreneurs preferred to clarify their choice by emphasising that good automation allows more time for animal care.

Time and Labour Management

The four statements about time and labour management reflected increasing flexibility in the management and work schedule.

Time and labour management:
- *We do our work according to a strict schedule.*
- *We plan our work, but we are also flexible when we have to be.*
- *Our farm management is more flexible than fixed.*
- *The animals create our work schedule; that is never fixed.*
- *None of the above.*

A vast majority of the farmers (61 of 85 responses on 82 farms: 72%) chose the second statement: ‘We plan our work, but we are also flexible when we have to be’. This is not surprising, as, in hindsight, the statement seems to lack specificity. There were no criteria given for judging flexibility in management (Supplement Table 5c).

Nevertheless, there were some differences among styles of farming. Craftsmen were concentrated on the first two statements (3 and 6 of 10): they are strict and flexible when required in their work schedule. Entrepreneurs (19 of 19) stewards (8 of 13) and stockmen (10 of 12) concentrated just on the second statement: they are flexible when it is required. And shifters concentrated on statements two and three (9 and 6 of 16): they are flexible when it is required, or they are even generally more flexible than fixed. None of the farmers chose the fourth option: never fixed.

So even though the differences among styles of farming were not very pronounced, the slight differences in results coincide with the expectations from the initial study. Craftsmanship requires a strict schedule to obtain high technical results. On the other hand, shifters are in a process of shifting activities, so they could be expected to be somewhat more flexible than others are. This issue did not lead to any further comments by the farmers.

Conclusion

Most farmers chose the statement ‘We plan our work, but we are also flexible when we have to be’. Without any further criteria about rigidity or flexibility in management and working schedules, this choice is in itself not very informative.

Investments and Labour Inputs

Investments and labour inputs were expected to be approached in different ways by the styles of farming. At the ambition level in the sphere of competition (entrepreneurs and craftsmen), the approach was expected to focus on the economy of investments. But a difference between entrepreneurs and craftsmen was expected on the rationale. Entrepreneurs were expected to emphasise the efficiency of labour input, whereas craftsmen were expected to emphasise that good results require good labour input. In the sphere of participation and autonomy (stewards, stockmen and shifters) the approach was expected to focus on the economy of the requirement of labour and investments. The questionnaire included six statements about investments and labour.

Investments and labour inputs:
- *Efficiency is more important than saving the last piglet.*
- *Investments in automation are always profitable.*
- *Good results require a lot of time input.*
- *A good farmer knows when to stop investing / working.*
- *It is the eye for detail that matters the most.*
- *It is better to keep the government and the bank at a distance.*
- *None of the above.*

One response was chosen much more than all others: ‘Good results require a lot of time input’. It was chosen 53 of 85 times on 82 farms (62%). There was no difference among styles of farming in making this choice.

The second most chosen statement (14 times: 16%) was ‘Efficiency is more important than saving the last piglet’. Again there was no difference among styles of farming (Supplement Table 5c).

Yet, some farmers found it difficult to make a choice, like this entrepreneur:

> *<E115> Our aim is a profitable farm and sufficient time off. The farm size is only this big for reasons of financial balance. But having a social life is important too.*

This aim of a profitable farm and sufficient time off is a statement that is likely to come from an entrepreneur. The statement implies that a level of technical planning is needed to achieve these goals. Yet, the statement ‘None of the above’, was hardly chosen in the survey (2 times).

Conclusion

It is not clear why there were no differences found among styles of farming related to this issue. It could be that the statements are too general. They are not specifically connected to actual farming practices. The farmers might have perceived them as statements of ‘general truth’, without relating them to specific contrasts in farming practices. This perception of ‘general truth’ may also be the reason that very few additional comments were given.

Entrepreneurship and Craftsmanship

From the initial study it was expected that differences among styles of farming would be pronounced with respect to views on entrepreneurship and craftsmanship. It was in fact these differences that triggered to a large extent research about styles of farming within specific regions and farm branches (Bolhuis & Van der Ploeg 1985/1988).[36] The expected differences were confirmed by the farmers' choices of statements on this issue, and especially by the extra comments they provided.

Farmers have individual perceptions of what entrepreneurship and craftsmanship mean, which may differ from the specifications in this study that correspond to domains and specifications of styles of farming (see Chapter 2). Four statements were provided in the set on entrepreneurship and craftsmanship. In the sphere of participation, particularly among stewards, the responses were expected like 'a smaller farm with keen management is better' and 'a good farmer known the value of being satisfied'. In contrast in the sphere of competition and particularly by entrepreneurs the response was expected that 'at the end of the day it is the profit that counts'.

Entrepreneurship and Craftsmanship:
- *The ideal farm is small and well managed.*
- *A good farmer knows the value of being satisfied.*
- *Organic pig farmers are better craftsmen than regular farmers.*
- *At the end of the day it is the profit that counts.*
- *None of the above.*

In almost equal numbers the farmers chose three of the statements, but there were differences among styles of farming concerning these choices. These differences are discussed below and shown in Supplement Table 5c.

Of 83 farmers (on 82 farms) 31 (37%) chose the statement 'A smaller farm that is well managed is better'. As expected this statement was chosen more often in the sphere of participation and autonomy: stockmen (7 of 12) and shifters (9 of 17 responses on 16 farms) chose this statement more than average. Some farmers gave supporting comments about their choice:

> *<K175> My view on craftsmanship is that you have to try and maintain a family farm. From that principle you have to try and get the best out of it.*

This farmer associated the smaller farm with a farm that does not use external labour. This association was expected, and thus it was also expected that entrepreneurs in particular would not choose this statement, since they are the most open to farm expansion and attracting hired labour. Yet this statement was still chosen by 5 (of 19) entrepreneurs. Unfortunately, these five respondents did not provide comments to support their choice. It is possible that these entrepreneurs were attracted by the addition of the phrase '…well managed' in the statement.

The statement 'At the end of the day it is the profit that counts' was chosen by 27 farmers (of 83 responses on 82 farms: 33%). As was expected, entrepreneurs chose this statement more often than the other farmers (8 of 19) did. Some farmers that chose this statement gave explanatory comments:

<K323> At the end of the day it is about economic balance, but the animal should not be lost from sight.

<U004> At the end of the day it all comes down to the economic balance. But as an entrepreneur you also have to know when to be satisfied. And you have to keep respect for pigs.

Both comments emphasise that even though the farmers chose this statement, they believe that pig production is not just about economics. It is about animals too. It is not surprising that one of these respondents is a stockman. Stockmen often emphasise their affinity with pigs. The second respondent, an unclassified farmer, added that farming is also about people and their satisfaction. Both these comments put the choice of these farmers in the sphere of participation and autonomy instead of in the sphere of competition.

The third statement that was often chosen (22 of 83 responses on 82 farms; 27%) was 'A good farmer knows when to be satisfied'. This statement was expected to be a typical choice for stewards, because it refers to the importance of people and it reflects the sphere of participation. That was confirmed in the results: of 13 stewards 6 chose this statement, which was more than average. In the comments that some farmers gave to explain this choice, their perspectives changed from the sphere of participation into the sphere of competition. For example:

<C021> A good craftsman should know when to be satisfied, but he also has to continue to grow. Otherwise the business won't continue.

Conclusion

The choices of the farmers among the statements about entrepreneurship and craftsmanship confirmed the expectations about styles of farming. Entrepreneurs chose more than average 'At the end of the day it is the profit that counts'. Stockmen and shifters generally preferred 'A smaller farm that is well managed is better', and stewards preferred 'A good farmer knows when to be satisfied'. The styles of farming were even more illustrated by the comments that some farmers added to their choices.

Position of Women

Women play an important role on pig farms in The Netherlands. Often they divide their time between performing household duties and working on the farm. The position of women on farms varies from being owners (in rare cases) to being full or part time farm workers, or to having off-farm employment. In Section 5.1 it was shown that the extent to which women work on the farm depended both on the age of the children in the family and the style of farming. The questionnaire included five statements about the role of women on the farm.

Position of women:

- *The woman should work in the house, the man on the farm.*
- *Without external labour, the husband and wife are more equal on the farm.*

- *Pig farming is a suitable business for a woman.*
- *Women in pig farming are more focussed on the animals than men are.*
- *This farm is a man's world – and we like it that way.*
- *None of the above.*

Four of these statements were chosen in nearly equal numbers. These are discussed below and presented in Supplement Table 5c.

The statement 'Pig farming is a suitable business for a woman' was chosen 21 times out of 84 responses on 82 farms (25%). This choice was equally distributed among styles of farming. The statement 'The woman should work in the house, the man on the farm' was chosen 20 times (24%). This choice was also equally distributed among styles of farming. The statement 'Without external labour, the husband and wife are more equal on the farm' was chosen 19 times (23%). This choice was not equally distributed among styles of farming, as it was absent among craftsmen. It is remarkable that the latter statement was not chosen more often, because as discussed in Section 5.1 there seemed to be a negative correlation between the labour input of women and the labour input of hired labour. However, many farmers (17 of 84 respondents on 82 farms; 20%) and in particular craftsmen (5 of 10) chose 'None of the above', so the suggested statements apparently appealed less to the farmers than had been expected.

Many comments were given on this issue, though they did not reflect typical opinions of any particular style of farming. The comments show that farmers in the survey (both men and women) found it hard to specify their feelings about the position of women on the farm. The dilemma was often how to express the difference between the status of women on the farm and the actual work that they perform.

Several farmers emphasised that even though the women may perform fewer tasks on the farm, their position is not less important:

> *E162> If you want to talk about whom does specific work, than I – the man – do the most. But at the end of the day we – man and woman – do everything together.*
>
> *<F055> The position of the woman can be the same as that of the man on the farm, though physically she may not be as strong.*
>
> *<C107> Our principle on this farm is that we decide together. But the tasks are divided.*
>
> *<W024> Man or woman – to us everyone is alike. You just complement each other.*
>
> *<U039> A family farm you can really do together. The woman often does the bookkeeping and has the financial overview. Important things are really decided together.*

All these comments suggest that even though that there is a task division between the men and the women, their status is in principle equal. Other farmers added that the inherent differences between men and women should be cherished:

> *<E617> A pig production farm is very suitable for a woman. A woman has a lot of love for the business.*

<E115> Women are better in various aspects of pig production. Generally they are more caring and prudent. That is important for pig farming.

<U004> The woman on the farm is very important and she has to support the business fully. She is also the most important chain on the farm between people and animals. She has a different outlook on the whole business than the man.

In these comments three specific qualities of women are highlighted: women *...love the business,* are *...more caring and prudent*, and they have a different *...outlook*.

Some farmers commented on the position of the woman in connection to hired labour:

<E250> On a family farm you do everything together. If hired workers get involved then both the woman and the hired worker are also involved with decisions.

<W147> On a family farm you can really do everything together. As soon as hired labour is introduced, the woman withdraws.

<C021> We truly manage the farm together. A hired worker would only be an intrusion.

The latter comment was by a craftsman, who did not choose the statement 'Without external labour, the husband and wife are more equal on the farm' nor did any other craftsman. Apparently for this farmer there is no comparison between hired labour and the position of the woman, because for him (or her) there is only one solution thinkable: no hired labour.

The three latter comments together explicitly suggest a tension between the position of the woman on the farm and the presence of hired labour. From the initial study a difference among styles of farming was expected in this regard. Craftsmen and stewards were expected to feel this tension the most. So it is not surprising that a craftsman and a steward gave the latter two comments.

It is hard to explain why the possible tension between the woman on the farm and hired labour was not demonstrated more clearly from the choices of statements made by the farmers. It could be that personal factors had to be taken into account. If the hired labourer was for example a relative, the expected tension between the woman and the hired worker may not occur. It may also depend on whether the hired person is a man or a woman. A hired man could be a possible threat for the women in decision-making and business developments. But – as one of the women suggested, a hired female worker could influence family life, for example by causing jealousy.

With respect to this issue it should be noted that the introduction of hired labour is never perceived as a possible threat to the position of the man on the farm. So, in this regard, the position of women is not as equal as some farmers perceive it to be.

Another comment given in the survey was that the introduction of hired labour is not necessarily a disadvantage for women. It depends on the position that she wants to have on the farm. In modern society some women would prefer to be independent and have a job of their own outside the farm. On family farms the introduction of hired labour might be a relief for such women, as it would reduce her obligations on the farm. This aspect was also discussed in some of the comments about external jobs:

> *<W205> Nowadays a woman has her own job and a life of her own. That is different from the past.*

> *<U313> On this farm the women are informed, but not really involved – they have a life of their own.*

On the other hand, a few farmers suggested that nowadays a woman might run a farm herself:

> *<E306> If a woman has feeling for it she can run a farm too.*

In this survey there was only one case in which a woman was the owner of the farm. She was a widow who had become the sole owner after the death of her husband. The initial study did include one case of a woman who had started a pig production business by herself.

Several farmers in the survey chose the statement 'None of above', because of specific personal circumstances:

> *<K025> It is true that pig farming is a 'stronghold of men', but I do not like that atmosphere. This farm is completely different, because the other farm branch is completely different [a dancing school – MC].*

> *<C226> Because of our family situation [a handicapped child – MC] the position of the woman on this farm has changed.*

> *<U090> I cannot say anything about the position of women on farms, because I am a man alone.*

Conclusion

The position of women on farms varied considerably and it was nearly impossible to represent such variety in a set of statements. Most farmers tried to express in their comments that the position of the woman on their own farm was good, some by emphasising the equal status of women, others by emphasising specific qualities of women. Although several farmers felt a kind of tension between the position of the woman and hired labour, it appeared to be difficult to specify that tension in general terms.

Availability and Ownership of Land

In industrialised pig production practices it is not essential for farmers to have large parcels of land for keeping and feeding pigs. Yet there might be other reasons for farmers to wish for a linkage between pigs and acreage. Based on five statements, the opinions of the farmers in the survey were investigated. It was expected that in the sphere of participation and autonomy (stewards, stockmen and shifters), ownership of land would be considered more important than in the sphere of competition (entrepreneurs and craftsmen) for a variety of reasons, such as manure management and insurance.

Availability and ownership of land:
- *Land of your own is important for manure management.*
- *Land ownership is like life insurance.*
- *It is not important for a pig farmer to own land.*
- *There should be a balance between animals and land.*
- *I would rather be in a co-operative of 3-4 farms, to balance land and animals.*
- *None of the above.*

The most common choice in the survey (34 of 85 responses on 82 farms: 40%) was the statement ‘It is not important for a pig farmer to own land’ (Supplement Table 5c). Many farmers have confidence in technical solutions to the manure problem that resulted from the disconnection between acreage and animals:

> *<U040> Land is expensive. A connection between acreage and animals is not required in pig farming with industrial processing of manure.*

The statement ‘It is not important for a pig farmer to own land’ was evenly chosen by all styles of farming, except by stewards: only 2 of 13 stewards chose this response. The stewards were more focussed on family farm continuity by spreading risk, and mixed farming is a preferred way of achieving that goal (Section 5.1). So, for stewards, having land is part of a broader strategy. There was no particular alternative choice for stewards, as the responses were spread over the other statements. But stewards were active in commenting on this issue. One of the stewards said:

> *<W174> Farms in pig production have developed in the direction of disconnecting animals from acreage. My desire is to return back to connections between animals and acreage.*

Ownership of land has financial consequences for a farm. There is an advantage in terms of flexibility and insurance. But there can also be disadvantages, for instance because it allows irrational farm investments based on land ownership as collateral. One of the farmers commented:

> *<W140> Land is like life insurance. But a farmer with land has the inclination to invest too much. And then the life insurance is gone.*

For some farmers the disadvantage of the availability of land is when the land is leased. Lease prices are high, but land is hard to get. Land leasing is well protected by law and lease contracts are hard to end by the owners. Yet the burden of the rent obliges a farmer to use the land at high levels of productivity and profitability. This is also true for landowners that invested in the farm using the land as collateral:

> *<C128> From a financial point of view my land is a millstone around my neck. But this land has always belonged to this farm so you don’t sell it just like that.*

In their comments some farmers referred directly to manure management as a prime consequence of the lack of balance on the farm:

> *<W122> I try to keep as much land as possible under my own management, for manure disposal. But in principle this is not necessary.*

<F055> Acreage is not important anymore for a pig farmer, but manure disposal should continue to be interesting from an economic point of view.

These comments are linked to the statement about this issue “Land of your own is important for manure management”. Of 85 responses on 82 farms 12 (14%) chose this statement. The choice was evenly distributed among styles of farming. Several farmers agreed with this statement, but in their comments they differentiated their response by viewing ‘…land of your own’ from a wider perspective:

<K323> Land is a basic need for farmers, including pig farmers. The idea of balance counts, but you do not need to have all the land yourself. I provide a lot of grains from this region to my animals. And I want the manure to stay in this area as well.

<U004> There has to be a link between acreage and manure. But that does not necessarily need to be your own land.

<U039> The balance between animals and acreage should have been established 25 years ago. Than the animal production industry would have developed in a much more balanced way.

<W166> This extended manure management programme of the government does not exist anywhere else in the world. We have to shift to connections between animals and acreage.

The choice in the survey for ‘There should be a balance between animals and land’ was the second most common response (19 of 85 responses on 82 farms: 22%). Shifters (5 of 17 responses on 16 farms) made this choice somewhat more than average. The statement did not specify whether the balance had to be within one farm or broadened to include a larger area (region, country).

<U212> In The Netherlands the ratio between animals and acreage is too high anyway.

Further comments on this issue are discussed below in connection to opinions about manure management.

Conclusion

Most farmers in the survey think that land is not important for pig farmers. However, the comments on the issue illustrate that the majority of the farmers think there should be a balance between acreage and animals. Some farmers, particularly stewards, prefer to own land, while other farmers, emphasise the balance between acreage and animals in more general terms.

Environmental Care and Manure

From the point of view of the Dutch government, the issue of manure management and mineral emissions was solved in the Law on Restructuring the pig industry in 1998:[37] excessive environmental pollution was put under control in extensive regulations dating back to 1986. The government expected that only some final extra measures would still be required after 1998 in the form of accentuation. For farmers the issue of manure management was still a hot issue 1998, as can be judged from the extensive comments inspired by this issue in the survey. The major problem for the farmers, however, was not the disposal of the manure produced on the farm, but the restrictions on farm expansion. In the questionnaire statements reflecting solutions for manure management at farm level covered the issue of manure management.

Environmental care and manure:
- *Efficient manure management is best for the environment.*
- *There should be a regional balance between animals and acreage.*
- *There should be less soya in pig feed: for smell and manure quality.*
- *New technologies will soon solve the manure and NH_3 problems.*
- *The real problem is not the manure but current farming practices.*
- *None of the above.*

It was expected that entrepreneurs and craftsmen would approach the problem from a more technical perspective, and that stewards, stockmen and shifters would emphasise local solutions. The results clearly reflected the contrast in rationale between entrepreneurs and craftsman. The choices of stewards, stockmen and shifters varied (Supplement Table 5c).

The statement 'Efficient manure management is best for the environment' was chosen the most (30 of 84 responses on 82 farms; 36%). As expected, craftsmen chose this statement more than average (6 of 10). Craftsmen are the most efficient producers: their sows produce the largest number of feeder pigs per sow [per year] (= Intensity; Section 4.1) and have the lowest replacement rate for sows (Section 6.2). So the animals of craftsmen produce the least amount of manure per unit of production (feeder pig).

One farmer (an entrepreneur) commented on this issue:

> *<E250> The more efficiently you deal with minerals, the more sustainable it is for the environment.*

The second most chosen statement was 'New technologies will soon solve the manure and NH_3 problems' (22 of 84 responses on 82 farms; 26%). As expected, entrepreneurs chose this statement more than average (8 of 19). Entrepreneurs were more than average involved with investments in new technologies, like automation and equipment. Some comments reflected this confidence in technology:

> *<E217> The manure problem can still be solved by technical means. But then the profitability of farms should increase more. It is uncertain whether that can be achieved.*

Another farmer (a shifter) commented by specifying a practical solution:

> *<F052> If manure is processed on the farm it is easy to remove phosphate – especially through farmyard manure with straw. There is just more traffic on the roads for the transport in comparison to processing at a central station, because you have to transport manure and straw.*

There were a variety of other comments. Several comments reflected on the necessity of balance between acreage and animals – a subject that was also raised in relation to the previous issue. Some farmers saw the problem in international perspective or in the perspective of the policies of the European Union. Other farmers did not accept the severity of the problems as presented by the Dutch government. They commented on the way the government imposed regulations on manure and mineral management, environmental pollution, and smell. Some farmers gave cynical comments, because they felt that they were treated unfairly by the government (see also: Section 5.1).

In the previous issue the connection between animals and acreage was discussed with emphasis on farm-level linkages. In relation to the manure issue, the linkage between animals and acreage was seen from a broader perspective. Entrepreneurs and craftsmen found it important to emphasise the regional, national or global level:

> *<E141> There has to be a balance between animals and land on a national level, not on farm level.*

> *<E115> The manure problem is caused by an excessive supply of minerals from abroad. There is too much supply compared to disposal. There are too many pigs.*

> *<E306> Production should be put in balance. That should be viewed in a broad perspective.*

> *<U212> It is good to have a view on recycling and the environment. If all the recycling systems are added the total cycle should fit.*

> *<C008> If the principles of 'good stewardship' were applied to manure, everything would be fine. If the manure would be distributed well, there would not be any problem. Actually the minerals should go back to where they came from: through manure processing and then back abroad.*

> *<E315> In future the European Union will regulate the connection between acreage and animals. So manure disposal is an issue of concern.*

> *<C226> If European Union regulations on animals per hectare for cattle will come into effect, the manure problem will be reduced dramatically as a consequence.*

Some farmers of the other styles of farming (stewards, stockmen and shifters) were also concerned with the lack of balance between animals and acreage, but they expressed their views from a different perspective. Their focus was more on the local balance and the consequences for farming practices:

> *<W188> For minerals the balance in the soil is important, especially in connection to the nitrate concentration.*

> *<K175> There are too many starting materials imported from elsewhere in the world. That creates lack of balance. Actually we should be allowed to practice farming in a different way, but there is no opportunity for that.*

The issue of manure distribution was not covered in the given statements. Several farmers (13 of 84 responses on 82 farms: 15%), particularly stockmen (4 of 12), did not feel that their views were covered by the given statements. In the comments some farmers related their choice explicitly to the fact that they did not see the manure problem as a problem of excess, but as a problem of distribution:

<K317> Manure is not a problem. It is just the distribution of manure, which is a problem.

<C139> If the manure would be well distributed here in the neighbourhood, then hardly anything would need to be disposed of elsewhere.

Yet there were also farmers who did not recognise either the problem of manure pollution or the severity of the problem:

<K002> Manure is not the key problem. The government says that farmers pollute the environment. That is relative. Cars are bigger polluters.

<K547> Manure is a political problem. All research about manure is unreliable.

<K323> That story about acid sensitivity of the nature reserves is not true. The emission does not drop right behind the farms, but expands gradually over a much bigger area. Actually you should be aware of the wind direction, but that is not feasible in government regulations. Fortunately the local government co-operates well with us.

The addition of the last line should be noted *'...fortunately the local government co-operates well with us'*. In The Netherlands the hierarchy of government consists of three levels: national, provincial and local. The regulations on manure management are released by the national government. They are largely in line with policies of the European Union. Yet the local government grants permits, for farm expansion for example. Sometimes discrepancies occur between the regulations enacted by the national government and the interpretations of the law by the local government. Such discrepancies with respect to farm expansion occur more than average in small rural communities, where the local economy is dependent on farming. The farmer who gave this comment apparently lived in a community where opposition from environmentalist groups was low. That was not the most common situation in the study area. In a large part of the study area environmentalist groups were active, particularly one group (Stichting Milieuoffensief) that specialised in bringing decisions of local governments in favour of farm expansion to the national court. The farmers in the survey who were directly affected by the activities of environmentalist groups complained about these actions. But some farmers showed an understanding too:

<U246> In principle we want to co-operate with the new regulations, but we cannot adapt as fast as Milieudefensie [another environmentalist group – MC] [38] *wants us to. For them there is no compromise and no discussion. ... Levying for the environment is ok, if they would return that money to farmers as subsidies for finding solutions.*

For some farmers the problem was not the manure, but the way the government was dealing with the issue. In their comments they implicitly or explicitly pointed at the government as the source of problems:

<K526> Within a few years manure and ammonia problems will be solved because by then farmers will be gone.

<W024>Manure can become a problem through government regulations. For that reason arable crop growers do not wish to receive manure anymore. It is a lot of juggling.

<E250> There have to be government regulations, but no generic policy. That is something different. And that could be hard to sanction or control, but it is fairer.

<U034> New problems are created nowadays in farrowing in connection to manure, because too many minerals are being left out of the feedstuff. The condition of the sows is declining.

The latter problem refers indirectly to the government regulations. As a result of the measures on manure pollution, the mineral composition of pig feed has changed. According to this farmer the change in feed composition has caused health problems for the sows during farrowing (delivery).

Some farmers wanted a different base to the government regulations, for example:

<U246> Farmers should solve environmental problems for themselves. But they should also have the liberty not to do so. Then the principle should be put into effect: the polluter pays.

Conclusion

With respect to preferred farm solutions for manure management, the majority of farmers chose efficient manure management (particularly craftsmen) and new technologies (particularly entrepreneurs). Many farmers, particularly entrepreneurs and craftsmen, saw this issue from a broader perspective as a problem of regional, national and global balance between animals and acreage. Stewards, stockmen and shifters put the issue more in the small-scale perspective of local and farm balance. Among all styles of farming there were farmers who disputed the approach taken by the government and/or the government's policies on the issue.

Farm Hygiene

There are basically two approaches available to farmers with regard to farm hygiene:

a) isolation, cleaning and disinfection

b) creating a balance between germ pressure and (natural) resistance.

It was expected that entrepreneurs and craftsmen would put more emphasis on cleaning and disinfection, and that stewards, stockmen and shifters would prefer to create a balance between germs and animal resistance. A choice of four statements was given to the farmers.

Farm hygiene:
- *We work as hygienically as possible.*
- *We try to be hygienic, but theory and practice are often different.*
- *Too much hygiene is not good; it disturbs the bacterial balance.*
- *Not overcrowding stables is more important than hygiene.*
- *None of the above.*

Of 83 responses on 82 farms, 43 (52%) chose the statement ‘We work as hygienically as possible’ (Supplement Table 5c). This statement was chosen more than average by entrepreneurs (15 of 19) and craftsmen (8 of 10). Stewards (5 of 13), stockmen (4 of 12), and shifters (6 of 17 responses on 16 farms) chose this statement less than average. A few farmers commented on their choice:

> *<U185> We work as hygienically as possible: everything is disinfected after every round and we never have overcrowded stables. The all-in-all-out system is also very important to us.*

> *<U039> We work as hygienically as possible. After every round the stables are hosed clean. But they are not disinfected – to find a balance between bacteria and infection pressure.*

> *<W205> If it is not necessary you should not disinfect, but cleaning is always important.*

These comments indicate that ‘working as hygienically as possible’ has different meanings to different farmers. Apparently these farmers all think that the stables should be hosed clean after each round (wet cleaning). But one farmer adds disinfection treatment as well, whereas the other farmers do not disinfect for reasons of bacterial balance.

Hygiene measures should also fit into the weekly working schedule. This schedule differs among farms (Section 5.1). On some farms there is tension between hygiene and the working schedule. One farmer commented:

> *<E141> We work as hygienically as possible, but is has to fit in the management. One should not exaggerate.*

For the farmers who have regular problems with fitting hygiene in the weekly working schedule the statement ‘We try to be hygienic, but theory and practice are often different’ was included. Surprisingly, this statement was hardly chosen (only 8 responses of 83 on 82 farms: 10%), although stewards (3 of 13) chose it more than average.

Stockmen (5 of 12) were relatively focussed on ‘not overcrowding stables’, which is a different approach to farm hygiene. The measure is meant to keep the germ pressure down.

Shifters (5 of 17 responses on 16 farms) were largely in favour of the statement ‘Too much hygiene is not good; it disturbs bacterial balance’. This clearly indicates that those farmers chose to strive for balance in germs and resistance.

Conclusion

The statement ‘work as hygienically as possible’ is rather general, and was therefore a popular choice for the farmers, though that choice was especially pronounced among entrepreneurs and craftsmen. Stewards, stockmen and shifters tended to value hygienic balance, which should be achieved by ‘not overdoing the cleaning’ and by ‘not overcrowding the stables'. For some farmers the desire to be hygienic is a problem in connection to the way they work; related to the weekly schedule.

Animal Welfare

Animal welfare was a hot issue in 1998, because the government had just enacted new regulations about group housing and other welfare measures for pigs to take effect in 2008.[39] Four statements related to animal welfare were presented to the farmers.

Animal welfare:
- *When the production is good, the welfare must be good as well.*
- *Group housing and straw bedding are better for the animals.*
- *A pig has no more value than as a commercial commodity.*
- *We only replace a sow when she is really old.*
- *None of the above.*

It was expected that craftsmen would choose the first statement more than average, because they are generally more focussed on the production results. Since stockmen are more preoccupied with the pigs themselves it was expected that they would be most likely to choose 'group housing and straw bedding'.

The most frequently chosen statement (34 of 82: 41%) was 'When the production is good, the welfare must be good as well'. There were no clear differences among styles of farming, though craftsmen chose this response slightly more than average (6 of 10) and entrepreneurs slightly less than average (6 of 19). Among farmers who chose 'None of the above' (19 of 82: 23%), there were more entrepreneurs (8 of 19) than average (Supplement Table 5c). The high percentage of farmers, particularly entrepreneurs, who chose 'None of the above' reflects the fact that farmers found it hard to express how they really felt about the issue of animal welfare. Their opinions were often more complex than could be expressed in one general statement, which explains why this issue generated the highest number of comments.

Among the farmers who choose 'When the production is good, the welfare must be good as well', several farmers gave explanatory comments. Often farmers turned the statement around in their comments:

> *<U004> If you treat animals well, they give you something back. If the animal welfare is good, then the production results are also good as a matter of course.*

> *<E306> If you treat your environment well you get good rewards. Treat the animals as employees.*

> *<F070> If you do not give enough attention to your animals then the production results will not be good either.*

> *<C226> Pigs are part of a food chain. But it has to be as agreeable as possible: no thirst, no chill, little stress, etc. And if the welfare is not good, then the production results won't be good either.*

In contrast, other farmers felt that production and welfare are actually independent entities:

<W140> The production results have to be good, as well as animal welfare.

<W122> The aim is to achieve as good production results as possible, while taking animal welfare into account.

Many farmers connect animal welfare and respectful treatment of animals directly to animal health. However, the behavioural aspects of animal welfare in relation to housing, which is currently an important topic in animal welfare research and government policy developments, get only marginal attention from most farmers.

A stockman warned that high production levels are causing increased sensitivity to diseases. As mentioned before (Section 4.3) stockmen are not focussed on high production levels:

<K175> If the farm results are good then the animal welfare is good as well. But the animals are more susceptible to diseases.

Some farmers felt that the statements did not cover their opinions, because they missed the role of the consumer. In the perception of farmers the animal welfare problem is not in the first place about animals, but about consumer demands. Among the farmers there were differences in the willingness to co-operate with these consumer demands:

<E115> It has to become economically possible to provide welfare. For the consumers we have to produce a tradable and well-treated pig.

<E217> Welfare is important, but there are limits. Consumers are critical, but also hypocritical.

<U086> We like to meet the demands of our clients. Nowadays they demand group housing.

<K323> It is a skill to bring coherence into what the consumer demands for ethical reasons, what is good for the welfare of the pig, and what the economy demands.

These examples reveal more about the attitude of farmers towards the consumers, than the attitude of the farmers towards the pigs. It indicates that these farmers are more weary of the behaviour of the consumers (who they seldom meet personally) than of the behaviour of the pigs (which they observe every day). The attitude of farmers towards the consumers is further discussed with regard to the next issue.

Raising the issue of animal welfare resulted in several additional comments about housing systems (see also Section 6.2). One farmer said:

<W122> For me the discussion is not closed about single ranged at a girth tether or loose housing. That can differ between farms.

This comment is not surprising, even though for the Dutch government and the European Union this discussion on single-ranged housing has long been finished – and even though the system has scientifically been proven to be bad for animal welfare. Some farmers continue to focus on animal health aspects as their first priority, and single-ranged housing has been proven to have the best potential for animal health control. The suggestion that animal health increases with behavioural welfare is basically wrong. Increased behavioural welfare is related to increased risks for injuries and diseases. But it supports the immunological development and a balanced growth of the animal and is therefore better for the animal health in the long run. The point is that pigs are usually not allowed to live in the 'long run'. Fattening pigs are usually slaughtered before they reach adolescence. The following comment is therefore correct, though the shortcut to *...a better life* is a bit hasty:

> *<U034> When pigs are kept in groups and on straw bedding the risk of infection is increased. It is not always true that an animal has a better life like that.*

The issue is that if animals (or humans for that matter) are kept in a (nearly) sterile confinement with little or no allowance for movement, they have very little risk of contraction infections or developing injuries. Yet this is not sufficient reason to call such an existence 'a good life'. Of course the opposite, a freer but unhealthy and painful existence, is not ideal either.

Only 14 farmers (of 82: 17%) actually chose the statement 'Group housing and straw bedding are better for the animals'. One of the farmers commented:

> *<W147> Group housing and straw bedding seem better for the animals and indirectly also for the farmer. Let's hope that the farm results will not be too bad either.*

So this farmer puts the importance of production results after behavioural welfare. That is a fundamental difference from all other comments given in the survey.

A contrasting opinion was expressed, for example, by an entrepreneur who chose 'None of the above':

> *<E066> It is important to find the balance between welfare, economic farm results and comfortable labour conditions. And comfortable labour conditions you won't get if you use straw.*

Stockmen chose 'None of the above' relatively more often (4 of 12) than average, but still the number was low. The interest of stockmen in the issue of group housing was expected. Stockmen are known to have affinity for pigs. The survey revealed that stockmen are slow in their investments – single ranged housing is more common among their farms than among the other styles of farming (Section 6.1). But most of them were at the time of the survey at a decision making stage about future investments. And for these investments they were more oriented toward group-housing, free-range farming or even organic farming.

The statement 'We only replace a sow when she is really old' was not chosen very much (7 of 82: 9%) in the survey. The statement appeared to cause confusion because of the word 'old'. In modern industrial farming sows are not allowed to get old. They are replaced when they get ailments (for example leg injuries), when the time between their oestrus cycles increases, when their production of piglets per litter decreases, or when milk production drops. They may reach full maturity, but they are not 'old' when they are culled for those reasons. So some farmers rephrased the statement accordingly:

> *<E162> We only replace a sow when she is no longer economically profitable.*

<F030> We only replace a sow when she is no longer satisfactory.

<F070> Actually we only want to replace a sow when she is no longer productive.

<U034> An animal should feel well, otherwise production is not good either. And a sow should only get replaced if production is really not good anymore.

The selection criterion for these farmers was economic profitability of the sows and not age. In Chapter 6 this issue is also covered extensively.

The economic profitability of the sow can be calculated from straightforward measures of the sow age, the last production in piglets, the remaining value of the sow for slaughter and the costs for replacement by a maiden sow (the TG-index). Not surprisingly, it was an entrepreneur who made the clearest comment about economic profitability cited above.

Yet some of the farmers really used the age of the sow as a criterion:

<K508> Elderly sows give somewhat less milk. Still I do like to keep them as long as possible.

It is not surprising that a stockman made this comment. As shown before, stockmen are interested in having pigs, and their greatest enjoyment in pig farming is caring for new life, the piglets.

A few farmers (8 of 82: 10%) chose the statement 'A pig has no more value than as a commodity'. For them this was not a positive choice but an acceptance of what they perceive as the reality:

<F052> Dumeco[40] treats pigs as a material resource. They only want them cheap.

This comment suggests implicitly that the farmer might disagree with Dumeco, but is prevented from putting that into practice.

Conclusion

The issue of animal welfare generated a lot of comments by the farmers. Yet the majority of the comments suggested that animal welfare should primarily be connected to production, animal health and respect for the animals. Behavioural welfare is seen by most of them as something that is indirectly imposed by the consumers. It thus appears that the discussion among farmers is poorly connected to the mainstream policy approach of the government and the European Union, in which behavioural welfare is the key issue.

Consumer Markets

Pig production is at the beginning of the pork production chain; consumption is at the end. In between there is a trajectory of fattening, slaughtering, processing and marketing. This trajectory has become more and more fragmented over the years into different firms. At the same time, the number of places and firms where each activity takes place has been reduced. The number of farms has been reduced and is still declining. But the decrease in the number of slaughter companies, processing factories and sales companies and supermarkets has been even more dramatic Paradoxically, the size of the area in which these activities take place has increased substantially. Pigs and pork are transported all around Europe, particularly among the Schengen-countries, which have an open-boarder policy.[41]

It was expected that a difference would be found in this study among styles of farming on the issue of farmer, and consumer relations. Entrepreneurs and craftsmen were expected to see consumers as being more calculating and to view supermarkets as economic units in a market. Stewards and stockmen were expected to be interested in contacts with consumers or to think that supermarkets were blocking their view of the market. Five statements about the role of consumers were presented to the farmers.

Consumer markets:
- *Farmers are the victims of the power of supermarkets.*
- *Supermarkets should conduct their business, like we should conduct ours.*
- *The trap for farmers is that supermarkets don't know the consumers.*
- *In future bulk production will shift to special products markets.*
- *Unfortunately farmers do not know the consumers at all.*
- *None of the above.*

Even more than with the issue of animal welfare, farmers found it difficult to choose one statement. The response 'None of the above' was chosen the most (20 of 82: 24%) (Supplement Table 5c). And just like with the issue of animal welfare, the farmers were eager to add comments, which revealed a variety of opinions.

'None of the above' was chosen most by craftsmen (5 of 10). Craftsmen generally believed that consumers opt for the cheapest products:

> *<C226> There is a difference between consumers and citizens. Citizens want other things than what consumers demand. The purchasing behaviour of people is not what research among 'consumers' brings forth.*
>
> *<C128> In the streets consumers demand that pigs should have free range, but once they are in the supermarket they watch their wallets.*
>
> *<C107> Most consumers choose only the cheapest meat. Only a small percentage is willing to pay for free range farm meat.*

Several farmers of other styles of farming that chose the same statement made similar comments:

> *<W140> The biggest problem is the doubt among the consumers. As a farmer you cannot rely on them. One day they will let you down.*
>
> *<F053> In the shops consumers do not keep their promises. Free-range meat is nice, until they see the difference in price.*
>
> *<W188> The consumer only wants free-range farm meat at Christmas. The consumer will always want the cheapest there is. The English chain store Tesco wants group housing, but they buy the meat from ordinary Dutch farms. I think that Albert Heijn will do the same.*

What these comments have in common is not only the conviction that consumers will buy the cheapest they can find in the supermarket. Implicitly or explicitly all these comments are linked to the societal discussion about animal welfare. These farmers are convinced that most consumers have a double morality. From an ideological point of view consumers seem to support improvement of behavioural welfare for animals, but in their actual purchases they do not accept the consequence, which is a higher price for pork.

One farmer commented by making an accusation. He accused supermarkets of cheating consumers by *'…telling the consumers what they want to hear [a story about animal welfare] and selling the consumers what they want to buy [cheap food]'*. Such stories circulate abundantly among farmers. They express mainly the suspicions these farmers have of supermarkets. Most of these stories do not seem to be founded in any direct research.

In contrast to the other farmers, no entrepreneurs chose 'none of the above'. Many (8 of 19) chose 'Supermarkets should conduct their own business, like we should conduct ours'. This statement was not at all popular among other styles of farming, as only 14 of the total 82 farmers (17%) chose that statement. Apparently entrepreneurs, and no other types of farmers, believe that business is business: and solely market demand and the economy determine it. No comments were given to elaborate on this choice.

Two statements that were equally chosen by all styles of farming were 'Farmers are the victims of the power of supermarkets' (17 of 82: 21%) and 'The trap for farmers is that supermarkets don't know the consumers' (16 of 82: 20%). These statements raised the question of whether the consumers or the supermarkets dictate the market. The farmers in the survey had contrasting views on that issue. These views did not seem linked to any particular style of farming. One farmer said:

> *<E005> The consumer dictates the market, not the supermarket.*

whereas another one said exactly the opposite:

> *<C139> The supermarket determines the market instead of the consumer.*

The triangle that connects supermarkets, consumers and farmers is also viewed in various ways:

> *<E217> Supermarkets make profits at the expense of consumers, producers and pigs.*

> *<W122> Supermarkets determine what consumers want. Farmers have to go along with it.*

> *<K071> Supermarkets dictate the markets. Farmers are the victims of that system.*

What these comments have particularly in common is the feeling of being powerless and defenceless. One farmer elaborated extensively on the issue of being powerless:

> *<W174> The power of supermarkets is so big because they co-operate among themselves. The agrarian sector is fragmented. Supermarkets force you towards a certain system, and – as an individual farmer – you wonder whether it is a desired direction. But you have no influence on that.*

Other farmers warned fellow farmers and consumers to be more aware of the power of supermarkets:

<F055> Supermarkets try to direct the farmers, not the consumers.

<W166> Consumers have to be more aware of their purchasing behaviour. Meat is now used as bait by supermarkets.

<C139> There is too much force; too many forced regulations. It has to go like this and it has to be like that. There is no room for ideas. You have to do it all like they tell you. It cannot be done otherwise. And it is the supermarket that dictates. And consumers just buy where it is the cheapest.

<E617> Supermarkets determine what consumers demand. Consumers are not as much interested in welfare demands, as supermarkets want us to believe.

These comments relate to comments about animal welfare. Several farmers had suggested that animal welfare – and in particular behavioural welfare – is primarily a consumer demand. While in these comments some farmers question whether it is the consumers or the supermarkets that dictate the issue of animal welfare.

Still other farmers accepted the consumers and the supermarkets as a 'fact of life' and emphasised what they perceived as farmers' duties:

<F0017> You have to try and keep an eye on society and decide for yourself based on what is going on.

<U313> Supermarkets dictate the market. You have to try and get something extra out of that – for instance with Tesco.[42]

According to some farmers the problem was not the consumer or the supermarket, but the trajectory in between:

<W147> There is a lot of money earned in the trajectory between farm and shop shelf, compared to the profits on primary production.

<K547> The ignorance of the consumer is a big problem. The consumer is unaware of all the work that is involved. The traders earn money, not the farmers.

These comments highlight an important aspect about the relation between farmers and consumers: the intermediate trajectory is often ignored. Yet it is the power of this trajectory to set prices in both directions: to the farmers and to the consumers.

The statement 'In future bulk production will shift to special products' was not chosen often (only 8 of 82 responses: 10%), but it was chosen relatively more by stockmen (2 of 12) and shifters (4 of 16) than by entrepreneurs (1 of 19) and craftsmen (0 of 10). Apparently entrepreneurs and craftsmen find it harder to imagine that less efficient production (for a special market) will have much future. A shifter that chose this statement commented:

<F052> The Netherlands cannot produce bulk market products any longer. Here it should come from specialities.

The advantage of specialities is that a higher price can be set, and that production is beneficial at places where cost prices are higher than elsewhere.

The statement ‘Unfortunately farmers do not know the consumers at all’ was chosen only 6 times (of 82: 7%). Yet in connection to that statement several farmers added comments. One farmer sighed:

> *<F077> The farmer doesn’t know the consumer, but the consumer doesn’t know the farmer either.*

Some disputed the statement because they thought that actually farmers should plainly fulfil the demands of the consumers:

> *<C008> Farmers have to fulfil the desires of consumers as much as possible.*

> *<E115> Our view on entrepreneurship is focussed on a product that sells well. The client should like the product.*

> *<U086> The consumer expresses what he wants and that is transmitted in the production chain.*

The actual worries of consumers (or citizens) about modern developments in pig farming in particular were very vocally expressed by an organisation that was founded after the Swine Fever outbreak of 1997/1998. The organisation is called ‘Varkens in Nood’ [‘Pigs in Danger’]. The organisation was not only opposed to the culling of (predominantly) healthy pigs (in total 11 million pigs), but also to the farming system from a welfare point of view. Since its founding the organisation has nominated a new ambassador every year usually a well-known personality in society. For this reason it was perceived as an ‘upper class’ movement among some farmers. Most farmers think that the shopping habits of consumers represent a cultural behaviour that does not change through an ‘upper class’ mission:

> *<K175> Food has become the item at the bottom of the list. Quality wins only if there is enough money for everything.*

The ambassador for ‘Varkens in Nood’ at the time of the survey in 1998 was Youp van ‘t Hek, a well-known cabaret performer. He had apparently made a lasting impression on some pig farmers, judging from the fact that his name was mentioned a few times in the survey. The comments varied though and were not typical for any particular style of farming:

> *<K317> The consumer doesn’t know the farmer. That is the problem. They say they want free-range farm meat. But actually they are provoked by a bunch of agitators, like Youp van ‘t Hek. In fact they should pay more attention to their own wallet.*

> *<K323> The treacherousness of big supermarket chains is that they don’t realise themselves what kind of role they play. All farmers would agree with Youp van ‘t Hek if that would pay. But 80% of the consumers just look at prices. In free-range farming the costs are not covered.*

The first farmer perceives Youp van ‘t Hek – and all he stands for – as the ‘enemy’. According to him (or her) the whole discussion about animal welfare, free-range farming, etc. should be closed. And consumers should go back to doing what they are supposed to do according to classic economic theories: buy cheap products and ignore the processes. The frustration he feels in not being able to mould the market environment to his wishes is reflected in his comment. The second farmer has no principle disagreement with Youp van 't Hek, but is dissatisfied that the condition for compliance (sufficient payment) is not being met. Another difference between these two farmers is that the first farmer thought that consumers dictate the market. The second one indicated that according to him supermarkets dictate the market.

It is interesting that all these farmers see the 'consumer' as a Dutch citizen, buying meat in a supermarket. That image does not represent the 'average consumer' of the pork from their pigs for three reasons. (1) About 60 per cent of the young pigs and the slaughtered animals are sent abroad; (2) a lot of the pork is processed, and thus not sold as plain meat; and (3) a lot of the produced pork reaches the consumers through restaurants and fast food establishments. So the majority of the 'consumers' of pork are not individuals, but representatives of business companies. The shopping behaviour of individuals who buy meat in supermarkets, even if they would be willing to pay a higher price for animal welfare, has limited influence on the price set on the wholesale market.

Conclusion

According to the farmers consumers have a double morality: they want improved animal welfare and cheap food at the same time. For many entrepreneurs there is no dilemma: 'supermarkets should conduct their business like we should conduct ours'. For craftsmen and other styles of farming, the dilemma is important: they feel trapped by these contrasting consumer demands. Many farmers expressed their confusion about the issue by commenting on whether supermarkets or consumers dictate the market, and on how to approach consumer organisations like 'Varkens in Nood'.

5.3.3 Conclusions: Statements and Styles of Farming

In the survey sets of statements were used to encourage interviewees to express their opinions about certain issues in pig production practices. This interview strategy can help people make up their minds, especially if interviewees are not well trained in expressing themselves verbally. In the current research the statements were carefully prepared. They were extracted from open interviews with farmers in the initial study, or in similar studies. The purpose of the statements was not primarily to classify farmers, but to encourage farmers to express their opinions. The statements were formulated in such a way that the original intention was preserved as well as possible, even though for reasons of space some original differentiation was lost.

It appeared that the statements did help the farmers make up their minds. It was a fast way to extract opinions. But the responses of the farmers were often not as clear-cut as the statements would suggest. The number of times that the farmers responded with 'None of the above' varied from zero (about time and labour management) to twenty (about consumers). In addition, farmers often explained their choices with comments in such a way that the meanings of the statements were substituted, or put in a different context. These differentiations could not be caught in parameters – and therefore they were not incorporated in the computer analysis.

This procedure is completely contrary to the method used in the initial study. In the initial study the classification of farms was mainly based on contrasts in comments made in open interviews. The interviews were evaluated for contrasts and coherence of the comments (initial study). In that case, the more differentiation that was given between farmers' opinions; the more accurate the classifications could be made. The evaluative study was completely different, because the differentiations could not be put in the computer analysis. So the more differentiation a farmer gave, the less value his or her actual choice among the statements would be.

In the evaluative study styles of farming were selected based on Productivity, Intensity, Scale and parameters that were correlated to Productivity, Intensity and/or Scale. It appeared that only three (of 57) statements were correlated to Productivity, Intensity and/or Scale. The value of the statements is that when connected to the accompanying comments they confirm the differences among styles of farming.[43] All other statements were not correlated to PIUS and therefore did not contribute to the criteria for the classification of farms. Yet this section (5.3) has shown that insight into the farmers' reasons for choosing particular statements gives clear support to the differences among styles of farming.

The choices made, including the reasons given for choosing or disregarding a particular statement, confirmed the expected differences in ambitions and rationales of the styles of farming. The differences in ambitions that were found confirmed that entrepreneurs and craftsmen operate within the sphere of competition and they illustrated the differences in their rationales within that sphere. Those farmers also preferred specialised farms. For entrepreneurs specific support for their rationale was found in the economy of investments. In this sphere farmers considered their farms to be big enough for automation – and their strategy was to pursue this. Entrepreneurs differentiated themselves by emphasising that good automation allows more time for animal care, and that 'At the end of the day it is the profit that counts'. Entrepreneurs and craftsmen 'work as hygienically as possible'. They approached the issue of animal concentration, manure management and land from a large-scale perspective. They argued for a balance between animals and acreage on a regional, national or global level and reflected on European regulations on that issue. With regard to animal welfare, the difference in rationale between entrepreneurs and craftsmen was revealed. Entrepreneurs emphasised a connection between animal welfare and consumer demands. They thought that 'supermarkets should conduct their business, like we should conduct ours'. Craftsmen emphasised a connection between animal welfare and production; they felt trapped by the double morality in consumer demands.

The sphere of participation and autonomy for stewards, stockmen and shifters was supported through the issues raised by the statements – as well as their differences in rationales. The difference in ambition emerged on the issue of the enjoyment of pig farming. For stockmen support for the rationale was found in the enjoyment of caring for the new life: the piglets. Their farms are often too small for complete automation. Stewards differentiated themselves from stockmen and shifters by choosing more than average the statement ‘A good farmer always pays attention to the figures’. Farmers in the sphere of participation and autonomy emphasised that ‘A smaller farm that is well managed is better’ (stockmen and shifters) and ‘A good farmer knows when to be satisfied’ (stewards). Stewards, stockmen and shifters interpreted ‘Working as hygienically as possible’ differently than entrepreneurs and craftsmen, through additional comments such as ‘one should not overdo the cleaning’ and ‘not overcrowding stables is important’. They approached the issue of animal concentration, manure management and land, from a small-scale perspective. They argued for balance between animals and acreage on local or farm level and reflected on national regulations on the issue. Stewards, stockmen and shifters perceived animal welfare as an issue that is primarily connected to animal health, respect for animals and consumer demands. They found it hard to focus on the double morality in the consumer demand for both behavioural welfare and cheap food. There is confusion whether to focus directly on consumers or on supermarkets, and how to perceive activist organisations for animal welfare.

The position of women on the farms was very differentiated. It depended on the age (and health) of the children, the personal ambitions of the women, to work on the farm or have an off-farm job, other specific circumstances and the style of farming.

Many issues that were raised did not lead to extensive comments. The comments were merely clarifications of how the farmers understood the statements. But there were a few issues that led to extensive differentiating comments by the farmers. This was true of the question about manure management and the connection between animals and acreage. Here the discussion was distinctly between the spheres of ambition (large-scale approach versus small-scale approach). Another question that led to many comments was about behavioural welfare for animals in connection to consumer demands. The farmers emphasised the double morality of the consumers in demanding both animal welfare and cheap food.

5.4 Outlook on Current Prices and Policies

The period in which the interviews were conducted was October / November 1998. That was only a few months after the end of the swine fever epidemic (May 1998), which had started over a year earlier (February 1997). The south of the country was directly affected by the outbreak, but farmers in Twente and The Achterhoek experienced some of the consequences too. In some local areas in the east animal transport had been blocked, and the export of pigs and pork from The Netherlands was blocked for over a year. This had a huge impact on all pig producers in the country, since until then about 60 per cent of the Dutch pigs and pork used to be exported at that time.

In the few months between the reopening of the export market (in May 1998), and the interviews, pig prices had dropped dramatically – to far below the cost price for production. An open question was incorporated in the survey asking farmers whether they had expected this price drop – and if so why. Some farmers who had not expected the price drop commented as well, reflecting in hindsight why the prices had dropped. The farmers were also asked whether the price drop could have been prevented. The objective of these questions was to get an impression of the outlook of farmers on developments in prices and policies – and the differences among styles of farming concerning this outlook.

5.4.1 Outlook on Market Fluctuations

In response to the question 'Did you foresee the dramatic drop of pig prices?' 41 of 82 farmers (50%) answered 'yes'. There was no difference in the rate of positive or negative responses among styles of farming (Supplement Table 5d). Although there was no solid basis upon which to predict how farmers would respond to this question, I had personally expected that nearly all farmers would say 'yes' – because I too had expected the decrease for several reasons. This made it even more interesting to learn how farmers motivated their answers, and in this respect a difference among styles of farming was indeed found.

When asked to explain, some farmers who had answered 'yes' gave a reason for why they had expected the prices to drop and others gave none. In addition some farmers who had not expected the drop in prices, mentioned some reasons in hindsight. In all this resulted in 74 reasons given by 82 farmers. Of all these, 19 entrepreneurs gave 29 reasons (average 1.5 per farmer), whereas 16 shifters gave only 8 reasons (average 0.5 per farmer). The other styles of farming gave 0.9 reasons per farmer – which corresponded with the population average.

The distribution over the styles of farming confirmed the image of the styles. Entrepreneurs take interest in developments in their farm business and in market developments. They probably read newspapers and magazines about their business. (There were no specific questions in the questionnaire about gathering business information.) Shifters on the other hand were shifting their attention to other activities. They were probably less focussed on gathering information about developments in the pig production branch.

For this study, farm magazines and other sources of information were not systematically checked for the ways in which they covered the issue of a potential price drop. But background news analyses had been noticed in several magazines. Undoubtedly that information influenced the farmers' answers. The farmers gave basically five different reasons for the drop in pig prices:

1.a 'Regular price cycles'
2.a 'The restart after the swine fever epidemic'
3.a 'New government laws (launched 10 July 1997) regarding hygiene and transport'
4.a 'The investments in pig industries abroad while our export was blocked'
5.a 'The economic crisis in Asia'

The reason that was mentioned the most (36 of 74 on 82 farms: 49%) was *(4.a)* 'the investments in pig industries abroad while our export was blocked'. This answer was more or less evenly distributed among the styles of farming. It is likely that this reason was also the most dominant in influencing the pig prices. When the Dutch export was blocked in 1997 and 1998, the pig prices on the European (and global) market increased substantially, because The Netherlands had been an important supplier. For almost a year and a half, international competitors had the chance to take over that market. The branch magazines noted in that period extensive investments in pig farming abroad – particularly in Denmark and France.

A striking difference among the styles of farming was found with the reasons *(1.a)* 'regular price cycles' and *(2.a)* 'the restart after the swine fever epidemic'. These answers were predominately given by entrepreneurs (8 and 7 of 19). They also accounted for the high number of reasons in general among entrepreneurs (Supplement Table 5d). The answer 'regular price cycles' refers to the simple economic law that prices drop when the supply is high, and prices increase when supply is low. It is common knowledge in The Netherlands that pig prices have always reacted sharply to market fluctuations. These fluctuations are even called the 'pigs cycle' of prices. Some farmers believed the end of the export ban was just one of the reasons for pig price fluctuation. The price drop was just business as usual.

The reason 'restart after the swine fever epidemic' was also clear as an explanation. A large number of farmers in the south of the country had not been producing pigs for nearly a year and a half. When all special regulations stopped, they all resumed production at the same time. As a result the price for maiden sows increased dramatically at first. Consequently a few months later, at the time of the interviews, there was an excessive supply of feeder pigs.

The next question about this subject was: 'Could the drop in pig prices have been prevented – and, if so, how?' Of the 82 farmers 36 (44%) answered 'yes', that is slightly less than the number of farmers who had foreseen the drop in prices. Stockmen (10 of 12) in particular were convinced that the drop in prices could have been prevented somehow. Such a conviction was much less prominent among entrepreneurs (6 of 19) and craftsmen (3 of 10) (Supplement Table 5d). The 82 farmers gave 89 explanations as to why (or how) the drop could (or could not) have been prevented. Thus more responses were given in support of answers to this question than in support of answers to whether or not the farmers had foreseen the drop in prices.

The number of responses was again more or less evenly distributed over the styles of farming, with an average of 1.1 per farm. But this time stewards gave slightly more answers, on average 1.3 per farm.

The responses can be grouped into six basic reasons mentioned by the farmers:

1.b 'no', 'The drop in pig prices is the result of a free market.'
2.b 'yes', 'Farmers should have prevented it (by not filling up all stables at the same time).'
3.b 'yes', 'The new laws (launched 10 July 1997) should have been different.'

4.b 'yes/no', 'The law introduced in 1984 should already have been different.'
5.b 'yes/no', 'Policies of the European Union (EU) should be different.'
6.b 'yes', 'The policy to control the swine fever outbreak should have been different.'

Answers *(1.b)* and *(5.b)* were given most often, each receiving 24 of the 89 answers (27% each). These answers were more or less evenly distributed among the styles of farming.

Several farmers blamed the policies of the national government for the drop in pig prices, either through recent policy developments (10 July 1997) or through all the regulatory policies since the premium subsidies on investments in farm buildings stopped in 1984. One farmer said:

> *<U212> When the Interim-law was introduced in 1984 the comparison factor for exchanging fattening pigs for sows was not well calculated. Besides, before that, the farmers' extension service from the government advised us to take the WIR-investment*[44] *premiums.*

This farmer was referring to the initial introduction of laws for production control and environmental protection that started in 1984 with the Introduction of the Interim-law. Through this law pig farm expansion was no longer unlimited. After the introduction of that law, farmers had to register the number of animals they had. Some farmers did so honestly, while others exaggerated their herd sizes. (On average the national pig population was exaggerated by 30%.)

Based on the Interim-law farmers could only expand their farms by purchasing 'production rights' from other farms. (When production rights were purchased the government reduced those rights by 30 per cent to compensate for the exaggerated amount.) To facilitate the market for production rights the production rights for boars, sows, fattening pigs, etc. were made exchangeable through official conversion rates. It is to this aspect that the above farmer was referring: he disagreed with the official conversion rate between sows and fattening pigs.

The farmer also referred to the WIR-premium, which ended in 1986. Farmers who wanted to invest in stables for farm expansion could get interesting tax-premiums. The government extension service used to be active in advising farmers (free of charge) on how to make use of these premiums and what stables to build. A high percentage of the stables that were build in those years (predominantly for single-ranged systems) were still in use in 1998 when the interviews took place, though about fifty percent of the stable equipment had been renewed in the meantime.

A special note should be made about answers *(3.a)* and *(3.b)*. They both refer to new government regulations that were launched in a letter from the Minister of Agriculture on 10 July 1997 – five months after the start of the outbreak of swine fever. In that letter the Minister announced a total reconstruction of the pig production sector in The Netherlands,[45] which involved extensive regulations on farm locations, animal transport and hygiene, etc. The regulations on farm location require an explanation. When farmers expand their production rights by purchasing rights from other farmers, they cannot simply use these production rights at whatever location they would choose: usually their home location. That depends on the ammonia emission rights, which is specific for each location, and depends on the sensitivity of the environment – proximity to nature conservation areas, urban population, etc. Therefore an increasing number of farms had two or more locations for production. As far as possible farmers tended to specialise the production per location – for example one location is used for pig production and another for fattening. Soon after the outbreak of the swine fever epidemic in 1997 this practice of specialisation appeared to be problematic with respect to piglet housing. Within a few days or weeks all pig producers with specialised locations had problems with housing the piglets, because all transport of life pigs was prohibited. So in the announcements of 10 July 1997 the specialisation per location was discouraged by the government – without withdrawing the laws on ammonia emission. Other features of the new laws announced on 10 July 1997 were new regulations for hygiene, particularly concerning animal transport and the means of transport.

It is remarkable that though farmers mentioned this letter from the Minister only two times as a cause for the drop in prices, they mentioned it 14 times in relation to the possibility of preventing the drop in prices – if the content would have been different (Supplement Table 5d). Apparently farmers disagreed with the content. Stewards (5 of 12) mentioned the letter more often than average and entrepreneurs (1 of 19) less than average. One steward noted:

> *<W024> The government should have made good regulations to allow farmers to stop after the outbreak of swine fever. Then the prices wouldn't have become so low either.*

This farmer is referring to offer of the Ministry of Agriculture in 1997 and 1998 to the pig farmers for selling their pig (manure) production rights to the government. There were discussions whether the prices that the government offered were right. In 1997 the offer was only open for farms in the swine fever affected area in the south. Then 550 pig farmers sold their production rights. In 1998 the offer was open to all pig farmers in the country. Then only 323 pig farmers sold their production rights.[46]

5.4.2 Outlook on Government Policies

Raising the issue of a market perspective led to several comments on national and international policies and market developments, which are worth mentioning. Some of the comments reflected a general view:

> *<C226> The circle that is formed by London and Paris and into the Ruhr-area in Germany and over Apeldoorn and Amsterdam back to London is destined for living, working and recreation. In that circle there is hardly any place for farmers. The land is just too expensive. Only in the north of the country will any space remain for farming.*

The perspective that is given here is in line with a report of the Ministry of Housing, Spatial Planning and the Environment (Ministerie van VROM 1998). The expectancy is that in the long run farming is not profitable enough to exist on that expensive land.

Another farmer expressed a view on the future perspective of pig price cycles:

> *<W166> In future the cycles in pig prices will increase to about eight years, with less pronounced peaks and deeper troughs.*

The farmer did not specify on what information he based his (or her) ideas. But the feeder pig is a market for 'real cowboys' – as some pig farmers call it, referring to the liberal behaviour of the traders. The destination and prices for feeder pigs are sometimes not determined until the feeder pigs are loaded for transport. Especially since the Schengen-agreement went into effect in 1994 to open international boarders in the EU, the pigs' destination is increasingly abroad. The advantage of this flexibility is that the margins in the market are used and price fluctuations are reduced. Particularly the peaks in prices are thus reduced. The disadvantage of the liberal trade system is the risk of outbreaks of diseases and the spread of diseases over Europe. The large outbreaks of swine fever in 1997 and foot-and-mouth disease in 2000 have illustrated the increased risks for epidemics.

Subsequent new insights in food safety and animal health have led to new government regulations against clustering animals from different farms. This means that animals from different farms cannot be mixed in a combined transport – unless they are being transported to a slaughterhouse. This regulation was already mentioned in this thesis with reference to the introduction of a 3-week working schedule for pig production. Thus pig producers can increase their transport group by threefold. The regulation also reduces the elasticity of the market for feeder pigs.

Low prices for pigs depend on the saturation of the fattening pig market. This market depends primarily on the available slaughter capacity based on the number of slaughter-hooks. A slight overproduction causes deep drops in prices. A slight underproduction may result in a fast increase of prices. Some pig traders are able to take advantage of these fluctuations because pigs that are ready for slaughter maintain their quality in terms of 'desired body weight for slaughter' for three to four weeks. Pig traders buy pigs when prices drop, and sell them a little later wherever the market is more advantageous anywhere in Europe.[47]

In 1996 the number of slaughterhouses in The Netherlands was reduced through subsidy-based regulations of the government to a limited number of large companies. This was done in relation to new European regulations about hygiene. Thus total capacity of slaughter-hooks was reduced in accordance with the decreasing number of pigs in the country. But the manoeuvre to concentrate slaughter-hooks in only a few companies has put the elasticity of the market under more pressure. Since 1998 the population of pigs in The Netherlands has been persistently decreasing from over 15 million to about 11-13 million in 2003.[48]

As a consequence of the decreasing market and new government regulations on hygiene many remaining small and large slaughterhouses closed. In November 2002 only 18 locations of big slaughterhouses (slaughtering a total of more than 25,000 pigs per year) were left. Just a few companies own these locations, so the national authority for competition (NMA) is now investigating the formation of trust cartels.[49]

The majority of the comments on the issue of policies were focussed on the Dutch government. For example:

> *<E162> There is no sensible word coming from The Hague [the government – MC] anymore. They are unpredictable and practically impervious to reason. Arguments are not important.*

Unfortunately this farmer did not specify what arguments should have been heard. Among the farmers in the survey there were different ideas about the direction that the government should take. Even within styles of farming there seemed to be disagreement. Especially among entrepreneurs some striking comments concerning this issue were made. One entrepreneur said:

> *<E115> The Ministry of Agriculture should relate better to farmers, and be open to non-standard farms – like farms with several locations. The Minister of Agriculture should come from an agricultural background – like having parents with a farm. Then the affinity with farmers would be better: more empathy.*

If this farmer would have it his (or her) way, and an agricultural background would be a criterion for becoming Minister of Agriculture in The Netherlands, then the population to select from would be less than 4 per cent – and still decreasing. Farmers are a small minority in the country. But a more important question is what a farmer's son or daughter would do better if he or she were in the position of being Minister. According to this farmer such a Minister should *'…be open to non-standard farms, like farms with several locations'*. In other words: allow farms to expand. However, this study has shown that non-expansion is more common, 'standard', than farm expansion. But whether that is desired is even disputed among farmers. The comments in this study illustrate that many farmers (particularly in the sphere of participation and autonomy – stewards, stockmen and shifters) would rather not expand if that would allow them a living. The message to allow further expansion is most often heard from entrepreneurs, like in the comment of this farmer:

> *<E633> Expansion is required because of the government measures. The number of sows that you have should account for all investments the government demands. So the more sows you have, the more efficiently you can produce.*

But another entrepreneur expressed a completely different view:

> *<E195> I am satisfied with my farm, but I am dissatisfied with the political regulations. It is getting harder. … We use every opportunity to attract attention to our problems. Unfortunately the trend is that only large-scale farms will survive. The issue is whether that is desired.*

So this farmer – even though he has a large-scale farm in comparison with other farms in the area, dared to dispute whether on-going scale-enlargement should be desired as a national development. And another entrepreneur said something similar:

<E167> We understand very well that something has to be done about the current expansion. But the big farms stay and the family farms quit.

In connection to national pig production, several farmers contributed to the discussion on whether The Netherlands should continue to produce so many pigs:

<K180> Of every pig sold, two out of three are exported. That is not realistic for the future.

<W188> I have always favoured the reduction of the national herd size. The superlevy[50]*worked perfectly in the dairy branch. They should have done the same thing with the pigs. They should have bought off 40 per cent of the production. You should not produce what you cannot sell. But they shouldn't come with the current regulations. ... They should have reduced the national herd size in 1986. But that was not feasible then. Then the pig-keeping business was still too important for the national economy.*

Many people (farmers and others) admit that in the 1980s it was not feasible in national politics to take drastic measures to control the national pig production. One reason cited above was that the *'...pig-keeping business was still too important for the national economy'*. Other reasons often mentioned were the conglomeration of political power based on the integration of farmers' organisations, their allies (high-ranking officers) at the Ministry of Agriculture and the Ministers at the time, all of whom had an agricultural background (Frouws 1993). This conglomeration of political power is often referred to as 'the Green Front'.

One of the remarkable things about the comments that the farmers made on policy developments is that they easily refer to developments dating ten to twenty years back. This is in deep contrast to the way policies are usually covered by the media and defended by politicians, who usually do not look any further back than the previous cabinet period (a maximum of four years). Farmers live in a far longer term perspective. They think in terms of farm succession cycles – about 30 years. This cycle coincides with the write-off period of stables. Stable equipment has an average write-off period of about half a farm succession cycle (see also Section 6.1).

Some farmers even based their comments on a time further back in history, to the previous generation when farmers had an important status in society as providers of food:

<F052> During the Second World War thousands of people came to the countryside for food. In a new crisis there will be nothing to spare.

<U212> If there would be a disaster for the people next year, then all emergency channels would open to produce food. Besides, elsewhere, extensive agriculture causes too much erosion. Eventually it shall all turn into intensive production. If The Netherlands would go back to the level of self-sufficiency, it would be an impoverishment. Fertile land would be wasted to expansion. ... Farmers are not third-class citizens, but part of a food chain process. We are important. ... Within a few years food will become expensive. The surplus of grain in Europe is now so small that

there are risks for shortages. The McSharry-regulations[51] *should stop as soon as possible.*

What is clear in these comment is the longing of this farmer to be recognised as important in society: to have status. That message is more significant than the facts they are trying to put forward. The facts about erosion and the shortage of grain can be disputed. But such a dispute would lead away from the emotion the farmers are putting forward about the undervalued position of farmers. Many farmers feel that they are victims of this situation:

<K547> The government in a certain way pushes farmers and next the farmers are victims of the policy.

This feeling of being a victim of government policies is sometimes underlined by the fact that the national government has the opportunity to influence European policies. The feeling is that if the government has that power, then why doesn't it use that power to the advantage of the farmers?

<K608> The future of pig keeping is dark. There are too many costs that are not transmitted into production. It is time that the countries of the EU are all treated the same. ... If the problem of the world surplus of grain would be solved, then pig keeping would be reduced to an acceptable level.

In addition to the complaint about EU policies and the national government, an important issue was stressed here: the availability of grain in the world. Is there a surplus of grain in the world or not? From an economic point of view there is a surplus, because on the world market prices are low; and from the food availability perspective enormous amounts of cheap grains are available to feed livestock. But from a distribution perspective there is not enough grain for human food available in large parts of the world. And if grain prices would rise again, tapioca and soya beans would replace grain in animal feed (for example in The Netherlands) again. This happened before the McSharry agreement existed. So the issue of grain availability is very complicated.

Not all farmers concentrate on the government as a focus for their frustrations. Some farmers turn to their own farmers' unions. One farmer said:

<W188> Wien van den Brink [chairman of a union of pig farmers – MC] has destroyed more than he has achieved. He continues to emphasise production. It is time that we – as farmers – become more realistic.

The union of pig farmers is a small but outspoken pig farmers' union. Their chairman Wien van den Brink is a public figure, who is often prominent in the media. Opinions on Van den Brink and his group vary among pig farmers.

Conclusions

The comments farmers gave in support of their choices of statements in the questionnaire reflected how these statements should be used in studies about styles of farming. The value of the farmers' choices among the statements depended on the differentiating comments they gave. Together they provided good insights into the styles of farming in the research area.

For example, this study has shed an unexpected new light on the issue of flexibility and elasticity. This issue was highlighted several times in this chapter in connection to income from the farm, work done by women on the farm, and market prices of pigs. Entrepreneurs were economically strong and had a high income, but also very specialised. Stewards were economically weaker and had a low income, even if the income was corrected for Productivity, but had flexible sources of income.

With respect to the position of women, women seemed to have equal power on the farm. Yet, depending on the style of farming, women also had flexibility in their choice of activities. The activities of women on the farm varied with farm size, the age of the children, the stage in the succession cycle and the presence of hired labour on the farm. Through the ongoing streamlining of the processing sector and through government regulations, the elasticity of the markets for pigs has been reduced. This has increased the vulnerability of the trade market for pigs. Slight changes in production may cause profound disturbances in price level – particularly in the case of excess production.

In general farmers in the study area perceived their area as genial and relaxed. The majority of the farmers appreciated the scenic beauty of the area, characterised by a small-scaled landscape. The farmers also appreciated the social atmosphere in the area, which they perceived as cosy. The majority of the farmers was also satisfied with their income, of all styles of farming. What the farmers disapproved of the most were the way government regulations were imposed and the pressure on persistent farm expansion.

Farmers in the sphere of competition – predominantly entrepreneurs and craftsmen, concentrated on international developments, dominated by the World Trade Organisation (WTO) and the European Union (EU). They felt pressured by what is happening in the world – at global level, with respect to markets, food safety and animal health. Their response to this pressure is to continue increasing their farm's Intensity and Scale. They would prefer the national government to restrict the development of regulations to ensuring a level of fair economic competition with other regions. They would prefer standardisation of regulations at the level of the European Union (EU). In a climate of policymaking at EU-level they have confidence in their ability to deal with the demands of lobbying groups about environmental pollution and animal welfare. Ultimately (some of) these farmers would be willing to take the consequence of leaving the region and settling somewhere else.

Farmers in the sphere of participation and autonomy – predominantly stewards, stockmen and shifters – concentrated on developments at national and regional level. These farmers felt pressured by the government's push towards further expansion, which they do not see as a long-term solution for farming.[52] They acknowledged that the ongoing expansion has created effects in terms of environmental pollution and animal housing, but they felt squeezed between the demands of lobbying groups for environmental protection and animal welfare, and developments in markets and government regulations that force further farm expansion. These include government regulations that were made to accommodate the demands of the lobbying groups. These farmers felt squeezed by what they saw as self-indulgent perpetuity of national government regulations.

The farmers in the sphere of participation and autonomy were willing to open a societal discussion about farm expansion. To them that discussion should be about farm continuity and a fair level of income, under reduced farm expansion – or even under conditions of reduced farm size. For them moving away could be an individual option, but not an option for the region, for which they also felt a responsibility. Some alternative ways out of the dilemma were expressed by shifters – in shifting activities and markets, and by stockmen in re-orienting production to free range and organic farming.

Rural people in The Netherlands live in a 'subculture' that is to a certain extent distinct from the urban society. Within this subculture a further division can be made between farmers and non-farmers, and maybe even between pig producers and other types of farmers. What the pig producers in this study considered to be an ordinary or commonly accepted way of discussing certain issues may be surprising to international readers of this work – and maybe even to readers within the Netherlands.

In the discourse among farmers in the study, the issue of farm size, intensity, and scale, was seen as a problem, for society as well as the farmers themselves. Many farmers in the study believe that family farming should be a socially desired situation. And a family farm should provide sufficient income for a family – and work for the available labour. This dictates a certain minimum size, intensity and scale. So if society is dissatisfied with the current size, intensity and scale of the farms at present, as expressed for example by environmental groups, than society should take measures to improve the situation. On the other end, the majority of the pig producers also consider real big farms (with more than a few hired personnel) a problem as well – because they are no longer family farms. And even among family farms there is a dispute as to how big a farm should be – as can be concluded by the comments in the survey about the larger farms in the south of the country.

In the discussion in the government in The Netherlands, family farming is not an issue for discussion. There is no general acknowledgement that farms should be primarily family farms. Farming could be anybody's business. Consequently there is no acknowledgement that farms should be big enough to provide a family income. So as far as the government is concerned, the modern problems with manure and environmental pollution are not related to the issue of family income. They are independent problems, to which independent regulations should be applied. So if farmers other than family farmers could better meet those regulations, than family farming should cease – or continue somewhere else.

For many farmers such a point of view is incomprehensible – particularly if their ambition is in the sphere of participation (stewards and stockmen). Family farming has always been part of the tradition of the country and of the national culture and pride.

Farmers in the sphere of competition (entrepreneurs and craftsman) have somewhat less problems in accepting the situation – particularly since some entrepreneurs were prepared to leave the country. But clearly in most cases, these two discussions do not meet. There seems to be no internal need or external inevitability for a confrontation between discussions.

To a certain extent the perspective of government is logical: why should farmers be 'privileged' to occupy the scarce rural area of this country? (See for example in Schnabel 2001). But at the same time, farmers have a point from an historical perspective. Farming in The Netherlands would not have developed in the way it has, if it hadn't been for government relations pushing it in that particular direction. It is as much a result of policy planning as anything else. But policy makers are not so much preoccupied with the policies of their predecessors, as with the present and the future – particularly in the short term. So unless farmers find arguments in the (near) future to convince government of the legitimacy of continuing as family farms, the link to the family income will not be acknowledged by the policy makers.

In The Netherlands there have been piles of government regulations developed to gain control over the external effects of farming that are not desired by society – particularly manure and mineral emissions. This is illustrated by many comments of farmers cited in this chapter. The discussion in the government is about the reduction of the disposal and emission of minerals – in particular where it may be dangerous for water (drinking water) and nature conservation areas. In addition, the government wants to reduce the smell in urban areas. In the Reconstruction law (released in 2000) the government even took the ultimate consequence by actively removing pig farms that were in close proximity to nature conservation areas. In a brochure the government explained: [53]

> *'…The eutrophication of surface water and the deteriorating quality of ground water are caused largely by minerals leaching into the environment. The ammonia emission from livestock manure are acidifying the soil and causing grass invasion in nature areas.'*

The regulations in turn had their own external effects. The farmers found some regulations to be confusing, unfair, contradictory or problematic. Consequently many comments made by the farmers in this study focussed on government power and government regulations, and not on the societal issues at stake. Many farmers, irrespective of their style of farming, expressed the same complaints.

For most farmers in the survey the discussion about environmental protection and manure was about restrictions to farm expansion. And all restrictions hampered further farm developments. There was hardly any discussion about the issue of pollution itself. Some farmers even rejected the idea, but most acknowledged that manure creates a problem for society, or at least a manure distribution problem, that should be solved. But for farmers manure is a not a key problem – the key problem is the combination of government regulations and the pressure to intensify and increase the scale of production in order to protect their income.

The government regulations also reflect incongruity in the perceptions of different aspects of farming. First, the concept of manure, which used to be seen a blessing of farming, is now seen as a burden. But also how each side views pigs is different. It is hard to find a direct explanation, for example, of why pigs, which are forest animals by nature, should be removed from the vicinity of forests for the sake of environmental protection. It raises questions about the discussion within the government about the perception of problems in farming in The Netherlands and the basic approaches for solutions.[54]

Many farmers in the survey felt powerless in society. But the issues around which power was concentrated in society were perceived differently by the farmers. Farmers were particularly reluctant to discuss these issues. Although many farmers in the survey addressed the issues of animal welfare, environmental protection and consumers' concerns extensively, they avoided offering solutions to these issues in a way that matches the expectations in society. They perceived these issues not as their problems, but as things that others imposed on them – the government, lobbying groups, supermarkets, etc. When the subject of animal welfare was raised, for example, many farmers in the survey thought primarily of animal health and respectful treatment of animals and only secondly, or even marginally, of behavioural aspects of welfare. According to the farmers the issue of animal welfare should be primarily addressed from the perspective of consumer behaviour. In civil society as well as in science, animal behaviour aspects dominate the discussion about animal welfare. According to these groups, the issue of animal welfare should be an ethical discussion about animal housing. In the perceptions of civil society and scientists, animal health is a separate topic.

Notes

1 see: http://www.cbs.nl/en/figures/keyfigures/llb0005t.htm

2 Average number of sows calculated via log transformation of data.

3 <X024> is a code for a farmer. The letter <X> stands for the classification of the farm:

<U> Unclassified

<E> Entrepreneur

<C> Craftsman

<W>Steward

<K> Stockman

<F> Shifter

<H> Inheritor

<T> Tender

All comments quoted in this report were recorded during this survey, unless stated otherwise. They are translated from Dutch into English.

4 The initial study was done with open interviews and conducted in 1996 (Commandeur 1998).

5 In Dutch: hinderwetvergunning

6 Personal communication of ir. Hay Hendriks (2003), pig farming expert, Expertise Center, Ministry of Agriculture.

7 Average no. of sows calculated via log transformation of data.

8 In Dutch: trouwen op huwlijks voorwaarden

9 Unlike in West Friesland, for example, it was not traditional (and was thus uncommon) in Twente and The Achterhoek for the youngest son to be the most likely successor of the farm. In Twente and The Achterhoek, one of the oldest children (often, though not exclusively a son) was usually predestined to take over the farm from the parents. This depended also on the possibilities of the older children to find work elsewhere and on the interests of the children in farming. Due to this predestination of an older child, the farm had to provide labour and income for two generations of families for a much longer period than elsewhere (Jopie Wessels, amateur historian of Twente, personal communication 2002).

10 More than 15 farms had already stopped before this thesis was finished in 2003.

11 see: http://www.lei.wageningen-ur.nl/home.htm

12 Some of the farms employed elderly or mentally handicapped people primarily for the sake of these individuals' well being and not so much as a vital contribution to the farm work. Questions about the presence of people who were working on the farm for social reasons were only asked at 33 of the 82 farms in the survey.

13 STAB: Stichting Agrarische Bedrijfsverzorging

14 see: http://www.lei.wageningen-ur.nl/home.htm

15 1 €=D*fl.* 2.20371 (D*fl.*: Dutch florins or guilders)

16 stillborn: born dead.

17 Modified schedule based on: IKC Veehouderij (1993)

18 This is also the origin of the invention of the term Inheritors for a style of farming, which evolved from take over as a more or less natural process.

19 Research about styles of farming so far has paid little attention to the role of women in craftsmanship and breeding expertise. Yet anecdotal stories exist about the importance of the role of women, for example the following story that is well known in my own family:

When Joris Ruyter (1855-1928) and Marijtje Commandeur (1857-1929) married in 1879 they founded the dairy-breeding farm WOUDHOEVE in Blokker. Of Joris it was said that he was *...a farmer who produced home made cheese and who liked wide-shaped cows.* Of Marijtje it was said that *...she knew all the cows; she knew all about farming, and especially about breeding. She always supported her sons in their quest to breed the best animals whenever her husband was reluctant. She was very skilful in breeding tactics and led the farm with economic skills, but was willing to spend money on good cows. So it must have been she who gave the offspring of the Ruyter family (through 6 sons and 3 daughters) the status of famous top-breeders.* The story does not relate where Marijtje got her skills to start with (source: Commandeur & De Vries-Lub 1999).

20 original line: *Dfl. 1.0 to 1.2 million*

21 This view appeals to the image of a government as a 'fatherly' institution. "Father government' is expected to direct and educate the people, and to be just and fair in supports, rewards and punishments.

22 In 2003 this was extended to 2013, the year that this regulation is put in effect in the whole EU.

23 In 1997 and 1998 the Ministry of Agriculture offered pig farmers to sell their pig (manure) production rights. In 1997 the offer was only open for farms in the swine fever affected area in the south. In 1998 the offer was open to all pig producers. In both 2000 and 2001 the government created special offers for buying out farms for intensive production (pigs and poultry) in the vicinity of nature conservation areas.

24 original line: *'Dfl 0.5 million'.*

25 In 2003 the regulation on group housing was postponed to 2013.

26 In the original lines: *about Dfl 300,000; and Dfl 60,000* respectively.

27 In this region most people have a Reformed background, though there is a small minority of Roman Catholics. In the south it is the other way around. The predominant religious background is Roman Catholic, with some exceptions in specific locations.

28 Campaign against the disease of Aujeszky: In several regions of the European Union there are campaigns to get an EU-certificate for the eradication of this disease. After several regions in Germany received this status The Netherlands intensified the campaign. The eradication in the south took longer than in the rest of the country – among others because the eradication campaign in Belgium was behind in comparison to the Dutch campaign. (personal observations 1996 – 2001).

29 In Dutch: 'gemoedelijkheid' and 'gezelligheid'

30 This level of integration in social organisations is not unusual for Dutch people. It is an historical element of the Dutch culture for people to organise themselves into formal and informal organisations. In recent year with the substantial influx of people from other cultures it has become clear that such a desire to organise is a Dutch cultural habit.

31 Personal communication of Jet Proost, expert in farm extension communication (2002)

32 Without disputing both the correctness of the research about environmental pollution and the aim of the government to make a physical separation between the domain of the wild boar and domesticated pigs for reasons of animal health, it remains awkward that according to the Reconstruction Law all domesticated pigs should be transferred away from their original environment: the forest. The prime effect of the Reconstruction Law is basically a redistribution of the problems: an increased density in the pig population in the areas to where the pigs will be transferred. This will locally increase the pressure on pollution and on disease transfer. In the perception of the government the concentration of pigs should be in areas where the pollution of the environment is thought to be less harmful: away from nature conservation areas and urban areas.

33 In Dutch: Ecologische Hoofdstructuur

34 Improvement of the scenic integration of farms in the landscape is an issue for which the Dutch government has (had) some support projects. According to ir. Liesbeth van Santen (expert in landscape architecture, personal communications 1997 and 2003) three components should be distinguished: the buildings, the yard and windbreaks. The components should be evaluated with respect to the following aspects:

- unity in shapes, materials and colours of buildings, paving and other hard materials
- ratio in mass between buildings and windbreaks (when fully grown)
- appropriate planting materials
- cleanliness and neatness of the yard

35The number between () reflect the number of farms, unless isolated otherwise.

36 According to Jaap Frouws (rural sociologist, personal communication 2003) the awareness of how different the perceptions of Dutch farmers were about entrepreneurship and craftsmanship did not really grow in the rural sociologists group at Wageningen University until the late 1980s. It was this specific awareness of differences in perceptions of entrepreneurship and crafsmanship among farmers that triggered the scientists to conduct research in styles of farming.

37 'Wet Herstructurering Varkenshouderij (1998)', see: http://www.minlnv.nl/thema/mest/wrg/

38 Stichting Milieudefensie is a member of the international organisation 'Friends of the Earth'.

39 The regulations for the welfare of pigs were compiled in 1994 in the so-called Varkensbesluit. Since then, the Varkensbesluit has undergone some major adjustments, particularly in 1998; see: http://www.minlnv.nl/thema/dier/welzijn/

40 Dumeco: a large company that provides feedstuff and runs slaughterhouses. For many farmers Dumeco is their major or even their only trade contact in the production chain.

41 The Schengen-agreement: an agreement between member states of the European Union for free trade. Since the start in 1995 the following countries have participated: The Netherlands, Belgium, Luxembourg, Germany, France, Spain and Portugal. At the end of 1997 Greece, Italy and Austria joined the agreement

(see: http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/l_239/l_23920000922en00010473.pdf).

42 The British supermarket chain Tesco demanded for their bacon market special animal welfare conditions. Thus the supermarket created its own niche market for bacon. They also offered higher prices to the farmers. A number of farmers in The Netherlands could meet the demands and entered this British niche market.

43 This finding raises a point of attention for judging people's opinions based on provided statements in general. If the interviewee's choices were (or should be allowed to be) clarified by comments, then the interviewee's actual choice might support the classification of the interviewee, but caution should be taken with respect to classifying the interviewees based on these choices.

44 WIR-investment regulation: National law to make investments in animal housing (and thus in scale enlargement) attractive through tax benefits.

45 The reconstruction that was announced after the outbreak of swine fever was called 'Herstructu-rering' in Dutch ['Restructuring']. This law was overruled after the outbreak of foot-and-mouth disease in 2000. The new reconstruction law in 2000 was called in Dutch 'Reconstructie' ['Reconstruction'].

46 Both in May 2000 and in October 2001 the government created special offers for buying out farms for intensive production (pigs and poultry) in the vicinity of nature conservation areas.

- In May 2000 there were 2705 farms involved. By 2003 there were 1257 farms dealt with in the eastern provinces (Gelderland and Overijssel), and 1074 farms in the southern provinces (Brabant and Limburg.
- In October 2001 there were 2342 farms involved. By 2003 there were 700 farms delat with in the province of Gelderland, and 1202 farms in the southern provinces (Brabant and Limburg).

(Information kindly presented by Ministry of LNV, department Laser, February 2003).

47 Personal communication ir. Toon Wassenberg, (1997) owner of the pig auctioneering firm Animo.

48 Sources differ in their estimates about the actual number of pigs in 2003. Most likely it is closer to 11 Million than to 13 Million, see: http://www.cbs.nl/nl/cijfers/kerncijfers/index.htm#Landbouw, and: http://www.lei.wageningen-ur.nl/home.htm

49 De Boerderij, no. 24, 19 November 2002, attachment: Varkenshouderij.

50 In Dutch: superheffing; regulation released in 1984 to reduce dairy production in Europe.

51 McSharry-regulations: European regulations for compensating barren periods for grain land.

52 Labour productivity in agriculture increased dramatically in the last half a century (Schot *et al.* 2000; see also Chapter 1). The increase in productivity was about tenfold, for example, for dairy farm activities. At the same time the returns on agricultural products – measured in index-linked currency, dropped about threefold (Van Bruchem 2000).

53 see: http://www.minlnv.nl/

54 I suggest that the discussion within the government about the perception of problems in farming in The Netherlands and the basic approaches for solutions should be more subjected to research. The discussion about problems in farming gives the impression of containing self-engrossed elements.

6 Constructions

6.1 Construction of Feeder Pig Production

This chapter discusses the materials, facts, and phenomena that identify supporting constructions for pig production. The discussion is divided into the following major issues: the material and management constructions in feeder pig production, the construction in terms of indicators about the production management, farmers' attitudes with regard to the indicators, and the farmers' principles about health management, animal cull and religion. Each issue is further split into smaller subjects.

6.1.1 Housing, Mechanisation and Stable Equipment

Housing

The housing systems of pigs went through a metamorphosis in the early 1970s from labour-consuming systems of pens with straw and an outdoor run to labour-saving indoor systems with concrete. Central heating systems and integrated ventilation systems were developed to control the housing climate. Slatted floors allowing manure to pass and mechanised manure removing systems were developed. And the pigs themselves got secured in position by tying them with girths into single ranges or by securing them in individual boxes. In the 1970s and 1980s a tax premium system (WIR) existed to stimulate farmers to build new housing systems. However, the expansion of farm buildings, and consequently of the national livestock herd, stopped abruptly in 1986 due to a law usually referred to as the Interim Law 1986. The government justified the abrupt stop because environmental pollution caused by manure was rampant. Many new stables were built just before the premium system stopped.

In the study it was expected that there would be differences among styles of farming concerning the housing systems. The housing systems were expected to reflect the age of the stables and the eagerness of the farmers to invest in new developments. In general, the age of the stables is often related to the stage of succession. Major investments in stables are often made around the time of succession. The average generation interval for succession is about 30 years. After 15 to 18 years stables are often renovated and stable equipment may be renewed. But diversity in styles of farming was expected. Entrepreneurs and craftsmen were expected to follow technical innovations more closely with investments, whereas stewards and stockmen were expected to be economic with investments.[1] In the questionnaire housing systems and farm mechanisation status were thus investigated to see whether there were differences among styles of farming.

In the survey 58 (of 82: 71%) farmers had some stables built or renovated before 1990 and some stables built after 1990. In 10 cases all of the stables were built before 1990, and in 14 cases all of the stables were built after 1990. This means that nearly 50 per cent of the stables were 8 years old or less (Supplement Table 6a; see also example). This was consistent with what was expected. Since major investments are usually done twice within a succession term (30 years), the expected average age of buildings would be about 7½ years.

Example: measurement of the age of the stables.
The succession interval of farms in The Netherlands is 30 years. This means that at any moment for an interview the farmers are on average half way the succession interval. Half the farms were taken over less than 15 years ago and half the farms were taken over more than 15 years ago.
Usually at succession – so that is every 30 years, stables are rebuilt or renovated. On average after 15 to 18 years, stables are rebuilt or renovated to serve for another 12 to 15 years before the next succession. So that means that at any moment for an interview the stables are half way from and before the next renovation. Half the stables were rebuilt or renovated less than (half of 15-18 or of 12-15) 7½ years ago and half the stables were rebuilt or renovated more than 7½ years ago.
Among styles of farming there were differences expected, particular in the number of renovations in-between farm succession. For the questionnaire it was chosen not to record the exact ages of all the stables on the farms, but to make an approximate. Therefore it was asked whether the stables were built before or after 1990 – which was eight years ago. The results show that on average the buildings were about eight years old, which confirmed the expectations. The diversity among styles of farming for in-between investments in stable renovations was covered in another question (see Chapter 5).

67 farmers (82%) were happy with the current housing system. Especially among farmers with only older stables, several were not or no longer happy with them. One of the stewards commented:

> *<W240> This farm was constructed in phases. In 1978 the dairy cows entered first. The stable was not built right for that. Then in 1984 – just before the Interim Law – the dairy cows left again. The stable was then re-equipped for 180 sows. So the equipment is not very logical.*

This comment reflects how it often works with farm expansion, especially with farmers that like to keep the financial investments as economic as possible. Whenever possible, they use existing buildings and equipment. This strategy works at the expense of labour efficiency. Such a strategy is therefore unlikely for entrepreneurs and craftsmen, because they strive for efficiency, but it fits with stewards and stockman, because they prefer to keep financial investments low.

A shifter commented on this issue as follows:

<F055> The stables have advantages and disadvantages. The advantage is that they are cheap. The disadvantage is that they are placed everywhere around in the yard. That makes the work unpleasant.

This farmer is clearly focussed on economy in investments and not in labour.

At the time the survey was conducted in 1998, measures had already been taken on most farms to improve manure management in accordance with government regulations. But few investments had been made to improve animal welfare.

In the near future, new (labour-saving) systems with straw and concrete, and sometimes an outdoor run, are expected. This is due to new government regulations for restoring and improving animal welfare. In the new system barren and gestating sows will have to be kept in group housing. These government regulations were released in 1998 and were expected to come into effect within 10 years. From the perspective of many farmers this implies an important destruction of capital. Therefore, required investments to improve animal welfare were discussed widely in the survey. Many farmers were thinking about rebuilding, reconstructing or renovating farm buildings in response to government regulations, but they were reluctant to make decisions because they had experiences with the capital-destructive effects of the development of government regulations concerning manure and mineral management. Nevertheless, eight farms in the survey had already switched to a group housing system, which will be required on all farms in 2008.[2] Three of them were located on farms of stockmen (Supplement Table 6a).[3]

74 farms (of 82: 90%) had housing systems for barren and gestating sows that will not be allowed after the year 2002 or 2008: single ranged at girth with two metres behind the trough, or in individual boxes. On two farms the sows were actually kept in a system that was already no longer allowed: single ranged at girth with 1.90 meters behind the trough.

Eight farms that had recently built or renovated stables and had received a Green Label Certificate for sustainable manure management. But five of them would have to rebuild or renovate their buildings again before 2008, because of the new regulations on animal welfare. One of them would even have to rebuild or renovate the stables again before 2003, even though they had just been built with a green Label certificate in 1998 (see Section 5.3 for an extensive coverage of this issue).

The type of stables generally reflects their age. In the 1970s stables were built that allowed 1.90 metres of space for sows behind the trough. Insights in animal welfare in the 1980s led to regulations that required at least 2.00 metres behind the trough. This regulation was followed in newly built stables. But for existing stables it was hard to adjust to the rule, because it required bigger stables. So many farmers (particularly stewards and stockmen – who like to keep financial investments low) preferred to wait in adapting to these regulations until they would have to build a whole new stable anyway.

The differences in current housing systems found in the survey among styles of farming were especially striking in the contrast between craftsmen and stockmen. Most craftsmen (9 out of 10) kept sows in individual boxes, whereas most stockmen (7 of 12) kept their sows either single ranged and tied with a girth or in group housing (3 of 12). This finding gives an impression of a phase difference in investments between craftsmen and stockmen. Stockmen apparently had either older stables (still tied with a girth – a system built in the 1970s and 1980s) or newer stables (group housing) than craftsmen (who kept their sows in individual boxes – a system dating from 1990).

The difference between craftsmen and stockmen might also reflect a difference in age of the farmers in terms of succession. The age of the eldest partner among craftsmen is higher than average: 55 years. The age of the eldest partner among stockmen is less than average: 47 years, which is the lowest in comparison to other styles of farming (see: Section 5.1 and Supplement Table 5a).

Some farmers in the survey believed that questions regarding housing systems were wrongly directed towards farmers. It is not farmers who decide about their stables and equipment, but the government:

> *<U212>To a farmer the choice of equipment is not important. Legislation has already provided for that.*

This comment suggests that at least some farmers do not feel (fully) responsible for the housing system that they have for their animals. They consider the housing system to be more a product of government legislation, than a result of personal ideas about how to keep pigs. Farmers in the survey rarely expressed personal ideas about how to keep pigs (see also Section 5.3).

As a result of consecutive European and national government regulations, welfare conditions for animals and environmental care are gradually improving. However, each new regulation implies destruction of investment capital for the farmers, because developments in ideas and the resulting new regulations evolve much faster than the average 'life span' of stables. Moreover, governments are unwilling to compensate for the costs of adjusting to the new housing systems. In the past the government fiercely stimulated the housing systems through premiums and extension. According to Stolwijk (2001) it may well be beneficial to the government, to also compensate for capital destruction to stimulate new improvements.

On four of the 82 farms in the survey straw was used for sows. This occurred on the farms of two stewards, one stockman and one unclassified farmer. On three of the four farms the straw was used as bedding for the sows, on one farm straw was provided to the sows as playing material. So even among farms that had switched to group housing, the obligation to use straw bedding was not yet fully met. Only one farm provided the sows with an outdoor run. There was no pasturing of sows on any of the farms.

Mechanisation

In the survey the differences among styles of farming with respect to mechanisation were expected to be similar to the differences related to housing. Entrepreneurs and craftsmen were expected to follow technical innovations closely, because they emphasise labour efficiency. Stewards and stockmen were expected to be economic with investments. In the questionnaire, housing systems and farm mechanisation status were investigated to see whether there were differences among styles of farming. On average mechanisation and labour-reducing methods were well implemented in the survey area (Table 6.1)

Table 6.1 Frequencies of mechanisation equipment in the pig housing systems of the 82 farms in the survey in Twente and The Achterhoek in 1998

Type of mechanisation	*Frequency*	
	Yes	*No*
Mechanical feedstuff supply	53	29
Automatic computer-directed feedstuff supply	21	61
Central heating	72	10
Floor heating	73	9
Sensor-directed heating system	54	28
Mechanical shaft ventilation	26	56
Bunk feeder ventilation	70	12
Turbo ventilation	31	51
Time and sensor-regulated light	18	64
Personal computer	76	6
Internet	12	70

Most pig stables in the survey (73 of 82: 89%) were equipped with a central heating system that provided floor heating. On 54 farms (66%) the heating system was sensor directed. Bunk feeder ventilation was the most popular (70 of 82: 85%) type of ventilation, while on some farms (26: 32%), mechanical shaft ventilation was still used. Turbo ventilation was gaining popularity (31: 38%). Clock and sensors on 18 farms (22%) regulated the lighting in the stables. Hand labour was still used for feedstuff supply on 29 farms (35%); it was mechanised on 53 farms (65%), and completely regulated by computer on 21 farms (26%).

In Chapter 4 it was found that the presence of an automatic mechanical feedstuff supply was correlated to Intensity and Scale ($p<.005$). The presence of turbo ventilation was correlated to Productivity and Scale ($p<.005$). This means that the parameters were associated with farms with ambition for competition. The food supply device is very labour reducing.

The survey revealed that automatic feedstuff supply was common for entrepreneurs (17 of 19) and craftsmen (all 10), and infrequent for shifters (6 of 16). Turbo ventilation was present on 31of 82 farms (38%), predominately with entrepreneurs (10 of 19). The advanced investments in stable equipment of entrepreneurs and craftsmen also coincided with the presence of a personal computer on the farm (see also: Supplement Table 6c).

Stable Equipment

In the survey farmers were asked what they considered the most important aspect of stable equipment. It was expected that differences among styles of farming would be revealed, because of the differences in the farmers' ambition and rationales for investing in stables and mechanisation.

The most important aspect of stable equipment is…
• low investments • labour efficiency • good automation • energy costs • group housing • good floors • free run outdoors • all-in-all-out system • flexible equipment • good stable climate

For the classification of styles of farming (Chapter 4), the statement 'the most important aspect of stables is labour efficiency' was singled out from a list of possible answers to the question about stable equipment. It was correlated to both Productivity and Scale ($p<.005$). This indicated that ambition was more important than rationale in explaining the differences among styles of farming in connection to this statement.

There were various contrasts found among styles of farming in answers to the question: 'What is the most important aspect of stable equipment?' The farmers were provided with a choice of ten answers and they were requested to choose three of them (Supplement Table 6a, and Table 6.2).

Table 6.2 Summary of responses of styles of farming to the question: "What is the most important aspect of stable equipment?" From a choice of ten answers, the 82 farmers in the survey were requested to choose three. The relatively favoured answers are given below (see also: Supplement Table 6a).

Style of farming	*N*	*Favoured choices*	*Disfavoured choices*
Entrepreneur	19	Labour efficiency Automation Good stable climate	Low investments
Craftsman	10	Labour efficiency Automation	Good stable climate
Steward	12		Labour efficiency
Stockman	13	Low investments Group housing Labour efficiency	All-in-all-out system Good automation Low energy costs
Shifter	16	Low energy costs Good stable climate Low investments	Labour efficiency
All (Including 12 unclassified)	82	Labour efficiency Good stable climate Low investments	Free run outdoors Flexible equipment

The answers that were chosen the most were ‘labour efficiency’ (53 of 82 farms: 65%), ‘good stable climate’ (51 of 82 farms: 62%) and ‘low investments’ (34 of 82 farms: 41%). Within this context there were several similarities and contrasts among styles of farming:

(a) Entrepreneurs and craftsmen versus stewards, stockmen and shifters:

This difference involved ambition. Both entrepreneurs (17 of 19) and craftsmen (8 of 10) chose ‘labour efficiency’ as one of three priorities for stable equipment. This was more than average (53 of 82 farms: 65%). Entrepreneurs (9 of 19) and craftsmen (5 of 10) also chose ‘automation’ more than average (27 of 82: 33%) as one of the three priorities. In contrast, ‘labour efficiency’ was chosen less than average by stewards (6 of 13) and shifters (6 of 16). ‘Automation’ was chosen less than average by stockmen (1 of 12) and shifters (3 of 16). In addition, ‘low investments’ was often chosen (34 of 82: 41%). It was among the favourites of stockmen (10 of 12) and shifters (8 of 16), but was chosen less than average by entrepreneurs (3 of 19).

Both ‘labour efficiency’ and ‘automation’ represent a choice for efficiency and investments. This aspect is more important to entrepreneurs and craftsmen than to stewards, stockmen and shifters. This is consistent with the findings above (and in Section 5.1) that entrepreneurs and to a lesser extent craftsmen had more mechanised farms and expected to invest more in the following three years than farmers in other styles of farming.

(b) Entrepreneurs versus craftsmen:

Entrepreneurs and craftsmen differed with respect to rationale in the ambition for competition. Among entrepreneurs the choice for ‘good stable climate’ was high (13 of 19), whereas among craftsmen the choice for this aspect was low (2 of 10). This does not necessarily mean that craftsmen consider this aspect to be less important. It could well be that entrepreneurs were less interested in making any other choice (for example because they thought those choices trivial). In contrast, craftsmen may have found that there was still a range of interesting choices available, for example ‘low energy costs’, ‘low investments’ or ‘flexible equipment’. They may also have thought that ‘stable climate’ was already covered in ‘automation’. This idea is somewhat supported by the fact that entrepreneurs chose ‘low investments’ the least among the possible choices (3 of 19 entrepreneurs).

(c) Craftsmen versus stockmen:

The difference between craftsmen and stockmen was connected to Intensity. Craftsmen (8 of 10) and stockmen (10 of 12) seemed to agree on one aspect of stable equipment: they both chose ‘labour efficiency’ as being important. This was surprising, because these styles of farming are each other’s opposite.

Craftsmen and stockmen seemed to disagree on several other related aspects: ‘automation’, ‘low investments’ and ‘group housing’. The craftsmen’s strategy was to improve pig production results, and automation is an important step in that direction. Stockmen, on the other hand, were focussed on pigs as a farm branch, and as a purpose for labour activity. The strategies of craftsmen and stockmen were thus opposite: increasing results and profits per animal versus reducing costs and investments. Given these differences, it may seem surprising that craftsmen and stockmen would agree on 'labour efficiency' as suggested above. However, for craftsmen 'automation' was seen as a tool to achieve 'labour efficiency', while for stockmen 'labour efficiency' stands for the opposite: it was a tool for achieving 'low investments'. So the two styles of farming involve a completely different type of 'labour efficiency'.

(d) Entrepreneurs versus shifters:

The difference between entrepreneurs and shifters was related to Scale. Entrepreneurs and shifters seemed to agree on the importance of 'a good stable climate', because they both choose this answer often. But they disagreed completely on the aspects 'labour efficiency' and 'low investments'. This seemed to indicate something similar to what is described in (c) about craftsmen and stockmen. Entrepreneurs were similar to craftsmen in this aspect. To them 'labour efficiency' was an important goal in farming. And they used resources like 'automation' to achieve that goal. In contrast, for shifters 'low investments' was a goal in farming. They tried to achieve that goal in various ways; among which 'low energy costs' was an important strategy. It might well be, therefore, that though both entrepreneurs and shifters thought that 'a good stable climate' was important, they probably had a different image of 'a good stable climate' in mind. An entrepreneur combines 'good stable climate' with 'automation', which is a different image than the shifter conjures up with the combination of 'good stable climate' with 'low energy costs'.

(e) Stewards versus other styles of farming:

Stewards have a different rationale and primary goal of farming (Chapter 4) than the other types of farmers have. For stewards, farming is primarily a way of life. In contrast to all other styles of farming, stewards had no 'favourite choice' with respect to the question about stable equipment. The choices of stewards were exactly in line with the population average. This indicated that either the stewards were varied in their opinions, or the issue was not a primary concern. The latter suggestion was supported by the fact that 3 stewards (of 13) gave only two answers each to this question, so the total number of answers came to 36 rather than the possible 39 (Supplement Table 6a). Among the less favoured choices, 'labour efficiency' was chosen less often by stewards (6 of 13) than the population average (53 of 82: 65%), supporting the fact that stewards, like stockmen, favour for example low investments over labour efficiency.

Conclusion

Differences in housing, mechanisation and stable equipment typified the various styles of farming. These differences were related to the age of the farm in terms of succession and to the strategies for farming investments. There were clear contrasts among styles of farming between ambition levels. Entrepreneurs and craftsmen preferred labour efficiency to investment economy, while stewards, stockmen and shifters preferred the opposite. Between Intensity levels the contrasts between craftsmen (automation) and stockmen (low investments) were shown in the different strategies. Between Scale levels the contrasts between entrepreneurs (automation) and shifters (low energy costs). Stewards had no particular 'favourite choice' for stable equipment, but they disfavoured one in particular: labour efficiency. So for each style of farming there was a clear and distinct set of strategies that led to the housing mechanisation and stable equipment that they had.

6.1.2 Feedstuff Supply

A few big (international) companies currently supply pig feed in The Netherlands, though some small companies are still active, especially in the eastern part of the country. At the time of the interviews, Nutreco in the south was the biggest feedstuff company in the country. That company had just fused with the commercial company Hendrix and the co-operative UTD. Another big company in the south was CeHaVe. But in the study area, Nutreco and CeHaVe were far less important than the regional feedstuff companies in the east. Two regional companies were popular: ABC (situated in The Achterhoek) and CTA (situated in Twente). Shortly after finishing the interviews in 1998 these two companies agreed to a fuse into ABCTA.

Most feedstuff companies demand a margin from the farmers to cover the costs for extension. The more farmers buy from the same company, the less the margin is for the service. Farmers are usually loyal to their suppliers. Besides, due to competition among supply companies, differences are small, especially for (relatively) small farmers. Farmers also often feel historically attached to extension workers of supply companies, which is illustrated by the following comment:

> *<F052> Once people are with somebody, like a feedstuff supplier, they don't change easily.*

For big farms – entrepreneurs – the outlook might be different (as indicated in the initial study). Big farms require a large volume of feedstuff. They are more interesting business partners to feedstuff supply companies than small farms. So there is more competition among suppliers to have contacts with big farms, which in turn creates more opportunities for farmers to reduce costs. It is also more interesting for large farms to try new options, such as feeding slop to pigs, which requires new investments in farm equipment, but substantially reduces food costs. One farmer explained:

> *<K323> I feed 95 per cent slop. I have a good relationship with the nutritionist of the feed supply company. Together we focus on the content. Farmer and feed specialist combine the mutual knowledge. ... The feed supply company should serve a shared goal. As a farmer I have to pay a higher margin, because I buy only a small amount from them in addition to the slop that I have. But that is not bad. In future the feed extension should explore the technical aspects more.*

Among the farmers in the survey, there was hardly any home production of feedstuff on any of the farms. The majority of the farms (47 of 82: 57%) were only connected to the companies in the region: ABC, CTA or both (Supplement Table 6a).

Entrepreneurs (9 of 19) and craftsmen (4 of 10) had fewer contacts with ABC and CTA than stewards (7 of 13), stockmen (8 of 12) and shifters (12 of 16) and more contacts with other suppliers. This can be explained by the fact that the ambition of entrepreneurs and craftsmen is in the sphere of competition. Loyalty to a feedstuff company is probably limited to the extent that entrepreneurs and craftsmen also retain control of services and prices. If other feedstuff companies provide better service or prices on particular aspects of the feedstuff supply, then these farmers (partly) switch to them.

As far as the feedstuff itself is concerned, there is a tendency to feed different types of food depending on the stage of the sows and the age and weight of the piglets. It is now common to feed barren and gestating sows a different feed type than sows with piglets. Furthermore, there are options for special feed, for example to provide in combination with slop or with other basics. For piglets there are also different types of feedstuffs available, depending on the age after weaning. Although on average farmers had 2.22 types (σ=.68) of feedstuff for weaners, some farmers had four or five different types of pig feedstuff for the young pigs between the weaning stage (at about four weeks) and the point at which they are sold as feeder pigs (at about eleven weeks). Entrepreneurs had more variety in types of feedstuff (2.60 types) and shifters had less than average (1.81 types) (Supplement Table 6a).

Farmers – and feedstuff companies – discuss feedstuff qualities in terms of purpose, like: ‘for barren sows’, ‘for lactating sows’, ‘as an addition to a specific grain basis’, ‘for piglets around weaning’, ‘for piglets during rearing’, etc. They usually do not discuss feedstuff in terms of ingredients (amounts of grains, soya, tapioca, sugar beet pulp, etc.). The discussion about feedstuff quality is concentrated on the costs and animal health, and to the mineral content and additives in view of animal condition, manure quality and regulations on residuals and the use of antibiotics. Specific knowledge about feedstuff ingredients is concentrated in companies, in various research institutes and the Universities in Wageningen and Utrecht, as well as abroad. This situation has evolved from a process of increasing ‘scientification of agriculture’, as described by Van der Ploeg (1987). The process is stimulated by scientific research in Wageningen University (Scholten 2001; Winsen 2001; Eissen 2000; Houdijk 1998; Van der Peet-Swering *et al.* 1994; Babinszky 1992; Miller *et al.* 1991; Beukeboom *et al.* 1991; Petterson 1990; Kanis 1988; Den Hartog 1984). The market for feedstuff ingredients is a global market with fierce competition. Feedstuff companies buy the ingredients from around the world, and these supplies may vary a lot from one bulk load to another. Quality standards for energy value, protein content, mineral content, etc. are intended to make different bulk loads comparable.

Most pig farmers nowadays rely completely on the feedstuff supply companies – and their extension services – to solve the problems as far as feedstuff ingredients and feed-related farm problems are concerned. This entails the individual farm problems with animal production and health, the costs for feedstuff and manure management and the government regulations on minerals and additives in feedstuff. The farmers in the survey were therefore questioned about what they though that feedstuff companies should do for them. In the questionnaire the farmers were given four statements to choose from to reflect their opinion about their feedstuff company.

The primary duty of the feedstuff company is to supply…
- cheap feedstuff
- good extension
- new ideas
- fitting feed types
- a combination of the above, or different from the above.

Many farmers (28 of 82: 34%) chose the answer that feed companies had a combination of duties. Another frequent choice was ‘fitting feed types’ (26 of 82: 32%), in which ‘fitting’ was related to the particulars of the farm and not to the price. The option ‘good extension’ was the third most popular choice (13 of 82: 16%). There was no particular difference among styles of farming with respect to the perceived primary duties of feed companies (Supplement Table 6a).

The statement: ‘the primary duty of the feed company is to supply cheap feedstuff’ was negatively correlated to Scale (p<.005) (Chapter 4). This suggests a relation between the statement and ambition for participation and autonomy. But the statement was not directly connected to any particular style of farming (Supplement Table 6a). Besides, the statement was not chosen often: only 13 of 82 farms (16%). The finding suggests that ‘cheap food’ was a secondary priority for the farmers; other themes were more important.

Farmers often have a close relationship with the extension worker from the feedstuff supplier, as is illustrated by the following comment:

> *<E167> Two years ago we expanded this enterprise with 30 sows. The procedure had been fought all the way to the State Council Court. The extension worker of the feed industry went with us to The Hague. It is more the person than the service on which you rely.*

To a certain extent is surprising because farm expansion is not the business of feedstuff companies. It is not among the duties of a feedstuff extension worker to plea in court for farm expansion of related farms. The comment illustrates how the network in farming is constructed. The ancestors of the present farmers and workers in the supply companies have been connected for many generations. The supply company may modernise, change its name, fuse with other companies, etc., but the workers who maintain the network with the farmers are still the sons and grandsons of family acquaintances.[4]

Conclusion

In the study area two regional companies were popular as feedstuff suppliers: ABC (situated in The Achterhoek) and CTA (situated in Twente). (These two companies fused soon after the survey into ABCTA.) Most farmers were loyal in their contacts with feedstuff companies, though loyalty was less for farms with ambition for competition (entrepreneurs and craftsmen). When asked what the primary duties of the feedstuff company were, most farmers chose the answers: ‘a specific combination of duties’ or ‘to supply fitting feed types’, and not ‘cheap feedstuff’.

6.1.3 Manure Management

Since pig keeping in The Netherlands is independent of the availability of land, manure management is a problem in pig farming. Since 1990 government regulations on manure management have gradually become stricter (Dietz 2000; Frouws 1993, Termeer 1993). Removal of excessive manure is a cost for farmers that can sometimes become substantial.

Only 7 (of 82: 9%) farms had enough land to distribute all pig manure on the arable section of the farm. All other farms in the survey had to remove some or all pig manure from the farm. The basic destinations of the pig manure were the farmers’ own farm (32% of the pig manure; σ=32), a farm in the area (26%; σ=35), a commercial manure distributor (Mest Bureau Oost, MBO) (29%; σ=40), or another farm elsewhere in the country (12%; σ=29).

There was a difference among styles of farming. In particular there was a contrast between craftsmen and stewards. Five craftsmen (of 10) had to remove over 90 per cent of the pig manure from the farm. Of stewards only one (of 13) had to remove over 90 per cent of the pig manure from the farm. The amount of manure that stewards could keep on the farm (54%; σ=29) was more than average (32%; σ=32). In contrast, craftsmen could keep only 23% (σ=29) of the farm manure on the farm. This confirms that craftsmen were very specialised in pig farming. And they may have had to become craftsmen to get an income out of the farm they owned: without land and other sources of income they had to be exclusively focussed on the production of pigs. Stewards had land and mixed farms. These circumstances forced them to divide their attention.

Compared to the population average, craftsmen had a bigger problem with manure disposal than farmers of other styles of farming. But it seemed that they found sufficient solutions for their manure problems. Craftsmen had above average contacts in the area with arable farmers to distribute the manure (26 per cent of the farm manure was average, σ=35; for craftsmen it was 40%, σ=38). They also had above average contacts elsewhere in the country for manure disposal (12 per cent of the farm manure was average; σ=29, and for craftsmen it was 20%; σ=38). Craftsmen disposed of the manure even less than average to Mest Bureau Oost (29 per cent of the farm manure was average, σ=40; for craftsmen it was 17%, σ=37) (Supplement Table 6a).

The discussion about manure management developed in The Netherlands in three stages. The focus ranged from manure management

(1) as a management tool for farmers

(2) as a government regulation focussed on the use of manure

(3) as a government regulation focussed on the loss of minerals.

To make manure management a tool for farmers, a system of farm manure bookkeeping was introduced in the late 1980s (Van Laarhoven & Willemsen 1988; Aarts *et al.* 1988;). The tool was meant as a means of self-education and self-control. Later the concept was enhanced in manuals and computer models (Van der Schans *et al.* 2001; Van Wagenberg and Backus 1999; Adriaenssens *et al.* 1998; Ketelaars and De Ruiter 1997). The idea of manure bookkeeping for self-control was also integrated in new concepts of animal production systems (Van Bruchem 1997; Groen and Van Bruchem 1996) and combinations of animal production and nature management (Pleune *et al.* 2000; Atsma *et al.* 2000; Van Paassen *et al.* 1998). The bookkeeping was a variable success among farmers – it alerted participants about the problems of manure. But the number of non-participants was high and varied over different regions.

In the mid-1980s the government first introduced measures for the manure problem (See for an extensive cover of the 'early' development of government measures on manure management Frouws 1994).[5] In 1991 the government took over the principles of manure bookkeeping and transferred them into a formal manure administrations system – similar to tax administration (Mest- en Ammoniak Maatregelen, M.A.M.'91). This administration system was based on the use of manure as fertiliser, independent of the use of artificial fertilisers and independent of the production intensity. Fines were charged for using too much manure and for using it in the period from October to February. Farmers were also no longer allowed to spread manure over the fields, but were required to inject it into the soil with new special (heavy) machines. Farmers have opposed all three aspects of these measures (the standards for using manure, the period for using it and the way of using it). A lot of the criticism of farmers has been incorrect, particularly when they denied the pollution problems (Frouws *et al.* 1996), but some of their points are well founded and supported by scientific research.

An introduction of an alternative would be for the farmers a diverse set of specific measures of farm management, but such a system would be difficult to incorporate in generic government regulations. Since 1998 two co-operatives set up by dairy farmers to ensure environmental protection in Friesland have been granted permission by the government to apply alternative measures to reduce manure pollution and improve the environment (Atsma *et al.* 2000, Eshuis *et al.* 2001).[6] In the study area there were no farmers' co-operatives involved with alternatives beyond the government regulations.

In 1995 the government created a new basis for the formal manure administration related to the loss of minerals in the mineral balance: the use of manure versus the loss of minerals in the production (Ministerie van LNV 1995). This relieved some of the criticism farmers had of the government measures of 1991. After the interviews were finished in 1998, the government imposed a system of manure disposal contracts. Farmers arranged contracts either with arable farmers or with manure distributors for all the manure they had in excess of the government standard. The regulations for these contracts were later reviewed (Hees and Hin 2001, Smit *et al.* 2000).

As shown in Section 5.3, the farmers' attitudes towards the manure problem were very diverse. The following two quotes exemplify the differences among farmers in accepting responsibility for manure problems.

> *<U180> That story about ammonia is nonsense. It just increases the production costs. The production costs are far too high! ... Arable farmers are not allowed to keep pigs now and they get lazy by demanding high prices for accepting the manure from pig farms.*

Pollution was apparently not this farmer's major problem. His (or her) major problem was farm continuity and gaining income from the farm – and that was under pressure. The cost prices in farming increased due to the regulations, whereas the sales prices of farm products were under pressure in the markets (see also Chapter 1). This farmer was thus blaming the arable farmers for gaining at the expense of his (or her) misery by contributing to the rise in cost price.

Another farmer, a stockman, accepted more responsibility:

> *<K175> Religion does not play an important role in my considerations, but societal responsibility does. Between 1980 and 1990 a lot of manure was dumped out of plain egoism. That should not have been done.*

This farmer is focussed on the problem, and recognises the cause. Yet this reference is connected to the past *...that should not have been done*. He (or she) did not continue the comment with a perspective of a better solution for the future.

Within the strict government regulations some farmers still felt inspired to seek for alternatives for the standard ways for solving the manure problem:

> *<E217> At the moment the manure of this farm is still going to the arable farmers. In future we will start a co-operation with eight farmers. We will feed the manure to algae in a pond. And the algae will grow on the manure. Then later the algae can be used as feedstuff again.*

This entrepreneur's solution requires investments in a new and uncertain technical development, an algae pond. This type of solution fits with the style of entrepreneurs. Entrepreneurs are more willing to make financial investments, and are keen on labour efficiency. So in approaching the manure problems they seek solutions that involve capital and not labour, whereas other styles of farming (like stewards, stockmen and shifters) prefer labour investments to financial investments for solutions.

6.1.4 Rearing and Selective Breeding

Boar selection for artificial insemination (AI)

For selective breeding Dutch pig farms rely on 'brands' that are produced by top breeding companies. The desired breed types are discussed in independent comparative studies, based on qualities and quantities for production. For pig production these qualities and quantities are identified in connection to:

- the end product: the type and quality of pork meat (hams, leanness, etc.)

- the piglets: vitality, stamina, growth capacity, etc.
- the sows: maternity qualities, like nursing and caring for the piglets.

Nowadays all pig ‘brands’ are crossbreeds, and often inimitable (Swinkels *et al.* 1998; 1995, Hovenier 1993; De Vries 1989). There are no traditional Dutch landrace breeds left in the country.[7]

Many pig farmers in The Netherlands have fixed contacts with breeding companies that provide the sperm material for artificial insemination (AI), which is usually applied by a specialised inseminator. So those farmers can only choose from the material available in that company. In the survey most farmers 42 (of 82: 51%) were connected to Dumeco breeding company. Second in line was the NVS co-operative (herdbook): 32 (of 82: 39%). There were no differences among styles of farming in the distribution over these breeding companies (Supplement Table 6a).

An entrepreneur explained:

> *<E141> Our sows are from the herdbook. It has always been that way and has never changed. ... Krusta-boars breed piglets with good vitality. Those piglets give little problems from birth. (NL x GY) sows do not just have good maternity capacities, but also a longer life span.*

While this study was being conducted, the breeding companies were in a process of fusion. After the interviews were held, most companies including the NVS co-operation (herdbook) fused together into one company called ‘Topigs’. For farmers very little changed – their direct business contacts are still with the same people. However, indirectly the fusion of the breeding companies may have a lot of impact. Farmers have become more integrated in a ‘monopolistic economic network’. The system keeps on losing elasticity. One of the farmers commented:

> *<W140> In the past we used to have (NL x GY) boars. Then came the Krusta brand. But we wanted better piglet growth. That’s why we now have GY-growth selected boars. They are our own boars.*

In discussions with farmers the breed types ‘brands’ of the pigs are often identified in terms of qualities and quantities for production and not in terms of original breeds. In the initial study it was already noticed that farmers vary a lot in the way they talk about the pig breeds or brands they use. Some farmers – particularly craftsmen and tenders – had shown detailed interest in the subject. They often had particular ideas about breed combinations for different purposes, like breeding maiden sows and fattening pigs for various markets. Tenders had specific interest in breed type ‘brands’ with good motherhood qualities in organic farming systems. Other farmers – particularly inheritors – hardly elaborated on the subject in the initial study. They just made some remarks about typical qualities. These farmers had fixed contacts for the supply of maiden sows and they were satisfied with the breed type ‘brands’ they had. These finding were confirmed in the current study. Craftsmen, such as the farmer quoted below, elaborated more than average on the breed types of the sows.

<C127> For breeding purposes we want good quality sows and good maternity qualities. That is concentrated in the NL-boar [NL: Improved Dutch Landrace – MC]. For fattening we focus more on the end product: a good pig for the slaughterhouse. That you can get with Pietrain-blood [Pietrain: Belgian breed that is sensitive to stress, but whose meat is lean – MC]. We take the Luxtar brand type to achieve that. [Luxtar: popular crossbreed for use as father to fattening pigs – MC]. That one has the advantages of strong and healthy piglets and a good food conversion. ... For the maiden sows we want the best technical results. Therefore we use a crossbreed of NL and GY [GY: Dutch York – MC].

Within a few lines this farmer gave detailed information about four different breed types he (or she) was familiar with – and their advantages for different purposes (mother to fattening pigs, father to fattening pigs, parents to maiden sows). Elaborating on the issue with extensive detailed knowledge is typical for craftsmen.

In contrast, most farmers in the survey were not particularly concerned with the choice of boar as father for the fattening pigs. Of 82 farmers 44 (54%) left the choice of boar to the breeding company. Others (23 of 82: 28%) simply chose Dutch York (GY) – a crossbreed Dutch derivative of the English Yorkshire Large White breed. From this information there were no differences among styles of farming with respect to boar type found (Supplement Table 6a).

In addition, farmers were specifically asked what characteristics they took in considerattion for choosing a certain type of boar. It was an open question, but a few suggestions were presented.

Considerations for the selection of the type of boar:

- advice of the breeding company
- request of the pig fattener
- personal; related to personal preference, tradition and network
- none of the above.

The largest number of farmers had their own considerations (35 of 82: 43%) for choosing a certain boar type related to farm traditions and their network. There was no difference among styles of farming. Nearly equal numbers of farmers let the breeding company (14 of 82: 17%) or the pig fatteners (16 of 82: 20%) guide them in their choice. Only 9 (of 82: 11%) of the farmers had a different or no answer to this question. There were some differences among styles of farming. Shifters (6 of 16) relied more than average on the advice of the breeding company for choosing a boar type, whereas none of the stewards (0 of 12) did. This is understandable for shifters as they were shifting to other activities and had little interest in choosing boars specifically. Stewards though were more focussed on loyalty to the network and therefore chose the ‘request of the fatteners’ and ‘personal considerations’. In contrast, only one stockmen (of 12) chose ‘personal considerations’. Most stockmen either answered that they were led by the pig fattener (4 of 12) or did not answer the question at all (3 of 12).

Sow Selection for Pig Production

In pig breeding there are many more sows required than boars. Within the top breeding companies the sows are kept for producing the boars that serve as fathers for the fattening pigs. The mothers of the fattening pigs, however, are raised in maiden sow production farms or sub-breeding farms. About ten percent of the pig producers are also maiden sow producers. Traditions and traditional networks play an important role in the contacts of pig producers with the suppliers of maiden sows. A steward said:

> *<W631> My brother-in-law breeds pedigree pigs for the herdbook. He sells his piglets to a rearing farm. And we buy our maiden sows from the rearing farm.*

A farmer in the situation of this steward would not be likely to look for change his maiden sow supplier, as long as he (or she) was satisfied with the situation. In this case, switching to a different rearing farm for maiden sows would have an impact on family relations too. So the choice of breed type for the sows is not a matter of choice based on breed characteristics, but also a choice based on network contacts.

Most farmers in the survey had fixed contacts for purchasing maiden sows. Of 82 farms 38 (46%) purchased the maiden sows directly from a Dumeco chain contact farm. The other farms also had fixed contacts, either through NVS co-operation (17 of 82: 20%), through Dalland Company (6 of 82: 7%), or through their own fixed contacts in the area (12 of 82: 15%) (Supplement Table 6a). There were no differences among styles of farming found with respect to the source and time for purchasing sows. Some differences were found among farmers, which seemed related to differences in strategies with respect to health and hygiene management. Health and hygiene management is related to styles of farming.

Source and Time for Purchasing Maiden Sows

Eleven farms (of 82: 13%) in the survey purchased their maiden sows from home farm rearing. Ten (of these 11) farms used exclusively home-farm-reared maiden sows. It was expected from the initial study that farms with farm-reared maiden sows would be particularly farms of craftsmen (because it involves specific craftsmanship) and of entrepreneurs (because it often occurs with a large farm size). This was confirmed in the current study. Six of the 11 farms with home-reared maiden sows were either craftsmen or entrepreneurs.

One of the farmers with home-reared sows commented:

> *<U313> We buy 80 sows each year as basic material for our breeding plan. For the feeder pig production we have our own rearing unit for maiden sows. In the last three years we have also bought some maiden sows as well. But the home-reared maiden sows are generally healthier.*

For this farmer the network is hardly important with respect to the breed type of maiden sows. This farmer has a breeding plan for selection, based on characteristics for production. The farmer also mentioned that home-reared maiden sows are healthier. This is because the maiden sows are reared in an environment that has the same pressure from infective agents as the environment they are subjected to later in life.

The majority of the farmers (67 or 82%) purchased the maiden sows at an age of six to seven months. At an age of seven to eight months, maiden sows come in puberty. So they were purchased just before they were ready for the first insemination. The idea is that the maiden sows will have a few weeks to adjust to the pressure of infective agents on the farm before the first gestation.

> *<K317> When the maiden sows come I always leave them here for three weeks to get accustomed, so they can adjust to the stable, acclimatise to the environment, build up disease resistance, etc.*

However, some farmers purchase their maiden sows earlier, at the age of a feeder pig (about 11 weeks and 25 kg of body weight). These farmers try to gain in animal health by rearing the maiden sows on their own farms. Other farmers purchased their maiden sows a month after they have come into the first gestation: at nine months of age. The advantage for the farmer is that there is a guarantee that the maiden sows are already in gestation (pregnant) and thus fertile. There is no loss of maiden sows due to fertility problems. The disadvantage is that the young sows are more vulnerable to infection if they are moved while in gestation. But some farmers prefer the advantages:

> *<W140> We always buy our maiden sows at an age of nine months. So that is one month after the beginning of the gestation. There is little room for sows here. This way we are always full, because the sows are brought to us with gestation-day guarantee.*

The differences among farms in strategies for purchasing maiden sows were related to hygiene and health care and to different protocols and working schedules (see also Section 5.1 and below) – and through these aspects they are also related to styles of farming.

Selection Criteria for Purchasing Maiden sows

It was expected that farmers would have more considerations for selecting sows than for selecting boars, because in contrast to boars, sows would actually enter the farm. Therefore the farmers were asked whether they had particular selection criteria for sows. Though it was an open question, the following answers were given as suggestions.

Considerations for the selection of the type of (maiden) sows:

- advice of the breeding company
- request of the pig fattener
- personal; related to personal preference, tradition and network, specified as:
  - large litters of piglets
  - strong piglets
  - good maternity qualities of the sows (farrowing, nursing and caring)
  - other qualities of sows and/or piglets
- none of the above.

41 farmers (50%) said that they had personal considerations for choosing a particular sow type. The personal considerations were a combination of qualities of the sows, tradition and the farmer’s network. The farmers who gave this answer were asked to

further specify their answer. ‘Good maternity qualities’ was mentioned the most (16 of 41: 39%), mainly due to the high number (7) of entrepreneurs present among them. This is because entrepreneurs were focussed on labour efficiency and because entrepreneurs had a high percentage of sow cull for reasons of sow fertility (litter size and conception problems (see also Section 6.2). Sows that required little assistance in farrowing are therefore preferred. And when sows are good in nursing, with a good number of healthy teats and plenty of milk, the number of piglets that have to be cross-fostered by a foster sow is reduced. Cross fostering is a labour-intensive activity, because foster sows sometimes have problems accepting new piglets and cross-fostered piglets sometimes have problems adapting to a new group. The aspect of caring was less important to entrepreneurs, because good stable equipment assists in avoiding such problems. In the initial study, however, the issue of good maternity qualities was predominantly chosen by the style of farming called ‘tenders’. In the stables of tenders (free range or organic farming) the sows have more space to move. In these stables it appeared to be more important that sows care for the piglets: that they not lye down on top of the piglets or bite them.

Ten farmers (of 41: 25%) chose ‘large litters’ as the most important consideration for selecting a particular type of sow. No difference was found among styles of farming in relation to this answer. Three farmers specified their choice by mentioning ‘strong piglets’. All three were craftsmen. This can be explained by the fact that craftsmen put in more effort than other styles of farming to keep even the weak-born piglets alive.

Twelve of the farmers who chose personal considerations did not specify their answer, or they gave a different specification than the three suggested options. This occurred more often with stewards, stockmen and shifters (7 of 17), than with entrepreneurs and craftsmen (2 of 17). This supports the suggestion that in the sphere of competition the personal considerations of farmers are more straightforwardly derived from production qualities of the pigs. In the sphere of participation and autonomy the situation is more complex, because considerations about animal qualities as well as tradition and networks are important.

Eleven farmers (13%) answered that they had no considerations in selecting sows. This was negatively correlated to Intensity ($p<.005$), and therefore used as a selection criterion for the classification of the styles of farming. But this was not a specific feature of any style of farming. This means that this aspect is typical for extensive farms of several styles of farming (ambition for autonomy).

Preference for a Certain Sow Breed Type

From the initial study it was already suggested that entrepreneurs and craftsmen might have a preference for a specific breed type, because that breed type had specifically desired qualities. In contrast, inheritors (stewards, stockmen and shifters) would rely more on the advice of the breeding company for the breed type. In the current study this finding was confirmed and extended to specifications about breed types. In the survey farmers were asked what breed type of sows they had. A few suggestions were given.

Preferred breed type of the sows:
• Purebred (NL, GY, LW, Du, Pi, etc.)[8]
• Common crossbreed (NL x GY)
• New crossbreed [(F_1 x Norwegian L), (F_1 x Fin L), etc.][9]
• Advice of the breeding company
• Rotation crossbreed

The answer 'advice of the breeding company' was negatively correlated to Productivity and Intensity (p<.005). This answer was chosen the most by all the farmers in the survey (33%), but both entrepreneurs (3 of 19) and craftsmen (0 of 10) chose this option less than average. In contrast, many shifters (9 of 16) chose this option, which was expected. Farmers with ambition at the level of competition do not leave those decisions to the breeding company. Of the other styles of farming, shifters most often left the decision to the breeding company, because they were shifting to other activities and had lost interest in the breeding type of their sows.

The choice 'common crossbreed (NL x GY) was positively correlated to Productivity (p<.005). It was interesting to find a contrast in this respect between entrepreneurs and craftsmen. Craftsmen (6 of 10) chose this option more than average (22 of 82: 27%), whereas entrepreneurs (11 of 19) appeared to prefer the new crossbreeds, in particular (F_1 x Fin L). This breed type was not mentioned at all by stewards, stockmen and shifters. This suggested that entrepreneurs in particular followed new technological developments in crossbreeding sow types.

On the other hand, it was remarkable that several stewards, stockmen and shifters had the new crossbreed (F_1 x Norwegian L), which was not present among entrepreneurs and craftsmen. This is peculiar, and can only be explained by the fact that the farmers who answered 'advice of the breeding company' actually had one of the given breeds or crossbreeds on the farm. For example the new crossbreed (F_1 x Fin L) could also be present on the farms of stewards, stockmen and shifters. It could be that those farmers just hadn't named them as such, but that they had referred to these crossbreeds indirectly by saying that they followed the advice of the breeding company. So for more detailed research on this specific issue it would be necessary to note specifically what breed type the breeding company had actually advised.

A few farmers preferred a system of rotation crossbreeding. This means that three different breeds or crossbreeds are crossed to create the required maiden sow for pig production. To make such a system profitable the farm should be larger than average, because various breeds should be kept next to each other on the farm and there should be home farm rearing of maiden sows. Six farmers in the survey applied a system of rotation crossbreeding, four of whom were entrepreneurs or craftsmen. One of them said:

> *<E306> Three years ago I switched to rotation crossbreeding. And now I rear the young piglets myself [to be later introduced as maiden sows – MC]. Since I have been doing this the sow cull has been reduced and the piglet production has improved.*

Only two farmers specified that they had pure-bred sows. Both farmers had English Large Whites (LW). Pure-bred sows were not mentioned for pig production, but only for maiden sow production.

Among the farmers who had chosen 'the advice of the breeding company' some farmers might have had different crossbreed or improved breed types – though in the comments the farmers only mentioned the common breed in the crossing, for example Pietrain. Pietrain was originally a Belgian breed, with a spotted skin. The breed is known for being hard to keep and having a nervous character, but also for having the leanest meat quality. One of the stewards explained the specific difficulty with this breed:

> *<W166> We have the Pietrain breed. Those piglets are often very small. Therefore the feeding of the sow during gestation is extra important.*

Conclusion

Differences among styles of farming appeared when farmers were asked what breed type they preferred. Stewards, stockmen and shifters left the choice for breed type more than average to the breeding company. This complicated the interpretation of the findings. Entrepreneurs and craftsmen had more specific preferences, particularly for (F_1 x Fin L) and the common crossbreed (NL x GY).

6.1.5 Animal Health Management

Health and Hygiene

In daily farm practices farmers take preventive measures for disease control, like hygiene and vaccination. There are basically two approaches to animal and stable hygiene: one strategy is to reduce the presence of pathogens through cleaning and disinfection. The other strategy is to control exposure to infectious agents by allowing animals to build up natural resistance. In most farming practices farmers use a combination of both strategies, though with a different emphasis.

There are basically two strategies to vaccination as well. One strategy is classical: vaccination is used to prevent diseases at individual level. Animals at risk are vaccinated as a preventive measure. Decisions about this strategy are basically made at farm level, though some vaccinations may be government-enforced – for example the vaccination against the disease of Aujeszky which is part of a national eradication programme. The other strategy is market driven. This is a government-enforced strategy based on a non-vaccination policy for extended export markets. Through government measures of chain control and isolation, diseases are first eradicated at farm, regional and national level – often by temporarily giving extra vaccinations. Next the farm, region and nation acquire the disease-free status, allowing the export of animals and meat from the country to a broad variety of other countries. Since the system of 'disease-free status' was introduced in the European Union in 1992, The Netherlands has had disease-free status for diseases like swine fever and foot-and-mouth disease, with the exception of the outbreaks of 1997/1998 and 2001 respectively.

The Netherlands is currently in the process of acquiring the disease-free status for the disease of Aujeszky.

In the survey, the farmers were asked about their farming practices concerning hygiene, as a general measure for disease prevention. Farmers were not asked about vaccination programmes. Some farmers, though, commented on their attempts to make their farms 'scabies-free' (skin disease caused by *Sarcoptes suis*) [10] through a vaccination and pathogen eradication programme at farm level.

In the questionnaire the farmers were first asked to list their top three expenses for animal health from a choice of five options.

The highest animal health costs are for:
- Prevention: vaccination and control
- Curative treatment: cure and medication
- Disinfection
- Worm treatment
- Scabies treatment

The results were remarkable. The most frequently chosen option as the highest expense was 'prevention: vaccination and control' (72 of 82: 88%). The second highest expense it was 'curative treatment: cure and medication' (41 of 82: 50%). The third-highest expense it was both 'worm treatment' (26 of 82: 32%) and 'scabies treatment' (25 of 82: 30%). On the whole, 'prevention' was chosen most frequently, as it was chosen by all but one of the farmers as either a first, second or third-highest expense (81 times; 99%). The option 'curative treatment' was chosen less often (53 times; 65%) and particularly less often in first position, and 'worm treatment' (44 times; 56%) was chosen third overall (Table 6.3).

Table 6.3 Summary of the most important animal health costs. Pig producers were asked to rank the three most important animal health costs

	Frequency			
	Total	1st priority	2nd priority	3rd priority
Prevention (vaccination and control)	81	72	7	2
Curative treatment (cure and medication)	53	7	41	5
Worm treatment	44	0	18	26
Scabies treatment	34	1	8	25
Disinfection	21	1	4	16
Different / unknown	13	1	4	8
Total	246	82	82	82

There were few differences among styles of farming with respect to this question. One difference to be noted has to do with the least chosen option 'disinfection' as a farm hygiene measure. This option was chosen more than average (21 of 82: 26%) by entrepreneurs (7 of 19) and craftsmen (5 of 10), and less than average by stewards (3 of 13), stockmen (2 of 12) and shifters (2 of 16). This indicates that farmers at the ambition level of competition (entrepreneurs and craftsmen) had other ideas about farm hygiene than farmers at the ambition level of participation and autonomy (Supplement Table 6a).

The issue of farm hygiene was discussed further in the questionnaire. Farmers were asked to rank the three most important measures from a list of eleven options for ensuring animal health management and hygiene.

The most important measures to ensure animal health management and hygiene are:

- vaccinations
- enhancing disinfection
- enhancing cleaning (without disinfection)
- improving animal housing
- making a separate clean way and dirty way for farm contacts
- disinfection of the means of transport that enter or leave the farm
- combining pig production and fattening on one location
- reduction of the number of farm locations
- reduction of the transport distances for the animals
- reduction of the number of trade contacts and service people
- reduction of the number of visitors admitted

The most frequently chosen measure to ensure farm hygiene is ‘reduction of the number of visitors admitted’ (44 of 82: 54%). This measure was listed in first (16), second (18) and third (10) place. There was no difference among styles of farming in the frequency that they chose this option. The second most listed option was ‘reduction of the number of trade contacts’, which was chosen 28 times by the farmers (of 82: 34%). Stewards (8 of 13) chose it more than average and shifters (0 of 16) less than average (Table 6.4).

Table 6.4 Summary of the most important measures to ensure animal health management and hygiene. Pig producers were asked to rank the three most important measures.

	Frequency			
	Total	1st priority	2nd priority	3rd priority
Reduce no. of visitors admitted	44	16	18	10
Cleaning and disinfecting means of transport	36	12	13	11
Reduce amount of trade contacts	28	9	10	9
Combine breeding and fattening	27	12	7	8
Vaccinations	24	4	10	10
Secure enclosure (clean way / dirty way)	23	11	4	8
Improve housing	10	5	1	4
More disinfecting	5	2	2	1
More cleaning (without disinfecting)	5	1	3	1
Reduce number of farm locations	3	1	1	1
Reduce transport distances	2	0	1	1
Different / unknown	39	9	12	18
Total	246	82	82	82

'Admittance of visitors' is a broad concept. It includes visits by family members, neighbours and colleague-farmers, trade contacts and service people (like the veterinarian, the extension worker, etc.), and schools classes and other occasional visitors (see also Chapter 5). 'Trade contacts and service people' represent a specific group among these visitors. The most dangerous visitors with respect to the spread of disease are the animal trade contacts who come to the farms to deliver maiden sows and to buy feeder pigs. Visits by colleague farmers, family members and neighbours, as well as other trade contacts and service people are also an important source of risk. Stewards chose the reduction of trade contacts more often than the other types of farmers, probably because stewards were less likely than entrepreneurs, craftsmen and stockmen to have either a maiden sow production unit or a fattening unit, and they often had other farm branches (particularly dairy) present. So they required more trade contacts than others did. Besides, with dairy cattle moving around on the farm it would also be more difficult for stewards to take measures like 'clean way – dirty way separation'.

Since the outbreak of swine fever in 1997/1998 some farmers have become weary of the visits of service people and government controllers. For example, one farmer complained during the interview about the new regulations on central storage of medicines, because he (or she) thought it was counter-effective to prohibit the presence of medications on farms. To allow the government better control, regulations had been passed requiring that medications be stored in central depots:

> *<F052> I have always had medication on the farm. That is not allowed anymore. In the past there was a supply transport three to four times a year. Now my suitcase with medicines is put with other suitcases in a central fridge. That gives far more health risks.*

In the survey the answer 'disinfection of the means of transport' was also often chosen (39 of 82: 48%). This measure was also distributed among the first (12), second (13) and third (11) choices. Here too differences among styles of farming were found. Stewards (3 of 13) chose this option less than average. The differences among styles of farming were illustrated by the farmers' comments.

> *<E617> Transport is the most dangerous aspect of farm hygiene. You never know what has been in there before.*

> *<U313> Transport is most important. That should have improved long ago.*

These farmers were correct to the extent that transportation, particularly of animals, represents an important risk factor in the transmission of diseases. This was confirmed for example during the outbreak of swine fever when, during a period of freezing weather, the means of transport seemed to have played an important role in the transmission and early spread of the disease over farms. Often there is only cold water available for cleaning and in freezing weather that water will freeze instead of clean. But the warm bodies of the loaded animals will thaw the ice, so the animals may get infected. Yet some farmers had a different opinion:

<K508> Cleaning and disinfecting the means of transport is nonsense. It is just too difficult.

This farmer's suggestion that disinfection is nonsense may be disputed, because it is not in line with the perspective of disease prevention. But on some farms, probably on his (or her) farm, it would be difficult to implement.

There is a big difference between whether a means of transport is used only for local transportation between a fixed and limited number of locations (for the supply of maiden sows and delivery of feeder pigs) or if it is used for intensive and international transport. The latter type should not be used for visiting farms where cleaning (and disinfection) of materials is problematic (see also Section 6.4).

The answer 'separate constructions for a clean and dirty way' was given by 23 of 82 farmers (28%) in the survey as either their first, second or third choice. This answer was chosen more by entrepreneurs (8 of 19) and craftsmen (4 of 10) than by stewards (3 of 13), stockmen (1 of 12) and shifters (4 of 16) (Supplement Table 6a). This can be explained by the fact that entrepreneurs and craftsmen had bigger and more specialised farms allowing them to invest in making separate procedures. Stewards, stockmen and shifters had more often smaller mixed farms, on which constructions for the separation of a clean way and dirty way are more difficult. One of them explained:

<F052> The 'clean way – dirty way' principle is nonsense. Our stables are crowded with swallows and church owls.

This farmer's opinion can also be disputed. The 'clean way – dirty way principle' is not nonsense: it can be a very good tool for hygiene control management. But on some farms, probably on his (or her) farm, the measure is hard to implement. The farmer here suggested that it is not possible because of his nature conservation management for swallows and owls. On some farms it is possible though to create devices for these birds on the outside of the stables. But on free-range farms and organic farms this is not an option. When the pigs run free in the open the birds can come in contact with them.[11]

Some farmers believed that the combination of pig production and fattening on one location ('closed farming systems') would support farm hygiene. On average this was chosen by 27 of 82 (33%) farmers. In common practice (until 1998) feeder pigs were often collected at different farms by the same means of transport, to be delivered at the address of the fattener. But since the outbreak of swine fever the government has found this transport of pigs a risk factor for spreading pathogens over the farms of pig producers. Therefore, new government regulations were introduced prohibiting the group transport of pigs (with destinies other than slaughterhouses) from more than one location of origin. Many farmers would prefer to arrange a smaller means of transport in co-operation with the fattener to achieve this goal. But since the number of farms from which feeder pigs are allowed to enter the fattening farms has also been reduced by new government legislation, this is often not an option. So for many farmers there were two options to choose from:

- switch to a three-week working schedule to enlarge groups of feeder pigs

- combine pig production and fattening on one location.

Craftsmen chose the entry ‘combining pig production and fattening’ six times (out of 10), which was more than the population average. In Section 5.1 it was noted that five craftsmen had a combination of production and fattening on the farm. In contrast, entrepreneurs chose this measure only two times (out of 19) even though five entrepreneurs have a system that combines production and fattening (see: Section 5.1 and Supplement Table 5a). Earlier in this section (Section 6.1) it was already mentioned that none of the entrepreneurs listed their farms as the destiny of their feeder pigs. More than average (19 of 82: 23%) the entrepreneurs (8 of 19) had said that their feeder pigs went to a farm in the area. The explanation is that several entrepreneurs owned other farms in the area as well.

Among the styles of farming there were also differences in the choice of the answer ‘vaccination’, which stockmen (1 of 12) chose less than average (24 of 82: 29%). Some farmers emphasised other answers that were chosen less often. One farmer had listed ‘improving housing’ among his choices, and commented:

> *<C127> If the housing and the housing climate are in order, then all other measures for animal health are not necessary.*

It may have been an exaggeration to say that ‘all’ other measures would not be necessary, but it can be argued that other measures might be reduced, particularly, if the stables are easy to clean, and aspects like ‘clean way – dirty way’ were included in the architecture.

Another farmer commented that he (or she) missed an important aspect that he wished to point out:

> *<W174> Farm hygiene is a matter of handling animals. So cleaning is something that should involve the pigs as well.*

This aspect is very much discussed among farmers and farm hygiene specialists. Some argue that the sows should be cleaned (showered) regularly as well, particularly when changing housing systems. Other farmers argue that showering reduces the natural resistance of the sows. And some farmers claim that showering is a stress factor for the sows that may even cause abortions. It seems that it all depends very much on how the showering is implemented in the farm management.

Of 82 farmers, 9 (11%) did not choose any aspects that were important for disease prevention. That is quite a high number, considering the fact that experts (veterinarians and extension workers) claim that farm hygiene is a very important part of farm management. One farmer, a steward, commented on this issue:

> *<W631> That fuss about farm hygiene is merely nonsense. You have got to have barns with eight stables for that. We don’t have that. We do clean though. But our practice does not fit with the theory.*

This farmer was referring to the ‘all-in all-out principle’ that was not mentioned on the list. In such a system the stables are divided into separate units. After weaning the units are completely emptied: from the farrowing house the sows return to the sow house for barren and gestating sows and the weaners go to the stables for weaners. So each time a unit can be cleaned as a whole. In a three-week system larger units are cleaned. Despite what the farmer quoted above believes, the system is not nonsense at all: it can be a very good tool for hygiene control management, and it has been commonly present on Dutch pig farms since the 1980s. But on some farms – probably on his (or her) farm, the measure is hard to implement.

Another farmer remarked that administration was an aspect that had indirect influence on health management, because the farmers' attention was distracted by it:

> *<K002> The most important focus for farmers in farm health is doing less administration. A real farmer works in the stables, not in an office.*

Conclusion

Farmers differ with respect to hygiene strategies. The most pronounced difference is between farmers at ambition level for competition (entrepreneurs and craftsmen) and farmers at ambition level for participation and autonomy (stewards, stockmen, and shifters). Farmers at ambition level for competition confronted the environment more often with isolation and disinfection as hygiene measures compared to farmers at ambition level for participation and autonomy. They also put more emphasis on the 'clean way – dirty way' principle, vaccination, and cleaning of the means of transport. On the other hand, farmers at ambition level for participation and autonomy (stewards, stockmen and shifters) were more integrated in the environment (wildlife, visitors, etc.).

Contacts over Farms and Farm Locations

Farm visitors and study clubs were already discussed in Section 5.2. The findings of Section 5.2 clarified also that different levels of farm contacts should be distinguished:

- daily contacts between locations of a limited number of people (farmer and family)
- regular contacts of veterinarian, service people, suppliers, transport, etc.
- contacts of neighbours, and friends; i.c. other farmers, other livestock owners, etc.
- occasional contacts through control visits for farm regulations and certificates
- incidental contacts of non-farm-connected visitors and other non-related contacts.

In this section the focus is on the farm workers themselves. Some farmers work at different farms or at different farm locations. To get an insight into the movements of people over various locations that house pigs, the interviewees were asked whether they also worked on other farms or other farm locations. Fifteen of the 82 farmers (18%) in the survey appeared to work on different farm locations that house pigs. Another 15 farmers had a job at another – independent – farm with pigs. So a total of 30 farmers (37%) had daily contacts with pigs at different locations. In addition 28 farmers (34%) worked at different location with other animals – predominantly dairy cattle. Another 8 farmers (10%) worked on other locations or farms that did not have any livestock – arable farms (Supplement Table 6a). Besides, many farms have part-time farm hands (see Section 5.1) who also work on other farms.

The risk of contamination between farms differs depending on the type of contacts. The risk of introducing pathogens increases with the number of other farm contacts that a contact person has. The findings in the survey revealed that contact between farms and farm locations were frequent. This implied a high risk of spreading pathogens after an introduction in the area.

It was remarkable that there was no difference among styles of farming in the number of contacts with other farms. Entrepreneurs and craftsmen had no fewer contacts with other farms and locations than stewards, stockmen and shifters. That is probably caused by the fact that those farms were often spread over several locations. Stewards, stockmen and shifters have fewer locations themselves, but they have often off-farms jobs, and stockmen and shifters often have personnel who work on their farms only a few hours per week. Those farm hands often work at different farms and locations. It could well be that there were differences among styles of farming in the precautionary measures taken upon entering other locations, but there were no questions about that aspect in the questionnaire.

The Swine Fever Outbreak

In 1992 the non-vaccination policy for swine fever was implemented in The Netherlands, after new regulations on the issue were passed in the European Union. In 1995 the Schengen-agreement was implemented, regulating open borders between various European countries. In this agreement there were no additional regulations made concerning a possible conflict between open borders and the outbreak of an important animal disease. It was agreed that in cases of outbreaks the national borders would close again for all export. Because of the agreement, the risk of an outbreak through the open borders was increased, whereas the chance that an outbreak would turn into a national crisis was increased by the measures that the national government is expected to take by the European Union (EU). Through the transport block and the closed borders for export, the welfare of large numbers of healthy animals becomes a greater problem than the outbreak itself. This became particularly apparent during a big outbreak of swine fever in 1997/1998, the outbreak of foot-and-mouth disease in 2001 and the outbreak of fowl plague[12] in 2003 in The Netherlands.[13] The study area for this research had not been directly affected by these disease outbreaks. The swine fever outbreak in 1997/1998 was concentrated in the south of the country, though some measures had been imposed on part of the study area too. To prevent further spread a temporary transport block affected 17 of the 82 farms in the survey. No animals were culled at any of the farms in the study area. The foot-and-mouth disease outbreak in 2001 and the outbreak of fowl plague in 2003 neither affected the study area directly.

The survey was held in 1998, a few months after the swine fever outbreak in the south of the country was over. Farmers were asked and several commented on how they did – or would – respond in the event of a transport block. In the event of an outbreak there is supposed to be a short period in which all transport is blocked (including feedstuff). After a few days to one week and for a prolonged period thereafter, only the transport of animals and manure would be blocked. This could lead to serious problems, especially on animal (pig) production farms, because these farms are not equipped for (instant) housing of increasing numbers of (growing) pigs. Several farmers in the survey had thought of a solution, which would be to create emergency housing in the machine barn. Farmers who have a mixed farm normally have a barn to store machines for fieldwork. For some of the farmers who had been blocked during the outbreak of swine fever, this had actually provided a temporary solution:

> *<W166> During the swine fever outbreak I emptied the machine barn. And right on the first day I bought a slop feeding system. Thus I could keep 600 feeder pigs of 20-25 kg and up.*

> *<K508> When we were blocked by the outbreak of swine fever I created emergency space in the barn. But after two months it became problematic nevertheless.*

Other farmers who had not been blocked commented that they had thought about the issue and that they had made similar plans in case such a block might affect them:

> *<W197> I have thought about what to do if the swine fever would block us. We have an emergency plan to keep the pigs in the machine barn.*

> *<K323> We have an emergency plan in case a transport block affects us. We could empty the machine barn and make stables. Besides, we have enough room to double the number of pigs in the existing stables. In addition, we would take extra measures for disinfecting and for the means of transport.*

During the swine fever outbreak some farmers were not directly affected by the transport block, but were impeded by the closed borders. The international trade to a neighbouring area in Germany – one of the major benefits of the Schengen-agreements – suddenly disappeared. Some farmers could not directly cope with these problems:

> *<W205> In the past we had Pietrain breed for the German market. But because of the outbreak of swine fever the export has come to a stand still.*

So this farmer was not blocked, but he was suddenly confronted with the problem of finding a new fattener for the feeder pigs. The same was true for the following farmer:

> *<K175> We were not blocked by the swine fever outbreak, but we could not sell our animals to Germany any longer. Now we have found another pig fattener close by in The Netherlands. ... If we would have been blocked we would have emptied the chicken barn to create emergency housing for the pigs.*

Other farmers did not have a machine barn available. An alternative on some of these farms would have been to create space between barns:

> *<C226> If we were to get a transport block in the event of swine fever, then I could create emergency housing between the barns. I deliberately purchased a frame for that. And to create a temporary roof is no problem.*

It was remarkable that most farmers indicated that they had not thought about the issue before the outbreak of swine fever in 1997. The possibility of a crisis requiring preparation planning by every individual farm was an evident implication of the combined EU-regulations about non-vaccination (1992) and open borders (1994). Disease outbreaks could never be handled anymore in the way they were before these regulations. But the awareness of the issue was low among farmers[14] and it was not communicated by any farm extension service. Yet some farmers had indeed foreseen the problems. One of the stewards remarked:

> *<W205> Pig producers are more affected by a swine fever outbreak than pig fatteners. At a certain moment the yard is full. ... When we built the new stables we anticipated the possibility of a transport block in the event of a disease outbreak. We can make a frame between the old and the new barn. In that way we can create a lot of emergency housing.*

No differences were found among styles of farmers with respect to the crisis preparedness of farmers. Apparently the recent event had triggered nearly all farmers to think about the possibility of being confronted with such a crisis. Nevertheless, not all of the farmers were triggered for creating emergency plans and keep it ready:

> *<U313> No, we don't have any plan ready in case the swine fever outbreak arrives here. We will see then.*

Some farmers saw the question as an opportunity to comment on the new government regulations, which were made after the outbreak:

> *<K180> The creation of corridors is unnecessary. It doesn't help animal health. They should spend the money on buying production rights.*

Conclusion

The outbreak of Swine Fever in 1997 in the south of the country forced the pig producers in the study area to find solutions to the problems of the transport block and to prepare for new outbreaks of diseases. Some farmers had to find new contact farms to sell their pigs for fattening, During the outbreak, some farmers created additional capacity to keep pigs at the farm during the ban on transport. The outbreak alerted some farmers, of all styles of farming that they should anticipate dealing with a transport block in the event of a disease outbreak. Some farmers had developed an emergency plan, but others had not (yet) done so. There are no indications that (veterinary) extension services assist the farmers in that planning.

6.1.6 Market-Oriented Management

Destination of the Feeder Pigs

Pigs that were ready for fattening were often sold from the pig producer (27 of 82: 33%) to a contact fattener in a chain-integration of Dumeco Company. On a number of farms the pigs stayed on the same farm (17 of 82: 21%), or went to a farm in the area (19 of 82: 23%). This pattern is characteristic for the eastern part of the country. Compared to the south, relatively few farms in the east combine feeder pig production and fattening on the same farm. The difference among styles of farming was already shown. Entrepreneurs sold their pigs more than average to a farm in the area, but it happens that the receiving farm is another farm of the same owner (see also earlier in this section and in Section 5.1).

The destination of the feeder pigs of this farm is…
- this farm (at the same or another location)
- another farm in the area
- a (fixed) contact in Germany
- a Dumeco contact farmer
- a (fixed) free trader.

The statement 'the destination of the feeder pigs is another farm in the area' was correlated to Productivity and Scale ($p<.005$) (Chapter 4), suggesting a link with ambition. Farms in the sphere of competition had more often a contact farm for fattening in the area than farms in the sphere of participation and autonomy. The fact that some entrepreneurs sold their pigs to other farms of their own supported this suggestion.

After the outbreak of swine fever in 1997, the government created new regulations on contacts between farms and farm locations. The combination of pig production and fattening was encouraged (see Section 5.1). The government also regulated the reduction of the number of farm contacts that farmers had and the reduction of combining animals from different locations. Yet through Dumeco Company many feeder pigs already had a destiny through fixed lines. One of the farmers commented:

> *<K142> We do not arrange the number of trade contacts ourselves. Dumeco arranges that. Small farms like ours are completely dependent on the chain organisation.*

With or without direct interference of Dumeco Company, feeder pigs from other farms in the area also went directly to a nearby fattening farm. Since the Schengen-agreement in 1994 the term 'in this area' had been broadened to include abroad – particularly nearby in Germany. But the closing of boarders during the swine fever outbreak showed that opportunity to be unreliable, because the borders can get closed. So after the swine fever outbreak ended farmers felt reluctant to restart those contacts abroad.

In the survey, the destination of feeder pigs from 12 farms (15%) was not fixed. Those pigs were sold through a fixed contact with a trader though, but they were transported anywhere within The Netherlands or abroad.

Chain Labels

In recent years participation of farms in chain labels has been successfully promoted both by the government and by the chain industry (food suppliers and slaughter companies). Chain labels were implemented as a food safety label. It is a certificate about standards for hygiene, use of medicines on the farm and control over chain contacts. The certificates are given for meeting criteria for serving consumers: farm hygiene (particularly through the 'clean way – dirty way principle'), the ability to trace animal origin through a chain of fixed contacts, and management of farm animals after medical treatment (not selling animals within a prescribed number of days). In contrast to what consumers often think, chain certificates have basically nothing to do with animal welfare and environmental protection. They are only focussed on food safety. All but one farm in the survey participated in the Good Farming (or IKB) chain certificate system – the exception was a boar producer[15] specialised toward the English bacon market.

Of the 82 farms 21 (26%) produced beyond the basic requirements for hygiene, use of medicines and chain contacts control and had a Good Farming Crown or IKB^{+} label. Not surprisingly, they were mostly entrepreneurs (9 of 19 entrepreneurs held such a certificate). None of the stockmen had a 'Plus' or 'Crown' label. This is not surprising either. Stockmen usually had different farm outlays, and ideas about hygiene and integration with the environment (wildlife) that did not match with the prescribed standards for food safety. One of the farmers in the survey had an AH2000+ certificate of a big Dutch international supermarket.

Some farmers had food safety labels connected to other branches on their farm. They were usually for milk production from the dairy section of the farm. The most common label is chain quality milk (KKM).

Conclusion

The outbreak of Swine Fever in 1997/1998 was the first disease outbreak to alert the farmers for the consequences of the Schengen-agreement in combination with a 'non-vaccination policy'. Thereafter extended market abroad (in Germany) was reduced. Due to new government regulations the number of contacts between fatteners and pig producers was also reduced. Some farmers – entrepreneurs – were planning to reorganise their farms in such a way that pig production, piglet rearing, and fattening can be done at the same location. But for most farmers in the survey this was not an option.

Nearly all farms in the survey had food safety labels (IKB or Good Farming), confirming safety measures in the production chain. For advanced labels ('Plus' or 'Crown') advanced farm measures were required concerning hygiene isolation and cleaning. These were more present among entrepreneurs and craftsmen than stewards, stockmen and shifters. A particularly small number of stockmen had a 'Plus' or 'Crown' label.

6.2 Indicators for Pig Production Management

6.2.1 Introduction to Indicators and Subsystems

In the 1970s and 1980s farm management improvement was (still) mainly considered from an instrumentalist paradigm: based on accountable and reproducible research, farm management could be 'improved' in the sense of efficiency, intensification and labour-reduction (Wielinga 2001). The definition of 'improvement' was (still) hardly a matter of discussion in itself: any increase in efficiency was considered an improvement. And even nowadays 'improvement' is often considered synonymous with increase in efficiency. In this development of efficiency improvement, standardised indicators were welcomed to evaluate farm production processes for efficiency comparisons (Huirne 1990). The use of these indicators has become common in farming practices, and particularly in pig farming. It is estimated that about 80 per cent of the pig producers in the survey area use a management support system[16]. In this study, though, the pig farm management indicators are used as a means to reflect on differences in styles of farming, and to evaluate the implications for production efficiency and economy.

As shown in Chapter 4 there were twelve management indicators used in the factor analysis for the classification of farms, because they were correlated to Intensity. Some of these indicators were closely related to each other. Farmers use the data from management indicators in daily farming practices. The indicators reflect key information to evaluate various aspects of the production process. Combinations of indicators reflect the production results of subsystems in pig production, like production and rearing of piglets, piglet growth, fertility cycles of the sows and sow replacement practices. The discussion in this section is about what aspects of farming practices the indicators reflect and how the farmers valued the data.

Indicators for Feeder Pig Production

Indicators can describe pig production practices. In the 1980s production indicators were developed for the control of farm management for feeder pig production. The indicators were standardised by the Agrarian Telematica Centre (ATC). Meanwhile, commercial provider companies started to provide farmers regularly with lists of data about their farm management. The effectiveness of this new tool for farm management control is well studied and appreciated (Verstegen 1998; Huirne 1990). Through the years, ATC and other institutes kept control over the standardisation of the indicators (ATC 1996).

The aim of the standardisation is to provide farmers with comparative information to support their farm management decisions. At first, standard indicators were specified about the subsystems of feeder pig production: production and rearing of piglets, piglet growth, fertility cycles of the sows and sow replacement practices. Later, indicators were added about inputs and outputs of supplies and animals. And finally, in the 1990s, indicators were added about farm economics (Table 6.5). The latest adjustments to the specifications of the standard indicators in pig husbandry were made in 1995 by a task group of several co-operating institutions (see also the Supplement Table to Appendix B).

Table 6.5 Types of management indicators standardised by ATC. The indicators refer to different aspects in pig production[1]

Part 1: Production indicators
Animals present
Piglet production
Fertility cycle of the sows
Sow cull and replacement by maiden sows
Piglet growth
Part 2: Inputs and outputs
Animals present

Animals bought and sold per year
Feedstuff consumption
Part 3: Prices and balance[2]
Prices for animals bought and sold
Feed costs
Returns on feedstuff [per year]
Various additional costs per sow [per year]
Balance of costs and returns

[1] For an extended table, see: Supplement Table Appendix B

[2] Some management support programmes have extended lists on prices and other economic data.

Basically, indicators might describe all aspects of pig production in detail, though in management support standards not all the potential indicators are actually specified. The indicators that are specified are the ones that are considered to be most important as tools for management support. In the current study all potential indicators are defined, for the evaluation of diversity in styles of farming (see also Appendix B).

Data Presentation

The 70 interviewees who supplied data for 1997 also supplied data about farm management indicators for the years 1996 and 1995, though sometimes those lists were incomplete. In Supplement Table 6b the total number of available data are given for every indicator on which the figures were based. If the data of less than six farmers of a certain style of farming (or less than 28 of all 70 participants; 40 per cent) were available for a particular indicator, then the figure was considered ‘not available’.

The availability of figures of three consecutive years allowed for a long-term evaluation of the data about the styles of farming. From the material, three independent sets of variables were specified: the mean, the trend and the fluctuation.[17]

The new variables were defined as:

Mean:	[(data 1997 + data 1996 + data 1995) / 3]
Trend:	[(3 * data 1997) – (2 * data 1996) – (1 * data 1995)]
Fluctuation:	[(2 * data 1996) – (data 1997) – (data 1995)]

Example:
Imagine that for a certain indicator the mean over the three years is ‘2’. If there was a trend, the data would increase (or decrease) over the years. For example: in 1995 it was ‘1’, in 1996 it was ‘2’ and in 1997 it was ‘3’. This would show up through the equation for a trend [(9) – (4) – (1)] = ‘4’, but not through the equation for a fluctuation [(4) – (3) – (1)] = ‘0’. If there was a fluctuation the data of 1996 would be highest (or lowest). For example: in 1995 it was ‘1’, in 1996 it was ‘3’ and in 1997 it was ‘2’. This would show up as an insignificant trend [(6) – (6) – (1)] = ‘-1’, and a clear fluctuation [(6) – (2) – (1)] = ‘3’.

The trends and fluctuations were checked to validate the classification of the styles of farming. If trends and fluctuations were found among indicators that were selected to classify the farms into styles of farming, this could support or reduce the validity of the classification of the farms. This could mean that if the survey had been done in another year, the classification might have been very different. In the following this aspect is taken into account.

6.2.2 Indicators about Production Intensity

In the current study Intensity is defined as 'produced feeder pigs per sow [per year]', but this is not completely accurate. As illustrated in Appendix B, the real 'intensity' is actually determined by four subsystems of physical transformation:

(1) linear: piglet production (in numbers per litter)
(2) cyclic: fertility cycle (in farrow frequency)
(3) cyclic: sow cull and sow replacement (in replacement speed)
(4) linear: piglet growth (in body weight gain)

In this section the coherence in farming practices of the styles of farming are discussed as diversity in the co-ordination of the various subsystems.

Litter Size

The number of piglets per litter that were reared to become weaners was expected to vary among styles of farming depending on the pig breed type, the total number of piglets born per litter, the age of the sows, and the farm management. The management might be related to the stable equipment (see also Chapter 5 and Section 6.1).

In Chapter 4 it was shown that both the 'number of piglets born alive per litter' and the 'number of weaners per litter' were among the selected parameters for the factor analysis, because of their correlation to Intensity ($p<.005$). This indicated that the largest contrast could be expected between craftsmen and stockmen. This was confirmed in the findings in the study (Supplement Table 6b).

The average number of piglets born alive per litter is determined by the 'total number of piglets born per litter' and 'the number of piglets born dead per litter' (see also Figure B1 in Appendix B). If pre-weaning piglet mortality is taken into account, the number of weaners per litter is available. Among styles of farming the most interesting contrast for 'weaners per litter' was between craftsmen and stockmen. Craftsmen produced more weaners per litter (10.2; σ=.4) in 1997 than the population average (9.8; σ=.4) and stockmen produced fewer (9.4; σ=.4) than average. The averages of the data of the mean over the years 1995 through 1997 were comparable.

The difference in numbers of weaners per litter between craftsmen and stockmen was not due to increased stillbirths (Supplement Table 6b). It seemed directly related to a difference in numbers of piglets born alive per litter, which was 11.5 (σ=.5) for craftsmen in 1997 and 10.5 (σ=.4) for stockmen, whereas the population average was 10.9 (σ=.5). Since breed type and sow age influence litter sizes, this indicated that the difference in number of weaners per litter for stockmen might be related to litter size and therefore to sow age and breed type.

In Section 6.1 it was shown that stockmen did not have different breed types from the population average, as far as could be checked. However, an elevated number of stockmen (6 of 12) compared to the population average (27 of 82 farms: 33%) in 1997 left the selection of the sow type to the advice of the breeding company. Craftsmen mostly had a particular sow breed type: an elevated number of craftsmen (6 of 10) compared to the population average (22 of 82 farms: 27%) had the common crossbreed (NL x GY). This difference in sow breed type could (partly) explain the difference in the number of piglets born per litter. Craftsmen also had particular considerations for selecting sows with specific qualities (like strong piglets). Stockmen left such considerations more to the breeding company (see also Supplement Table 6a).

With respect to other aspects of breeding strategies stockmen were not really different from the population average, and particularly not different from shifters. So there must be an additional reason why stockmen were so different from the population average on the aspect of litter size. A probable explanation is sow age. In general young sows (first farrows) are known to produce smaller litters. On the other hand, old sows (ninth and higher farrow) have a slowly decreased litter size per farrow as well. But herds with a low sow cull percentage, and a low percentage of introduced maiden sows (‘percentage young sows after first farrow’), usually have bigger litters. To check this, the data of the indicators ‘piglets born alive per litter’ and ‘weaners per litter’ of the population of farmers in the study were evaluated for correlation to the data on the indicators: ‘percentage young sows after first farrow’ and ‘percentage sow cull’. The correlations were not found to be significant for the population ($p<.2$ to .3) as a whole. Nevertheless the ‘percentage young sows after first farrow’ (15%; $\sigma=3$) and the ‘percentage sow cull’ (33%; $\sigma=10$) of craftsmen were low in 1997 compared to the population average, whereas the ‘percentage sow cull’ of stockmen was elevated (42%; $\sigma=11$) compared to the population average (Supplement Table 6b). This suggests that the sow herd in 1997 of craftsmen was older than average and the sow herd of stockmen was younger (see also below). In addition, it appeared that the number of days lost per culled sow was low for craftsmen (26 days; $\sigma=7$) and elevated for stockmen (44 days; $\sigma=15$).

The contrast that was found between craftsmen and stockmen could also be explained by differences in stable equipment and management. Craftsmen had modern stables and stable equipment. The loss of sows for example due to lung, leg, other health problems, and fertility problems was probably low. This could explain why the culling of sows in the most productive years of their lives was low. At the same time the strategy of craftsmen for unproductive sows was rigid, as was shown by the low number of days lost due to sow culling (see also below).

The stables of stockmen were older, and stable investments were made as economically as possible at the expense of labour input. Sows may have had more lung, leg, other health problems, and fertility problems. Lung problems may have been caused by a less optimal stable climate, leg problems by poorer floor quality, and other health problems and fertility problems by a variety of factors, such as feedstuff quality. More stockmen (6 of 12) than the population average (26 of 82: 32%) found it important that the feed supply company provide them with a ‘fitting feed type’ (Supplement Table 6a). The number of ‘days lost due to conception problems’ was higher than average, indicating that stockmen took more time than average to try and cure the sows of health and conception problems before deciding that the sows should be culled. This confirms the suggestion in Capter 5 that 'caring for animals' (stockmen) does not necessarily mean that the animals have a better healt or a better housing system.

The percentage of pre-weaning piglet mortality was higher for craftsmen (11.7%) than for stockmen (10.8%). So in this respect the roles were reversed, although the results in terms of weaners per litter still favoured the craftsmen. A high percentage of pre-weaning piglet mortality can be related to the large litter sizes. The larger the litters, the higher the number of weak piglets and the more complicated piglet management becomes. This is explained in the following.

Large litters create specific problems for animal management. In western pig breeds the sows usually have 12 healthy teats (occasionally 14). In their first farrow the sows often produce nine to ten piglets. But in consecutive farrows this can increase up to 16 piglets in one litter, which increases the likely number of weak and small piglets in each litter. Soon after they are born, piglets establish a hierarchy in getting access to the teats. The stronger piglets confiscate the teats that are closest to the sow's head and the weaker piglets get the teats that are situated farther back. Within a few days each piglet has its own teat. So the weakest piglets get nothing, because they fail to gain access to the teats. So the farmer should come to their rescue. Right after birth the farmer puts either the weakest or the strongest piglets with another sow, to create uniform groups of piglets in both litters. Sometimes a whole new group is formed of piglets from different litters, which is put with a sow (with a perceptive character) whose piglets have just been weaned. These measures should be taken as soon as possible after birth, before the hierarchy among the piglets is established and before the bond between the sow and the piglets is strengthened (see also Section 5.1).

There are differences among styles of farming in how often the farmers encounter these problems. Styles of farming, such as craftsmen, in which larger litters are normally produced thus require more this specialised work. And therefore the work requires longer hours of attending the piglets. Specific and skilled attention are required of the farmers to keep those piglets alive.

On farms of entrepreneurs the number of stillborn piglets, as well as the pre-weaning mortality of piglets, was low compared to all other styles of farming (Supplement Table 6b). This was not just the case in 1997, but throughout the period 1995 through 1997. This was consistent with the more modern housing systems and improved climate conditions of entrepreneurs compared to the population average, as shown in Section 6.1.

Trend and Fluctuation in Litter Size

There were hardly any trends or fluctuations found in the indicators concerning the number of feeder pigs per litter. However, a slight downward trend in the number of piglets born alive per litter was found on farms of entrepreneurs. This could be related to an increased number of young sows in the herd, either for replacement strategies, or related to farm expansion. On farms of shifters there was a slight positive fluctuation in the number of piglets born dead per litter (Supplement Table 6b; see also below).

On farms of stockmen there was a slight positive fluctuation in the number of piglets born alive per litter, which was also reflected in the number of weaners per litter. Sow age or health problems could explain this finding. There was an elevated sow cull on farms of stockmen (Supplement Table 6b; see also below).

The 'percentage pre-weaning piglet mortality' had significantly dropped on farms of stewards by 0.9% (σ=2.2) as a trend over the period 1995 through 1997. On average over the entire period, this percentage was much higher on farms of stewards (12.2%; σ=2.0) than average. So in 1997 the 'percentage pre-weaning piglet mortality' on farms of stewards was still higher (11.7%) than average. Even though piglet mortality in 1997 on farms of stewards was the same as on farms of craftsmen, the causes of pre-weaning piglet loss were different. On farms of stockmen the causes were related to large litters; while the sows of stewards did not have these litter sizes. So the pre-weaning piglet mortality rate on farms of stewards was more likely to be related to the condition of the animals – health problems (which may or may not have been related to housing) or unbalanced feed supply (see also the illustrative example in the box).

The number of piglets per litter that was reared to weaners was thus highly dependent on the total number of piglets born per litter. This seemed related to the pig breed type, the age of the sows, the quality of the stables and equipment and the management of the sows. Entrepreneurs and craftsmen seemed to keep their sow herd in better condition, which resulted in the higher number of piglets born per litter (craftsmen) and a lower rate of piglet loss (entrepreneurs).

Conclusion

The differences between craftsmen (large number of piglets per litter) and stockmen (small number of piglets per litter) were the most pronounced. These differences could be explained by differences in breed type, sow age, stable equipment, and differences in management practices. For stewards the pre-weaning piglet mortality rate was higher, though the situation had already improved in 1997 compared to 1996 and 1995. The problems were probably related to the condition of the animals.

Farrow Cycle

The farrow cycle is summarised by the indicator 'farrow index', which reflects the number of farrows per year (per sow). The farrow index is highly determined by the gestation period of the sows (about 115 days), and the usual duration of the nursing period (in common practice four weeks). But these parameters are hard to influence by management – particularly the gestation period. The same is true for the interval between weaning and first oestrus; the first insemination is usually after 6-7 days.

For farm management the most important indicators are those that can be influenced. Therefore the most important indicators concerning the farrow cycle are the conception rate after the first insemination, the percentage of re-inseminations, the interval between the first and the last insemination, and the speed of sow culling for conception problems.

The natural farrow index for sows is 2. But this frequency is elevated in modern farm management. It was expected that the farrow index would be highest on the farms of craftsmen. A high farrow index implies a good physical condition of the sows, close observation of the sows for detecting oestrus, precise timing of the inseminations, adequate anticipation of which sows will have to be culled in order to reduce the number of days open, and determination of the farmer to achieve a high farrow index.

The indicators 'farrow index', 'interval weaning to first insemination', and 'interval first to last insemination' were included in the factor analysis because they were correlated to Intensity ($p<.005$) (see also Chapter 4). So the biggest contrast was expected to be found between craftsmen and stockmen.

Example:
In the study the feeder pig production per year was about 4000 pigs per farm, varying from about 6000 feeder pigs per year for entrepreneurs to 2000 feeder pigs per year for shifters. The following example indicates the losses in numbers of piglets in the production process. Furthermore, the example illustrates how differences in farming strategies can affect the results in feeder pig production. Therefore the differences in strategies of craftsmen and entrepreneurs are compared.
Imagine that on a pig production farm there are 5000 piglets born in total per year. With a farrow index of 2.35 this means that the hypothetical farm has 180 sows. The annual losses in the pig production process on this hypothetical farm are given in Table 6.6.

Table 6.6 Average losses in the pig production process on a hypothetical farm on which 5000 pigs are born per year.

Indicator	*Losses*	*Numbers*
Piglets born in total per year		5000
Piglets born dead per year	About 0.8 piglets [per litter of 11.8]	340
Pre-weaning piglet mortality	About 11% of the piglets born alive	510
Piglet mortality after weaning	About 1.7% of the weaners	70
Feeder pigs in total per year		4080

The larger the litters, the higher the losses will be in absolute numbers. Craftsmen, with a total average litter size of about 12.2 and a pre-weaning piglet mortality rate of about 11.5 per cent, lose about 10 piglets less per year as stillborn piglets and gain 25 piglets more as pre-weaning piglets. In total they lose about 15 piglets per 5000 (0.3 per cent) more than average. But they produce these piglets with 13 farrows less than the population average of (5000/11.8) = 423 farrows. With a farrow index of for example 2.35 this means the involvement of 6 sows less for craftsmen than for the population average of 180 sows. The sows of craftsmen produced 23.4 feeder pigs per sow (per year) over 1995-1997. To produce the same total number of feeder pigs as the given average (4080 feeder pigs; see table), a craftsmen would require (23.4/15) about 1.5 sows extra. But still the advantage for craftsmen is about 4.5 sows in comparison to the population average of 180 sows.
On farms of entrepreneurs the number of stillborn piglets is 0.1 less per litter and the pre-weaning piglet mortality rate is about 1.0 per cent less than for the population average. So they lose about 45 piglets less than average as stillborn piglets and about 15 piglets less than average as pre-weaning piglets. So in total entrepreneurs lose about 60 piglets per 5000 (1.2%) less than average. To produce the same number of feeder pigs as average (4080 feeder pigs; see table), an entrepreneur would require (60/23.1) sows less, so the advantage is about 2.5 sows to an average population size of 180 sows.
Note that on farms of entrepreneurs are slightly more labour efficient than craftsmen are, at the expense of financial investments. So from an economic perspective the two styles of farming are probably in balance. This supports the hypothesis that entrepreneurs and craftsmen share the same productivity curve, but with contrasting rationales.
Note also that this example is placed in a sphere of competition – there is an 'advantage' to be gained by reducing the number of sows involved with the production of a fixed number of piglets. In a sphere of participation the focus would be different. Not the advantage in reducing the numbers of sows or gaining efficiency, but the advantage in strengthening basis for farm continuity would be central – with a certain level of productivity as consequence.

Successful insemination results depend largely on the detection of the return of oestrus of the sow, on the quality of semen and fluids, on the insemination technique, and on the condition of the sows. The expression of oestrus of sows does not vary much among the breed types that are common in The Netherlands. A healthy, well-fed sow returns in oestrus within a few days after weaning. At about six to seven days after weaning, most sows are in their optimum stage of oestrus for insemination, which lasts about 24 hours (Van der Lende 1989). This knowledge is usually incorporated in the planning of weekly working schedules in all styles of farming (see Section 5.1). Still it is not easy for farmers to detect and differentiate the various stages of the oestrus (particularly of maiden sows) and regular checks of the sows are required to determine the optimal moment for insemination.

In Dutch farming, inseminations are usually done by professionals, although self-service has become common on large farms (at least 400 sows) since the mid-1980s. For the majority of the farms in the study there was no difference expected in the quality of the semen and fluids (from large companies) and insemination techniques (of professionals who visit the farms). So the difference among styles of farming in the conception rates after the first insemination were assumed to be largely dependent of the detection of the stages of oestrus by the farmer and on the condition of the sows.

In the study, the average farrow index was 2.31 over the period 1995 through 1997. The farrow index on farms of both craftsmen (2.37 in 1997) and entrepreneurs (2.35 over 1995-1997) were higher than the population average. This means that entrepreneurs and craftsmen make more rigorous decisions in the event of conception problems of the sows. The farrow indexes of stockmen (2.26 in 1997) and shifters (2.27 over 1995-1997) were lower. The contrast between craftsmen and stockmen is illustrated in an example.

Example

An average farrow index of 2.31 (see Supplement Table 6b) means that the average interval between two farrows of a sow is 158 days. Since the gestation period of sows is 115 days and the nursing period is on average 27 days, there are on average 16 days left as ‘open days’. Since the number of days in gestation is fixed and the nursing period varied only ± 1 day, the differences among the styles of farming in farrow index reflected actually differences in the number of ‘open days’.

The interval between weaning and first insemination is 6-7days. On average 80-85 percent of the sows on all farms have 6-7 open days after weaning of the piglets. Then they (usually) return in oestrus, get inseminated and return in gestation (Supplement Table 6b).

On farms of craftsmen the farrow index is 2.37, and on the farms of stockmen the farrow index is 2.26. This reflects a difference of (154 versus 162) eight ‘open days’: 12 open days for the sows of craftsmen and 20 open days for the sows of stockmen.

On farms of craftsmen 85 percent of the sows return immediately (after the first insemination) in gestation, while on farms of stockmen this is 80 percent. The rest of the ‘open days’ account for differences in strategies for re-insemination. Re-insemination is possible after a delay of 21 days. That time is required for sows to return in oestrus. Of the inseminations that occur on the pig farms there is a certain percentage of re-inseminations of sows that did not get in gestation the first time. In the survey the percentage of re-

inseminations is 10 per cent on farms of craftsmen and 15 per cent on farms of stockmen. On the farms of both styles of farming the remaining sows are culled because of 'conception' problems.
The craftsmen in the study lost on average 29 days due to 'open days before sow cull'. So that is about 6-7 days for the first oestrus, plus 21 days for the second oestrus. So craftsmen cull sows rigidly if they do not get in gestation after the second insemination. The stockmen lost 47 days due to 'open days before sow cull'. That is 18 days (62%) longer. This is close to the time lapse of about one oestrus cycle (21 days) extra in comparison to the craftsmen. So this means that on farms of stockmen a large percentage of the sows with conception problems are kept for trying to get them in gestation after three times (Suppl. Table 6b).
These findings coincides with the interval between the first and the last insemination (Supplement Table 6b). This is almost twice as long (6.3 days) for the sows of stockmen as for the sows of craftsmen (3.4 days). The data suggest that stockmen wait on average one oestrus cycle longer than craftsmen before coming to the decision to cull a sow for conception problems.

Supplement Table 6b also shows other differences in insemination strategies among the styles of farming. Both craftsmen (87%; σ=2) and stewards (87%; σ=4), for example, had higher success rates than average (85%; σ=4) with the first insemination in 1997. For both styles of farming this was an improvement after a negative fluctuation in 1996. Nevertheless, the average over 1995-1997 was also 87 per cent for both styles of farming. These two styles of farming also had comparable data for the percentage of re-insemination among the inseminations of the sows: 10 per cent on the farms of craftsmen and nine per cent on farms of stewards. This finding suggests that stewards might have had a higher sow cull than craftsmen, and this was indeed confirmed in the study. Craftsmen had a four percent lower sow cull in 1997 (33%) than stewards (37%), which was also three percent less than the population average (36% in 1997). This difference of four per cent in sow cull rate between craftsmen and stewards was also present in the data over 1995-1997 (Supplement Table 6b; see also below). The explanation is that stewards had a higher sow cull than craftsmen for reasons other than insemination results. These could be, for example, lung, leg and other health problems. Those problems might be related to differences in the quality of stable equipment and to other management aspects.

Conclusion

Entrepreneurs and craftsmen were both focussed on a high farrow index. This means that the conception of the sows of entrepreneurs and craftsmen is better than average and that entrepreneurs and craftsmen make more rigorous decisions about the fertility status of the sows. The reduced farrow index for stockmen seems to be caused by the fact that stockmen tend to delay culling for fertility reasons longer: one oestrus cycle longer than (for example) craftsmen.

A high farrow index is related to a high conception rate of first inseminations, accompanied by a rigorous sow cull strategy if the first insemination is unsuccessful (as demonstrated by craftsmen). However, a high conception rate of first inseminations and a rigorous sow cull strategy do not automatically lead to a high farrow index (as demonstrated by stewards).

Nursing Period

In conventional farming, the nursing period for piglets is four weeks. In organic farming a nursing period of six weeks is prescribed. No organic farmers were included in the current study. On all farms in the study the nursing period was four weeks (minus one or two days for management reasons).[18]

If the nursing period would be linked to the farrow cycle, the nursing period would differ among styles of farming in terms of weeks, because the weaning day is incorporated in the weekly working schedule of the farmer. But in the survey the differences found for the nursing period were in terms of days, and not in terms of weeks. This indicated that differences among styles of farming in nursing period were not related to the farrow index, but to other aspects of the farm management. There are two basic reasons for differences in management: piglet health and hygiene. Some farmers think that weaning the piglets and transferring them to the rearing house is too much stress for one day. So they remove the sows one day, which automatically means that the piglets are weaned, but they transfer the piglets to the rearing house the next day (or even the day after). The other factor is the number of days that stables were empty for cleaning. Some farmers cleaned the stables with water from a pressure hose and allowed the stables to dry for an extra day before they repopulated them after the removal of sows and weaners. Other farmers (dry) swept the stables between rounds, and some farmers did not clean the stables until after the stables were repopulated with a new round of sows (see also Sections 6.1 and 6.4). So the difference in nursing days among the styles of farming is a result of the health and hygiene management.

The indicator 'duration of the nursing period' was among the criteria for factor analysis, because of its negative correlation to Productivity and Intensity ($p<.005$) (Chapter 4). This means that the shortest nursing period is expected more of entrepreneurs than of craftsmen and the longest is expected more of shifters than of stockmen.

The analysis revealed that nursing period in 1997 was less than average (26.8 days; σ=1.8) on farms of entrepreneurs (25.9 days; σ=1.4) and more than average on farms of shifters (28.0; σ=1.7). The calculation of the mean over 1995-1997 showed comparable data. There were no trends or fluctuations in the nursing period (Supplement Table 6b).

The data also indicated that the entrepreneurs took two days for weaning and cleaning. Probably most entrepreneurs take one day for weaning before cleaning the stables and one day for drying the stables after cleaning them with a pressure hose. Shifters did not allow any time in-between rounds. This means that weaning and transfer of the piglets to the rearing house takes place on the same day, and no time is allowed in-between rounds of sows. This means that either the stables were either not cleaned, or not cleaned wet, but swept dry in-between rounds, or the stables were hosed clean but not allowed to dry before the next round of sows enters. And it is also possible that the stables are cleaned after the sows have had a few days to adjust. (see also Sections 6.1 and 6.4). As was outlined in Chapter 2 the issue of difference in hygiene practices issue was not extensively covered with specific questions in the survey. So the differentiation among styles of farming cannot be specified in detail.

Sow Cull and Replacement

The average age of sows on a farm reflects the replacement management of the past. If the replacement percentage was high in the recent past, then the rate of sows in the first and second farrow cycle will be high in the near future. This is also the case when the herd size was recently increased, for example through the purchase of production rights. In the first farrow cycle the average number of piglets born per litter is lower. The piglet production of sows is best from the third to the eighth farrow – both in the number of piglets born alive per litter and in the number of produced feeder pigs per litter. From the second farrow onwards the number of stillborn piglets and the percentage of piglet loss before weaning increases. The most productive age category of sows can vary between farms (IKC Veehouderij 1993).

The percentage of sow replacement depends on the ambition of the farmer in pig production, the farmer's incentives for sow replacement, and the (maiden) sow prices. The farmer's incentives for sow replacement usually vary with the number of farrow cycles completed. For young sows they are often about conception problems and leg problems. Older sows are more often culled because of reduced piglet production per litter and reduced maternal qualities (predominantly having to do with the crushing of piglets). In general the predominant reasons for sow culling are (IKC Veehouderij 1993):

- over 50% of the cull: conception problems and insufficient litter sizes
- 10 – 20% of the cull: leg problems
- 20 – 30% of the cull: lung problems, other diseases and other health problems.

The best results in terms of pig production per sow (per year) are usually achieved at a sow replacement rate of 35 to 45 percent per year. Depending on the farrow index – usually about 2.30 per year, this replacement rate amounts to 15 to 20 percent of first farrows per farrow cycle. The best division over age categories with respect to pig production per sow (per year) in conventional pig farming is (IKC Veehouderij 1993):

25 – 35%: sows in first farrow cycle; in gestation or nursing the first litter
55 – 70%: sows in the second to the eighth farrow cycle
5 – 10%: sows in the ninth or higher farrow cycle

Modern developments have changed farmers' strategies in use and replacement of sows. On the one hand, the housing system and stable climate have improved from a point of view of animal health. Over the years this has reduced the in-between culling of sows for health problems, like lung infections and leg injuries. It could be suggested that sows in a modern system, which is particularly present among entrepreneurs, profit the most from the improved housing with respect to their health (of lungs and legs and general condition). Indicators have indeed shown that piglet mortality is less for entrepreneurs, which could be due to improved housing and management systems (see: Section 6.1). Below, sow cull and replacement are discussed from the perspective of styles of farming for the aspects fertility and housing management, considerations for culling and herd size manipulation management.

Thanks to the modernisation process, the average farrow index of sows has increased from 2.0 (or less) to 2.3 (or more). Nowadays sows complete about eight farrows within three years instead of three and a half years in the past. This has given an extra stress on the fertility of sows. After the eighth farrow sows are often culled, because of reduced fertility. So the predominant reason for sow culling has shifted from health (lung and leg) problems to fertility problems, which are related to increasing production speed. This shift was most prominently observed in the initial study among entrepreneurs. In contrast, among tenders who had free range and organic farming systems, in which a farrow index of about 2.0 was maintained, sows often remained on the farms until the eleventh or twelfth farrow, which they produce around the age of six years. The shifting cause for sow replacement plays a role in the emerging debate in society about the justification of animal production practices.

Recruitment of Maiden Sows

Maiden sows are usually brought into the sow herd at an age of 6-7 months. The maiden sows in the study area were usually purchased from other farms, but some farmers reared their own maiden sows. About a month after joining the herd, the sows received the first insemination.

In the current study, the data of 1997 showed that the maiden sows entered the sow herd at an average age of 205 days and they were first inseminated at the age of 237 days. Some craftsmen had recently started to experiment with allowing some maiden sows to wait an extra oestrus before the first insemination. Other than these experiments there were no differences among styles of farming in 1997 (Supplement Table 6b).

In earlier years some stockmen had experimented with purchasing maiden sows a month after the first conception (at 9 months). These experiments were not continued in 1997. The advantage of that practice is the gestation guarantee, which relieves the farmer from the task of oestrus detection in maiden sows. The disadvantage though is the price of these young sows and the stress of transferring them to a new location and introducing them into the sow herd after the first conception. This might cause health problems and increased rates of stillborn piglets.

The number of maiden sows that entered the sow herd cannot be discussed in the current study due to lack of data. Of the 70 farms that provided management support data in the study, only 20 farms gave data about the recruitment of maiden sows in their management support lists. The same was true of data about the culling of maiden sows.

These data about maiden sows were incomparable among the farms. On the one hand some farmers reared maiden sows as well as purchasing them. They counted all the maiden sows in the management support books so those data were incomparable to the data of farms where only maiden sows were counted that entered the sow herd. In addition, many farmers did not account for maiden sows in their management support administration at all. They just kept these data in the central farm administration – and that administration was not requested for this study. These farmers only included information in their management support programme if that information was actually important for their management decisions in the stables. The farmers did not need management support to count numbers of recruitment of maiden sows.

From the data that were available of the management support, the numbers of sows that actually participated in the farrow cycles were estimated for 1997. On average over the farms, 75 young sows per farm (per year) had their first gestation. This varied from 31 young sows on farms of shifters to 114 young sows on farms of entrepreneurs (see also Table 6.8).

Introductions of Maiden Sows for Sow Replacement

From the initial study it was known that there were differences among styles of farming with respect to sow replacement. Some entrepreneurs and craftsmen never kept a sow longer than up to the eighth farrow cycle. Others, particularly tenders, usually continued to the eleventh or twelfth farrow. The percentage of sow cull before the eighth farrow varied a lot as well. Some farmers culled young sows rigorously if the first (or the second) litter was too small. Other farmers had levels of sow cull that deviated from the average because of specific problems in the housing system.

The variety in sow replacement strategies among styles of farming was mainly found in two indicators: 'percentage young sows after first farrow', and 'percentage newly introduced sows per year'. The percentage of young sows after first farrow is an indicator for sow replacement per round. The percentage newly introduced sows per year is an indicator for sow replacement per year – in which the farrow index is included.

In the survey, the average 'percentage young sows after first farrow' in 1997 was 17% (σ=4), and the average 'percentage newly introduced sows per year' was 41% (σ=12). For craftsmen the percentages were lower than average: the 'percentage young sows after first farrow' was 15% (σ=3), and the 'percentage newly introduced sows per year' was 38% (σ=8). Data were also found to be lower for shifters: the 'percentage young sows after first farrow' was 14% (σ=3), and the 'percentage newly introduced sows per year' was 35% (σ=7). Stewards on the other hand had an elevated 'percentage young sows after first farrow' in 1997 (20%; σ=5), and an elevated 'percentage newly introduced sows per year' (44%; σ=14). Entrepreneurs also had an elevated 'percentage newly introduced sows per year' (46%; σ=13) (Supplement Table 6b).

The differences for these indicators were also present, though less pronounced over the period 1995-1997. Over the period of three years, there were hardly any differences among the styles of farming, with the exception of shifters who had lower percentages of new introductions.

The differences that were found among these styles of farming reflect different management strategies. On farms of craftsmen the sow replacement percentages were lower than average, in a farm perspective of continuity. This was in contrast to the perspective of shifters. The low percentages of sow replacement of shifters supports the fact that shifters were shifting their attention to other farm activities or off-farm activities. Some shifters therefore had reduced the sow replacement. The finding was supported by the significant trend of reducing percentages of young sows after first farrow over 1995-1997.

Both entrepreneurs and craftsmen had modern housing systems and fewer animal health problems with lungs and legs compared to the other styles of farming. So low percentages of sow replacement were expected for both styles of farming (see also above). In contrast, stewards and stockmen were expected to have higher replacement percentages, due to leg, lung and other health problems for less advanced housing conditions. But this suggestion was not directly confirmed by the data (Supplement Table 6b).

The ‘percentage newly introduced sows per year’ was higher for both entrepreneurs and stewards, and the ‘percentage young sows after first farrow’ was higher for stewards and not for entrepreneurs and stockmen. Since the differences were not found over the period of three years, this means that entrepreneurs must have had extra maiden sows introduced at the end of the previous year (1996). These sows had their first farrow (115 days later) in the following year (1997). Stewards must have had extra maiden sows introduced early in the year (1997) and these sows had their first farrow also in the same year (1997). The finding was supported by the fact that there was an increasing trend in the percentage of young sows after first farrow on farms of stewards (Supplement Table 6b).

The differences among the styles of farming suggest that timing of sow replacement might be an important factor in farm management. Therefore sow replacement should be observed at intervals for a longer period than a year, to detect differences in strategies. The timing could be both related to internal farm processes (animal condition and age, etc.) or external processes like prices for maiden sows (see also below where costs, prices and returns are discussed). These are different dimensions involved with the aspect of sow replacement, which should be studied in connection to each other (see also Chapter 2 and Appendix B).

The percentage of young sows after first farrow and the classification of farms
Data about sow replacement for the styles of farming differed between 1997 and the mean over the years 1995-1997. This was caused by differences in the timing of sow replacement by the farmers.

The percentage of young sows after first farrow was among the parameters selected for the classification of styles of farming, for its correlation to Intensity ($p<.005$). If the classification of the styles of farming would have been done in another year, the data about introductions of young sows might have been different. If so, the data would be less correlated to Intensity. In that case this parameter would not have been selected for classification.

To evaluate the influence of this indicator on the classification of farms in styles of farming, the factor analysis described in Chapter 3 and 4 was repeated after exclusion of the indicator 'percentage of young sows after first farrow'. The classification of farms was largely comparable to the original classification, though some farmers would have been classified differently (Table 6.7).

Table 6.7 Distribution of the classification of farms in styles of farming if the indicator 'percentage of young sows after first farrow' is excluded from the selection of parameters for the factor analysis

Computer analysis after exclusion of '% sows in first farrow cycle'						
Variable		*Entrepreneur*	*Craftsman*	*Steward*	*Stockman*	*Shifter*
number (n) correlation (r)[1]	N	n r	n r	n r	N R	n r
Computer analysis without exclusions						
'Entrepreneur'	19	15 .736***	2	2 -.256*	0	0 -.381***
'Craftsman'	10	3	7 .609***	0 $-.206^{+}$	0	0
'Steward'	13	1	0 $-.204^{+}$	12 .863***	0 $-.227^{+}$	0 -.272*
'Stockman'	12	2 $-.249^{+}$	1	0	9 .789***	0
'Shifter'	16	0 -.305*	1 -204^{+}	0 -.239*	1 $-.227^{+}$	14 .919***
∑ N	70	21	11	14	10	14

Conclusion

The percentage of young sows after first farrow was a parameter that determined the classification of farms. If this indicator were not selected for the classification, the classification of farms would hardly be different form the current classification.

[1] Notation of correlation (r) and significance (Pearson, 2-tailed): r+: p<.1; r*: p<.05; r**: p<.01; r***: p<.005; only significant correlations are shown

Sow Replacement, Herd Size and Herd Age Management

Through government regulations since 1994 (Interim-law), farms cannot expand their herd sizes, unless they purchase production rights from other farms. So in general the farmers are required to maintain sow herd sizes, by balancing sow introduction and sow cull. Another consideration about balancing sow introduction and cull is for the desired age categories in the herd. The management considerations that are involved in these decisions are illustrated in an example (see box).

As was shown above and illustrated in the example (box), the 'percentage of newly introduced sows' and the 'percentage of young sows after first farrow' do not completely overlap. A young sow is counted as 'newly introduced' as soon as she starts her first gestation. That sow is not counted as a sow when she is for example culled before she actually has her first farrow nearly four months later. So there are always minor differences among the data.

The interdependence of various indicators (such as replacements of sows, herd size and herd age management) is illustrated by the following example.

Imagine a farm has 100 sows. With a farrow index of 2.35 the sows on this farm produce 235 farrows a year.

If the 'average number of farrow cycles completed' is 4.0, then in a normal distribution of data the number of sows on the farm that have a farrow cycle of 1- 4 is the same as the number of sows that have more than 4 (see also Figure 6.1). So sows with more than 8 farrow cycles completed are rare. Since sows usually have the first farrow at the age of about a year, this means (with a farrow index of 2.35) that the 8th farrow is completed at an age of about 4 years.

If the 'percentage of young sows after first farrow' is 17 per cent, then during the year newly introduced sows produced together 40 farrows (17 per cent of 235 farrows). At the same time, since there are 2.35 rounds of farrows per year completed at the farm, the 'percentage of newly introduced sows per year' is expected to be close to (2.35 * 17) 40 per cent. This is not exactly how 'percentage of newly introduced sows' is measured though, (see for details IKC; 1996).

Both a high and a low 'percentage of young sows after first farrow' can explain small litter sizes, since litter size is usually reduced among those that have completed the first farrow and among those that have completed 9 and more farrows. But the impact of high farrow numbers on the average litter size is usually less, because their number is usually less in the sow herd. With a 'percentage of young sows after first farrow' of 17 per cent, the sows complete on average of 5.9 farrows (100 divided by 17).

If the 'percentage of newly introduced sows per year' is actually 42 per cent, then 42 sows (42 per cent of 100 sows) were newly introduced sows in the given year. In this example that is 2 sows more (42 minus 40) than the number of sows that have produced first farrows. The reason to have this as a strategy is that usually a (small) number of maiden sows introduced are culled before the first farrow.

If the 'percentage of culled sows per year' is for example 38 per cent, then 38 sows (38 per cent of 100) were culled in the given year. In this example the 'percentage of culled sows' is then 4 sows smaller (42 minus 38) than the 'percentage of introduced sows'. This means that during the year the herd size has increased. At the beginning of the year there were probably 98 sows and at the end 102, making a year average of 100 sows and a difference of 4. This shows how farmers can manipulate sow herd sizes, provided that the average sow herd remains the same, as measured on a reference day. Usually the reference day is not the first of January, but the first of April. So the yearly overview form January to January can give deviated figures.

The 'percentage of culled sows per year' is also 2 sows smaller (40 minus 38) than the number of new sows that were involved with farrows. This reduces indirectly the data for the farrow index.

If both 'percentage of culled sows per year' and the 'percentage of newly introduced sows' are low in one style of farming compared to the population average, it means that the 'average number of farrow cycles completed' has increased for that style of farming. This implies deviated differentiation of sows over age categories (see also Figure 6.1).

The percentage of sows culled per year is counted according to the date that sows are actually culled. This varies a lot among sows, depending on the reasons for culling. If sows are culled for age (which is almost equivalent to an expected reduction of litter size in terms of 'piglets born alive in the next litter'), then the decision to cull is usually taken after weaning the piglets in the last round. These sows do not return to the housing for barren and gestating sows. If sows are culled for lung, leg or other health problems, it depends on the severity of the problem at what time the sow is culled. If the sow is barren when she develops a health problem she is usually culled as soon as possible. But many farmers prefer a nursing sow to continue until the end of the nursing period – if possible. If that is possible there is no problem concerning cross fostering the litter. As far as gestating sows are concerned it depends both on the severity of the health problem and on the ethical principles of the farmers. Some farmers are very reluctant to cull gestating and nursing sows (see also Section 6.4).

If sows are culled for conception reasons it means that they have spent 'open days' in the housing for barren and gestating sows, because they were kept for a new insemination, but they failed to conceive.

Among the indicators, the average number of days lost per culled sow was counted. This indicator 'days lost per culled sow' was among the selection of parameters for the classification of farms in styles of farming, due to the negative correlation to Intensity ($p<.005$) (Chapter 4). This is consistent with the findings about the classifications of farms.

On farms of entrepreneurs (31 days; $\sigma=9$) and craftsmen (26 days; $\sigma=7$) were fewer days lost per culled sow in 1997 than average (37 days, $\sigma=14$). On farms of stockmen (44 days, $\sigma=15$) and shifters (46 days, $\sigma=13$) there were more days lost than average. These data were consistent with the average over 1995-1997. There was no trend or fluctuation in the number of days lost per culled sow. The differences among the styles of farming were predominantly related to the fact that stockmen and shifter usually waited one oestrus cycle (21 days) longer than entrepreneurs and craftsmen, before deciding to cull a sow for conception problems (see also example above).

One of the farmers commented:

> *<K317> Every day a sow is kept, it costs € 2.30.*[19] *So you have to take care that she is either in gestation or with piglets. If not, she has to go.*

In the study, the average 'percentage of sows culled per year' was 36 per cent (in 1997). The 'percentage of sows culled per year' on farms of craftsmen (33% in 1997) and on farms of shifters (32% in 1997) was lower than the population average and on farms of stockmen it was higher (42% in 1997). The average over the years 1995-1997 were comparable for all the styles of farming except stewards, who had a higher percentage. But the trend for stewards was towards a lower sow cull rate. The percentage of 37 per cent in 1997 was similar to the population average.

As was discussed in relation to the introduction of new sows, the sow cull is also subjected to timing. The timing might be related to sow prices (see also below), but also to other incidental events in farming. For example: if farmers renew the stables or the equipment they sometimes have to empty some stables temporarily for the renovation. After the renovation the farm has to restart with young sows. Sometimes it is not required to empty stables for renovation. Then a higher sow cull can be desired, for example when older sows are expected to fail to adapt to the new situation. This can occur particularly when an entirely different housing system is introduced (like from girth tether to individual boxes or to group housing). In anticipation of the renovation farmers often keep the sows longer before the renovation and increase sow replacement right after the renovation.

Some farmers gave examples of such situations:

> *<W197> Since I am in the process of changing to group housing the number of farrow cycles completed has my special attention. Old sows are often too old to learn a new system.*

This is an important problem that farmers encounter in changing farming systems. When sows are used to a certain type of housing system it is hard for them to adapt to another system – especially when that system is based on a completely different concept. So changing systems implies increased replacement of sows. But also minor change, for instance at the level of farming practices, can induce increased sow replacement. One farmer explained:

> *<E315> The percentage of sows culled is somewhat higher now, because we selected too little last year. This happened because we switched to a three-week system for sales of maiden sows.*

In summary, sow replacement for herd size management has implications for a variety of indicators. The data for these indicators should be analysed in connection with each other. Incidentally the data might be influenced by special occasions, for instance stable renovation.

Life Spans, Animal Health and Disposable Sows

The average 'farrow cycle number completed' by the sows is not a 'standard indicator' of the ATC list. But the data about this indicator were given in one of the management support programmes (CBK). Therefore the data were available for 37 farms in the survey – though for less than six farms classified as stockmen and shifters. So for these styles of farming there were no data available (Supplement Table 6b).

The average number of completed farrow cycle of the sows in the survey was 4.2. As far as data were available, they were no different for the various styles of farming. But this does not mean that the age categories on the farms are comparable. They can differ a lot. Craftsmen for example have the strategy to introduce low percentages of new young sows, but to cull rather rigorously for fertility reasons: conception problems or expected small litters related to age.

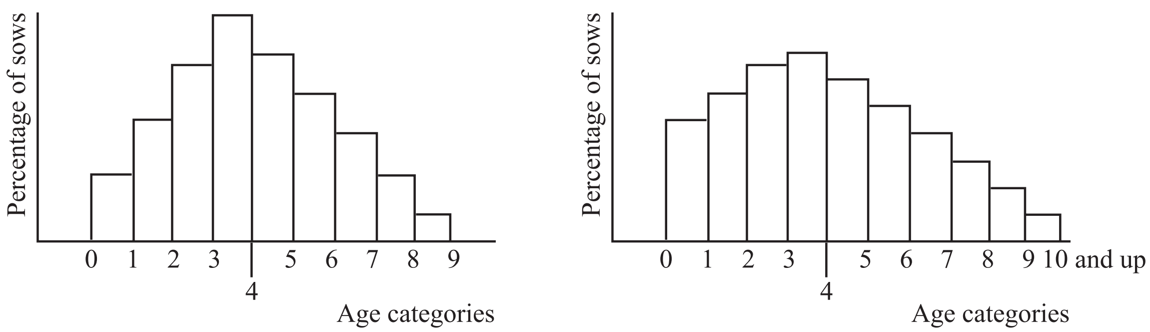
One of them commented:

> *<C226> If the average number of farrow cycles completed rises too high, then you have to select anyway. If not, you get in trouble later on.*

This farmer was referring to the fact that after a while a high percentage of sows would have to be culled and replaced by a high number of replacement sows. This might cause fluctuations in the number of piglets, which is not desired in a farming system in which standard numbers of animals to fill the stables and standard numbers of produced pigs are incorporated in the management and the transport schedules for transfer to the fatteners. Moreover, at a certain moment one feels obliged to replace an increased number of older sows. Then more maiden sows than usual need to be introduced. Farmers usually have fixed contacts and chain certificates for their supply of maiden sows (Section 6.1). For fear of breaking such agreements, and of disease problems, the farmers are reluctant to buy the sows from anywhere else. So the margin of flexibility in changing replacement rates is limited.

Compared to craftsmen, the strategy of stewards is to introduce more young sows. But their sow cull per year is also high (42% in 1997), due to both fertility problems and various health problems. An example of the impact of the replacement strategies on the sow age categories on the farms is shown for craftsmen and stewards in Figure 6.1.

Figure 6.1 Example: differences in the distribution over age categories of sows with a herd average of 4.0 farrow cycles completed, on two farms with a low (e.g. craftsmen) and high (e.g. stewards) percentage of sows after their first farrow. In the first example the sow cull for health problems (at any age) is low, resulting in a high number of sows that reach the age of 4-5 years. But the sow cull for fertility reasons (conception rate and litter size) is rigorous for older sows. In the second example the sow cull for health problems (at any age) is rigorous, resulting in a low peak at 4-5 years. But the sow cull for fertility reasons for older sows is mild.



In pig production management support a validation system was developed (TG-index) to estimate the remaining economic value of sows after each farrow. According to this validation system, the remaining economic value of a sow after the eighth farrow is better for replacement and slaughter than for continuation in pig production. The validation system depends on many assumptions, particularly based on population averages of data. Some farmers use it as a guide for farming strategies, though it differs among farmers with what rigidity the index is used. A craftsman said:

> *<C139> The TG-index validates the sow. But it is focussed on age. After the eighth time it is negative anyway, although such a sow might still have a good production level.*

A stockman commented:

> *<K180> In the past we had a cull percentage of 40 per cent. Now we just cull the sows rigidly after the eighth farrow.*

Working with the TG-index is particularly common for entrepreneurs. In the study the entrepreneurs had a different replacement pattern from both craftsmen and stewards. The difference between entrepreneurs and stewards is that the health was much better, so sow cull for reasons of leg, lung and other health problems was low. And for entrepreneurs there were no trends or other indications that incidental events were disturbing the figures. Still entrepreneurs had a high percentage of newly introduced sows (46 per cent in 1997 and as an average percentage over 1995-1997) compared to the population average (41% in 1997 and 44% over 1995-1997). Part of these new introductions might be explained by increasing the sow herd, but that explanation does not cover the whole difference between entrepreneurs and – for example – craftsmen, who also had increasing sow herds and who had a percentage of 38 per cent newly introduced sows in 1997 and an average percentage over 1995-1997 (see also Table 6.8).

Table 6.8 Overview of replacement data of sows in 1997. Estimated numbers of newly introduced sows in relation to replacement for sow cull.

Variable		*Entre-preneur*	*Crafts-man*	*Steward*	*Stock-man*	*Shifter*	*All*
n		19	10	13	12	16	N
Mean (μ)	N	*μ.*	*μ.*	*μ*	*μ*	*μ.*	*μ.*
1998 Farm size in no. of sows[1]	82	310	253	134	153	95	223
1997 Farm size in no. of sows	70	273	227	130	161	96	191
1997 Farrow index (farrows per sow / year)	70	2.33	2.37	2.34	2.26	2.30	2.32
1997 Estimated total no. of farrows on the farm		*636*	*538*	*304*	*364*	*221*	*443*
1997 % First farrows	68	18	15	20	18	14	17
1997 Average life span of sows in no. of completed farrows		*5.6*	*6.7*	*5.0*	*5.6*	*7.1*	*5.9*
1997 Estimated no. of introduced		*114*	*80*	*61*	*66*	*31*	*75*

sows with first farrows							
1997 Estimated % of introduced sows involved with farrows		*42*	*35*	*47*	*41*	*32*	*39*
1997 % Of actually introduced (new) sows in this year	70	46	38	44	39	35	41
1997 % Of sows culled in this year	70	40	33	37	42	32	36
1997 No. of piglets born alive per litter		11.0	11.5	10.8	10.5	11.0	10.9

[1] Data from provided indicators are written in non-italic; *estimated data are written in italic.*

The explanation of these data is that entrepreneurs are more rigorous than farmers of other styles of farming in culling sows for fertility reasons (conception problems and small litters of piglets born alive), and they take more advantage of fluctuations in market prices for replacement sows (see also below). A steward commented about that practice:

<W174> The pig is less important than the wallet.

The issue of sow cull strategies of entrepreneurs motivated Van der Ploeg to speak publicly of 'disposable sows', which led to a lively discussion in the Wageningen University Newspaper.

Van der Ploeg (1998) used the expression 'disposable sows' to typify the practice of entrepreneurs in his oration on Wageningen University foundation day, 6 March 1998. He used this expression with reference to the initial study of the current research. The statement led to a lively debate in the University Newspaper,[20] in which Brascamp disagreed with the image of 'disposable sows'. He claimed that on average the replacement percentage of sows had not changed over the past 15 years, or in fact there had been even a slight reduction from 45 per cent to 42 per cent. At the same time the average farrow index had increased from 2.04 to 2.28. Brascamp concluded from these figures that the replacement of sows had improved. So he argued that the image of 'disposable sows' was incorrect. Van der Ploeg reacted in the next edition that this was not his point. Entrepreneurs represent a style of farming and not average farmers. Zoebl also contributed to the dispute in the University Newspaper by emphasising that intensification of animal production occurs at the expense of the life span of the sows.

The current study supports the points of view of all three debaters. The average 'percentage of newly introduced sows in 1997' among the farmers in the survey was 41% ($\sigma=12$). Among entrepreneurs the 'percentage of newly introduced sows in 1997' was higher (46%; $\sigma=13$) than the population average ($p<.05$). And although the average data over 1995-1997 were less pronounced, the percentage of newly introduced sows at farms of entrepreneurs was still higher than average (Supplement Table 6b).

These results reduce the dispute in part from facts to interpretations of data. The surface question is whether or not the facts give sufficient grounds to link the interpretation 'disposable sows' specifically to the practices of entrepreneurs, in contrast to the practices of all other styles of farming. The underlying emotional debate is still centred on the acceptability of the distinction between 'productive sows' and 'disposable sows'.

Differences among styles of farming are not defined as contrasts to practices in the past, but as deviations from the population average. To clarify the debate it should first be confirmed that over the years the animals' health status has improved dramatically on the farms, allowing a reduction of sows culled for lung, leg and other health problems, as well as problems with conception. The physical condition and nutritional status of the sows has improved so much that the farrow index has increased from 2 (or less) to 2.3 (or more). This means that the time required for a sow to complete eight farrows is reduced by a year, from five years to four years of age. But the life span of sows has not increased, because the number of piglets born alive does not decrease with of the sow's age but with the number of farrow cycles she has completed. After the eighth farrow the number of piglets born alive decreases. Therefore the life span of sows in number of years has declined.

The clearest contrast to illustrate this issue from this study is the contrast between entrepreneurs and stewards. In the current study entrepreneurs and stewards both had a higher percentage of newly introduced sows per year, reflecting a higher sow replacement than the population average. In this respect entrepreneurs and stewards were similar. But the motivations for sow replacement were different. On farms of stewards the motivations for replacement had more than average to do with leg, lung and other health problems, as well as the condition of the sows.

On farms of entrepreneurs the incidence of animal health problems was less than average, because of the impact improved housing and feeding conditions had on animal health. Their motivation for sow replacement had more than average to do with fertility management (real or expected reduction of litter size, and conception problems) and prices of maiden sows for replacement. For these reasons, most sows of entrepreneurs were culled on technical grounds (TG-index) ultimately after the eighth farrow. So the contrast in motivation is between an internal business focus (stewards) and an external market focus (entrepreneurs). If the market orientation for sow replacement were extreme, the term 'disposable sows' would make sense.

The sensibility of the term 'disposable sows' is related to culture. The ruling justification for keeping animals is based on the so-called 'utility principle'. This means that domestic animals are respected to the extent that they are useful to people. Sows are useful because they produce piglets. According to the ruling culture the principle is that sows should be allowed to live as long as they are sufficiently productive. Now of course there are different opinions about how much is 'sufficient'. But that is not the key issue here.

In the business culture of international markets the 'utility principle' is transformed into an 'instrumental principle'. According to the 'instrumental principle' sows are like commercial instruments; production tools that are validated by their economic value on markets in terms of capital. The difference between the entrepreneurs and the stewards in the current study reflect a difference in attitude towards the 'instrumental principle'. Entrepreneurs accept the 'instrumental principle' more than average; stewards accept it less than average.

(Farmers' principles about culling animals are discussed further in Section 6.4).

Conclusions

The 'percentage of newly introduced sows per year', the 'percentage of young sows after first farrow', and the 'percentage of sow cull per year' reflect the sow replacement strategies of the farmers. These strategies differ among styles of farming. The strategies cause subtle fluctuations in sow herd size – even though the sow herd sizes remain constant over the years (with the exception of farm expansion after the purchase of production rights).

The strategies and motivations for sow replacement differ among styles of farming. The differences are massive – they even include differences in distributions of age categories of sows. Both entrepreneurs and craftsmen manage to maintain a better health standard of the sows than average, allowing them to weigh other principles for sow replacement. For entrepreneurs the market values of the sows are more important than for other styles of farming. Craftsmen are more focussed on the economic use of sows.

For stewards, stockmen and shifters lung, leg and other health problems, as well as sow condition for conception and detection of oestrus by the farmers, lead to different strategies for sow replacement. Stewards have a high sow replacement, leading to average production results of the sows. Stockmen have low replacement rates – which fits with their image of being economic farmers in terms of investments. Consequently stockmen have to accept lower production results. Shifters have low replacement as well. This is related to their focus on other on-farm activities and off-farm jobs, implying that in the longer term several shifters will stop producing pigs.

Balance: Number of Feeder Pigs per Sow [per year]

Intensity is defined in this study as 'the number of produced feeder pigs per sow (per year). The motivation to use this indicator as Intensity instead of all subsystems that contribute to production intensity is explained in Appendix B. By definition the indicator 'number of feeder pigs per sow (per year)' was therefore among the selected parameters for factor analysis. As expected Intensity was correlated to Productivity ($p<.005$). But Intensity was also correlated to Scale ($p<.05$), which indicated that the dimensions Intensity and Scale were not independent (see Chapter 4). Because of the specifications of the styles of farming, craftsmen were expected to be the most intensive and stockmen were expected to be the least intensive.

The indicator 'weaners per sow (per year)' was closely related to Productivity and Intensity and was also among the selected parameters for factor analysis ($p<.005$) (Chapter 4). Therefore it was also expected that craftsmen had more weaners per sow (per year) than average and stockmen less than average.

The analysis revealed that craftsmen (23.4; σ=1.1) and entrepreneurs (22.7; σ=.8) had the most feeder pigs per sow (per year) in 1997 compared to average (22.0; σ=1.7), whereas stockmen (20.6; σ=1.7) had the least. The data for the period 1995-1997 were similar: the Intensity on farms of entrepreneurs was even higher. The number of weaners per sow (per year) also supported the data, because the percentage of piglet mortality after weaning is low (1.7% to 1.8%) and comparable for all styles of farming.

The contrast between craftsmen and entrepreneurs on the one hand and stockmen on the other was an accumulation of the data on a series of indicators that reflected differences in farm practices. These data reflected differences in the ages of the sows, sow breed types, stable climate and equipment, piglet care in cross-nursing, oestrus detection of the sows, and the condition of the sows (see above and Supplement Table 6b).

The elevated data for Intensity on farms of entrepreneurs was not due to elevated data on any particular indicators that were mentioned above for the management of craftsmen. It seemed that the combination of slightly improved data together, which reflected these different management aspects (sow age, breed type, stables, piglet care, oestrus detection, condition of the sows, etc.) caused the elevated number of feeder pigs for entrepreneurs.

There was no average trend or fluctuation in any of the indicators concerning the number of feeder pigs per sow (per year), with the exception of the data for stockmen.

On farms of stockmen the ‘number of weaners per sow (per year)’ had been elevated in 1996, compared to 1995 and 1997, in combination with an elevated number of feeder pigs per sow (per year) in 1996. This elevation resulted in a higher (21.0) number of feeder pigs per sow (per year) over the years 1995-1997 than in the year 1997 (20.6). Still both data were significantly lower than the population average (22.2 in 1995-1997 and 22.0 in 1997).

The number of produced feeder pigs per sow (per year) reflects therefore a balance of management measures related to pig production in terms of a physical transformation process.

Piglet Growth

Piglet growth depends on genetic potential, birth weight, sow milk received during nursing, feedstuff quantity and quality, and age of the piglets. The indicators for piglet growth in the management support programmes are ‘body weight of feeder pigs’, ‘age of feeder pigs’, and ‘weight gain per day’. These indicators did not show any particular correlation to Productivity, Intensity and/or Scale (Chapter 4). That is not surprising, because in the current study Intensity was specified in numbers of feeder pigs, without including the feedstuff balance.

Piglet growth, as well as body weight of feeder pigs is dependent of the age of the piglets. On most farms there was a weekly schedule for selling feeder pigs (Section 5.1). Pigs were usually sold at an age of 10½ weeks – plus or minus one week. Some pigs were already big enough – which is about 25 kg of body weight, at the age of 9½ weeks. Feeder pigs that were too small were kept a week longer, until they were 11½ weeks, to create standardised groups for sale to the fatteners at a body weight of about 25 kg. In the survey the pigs were sold at an average age of 10 weeks and 4 days (74 days; σ=5). The body weight was 25.8 kg (σ=1.7) and the growth rate was 334 grams per day (σ=26).

The data were similar for the styles of farming, with the exception of shifters. The pigs of shifters had a higher average body weight and a higher piglet growth than other styles of farming. This was most apparent over the entire period 1995-1997. The findings were not supported by a higher age of the feeder pigs of shifters. So the findings indicate that these piglet might have received feedstuff that stimulated the growth more than average.

On farms of craftsmen there was a fluctuation in the ‘age of the produced feeder pigs’: it was lower in 1996 by about a week compared to both 1995 and 1997. This was different from average. At the same time the ‘growth per day of the produced feeder pigs’ was higher in 1996 compared to both 1995 and 1997. This indicates that the piglet growth in 1996 was elevated and that the craftsmen decided to sell some of the pigs a week earlier. The differences were small, though, and did not lead to differences in terms of piglet growth in 1997 or over the period 1995-1997 (Supplement Table 6b).

On farms of stockmen there was a trend that the ‘age of the produced feeder pigs’ increased over the years 1995-1997. This was different ($p<.01$) from average. At the same time the ‘growth per day of the produced feeder pigs’ decreased over 1995-1997. This might indicate that there had been a problem with the health condition of the piglets, resulting in poorer growth results. The differences were small, though, and did not lead to differences in terms of piglet growth in 1997 or over the period 1995-1997.

Differences in farm equipment and farm management systems thus hardly influenced piglet growth. In the survey piglets grew to an average body weight of 25.8 kg in 74 days. There were hardly any differences found among styles of farming in piglet growth.

6.2.3 Balance of Inputs and Outputs and of Costs and Returns

There were three types of indicators for inputs and outputs specified in the management records: numbers of animals present, recruitment of maiden sows and sales of feeder pigs and purchase of feedstuff. In addition there were six types of indicators for costs and returns: prices for (1) purchases and (2) sales of pigs of different types (maiden sows, boars, feeder pigs, etc.); (3) feedstuff costs and (4) returns on feedstuff costs; (5) other animal-related costs; and (6) the financial balance (see Supplement Table Appendix B).

Many farmers in the study did not keep records about the farm balance in their management support programme. Insofar indicators were included in the management support programmes, some farmers did not provide the programme with the necessary basic information. Several farmers kept other types of records or archives about the balance on the farm and did not find it necessary to include these data in the management support. Therefore the available data about inputs and outputs for this study were limited.

The available data about inputs and outputs were unevenly distributed over the styles of farming, either because a particular management support programme did not provide these data, or because the farmers themselves did not provide the management support programme with the acquired information to calculate the data. For the current study, it was decided to analyse the data if at least 28 farmers (of 70: 40%) had a record about an indicator. For the styles of farming, data were recorded in the table if at least six farmers of that style had a record about that indicator (Supplement Table 6b).

No data were analysed for most of the indicators about balances on farms of stockmen and shifters. This uneven distribution over the styles of farming of recorded data reflected also an uneven distribution of the different types of management support programmes that the groups of farmers used (Comzog, CBK or ZAP) (see also Section 6.3 and Supplement Table 6c).

Numbers and Prices of Sows and Piglets

Data on the 'number of sows present' were usually recorded by all farmers, in contrast to data about the presence of maiden sows. On farms where maiden sows were produced for sale, the total number of all maiden sows was sometimes recorded and not just the number that entered the farmer's own sow herd for pig production. Therefore no comparison could be made on the presence of maiden sows. The majority of the farmers also did not record data on other 'pig categories' (like the number of fattening pigs) in these records. Some farmers kept records of the number of boars (see below).

Number of Sows

The number of sows on the farms at the time of the interviews (1998) was already discussed in Section 5.1. In Chapter 4 it was shown that the number of sows in the records of the farms (1997) was connected to Productivity, Intensity and Scale ($p<.005$) and therefore part of the classification of farms into styles of farming.

The number of sows at the time of the interviews (1998) and in the records (1997) was closely correlated. In 1997 entrepreneurs (273; σ=110) and craftsmen (227; σ=57) had bigger farms in number of sows than average (162 sows).[21] Stewards (130; σ=70) and stockmen (96; σ=20) had smaller farms than average. The figures for 1995-1997 were comparable (Supplement Table 6c).

Both on farms of entrepreneurs and craftsmen there was a trend of increasing sow herd size; on farms of craftsmen the expansion particularly occurred in 1996. The sow herd sizes on farms of stewards, stockmen and shifters did not change in the period 1995-1997. It was expected that the farm size on farms of shifters would drop, because many were stopping with pig production. But apparently that did not (yet) happen. As was already shown, shifters tended to keep their old sows longer (see above). The explanation is that sows are attended in groups or rounds, according to a weekly working schedule. Within certain limits the amount of work hardly depends on the group's size. And since the space in the stables was available, the number of sows could stay constant until the farmers would actually stop the pig production.

Comparison of Supplement Tables 5a and 6b shows that the sow herd sizes of entrepreneurs (310 versus 273) and craftsmen (253 versus 227) also increased. This confirms the expectation that the farms with ambition in the sphere of competition were persistently involved in farm expansion, whereas the farms with ambition in the sphere of participation and autonomy (stewards, stockmen and shifters) preferred on consolidation of the current farm size.

The sow herd size of stockmen appeared to decrease slightly between 1998 and 1997 (from 161 to 153). However, comparison of the herd sizes of stockmen at the time of the interview (1998) with the data over 1997 and the period 1995-1997 suggests that over the years the sow herd size of stockmen remained constant (see also above and Table 6.8).

Number of Boars

Information on the number of boars was available from 36 farms (of 70: 51%). The average number of boars on all farms was low: 1.7 (σ=.7). The number of boars was independent of the number of sows, because in conventional feeder pig production practices boars are commonly kept as sniffer boars, to assist farmers in detecting the oestrus of the sows. Some farmers have boars for fresh sperm collection for fresh inseminations. Natural mating is rare in conventional farming practices.

Total Number of Feeder Pigs Produced [per Year]

The total number of feeder pigs produced per farm was not recorded in the available records. For the analysis of the data in this study the total number was required (see also above). Therefore the total number of produced feeder pigs was calculated from the farm size in 'number of sows' and the Intensity in 'number of feeder pigs per sow (per year)'.

The results show that in 1997 entrepreneurs (6243; σ=2707) and craftsmen (5331; σ=1472) produced more pigs per farm (per year) than average (4034; σ=2412). Stewards (2829; σ=1599) and shifters (2103; σ=504) produced fewer feeder pigs per farm (per year) than average. For stockmen the data (3339; σ=1406) were similar to the population average.[22]

The difference in farm sizes in 'total number of produced feeder pigs per farm (per year)' was most distinct between entrepreneurs and craftsmen on the one hand and stewards, stockmen and shifters on the other hand. Both the farm sizes in numbers of sows and the number of feeder pigs per sow were higher for entrepreneurs and craftsmen than for stewards, stockmen and shifters.

Purchase Prices for Maiden Sows

Information about purchase price of maiden sows in 1997 was available for 30 farms (of 70: 43%). For stewards (€ 281; σ=34) the purchase price in 1997 was higher than average (€ 245; σ=75). At the same time the price that stewards received for the feeder pigs (€ 51.51; σ=1.85) was lower than average (52.83; σ=3.01). In both cases, entrepreneurs and craftsmen dominated the averages, since there were insufficient data available for stockmen and shifters.

In comparison to entrepreneurs and craftsmen, stewards had a poor financial balance (see below) as well as a poor income corrected for Productivity. As far as the costs for maiden sow purchase was concerned, this difference of stewards with entrepreneurs and craftsmen could be related to the timing of the purchases. As was shown above, stewards purchased maiden sows at the beginning of 1997, whereas entrepreneurs purchased relatively more maiden sows at the end of 1996.

In February 1997 swine fever broke out in the south of the country. Soon after the start of the outbreak the prices for maiden sows began to rise, because these animals could no longer be purchased from the south of the country. Entrepreneurs happened to have introduced extra sows at the end of 1996, and therefore they probably had more time to wait in early 1997 before making extra purchases. There is no way that entrepreneurs could have anticipated on outbreak of swine fever in their purchase strategies for maiden sows, so this advantage was incidental. Yet entrepreneurs were generally more alert to prices than stewards, so it could well be that the entrepreneurs simply took advantage of the good prices when they bought their maiden sows, which happened to work out nicely when the swine fever broke out.

Sales Prices for Feeder Pigs

As shown above, for stewards the sales price of feeder pigs was lower than average. Yet all feeder pigs were of the same age and body weight when they were sold (see Section 6.2), and in theory they were sold on a completely uniform market. So the only reasonable explanation is that the feeder pigs of stewards had less market quality than feeder pigs of entrepreneurs and craftsmen. A few reasons can be suggested:

- The breed type that entrepreneurs and craftsmen produce might lead to a better price (see Section 6.1).
- The chain certificates of entrepreneurs and craftsmen (Good Farming Crown or IKB^{+}) lead to better prices than the ordinary Good Farming or IKC certificates of stewards (see Section 6.1).
- Entrepreneurs and craftsmen might do a better job of managing sales contacts and contact farms (see Section 5.1 and 6.1).

The extra gain is substantial. For an average yearly pig production of about 4000 pigs per farm in 1997, entrepreneurs received € 8400 (4000 * € 2.10) and craftsmen received € 6600 (4000 * € 1.65) more than stewards, for a similar commercial product: feeder pigs of 25 kg.

Feedstuff for Sows and Piglets

Kg Feedstuff for Sows and Piglets

Information about the purchase of sow feed was obtained from 36 farms (of 70: 51%). In 1997 the farms in the survey purchased on average 1097 kg (σ=88) feedstuff per sow. This indicates a ration of about 3.0 kg per sow per day. Information about feedstuff for piglets was obtained from 37 farms (of 70: 53%). An average of 30.7 kg per feeder pig was purchased for raising the piglets from birth to a body weight of about 25 kg. The types of feedstuff for sows and piglets were all commercially purchased concentrates. There were no differences (nor any clear trend or fluctuation over the years 1995-1997) among styles of farming in the amounts of feedstuff that were purchased per sow and per piglet (Supplement Table 6b).

Feedstuff Costs for Sows and Piglets

Feedstuff costs for sows were recorded in two ways: costs per 100 kg and costs per 100 Energy Value Equivalents (EV). EV is an indicator for feedstuff, standardised for the energy content in weight equivalents. A price comparison between types of commercial feedstuff is more accurate using EV than just kg. Feedstuff costs for feeder pigs were recorded both per 100 kg feedstuff and per produced feeder pig.

Information about feedstuff costs for sows per 100 kg feedstuff was obtained from 34 farms (of 70: 49%). Information about feedstuff costs for sows per 100 EW feedstuff was obtained from 30 farms (of 70: 43%). Information about feedstuff costs for piglets per 100 kg feedstuff was obtained from 33 farms (of 70: 47%). Finally, information about feedstuff costs for piglets per produced feeder pig was obtained from 33 farms (of 70: 47%) (Supplement Table 6b).

The average price for 100 kg feedstuff for sows was € 18.66 (σ=1.04) and the average price for 100 EV was € 18.59 (σ=0.77). There were differences in prices, but they were small. If EV was used to compare feedstuff prices the standard deviation was less, due to the standardisation of the content of the feedstuff. In the survey the average price for 100 kg feedstuff for piglets was € 29.33 (σ=2.76) and the average price per produced feeder pig was € 9.01 (σ=1.65). Among styles of farming there were no differences with respect to piglet feed costs.

There were no differences found related to the type of feedstuff among the styles of farming. This was not surprising since the majority of the farmers purchased their feedstuff from the same supply companies (ABC and CTA) in the area. There might be some hidden differences among styles of farming, since some farmers also had slop feed, which is cheaper than ordinary concentrates – after the installation of the equipment. This equipment is more profitable on larger farms, so this type of equipment was found with entrepreneurs. Some other farmers (stewards) could occasionally use their own grain or grain from the area as a feedstuff basis. But these differences among styles of farming were also too small for detection in this study, with a limited number of available data.

Though there were no straightforward differences found among the styles of farming concerning feedstuff purchase and feedstuff costs, there were differences found in the effect of combined farming practices, including purchase and costs of feedstuff. This issue and the financial balance are discussed below.

Costs for Health Care

Health care costs reflect only part of the health problems on a farm. Farms may also vary in their strategies for sow cull. On one farm a disease may be medically treated, whereas on another farm the same health problem may be eradicated through sow cull. In the study the most important costs for health care were for prevention (vaccination) and control (see Section 6.1). Therefore the differences among styles of farming in health care predominantly reflect the differences in vaccination and control.

Information about animal health care was obtained from 30 farms (of 70: 43%). Average animal health care costs in 1997 were € 42.63 (σ=15.98) per sow (per year).

Differences among styles of farming in health care costs were hard to detect, due to the large standard deviation (σ) of the data. Nevertheless, the data on farms of craftsmen seemed higher (€ 49.39 in 1997) than average (€ 42.63). Over the period 1995-1997 the data were also higher on farms of craftsmen. There can be two reasons for this result. First, health problems probably occur more often on farms of craftsmen because they have the most intense production. And second, craftsmen are more alert than other styles of farming to health problems, because they are so focussed on production.

The standard deviations for health care are high because health costs can remain relatively low as long as there are no health problems. As soon as there are health problems the veterinary costs may rise substantially. Therefore the differences between farms within a style of farming can be big.

Farmers can also have temporary extra health care costs for strategically reasons, for example to eradicate scabies problems or to obtain the 'Aujeszky-disease free' status.

Financial Balance

Management support programmes calculate the financial balance in feeder pig production without using data on interest or labour costs.

The financial balance per sow (per year) is calculated as follows (see also Supplement Table to Appendix B):
The sum of the indicators: 219 Profits on sales of sows and feeder pigs per sow (per year) 220 Profits on sales of maiden sows, boars and other pigs per sow (per year) 222 Difference in balance per sow (per year)
Divided by: 221 Costs for purchased maiden sows, boars and other pigs per sow (per year)
Leads to: 223 Turnover and difference in balance on feedstuff per sow (per year)
The indicator: 223 Turnover and difference in balance on feedstuff per sow (per year)
Divided by: 224 Feedstuff costs for sows and piglets per sow (per year) 226 Feedstuff costs for maiden sows, boars and other pigs per sow (per year)
Leads to: 227 Profits on feedstuff per sow (per year)
The indicator: 227 Profits on feedstuff per sow (per year)
Divided by: 229 Costs of health care 230 Costs of artificial insemination (AI) 231 Costs related to other breeding activities (not AI) 232 Costs of fuel 233 Costs of electricity 234 Costs of straw 235 Costs of drinking water

238 Costs of manure removal[2]
Leads to: 236 Balance per sow (per year)
The indicator: 236 Balance per sow (per year)
Divided by: 004 Average number of produced feeder pigs per sow [per year]
Leads to: 237 Balance per produced feeder pig

[1] costs of manure removal [238] did not exist (yet) in the standard lists before 1997

Information about the financial balance per sow (per year) and per feeder pig were available from 31 farms (of 70: 44%) in the survey. In 1997 the balance (without interest) per sow (per year) on farms of craftsmen (€ 647; σ=87) was higher than average (€ 558; σ=88). Expressed per produced feeder pig the balance on farms of craftsmen (€ 27.93; σ=3.63) was also higher than average (€ 25.30; σ=3.20) (Supplement Table 6b).

The difference is substantial. For example: the balance on farms of craftsmen for an average yearly pig production of about 4000 pigs was € 10,520 (4000 * € 2.63) better than the average balance. But although craftsmen were the most intensive pig producers found among the styles of farming, there was no direct correlation between '1997 financial balance per produced feeder pig' and Intensity in '1997 feeder pigs produced per sow (per year)'. This indicates that Intensity of production is not the only reason for the better income. It is the coherence in co-ordinating farm measures taken by craftsmen that was responsible for the better income (Table 6.9).

The '1997 financial balance per produced feeder pig' was directly correlated to the sale price of feeder pigs, to the 'costs of piglet feedstuff per 100 kg feedstuff', to the 'costs of piglet feedstuff per feeder pig', and to the 'costs of health care per sow (per year)' ($p<.05$). This supports the finding that although differences among styles of farming in costs for feedstuff and health care may not be revealed by a single indicator, but they are shown by combinations that point to distinct overall results.

Table 6.9 also shows other relations among indicators. The correlation between 'costs for health care per sow (per year)' and the 'costs for piglet feedstuff per 100 kg' support the suggestion that farmers tend to change and improve feedstuff in the event of of a health problem. The correlation between the 'costs of piglet feedstuff per 100 kg feedstuff' and the 'costs of piglet feedstuff per feeder pig' showed that more expensive feedstuff leads to more feedstuff costs per feeder pig. But the 'costs of piglet feedstuff per feeder pig' were also correlated ($p<.05$) to the 'selling price per feeder pig'. So more expensive feedstuff might pay off. This gives further support to the finding that farming practices should be studied in combinations with one another to find the differences among styles of farming.

From the available data no important trends or fluctuations over the years 1995-1997 were found for most indicators concerning the financial balance. The standard deviations (σ) for indicators of costs, returns and balance were larger than any significant trends or fluctuations found, with the following few exceptions (Supplement Table 6b):

- a trend in the average 'sales price per feeder pig'
- fluctuation in the average 'sales price per feeder pig'
- fluctuation in the average 'financial balance per sow (per year)'
- fluctuation in the average 'financial balance per feeder pig'

As the trend and fluctuations show 1996 was a good year for pig prices. 1997 was on the whole not a bad year for these farmers – despite the swine fever outbreak in the south of the country in February 1997. The extreme drop in prices discussed in Chapter 5 did not come until the second half of 1998 – a few months after the swine fever outbreak was over.

No correlation was found between the 'financial balance per feeder pig in 1997', the 'trend in financial balance per feeder pig 1995-1997' and the 'fluctuations in financial balance per feeder pig 1995-1997'. Thus it cannot be assumed that individual farmers who had a good balance in 1997 were the same individuals who benefited from trends and fluctuations. The market is too unpredictable and inelastic for that.

Table 6.9 Correlations among indicators concerning the balance per produced feeder pig

Correlation[1]	N	*[237]*	*[004]*	*[207]*	*[210]*	*[218]*	*[229]*
[237] 1997 Financial balance per produced feeder pig	27	1.000					
[004] 1997 Intensity in: Feeder pigs per sow (per year)	31	.290	1.000				
[207] 1997 Sales price per feeder pig	32	.348 r^+	-.010	1.000			
[210] 1997 Costs feedstuff for piglets per feeder pig	31	-.360 r^+	-.311 r^+	.396 r*	1.000		
[218] 1997 Costs feedstuff for piglets per 100 kg	31	-.449 r*	-.099	-.084	.316 r^+	1.000	
[229] 1997 Costs health care per sow (per year)	28	-.419 r*	.082	-.018	.310	.546 r***	1.000

[1] Only (nearly) significant correlations are given; notation of correlation (r) and significance (Pearson, 2-tailed): r^+: p<.1; r*: p<.05; r**: p<.01; r***: p<.005.

However, it can be argued that such is different for styles of farming. A group of farms classified in one particular style of farming can be capable of benefiting more from good prices than the population average or than another group of farmers classified in a different style of farming. The current study has shown that the farming practices of entrepreneurs and craftsmen are better oriented for profiting from good prices than for example the practices of stewards. And although insufficient data were available to judge the market strategies of stockmen and shifters, the characteristics of these styles of farming indicate that they are comparable to stewards in this aspect.

At the various levels of ambition the financial results are not as obvious. For example: better marketing management does not necessarily favour the income of entrepreneurs because the unpredictability of the market also plays a role. If the marketing strategies of entrepreneurs would automatically lead to better profits, then they would have the best financial balance rather than the craftsmen. That was not found. So the difference in strategies between entrepreneurs and craftsmen might well lead to a comparable farm income. This again supports the suggestion that farming practices should be judged in terms of coherent combinations of decisions and not on single indicators.

6.3 Attitudes towards the Indicators

Farmers use the management indicators in daily farm practices. The data reflect key information needed to evaluate various aspects of the production process. Combinations of indicators reflect the production results of subsystems. This section introduces the management programmes, indicators, and data used in the various styles of farming, and it explains why and how the farmers in the study used them.

6.3.1 Purpose of Management Support

There are two major purposes for management support: the internal farm management of the pig production process, and the external market management of purchasing supplies and selling products. It was expected that farmers of the various styles of farming would use the support differently. Entrepreneurs and craftsmen were expected to focus on both the indicators for the internal management and the indicators for external market management. But craftsmen were expected to be more interested in internal management and the indicators for production and entrepreneurs were expected to be more focussed on the indicators for external management. Stewards, stockmen and shifters were expected to be less interested in the indicators in general – particularly in the indicators for external management. Stockmen and shifters appeared to keep an overview of purchases and trade by means of another archive administration.

General Purpose

In the survey the farmers were asked what they saw as the general purpose of keeping records of management support information. Most farmers (41 of 85 answers from 82 farms: 48%) chose the answer ‘for technical production improvements’. There was no difference among styles of farming for this choice (Supplement Table 6c). This confirms that most farmers have management support for the internal farm management of the pig production process.

There were differences, however, in the farmers’ second and third choices with respect to the general purpose of keeping records. None of the craftsmen (of 10) chose for example the option ‘general overview’. This confirms that craftsmen work very seriously with the data. They study them closely and base their farm decisions on them. In contrast, the stockmen chose the option ‘general overview’ more (5 of 12) than average (20 of 85 answers on 82 farms: 24%). At the same time stockmen chose less (1 of 12) than average (24 of 85 answers at 82 farms: 28 per cent) the option ‘economic improvements’. This suggests that stockmen take a more global look at the data than other styles of farming do, and that they are not as interested as others in basing decisions for market integration (supplies and sales) on management support indicators.

Purpose of Economic Indicators

Interviewees in the survey were asked to comment on the importance and purpose of economic indicators (inputs and outputs and costs, returns and balance). Of 82 farmers, 66 (80%) indicated that economic information was important in the management support programme. This was far more than the number of farmers (56: 68%) that actually received management support information about economic data (Supplement Table 6c). Even fewer farmers, particularly among stockmen and shifters, could provide such economic data for the current study. In addition, 25 of the total number of farmers that had indicated that economic data were important (66: 38%) did not specify why they found it important. This was most pronounced among shifters (8 of 12).

One shifter commented:

> *<F055> I do get the supplements about inputs and outputs and farm economics, but I am too busy to use them. Besides I do not receive information about the national comparison of farm data. However, Comvee does ask for my data for comparison statistics.*

The conclusion is that several farmers found management support for external management less important than they wanted to admit in the survey. But through the combination of questions, stockmen and shifters in particular revealed that their interest in management support for external management is low.

The farmers that did motivate why they found economic data important could choose from four suggested options. The farmers were asked to choose one or more answers or give another answer.

If economic data for management support are important to you, for what purpose are they important:

- no specific answer
- control of feed costs
- financial balance per animal (per sow or per feeder pig)
- financial balance of the farm

By the 66 farmers that did motivate why they found economic data important, three specific suggestions were given as answers to the open question on the purpose of economic data: ‘control of feed costs’ (17 of 66: 26%), ‘financial balance per animal’ (12 of 66: 18%), and ‘financial balance of the farm’ (12 of 66: 18%).

There were some differences among styles of farming in the answers chosen. Four of the nine craftsmen found ‘financial balance per animal’ to be most important, which was higher than average. This matches the findings in Section 6.2 that craftsmen had the best financial balance per animal. The rationale of craftsmen is that they try to use the sows as economic as possible to get the highest production. This practice had led to the best financial balance in the study. So they use the financial balance per animal as the standard by which to evaluate their own farming performance.

Reference for Comparison of Internal Farm Management

Different groups of farmers use different standards to judge their performance. Entrepreneurs and craftsmen were expected to evaluate their data in the sphere of competition: the data would be judged to be better or worse than an external reference standard. Stewards, stockmen and shifters were expected to evaluate their data in the sphere of participation, i.e. in relation to farms of comparable sizes or to their own results in previous years.

In the interviews, the farmers were asked what their references were for comparing their own farm management support information. Six options suggested, and farmers were asked to choose one or more answers.

Comparison of farm data with reference to:

- the national average
- farms of comparable sizes
- the national top 10%
- colleagues in the study club
- previous years
- personal targets

Entrepreneurs (52%) and craftsmen (50%) chose more answers than average (39%). Stockmen (31%) and shifters (35%) chose fewer answers than average and (Supplement Table 6c). This supports the idea that entrepreneurs and craftsmen are more eager than stockmen and shifters to work with the data and discuss them.

The answer that was chosen the most (50 of 82: 61%) was ‘colleagues in the study club’. Entrepreneurs (18 of 19 entrepreneurs) chose this answer more than average. Stockmen (4 of 12) and shifters (6 of 16) chose this answer less than average. There is logic in this result. Entrepreneurs had ambition to improve their data, whereas stockmen were more focussed on the animals than on the results, and shifters had their attention focussed on other activities.

These results are comparable to the findings of Leeuwis (1993) in his work about the use of indicators by dairy farmers. Leeuwis concluded with respect to the management support indicators for the dairy sector (DELAR) that *...not only the interest in particular parameters and norms varies between the styles of farming, but also that there are differences with regard to the ways farmers reason about and interrelate these parameters and norms.*

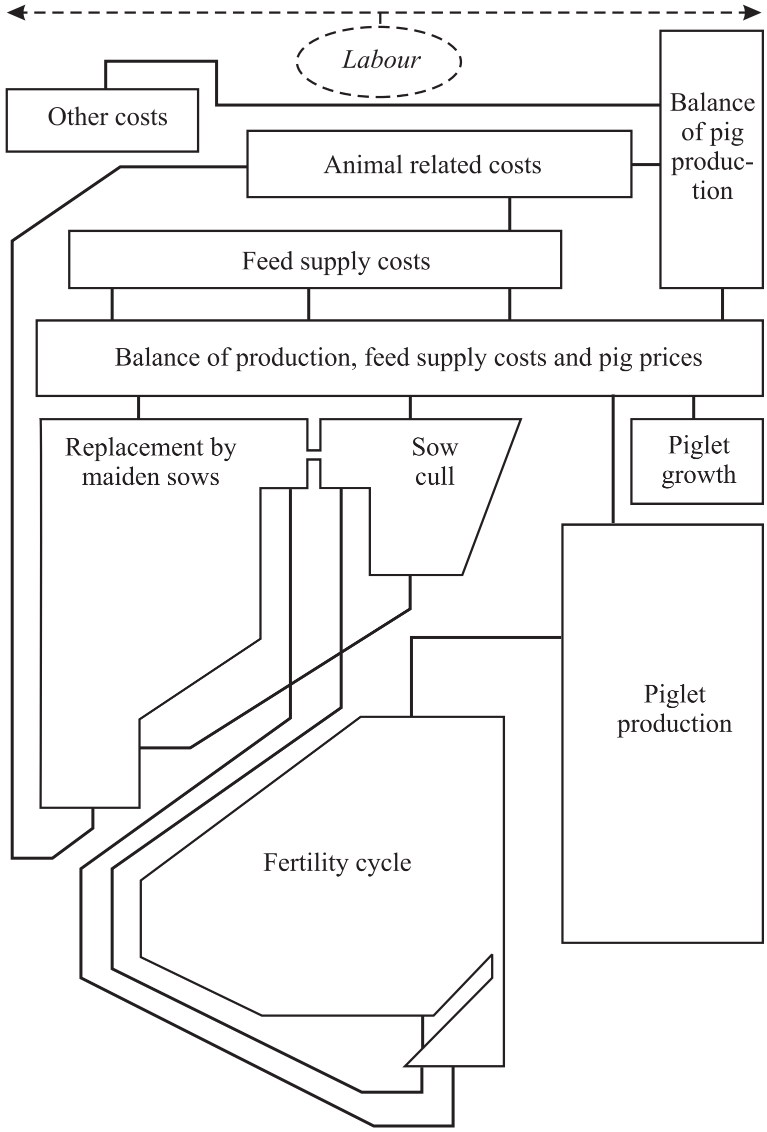
The answer 'national top 10 per cent' was chosen by 23 (of 82: 28%) farmers. This indicator was correlated to Intensity ($p<.005$) and therefore included among the parameters for factor analysis. The indicator appeared to express a pronounced difference between craftsmen and stockmen. Craftsmen compared their data more (6 of 10) than average with the national top 10 per cent, whereas stockmen compared their data less (1 of 12) than average with the top 10 per cent. This finding illustrates the contrast in focus between craftsmen and stockmen. Craftsmen were focussed on sow production, whereas stockmen were focussed on the animals themselves.

6.3.2 Validation of Indicators

Validation at the Level of Subsystems for Farming Practices

As was shown in Section 6.2, management support indicators can be grouped in subsystems, which reflect the co-ordination of pig production practices (Figure 6.2; see also Appendix B).

Figure 6.2 Overview of the subsystems connected to the production of pigs and their extent of market interactions. The subsystems 'piglet production', piglet growth' and 'fertility cycle' reflect physical transformation processes in pig production. The subsystems 'balance of production, supply costs and pig prices' and 'sow replacement and sow cull' involve both physical transformation processes and market interactions. At the upper part of the scheme the subsystems about 'feed supply costs', 'animal related costs' and 'other costs' involve predominantly market interactions (see also Figure B1 in Appendix B).



The key subsystem in Figure 6.2 is at 1/3 down from the top of the scheme, reflecting the indicators for the balance of production, feedsupply costs and pug prices. It is the basis for economic evaluation of the production process.

The section below the key subsystem is comparable to Figure 5.5 in Section 5.1. In Figure 5.5 the purpose was to show the process of movement of the animals – in which housing they are and at what stage in the production cycle. Below the key subsystem the subsystems represent the indicators about pig production and piglet growth (on the right side of the scheme), and about the fertility cycle (below) and the sow replacement (on the left side of the scheme).

The subsystems ‘piglet production’, piglet growth’ and ‘fertility cycle’ reflect physical transformation processes in pig production. The key subsystem ‘balance of production, supply costs and pig prices’ and ‘sow replacement and sow cull’ involve both physical transformation processes and market relations. At the upper part of the scheme the subsystem about the ‘balance of production, supply costs and prices’ is connected to other subsystems that represent pure market relations. Physical transformation processes can be measured in units comparable to the units in physics. Market relations are measured in monetary units. The combination of the subsystems leads to the 'balance of pig production per year' in the right top corner of the figure.

It was expected that farmers would vary with respect to the type of indicators and subsystems they would find important. Entrepreneurs were expected to focus on indicators reflecting marketing aspects, craftsmen were expected to focus on the production per sow; and stewards, stockmen and shifters were expected to give less pronounced responses, but to focus on farm continuity and other goals.

In the survey, the farmers were confronted with nine groups of indicators, reflecting nine different aspects of the pig production process.

The most important groups of indicators for pig production are those concerning…

- production per sow
- sow fertility
- sow replacement
- rearing piglets
- profits and financial balance
- feed costs
- animal health care
- mineral efficiency
- heating and general costs

The farmers were asked to identify in sequence the three groups of indicators that they thought were the most important in pig production (Table 6.10).

Two answers were chosen by nearly all the farmers: the groups of indicators concerning 'production per sow' (63 of 82: 77%) and 'sow fertility'(60 of 82: 73%). The group of indicators concerning 'production per sow' was particularly seen as the most (27 times) or second-most (27 times) important indicator. The group of indicators concerning 'sow fertility' was more equally divided over all three positions (23 farmers found it to be most important, 20 chose it as second, and 17 chose it as the third-most important indicator).

Table 6.10 Pig production farmers (total 82) in Twente and The Achterhoek were asked to choose the three most important groups of indicators for pig production, in order of importance from a list of nine options.

The most important groups of indicators are about	*1st priority*	*2nd priority*	*3rd priority*	*Total*
Production per sow	27	27	9	63
Sow fertility	23	20	17	60
Costs and financial balance	21	8	9	38
Feed costs	4	9	15	28
Rearing piglets	1	6	20	27
Animal health care	3	3	4	10
Sow replacement	1	6	3	10
Mineral efficiency	0	0	2	2

Heating and general costs	0	0	1	1
Do not know	2	3	2	7
Total	82	82	82	246

Several farmers (mostly entrepreneurs) chose the group of 'indicators about costs and financial balance' as the most important (21 times). This answer was much less often chosen in second or third position. This suggests that the rationale of farmers to put the economic results first – just like the statement 'at the end of the day it is just the profit that counts' (Section 5.3), is rather radical. Farm economy seems either in the centre of focus for farmers – or relatively unimportant.

Groups of indicators about 'feed costs' were seldom mentioned in first (4 times) or second (9 times) position, but appeared prominently in the third position (15 times). Similar results were found for groups of indicators about 'rearing piglets' (1 farmer found it to be most important, 6 chose it as second, and 20 chose it as the third-most important indicator). This means that these groups of indicators are neither in prime focus nor unimportant, but somewhere in-between.

The most remarkable difference among the styles of farming was that all (10) craftsmen mentioned the group of indicators about 'production per sow' as one of the most important indicators, while stockmen included this group of indicators less (7 of 12) than average (63 of 82: 77%) in their list of three most important groups of indicators. This finding emphasises how important the production per sow is for craftsmen, and how unimportant this aspect is for stockmen. Stockmen have pigs, because they want to be pig keepers, not because they want to achieve particular production goals.

Ten farmers in the survey gave the answer the group of indicators about 'sow replacement' among their answers. This group of indicators was correlated to Intensity ($p<.005$), and therefore included as part of the classification in styles of farming. But it was not specifically connected to any style of farming. As was shown in Section 6.2, the issue of sow replacement entails a complicated co-ordination of both internal farm processes and market management. So the variety of indicators that relate to sow replacement is very wide (Supplement Table 6b).

When Huirne (1990, page 34) developed his figure concerning pig production indicators, he implicitly assumed that an optimisation of the model would exist with a single solution: the economic optimum. Based on the current study this can be disputed. The current study suggests that the economic optimisation of the pig production process can vary among styles of farming (see also Appendix B).

From the differences in choices of the styles of farming about the groups of indicators they found important, it was suggested that styles of farming co-ordinate farming practices different over subsystems. Each style of farming seems to create a different coherence in the co-ordination of the farming practices, with respect to both the physical transformation processes to produce pigs, and with respect to market interrelations. It is fair to assume that these differences in co-ordination lead to differences of the optimisation of the system as a whole. The data in the study suggest that there are different levels of optimisation of Productivity (related to ambition), and differences in co-ordination of farming practices at similar levels of Productivity (related to the rationales).

Specification of the Validation in the Groups of Indicators about Pig Production

For the subsystem of pig production, there are four key indicators available in the management support programmes. The farmers were asked in the questionnaire to choose the one that was most important to them.

The key indicator for pig production is:
- number of piglets born alive per litter
- number of weaners per litter
- number of weaners per sow (per year)
- number of feeder pigs per sow (per year)

In total, 46 of the 82 (56%) farmers found ‘feeder pigs per sow (per year)’ to be the key production indicator. There were no differences among styles of farming, with the exception of stockmen, who chose this indicator less (3 of 12) than average. Stockmen chose ‘number of piglets born alive per litter’ more (3 of 12) than average (21 of 82: 26%), which reflects their particular way of farm management. Stockmen have a low sow replacement rate (Section 6.2) and they prefer to keep their sows for a higher number of farrows even though these elderly sows have a higher number of piglets born dead per litter.

Specification of the Validation in the Group of Indicators about Sow Fertility

For the subsystem of sow fertility there are four key indicators available in the management support programmes. The farmers were asked in the questionnaire to choose the one that was most important to them.

The key indicator for sow fertility is:
- percentage newly used sows per year
- percentage of sows culled per year
- number of days lost due to ‘open days of sows’ before cull
- percentage re-inseminations

The most frequently chosen answer was ‘percentage re-inseminations’ (43 of 82: 52%). There were no differences among styles of farming. And although the answer ‘percentage of sows culled’ was not chosen very frequently (7 of 82; 9%), four of the seven farmers who chose it were entrepreneurs. As shown in Section 6.2, a high percentage of sows on farms of entrepreneurs were culled – predominantly for fertility reasons (small litters and low conception rates).

It was remarkable that ‘percentage re-inseminations’ was chosen so many times in this context, whereas it was not among the parameters selected for the factor analysis to classify the styles of farming. The indicator was expected to have a negative correlation with Intensity in terms of ‘feeder pigs per sow (per year)’. But the ‘percentage re-inseminations' appeared a key indicator for management strategy input, and not for outcome. If the number of sows that get re-inseminated is decreased, it can mean that an the oestrus detection, or of the physical condition of the sows (nutritional status) is improved. But it can also mean that the strategy for sow cull is changed.

Specific Indicators for Concern or Satisfaction

Every few weeks the farmers in the survey received lists of data from the management support programme, either on a floppy disk through the mail, or as a print-out from the extension officer. The objective in the study was to determine whether any specific data or indicators could be of particular concern to the farmers. So the farmers were asked to choose three indicators, and values of data, that might cause serious concern. They were also asked to choose indicators and values of data that might cause them to feel satisfied or pleased with their farm's performance. It was expected that not only the type of indicators would vary among the styles of farming, but also that the value at which the data would be of particular concern or cause for celebration would vary. The results of the two questions were combined (Supplement Table 6c).

In total, 34 farmers (41%) said that data would never be a cause for serious concern (6 farms), or for satisfaction and celebration (19 farms), or for either (9 farms). In this respect there were no differences among styles of farming. Fewer farmers thus found the data to be a reason for satisfaction than a reason for concern. According to some farmers this is due to regional culture. One farmer explained:

> *<K317> Indicators are never a reason for celebration. We are too level-headed for that. We would never do that. We did not do it in the past either, when production rose from 18 to 22 pigs per sow per year.*

But for some other farmers the results could be a source for family pride. One farmer commented:

> *<W138> For the last three years we have been better than the national average in all indicators.*

Another farmer put the value of the data in an economic perspective:

> *<U246> Good technical results are no guarantee for a good economic balance.*

The farmers who did find that the data might be cause for concern or pleasure often chose fewer than the requested three indicators for their answer. The number of their answers was far less than the requested three though; on average about 1.5 (46%). In this respect there were differences among styles of farming. Entrepreneurs chose more indicators than average (nearly 2.0: 62%) and stockmen chose fewer indicators than average (about 1.0: 33%). This supports the suggestion that entrepreneurs are much more involved with the interpretation of the data than average and stockmen less than average.

There was a remarkable variety in the indicators chosen by farmers who did believe the indicators could be cause for concern or pleasure. The farmers chose twenty different indicators, four of which were chosen relatively often. The 'number of feeder pigs per sow (per year)' was mentioned most often (49) particularly in connection to satisfaction and celebration. The 'percentage re-inseminations' (25), the 'number of piglets born alive per litter' (25), and the 'pre-weaning piglet mortality' (23) were chosen in almost equal numbers.

Remarkably, no differences were found among styles of farming with respect to the indicators mentioned, even though it was expected, for example, that craftsmen would choose the 'number of feeder pigs per sow (per year)' more often than others. The only differences among styles of farming appeared with respect to the values of the data that would cause satisfaction or concern. One of the craftsmen would already get seriously concerned if the 'number of feeder pigs per sow (per year)' would drop below 23.5. One of the stockmen said that if the 'number of feeder pigs per sow (per year)' would drop below 16.0 then it would be a reason for serious concern. On the other hand, a few stockmen said that if the 'number of feeder pigs per sow (per year)' were to rise over 22.0, the data would already be cause for satisfaction and celebration. This value was the average in the survey in 1997 (Table 6.11).

Table 6.11 Data values for some indicators that would be cause for concern, and data and values for one indicator that would be cause for satisfaction and celebration (compared to the actual average values in the survey in 1997 of 82 pig production farms).

Indicator	*N*	*lowest value mentioned*	*highest value mentioned*	*average value 1997*
		Value below which the indicator would be cause for concern:		
feeder pigs per sow (per year)	9	16.0	23.3	22.0
piglets born alive per litter	16	5.0	11.5	10.9
Value above which would be cause for concern:				
percentage pre-weaning piglet mortality	15	5.0	15.0	11.0
percentage re-inseminations	17	5	20	11
		Value above which the indicator would be cause for pleasure:		
feeder pigs per sow (per year)	31	22.0	27.0	22.0

Some farmers commented on their responses, for example:

> *<W631> The data are never good enough. You always want them to be better: 21 pigs per sow per year are not good enough anymore. At the current price level even 24 pigs do not bring a profit. So you always want more.*

But other farmers did not share that opinion. Another farmer argued that an optimum for the number of feeder pigs per sow (per year) should be pursued.

> *<K180> Even for the number of pigs per sow per year there is an optimum: 23 should be possible, but it is not good to go beyond that.*

The farmer did not specify why it would not be good to go beyond 23 pigs per sow (per year). But as outlined in Section 6.2 large litters require a high input of labour: in cross-fostering piglets with other sows. That would also increase the percentage of pre-weaning piglet mortality.

6.3.3 Differentiation in Economic Principles

The styles of farming appeared to vary in every aspect of farming – from labour organisation and social integration in the area to stable equipment and sow breed types, and principles about management. It can be concluded that for each style of farming the value of a pig is different to every standard: in terms of physical caring, in emotional value, but also in monetary economy. The overall conclusion is, that the economic values differ over styles of farming so much that the optimisation of the production system gives different solutions for each style of farming. This is explained in the following.

Basically there is diversity in repertoires of physical and social behaviour, reflecting the diversity in farming practices of the styles of farming. This suggests that the optimisation of the pig production process will not lead to the specification of a single optimum, but that a variety of optimisations are possible – of which one is different from the other, but not necessarily better or worse. Technically there are two types of reasons why differences in repertoires occur:[23]

(1) Technical repertoires related to time and order in physical terms:

- *a)* Decisions about activities can not be made at a time that is best to optimise each subsystem independently. There are mutual dependencies between subsystems. At the same moment that is right to optimise the conditions for one subsystem, sub-optimal conditions are created for another subsystem.
- *b)* Decisions about activities are dependent in sequences to each other. One decision follows another or leads to another in a specific order.

(2) Behavioural repertoires of farmers related to working schedules:

The whole system of pig production is very complex for a person to overlook, comprehend and decide about at any moment. What people do under such circumstances is going by repertoires in activities.[24] In the current study the repertoires are fixed by the week working schedules of the farmers. This is a typical aspect, already described in early literature about styles of farming of Hofstee (1985). Working schedules and flexibility in working repertoires differ among styles of farming, depending on farmers' attitudes and convictions about how farming practices should be performed best. The conditions about how farming practices should be performed best are founded in a space of domains (Frouws and Van der Ploeg 1988), and reflected in the farmers' capacities (Van der Ploeg (1991). These capacities are related to productivity and are reflected in the styles of farming (current study).

Among the styles of farming there were differences in farmer's judgements about the best moment in the sequence of events to intervene in the physical processes in pig production. They put different emphasis in the priorities for subsystems to optimise.

And they made different judgements about which indicators and subsystem should be given special attention.

Conclusion

Styles of farming challenge the principle in economic science that monetary values of production factors and products can serve as a mediator for comparison of production efficiency. The current study has shown that the values in terms of physical processes differ fundamentally among styles of farming, and lead to a differentiation in possibilities for economic optimisation.

Participation in Management Support

Source of Information

All of the farmers in the survey were involved with one of three management support programmes: Comzog (of Comvee BV) or CBK or ZAP (of SIVA Software BV). SIVA Software BV and Comvee BV had slightly different company histories. SIVA Software BV was situated in Wageningen and had a historic relation to the Agricultural Telematic Centre (ATC) and the Wageningen University, where the management support indicators were developed. Comvee BV was situated in Deventer and had a historic relation with the feedstuff company ABC. The historic relations were reflected in the type of management programmes farmers in the survey used. Many farmers with connections to ABC Feedstuff Company in The Achterhoek were also connected to the Comzog management programme. Users of the ZAP programme appeared to have more than average contacts with the Feedstuff Company CTA in Twente. There was no relation between the users of the CBK programme and the feedstuff companies in the area (Table 6.12).

Table 6.12 Correlations between the management support programme (Comzog, CBK or ZAP) and the feed Supply Company (CTA in Twente or ABC in The Achterhoek)

Correlations[1]	*N*	*Comzog*	*CBK*	*ZAP*
Feed company CTA (Twente)	82	.022	-.151	.246 r*
Feed company ABC (The Achterhoek)	82	.314 r***	-.231 r*	-.161

[1] Only (nearly) significant correlations are given; notation of correlation (r) and significance (Pearson, 2-tailed): r^+: p<.1; r*: p<.05; r**: p<.01; r***: p<.005.

The three programmes of SIVA Software BV and Comvee BV covered about 90 per cent of the management support of the pig producers in the area. The remaining 10 per cent of the farmers used predominantly another management support programme of SIVA Software BV (TEA) as well as programmes from some other suppliers. TEA was a programme with limited possibilities because that system was not computerised, and it would soon cease to exist. TEA users were not approached for the current survey. Since the survey was completed, company fusions have taken place. The Feedstuff companies CTA and ABC fused into one feedstuff company, ABCTA. SIVA Software BV and Comzog BV also merged into one company, called Agrovision BV,[25] which now has a management programme available on Internet.

The type of management support programme used by the farmers was correlated to Productivity and Scale. Therefore CBK and Comzog were part of the parameters for factor analysis (see Chapter 4). Because of this correlation, it was expected that larger scaled farms (entrepreneurs and craftsmen) would use the CBK programme more often.

Differences among styles of farming were found. On 82 farms, there were 39 (48%) users of Comzog, 37 (45%) users of CBK and 6 (7%) users of ZAP. Entrepreneurs (4 of 19) and stewards (2 of 13) used Comzog less than average, and used CBK more than average (13 of 19 entrepreneurs and 11 of 13 stewards). Shifters (14 of 16) used Comzog more often than average and shifters (2 of 16) and stockmen (2 of 12) used CBK less than average. This might be related to the fact that CBK had more information about the balance in inputs and outputs and the costs and returns in the standard programme than Comzog.

The CBK users in the survey were provided with both the technical data on pig production and data on the balance of inputs and outputs and costs and returns. For the Comzog users in the survey the data the balance of inputs and outputs and costs and returns was optional: farmers could choose to receive this additional information.

In total 56 (of 82: 68%) farmers received additional information on the balance of inputs and outputs and costs and returns. Entrepreneurs (17 of 19) and craftsmen (all 10) received this additional management support more than average and shifters (4 of 16) less than average.

Even though 56 farmers received this information, only 34 farmers were able to provide data about these indicators for the current study. For stockmen and shifters the number of farms was too low (less than six) for the calculation of data for the styles of farming (Supplement Table 6b).

For management control and business administration 76 (of 82: 93%) farms had a personal computer. There was no difference among styles of farming. Only 12 (of 76: 16%) of the computer users were connected to the Internet in 1998, but that number was rapidly increasing.

Communication about the Information

All farmers in the survey mentioned at least one contact with which they discussed the management support data. In the survey there were ten possible contacts mentioned with whom they might discuss the management support. The farmers could choose as many as were appropriate (Supplement Table 6c).

Farm data were discussed with:…

- nobody
- partners (family)
- other relatives
- personnel
- study club members
- general extension service (DLV)
- accountant
- feed supply extension officer
- market chain contact (Dumeco)
- veterinarian
- breeding company

Entrepreneurs mentioned more categories (4.3: 43%) of contacts with which they discussed the management support data than average (3.6: 36%), shifters mentioned fewer (2.6: 26%) categories than average. This supports the suggestion that entrepreneurs are much more involved with the interpretation of the data than average and shifters less than average.

Of 82 farmers 70 (85%) discussed the management support data with the extension officer of the feed supply company. This was much more than the number of farmers (30 of 82: 37%) who discussed the data with a general extension officer of DLV (the former government extension organisation). But this was not a surprising result: some of the farmers got the data through the feedstuff company. So it was likely that many farmers would discuss the data with the feedstuff company too.

Of 82 farmers 42 (51%) discussed the management support data in their study club. This indicator was correlated to Productivity and Scale (p<.005) and it was therefore among the parameters used for factor analysis. There were also differences among styles of farming. Entrepreneurs discussed their data more often (14 of 19) in their study club than average. Shifters (4 of 16) mentioned less than average the study club. This again supports the suggestion that entrepreneurs are much more involved with the interpretation of the data than average and shifters less than average. Entrepreneurs also had the most contacts with the study club anyway (18 of 19) and shifters the least (10 of 16) (see: Section 5.2). In addition, the contacts with the general extension officer of DLV and the veterinarian were also less for shifters. This can be explained by the fact that shifters were shifting their attention to other activities.

As shown in Supplement Table 6c, stewards did not discuss management support data with personnel or an accountant. That can be explained by the fact that the stewards in the survey did not have any personnel. The family, often the farmer's wife, usually does the accountant's work. In contrast, it was expected that entrepreneurs, who have more personnel than average (see Section 5.1), do discuss the management data with their personnel. This was confirmed in the results.

Craftsmen discussed their management data more (8 of 10) than average (41 of 82: 50 per cent) with the veterinarian, and shifters less (5 of 16) than average. This can be explained by the fact that the high production level of craftsmen requires keen health management. So craftsmen keep close contacts with the veterinarian to maintain a good health control.

There was a relation between the interest of farmers of the various styles of farming in indicators and how and how much they discussed about the indicators. Entrepreneurs and craftsmen discussed about them often and with a greater variety of contacts than stewards, stockmen and shifters. Entrepreneurs mention the study club and the farm personnel more than average, whereas craftsmen mentioned the veterinary and the breeding company more than average.

General Remarks by the Farmers about the Indicators

Some of the farmers had general comments on the supply of data when they were asked to provide them for the study. The comments reflect the time frame in which the questionnaires were held. For example, relatively few farmers had computers in 1998. One farmer complained about the inefficiency of supplying basic information:

> *<K071> The management programmes should be connected better. Now you have to give the same input three times: separately for the breeding organisation, the manure bookkeeping, etc. One time should be enough for all purposes. That would cost less time and stress for the farmer. The farmer has too much office work.*

The information branch developed quickly in the subsequent years. Within a few years the supply of information switched from floppy disks to telephone data transfer, E-mail and Internet, to which the majority of the farmers obtained access by 2003.

Other farmers complained during the interviews about the limitations of the management support programmes in honouring specific requests for data information:

> *<U246> The financial balance should also be expressed per sow housing unit or per square meter (m^2), and not just per sow.*

> *<K323> I would also like to know the individual feed conversion of the sows. In the new computerised feed station there will be an individual registration of the feed consumption. There should be a programme attached to this information.*

> *<W140> For a combination farm with both pig production and fattening, the distinction between pig production unit and fattening unit is artificial. I would rather have a total overview of my farm through calculations of indicators per slaughtered pig.*

The demand for management support data thus varies considerably among farmers. Some farmers in the study were too busy to pay attention to all the information. Other farmers demanded more – especially better forms of information supply and data that is more specified to their personal circumstances.

The organisation of the provision of the management support data was not just a problem for the farmers in the survey at that time. Gathering data for this study would have been much easier if it were done a few years later, when the data had become available on Internet.

6.4 Health Strategies, Cull Principles and Religion

Differentiation in Health Strategies

There are many diseases and health problems, which have to be kept under control in daily farm management (Eich 1992). Health management has therefore been an important issue in pig farming development (Dommerholt and Grashuis 1967/68).

Animal health management requires optimisation of two conflicting aspects: exposure to germs to gain natural resistance versus isolation, hygiene, and other measures to prevent exposure to potential pathogens. The issue is how to find a balance. Achieving such a balance requires most importantly education, but cultural traditions and indigenous knowledge are also involved. From childhood onwards, young farmers learn about health and hygiene, about building up a natural resistance in the animals and about hygiene and disinfection – both for themselves and for their animals and environment. In the study area, many farmers like to show that they are neat and clean (Section 5.2) in the way they maintain their farm. That is the cultural context in which animal health management and hygiene is discussed in this section.

In the survey there had been few questions about the details on the issue of hygiene management, because socio-material interrelation were not included in the objective of the study. Yet the following image can be drawn from the available information.

Among styles of farming there were different principles behind the strategies for health management. For most entrepreneurs and many craftsmen a high level of hygiene was important to achieve a high production level and to extend markets. Their strategy emphasises isolation of the production unit from the environment, cleaning and disinfection. The practices are associated with the market and food safety, and safety guarantee certificates. The idea behind this strategy is both to prevent strange germs from entering the farm and to reduce germs on the farm. Farm workers as well as visitors have to pass through a so-called hygiene lock, where they have to put on special farm clothing. On some farms it even involves a shower. There is also a 'clean way - dirty way' principle implemented on the farm. Visitors to the farmhouse and 'clean' buildings are kept separate from visitors to the actual farming area. And there is a separate way for entering 'clean' buildings than for coming in contact with animals, manure etc. Inside the stables there are schedules for cleaning (and disinfecting) after each round of piglet production. Cleaning is done carefully by high-pressure spray after a few hours of soaking. Sows go 'all in and all out' of separate sections of the stable, allowing an interval for complete cleaning and drying. The system is often combined with fixed chain contacts for supplies. Some farmers go even further and implement a so-called Specific Pathogen Free (SPF) system with ultra-hygienic measures.

In contrast, there is a strategy associated with mixed farming and diversity in farm activities. These farmers, involving part of the stewards, stockmen and shifters (and some craftsmen), strive for isolation from the outside to a large extent, but they also have a firm belief in maintaining a balance within the premises of the farm. They believe it is important for animals to adjust to the germ environment of the farm. Some farmers even deliberately bring manure from one stable to another or even from one location to another, to facilitate adjustment of the animals. Such practices are usually done a few days before they move the animals to the next stable or location. By bringing in manure to the animals, they can adjust to the microbiological environment before they move. In this strategy the need for cleaning is different. In this perception there are two basic purposes of cleaning:

(1) It is unpleasant for the farmer and the animals to be in a dirty system – particularly because these farmers live in a culture in which neatness and cleanliness is the standard.

(2) Like anywhere else, once in a while an infection with a problematic germ may enter the farm. If that happens the whole system should be fully cleaned (and disinfected) to eradicate the problem. Stables should not be too dirty when such a problem occurs, because then cleaning would become complicated and costly. With respect to such incidents, some farmers believe that 'not overcrowding stables is more important than any other measure' (see also Section 5.3).

So most farmers in the survey do clean their stables, but the way they do it varies. Some do it wet with a high-pressure hose, some farmers use disinfectant, and some do it dry – through sweeping and shovelling. And some farmers do not clean empty stables. They do the cleaning a few days after the sows have moved in. They clean stables and animals together.

After sales pigs are often mixed and recombined with pigs from other farms on the fattening farm. A remark should be made about these pigs that are ready for sale. A pig that is raised in a hygienic system is less ‘robust’ than a pig that is raised in germ balance system. If both groups of animals are brought together at the same fattener, the hygienically raised animals will be prone to pick up diseases than (or from) the more robust animals. So it is important that animals from different sources match when they are brought together at a fattener’s farm. This is one of the reasons why pig fatteners usually prefer fixed contacts with pig producers.

A third way to approach the issue of hygiene is through regional integration. This strategy is focussed on integration with nature management and recreation activities. This system is mainly found among stewards, stockmen, shifters (and tenders in the initial study). These farmers do not isolate the farm site, but try to keep it in balance with their immediate environment. They prefer integration with the physical environment, often involving contacts with wildlife: small mammals and birds. These farms are not necessarily dirty. On the contrary they are often neat and clean, but neatness and cleanliness are expressed differently, through different accents and activities. These farms are often an integral part of the scenic landscape. The farms promote the idea of regionalisation: in their view, the robust animals and side products (manure) should all be kept and processed within the region. Isolation of the farm or region is in their view only necessary in the event of actual disease problems.

All of the farmers described above have a deliberate view and strategy related to health and hygiene. It is common knowledge that there are also farmers who are less preoccupied with the subject of hygiene. They often refer to specific hygienic measures as ’nonsense’ (see also Section 6.1). These farmers appear to lack a strategy, and health and hygiene-directed activities. Other farmers often consider them to be a risk factor in the region. The existence of these farms is often mentioned by others – farmers rarely consider themselves as belonging to that group.

Cull Principles

There used to be a commonly accepted justification for culling livestock.[26] It was called the ‘utility principle’.[27] It held that domestic animals were basically allowed to live as long as they were useful to people (Thomas 1983). There was a generally accepted hierarchy in relation to the use of the animals. At the top were the animals that were kept for company or work (like dogs, cats, and horses). They were (and still are) usually allowed to live long enough to grow old. Next are the animals that are kept for their genetic heritage – either as resources for animal production or for hobby breeding. These animals are often allowed to live relatively long – basically their whole productive life. Third in line are the production animals. They are usually allowed to live as long as the production (like milk, piglets, or eggs) is considered to be sufficient. In recent years, the criterion for what is ‘sufficient’ has been constantly increased. Last in line are the product animals (veal calves, fattening pigs, or broilers). They are basically allowed to live until they are at the desired age and weight for consumption.

This allowance for animals to live has long been an unwritten rule about ‘respect for animals to make them serve a purpose, which was considered honourable for them’ (Thomas 1983). This attitude is often referred to as ‘respect for life’, and farmers co-ordinated their animal cull and sales management according to these principles.

Recently, however, this unwritten rule has been overruled by market principles. Those market principles are also incorporated by the European Union (EU). Since the 1970s the EU has been confronted with overproduction. These piles of excessive products used to consist of crops (grain, sugar) and animal products (milk, butter). In response, the EU developed among others measures, a regulatory practice of withdrawing these products from the markets. In the 1980s the EU developed the principle in the world-wide General Agreements on Traffic and Trade (GATT) that agricultural products should be treated like any other market products. In the Uruguay round of the GATT-agreements this principle was extended to livestock. As a consequence, the former ‘respect for animal’ of livestock was implicitly degraded to ‘instrumental principles’. This means that healthy livestock can be culled and removed from the market, for reasons that may have nothing to do with their ‘honourable utility’ – for example during the outbreak of a serious livestock disease. This principle was used to fit the issue of animal health in the Schengen-agreement about open borders, which was implemented in 1994.

Though animal disease control has always been an important issue, but since the Schengen-agreement in the European Union (EU)[28] of 1994 its importance has increased. Although the international transport of animals began before 1994, it has increased dramatically since the opening of the borders to other countries included in the Schengen-agreement. In 2001 Dutch export of pigs amounted to about three million live animals per year. The main destinations were Germany, Italy, Spain, Belgium, Luxembourg, Portugal and Austria (Talsma 2002). The open border policy substantially increases the risks of epidemics, – as well as the economic impact of an outbreak, especially because the new disease control program of the EU that came into effect in 1992 is based on non-vaccination, and country boarders get closed in the event of an outbreak.

The practical consequences for farmers and society of the combination of measures by the EU became clear in The Netherlands during the outbreaks of swine fever in 1997/1998, foot-and-mouth disease in 2001, and Newcastle disease (fowl plague) in 2003. Several other European countries have also suffered from crises caused by outbreaks of animals diseases since 1994.

During the outbreak of swine fever in 1997/1998 about 11 million (healthy) pigs were culled, without respect for the ‘usefulness’ of the animals. That shocked many farmers, because they were not prepared to find their principles on ‘animal cull and respect for animal to live for an honourable purpose’ violated.[29] Actually farmers (and society) were not prepared for the crisis of an outbreak in any other way either. For example in terms of dealing with the livestock management in the event of a transport block or closed borders, etc., there were no developments in terms of ‘anticipation plans’ for farming practices or extension from the government to farmers. Nor where there any specific anticipations in the policies of government and industries. [30]

During the interviews, some farmers expressed various objections to the principles of the government strategies:[31]

- Maiden sow producers had problems with the idea of destructing valuable genetic material.
- Pig producers had ethical problems with the cull of gestating and lactating sows, and of suckling piglets.
- Pig farmers had sincere and emotional objections to the mass destruction of healthy pigs, because they were not allowed to enter the food chain. For some farmers the culling of so many healthy pigs undermined the whole justification of present day pig farming, because the destiny of the pigs was 'dishonourable'.

Some farmers explained in further detail their attitudes and ethical principles towards the culling of animals.

<K508> It is not about religion, but I shall never sell gestating sows for slaughter.

This is a clear ethical principle. Although there was no direct connection made to the outbreak of swine fever, it was implicitly a clear statement against the imposed switch in the government's approach to controlling the outbreak. One of the government measures taken during the outbreak of 1997/98 was specifically to cull gestating and lactating sows.

Some farmers cherished the notion that the animals that leave their farm were sold to stay alive. It may be irrational, but it makes it easier for them to sell feeder pigs. One farmer said:

<U212> You do not just get rid of a sow. That is the difference with feeder pigs: they leave here to stay alive. It all has to do with respect for animals.

An entrepreneur in the current study commented on the issue and said firmly:

<E239> I shall not kill an animal if it has a chance to survive.

Some farmers made just general comments about their respect for animals:

<W197> I talk with pigs too. I have respect for animals.

Some other farmers connect their comments about treatment of animals specifically to family farm objectives.

<U077> Pigs are treated well here. They are so to speak like children. This is a true family farm and not a bulk production farm.

One of the farmers even gave a definition of what he (or she) considered good stewardship:

<C008> Stewardship means to handle the animals properly. You are allowed to use them and to slaughter them. But you have to manage them properly.

From these comments it is apparent that the pig farmers do not (yet) accept the formal paradigm change implemented by the EU and the national government, from animal cull principles based on ‘utility value’ towards principles based on ‘instrumental value’. Farmers feel emotional resistance to culling healthy animals.

Religion

It was expected that farmers in the survey would elaborate on their religious convictions in relation to pig production. They didn’t. Only 8 farmers (of 82: 10%) told the interviewer that religion played a role in their farming practices, and 10 (12%) briefly specified that role.

One of the farmers commented:

> *<C107> Our religion has an important influence on the way we handle our animals. They are part of God’s creation; that means they have to be handled with a certain degree of respect. We also rest on Sunday.*

Another farmer said in more general terms:

> *<F077> Based on my religion I say: you are dealing with living creatures, so you have to treat them well.*

One of the farmers in the survey was even involved in a bible study group, which concentrated on the relation between ethics in farming and the Bible:

> *<E162> I try to live based on my Christian principles and to be honest in doing my business. In group conversations we ask ourselves: how do you deal with the animals and the environment from the perspective of the Bible?*

The number of non-respondents did not reflect a complete image of the actual situation. It is common knowledge that all farmers respect to at least a certain extent a Sunday rest. In addition, most farmers have based their attitude towards animals on the Christian cultural tradition. But apparently farmers do not connect their religious cultural background to questions about religion. In the survey, religion only played a role in the comments of the farmers when they were reflecting on cultural differences between their own area, dominated by Protestantism, and the south, dominated by Roman Catholicism.

Though most farmers responded negatively to the question of whether religion played a role in their farming practices, several farmers did make comments concerning religion at another stage during the interview, for example:

> *<K142> We have inquired about the chances of switching to free-range pig farming not just from the perspective of farm economics, but also based on Christian motives. To us the forced injections for oestrus synchronisation for sows are not an option.*

Another farmer also commented about religion with regard to the use of hormones:

> *<W197> I don’t know whether it has to do with religion, but I have ethical objections against some things. Nowadays the three-week sales system is promoted. If anything*

> *does not go according to plan, then the sows have to be injected for their oestrus. That goes beyond what I can approve of.*

The three-week system was already briefly discussed in Section 5.1, in reference to labour schedules. A three-week system implies that the sows all come into oestrus on the same day, due to a hormone injection. As a result, at the end of the line the feeder pigs are ready for sale (transport) in large groups every three weeks, instead of every week. This has obvious logistical advantages. The system has quickly grown in popularity in connection to the introduction of group housing, but especially since the outbreak of swine fever in 1997/98. Since then farmers have been encouraged by government regulations to create larger groups of animals for transport. The government regulations were meant to reduce cross contamination of pathogens between pigs, which were loaded at different farms (or farm locations) by the same means of transport. Since the new regulations came into effect, pigs from different locations are no longer allowed to be loaded together, unless they are being sold for slaughter. So a problem arose particularly for pig producers who sell their pigs to fatteners and not directly to slaughterhouses. Some pig producers welcomed the three-week working schedule as a good solution, accepting all the implicit consequences. For others an ethical dilemma was created because of the consequence of hormone injections. Among conventional pig farmers it is commonly accepted that a three-week working schedule cannot be introduced without oestrus synchronisation[32] (see also Sections 5.1 and 6.2).

Notes

1 Because of these differences in styles of farming it should therefore be recommended that government regulations, which implicate complete renovations of stables should basically allow farmers about 20 years for implementation.

2 In 2003 the governmental requirement to introduce these new systems was extended to 2013.

3 By 2003 group housing was introduced on 10 per cent of the farms in The Netherlands, involving about 30 per cent of the pigs (personal communication, Expertise Centre of the Ministry of Agriculture). This finding confirms the research results, that farmers at big specialised farms (entrepreneurs and craftsmen) are more willing to invest in new developments and more willing to accept capital destruction than farmers with other ambitions (stewards, stockmen and shifters). This attitude towards capital management is not directly linked to any specific attitude towards the animals.

4 That these traditions in network constructions are strict was illustrated during the outbreak of swine fever in 1997. The outbreak took place in a relatively new area of farmer colonisation (about 100 years = 3-4 generations ago). The colonisation was done in two parts. First the north-western part (north-west of the geological break in the soil called ‘Peelrandbreuk’), and later the south-eastern part. The colonisers in each part brought their own network of suppliers and contacts for transport. And even though farming had evolved dramatically over the century, the network was still populated with the descendants of the same people. The swine fever broke out north-west of the ‘Peelrandbreuk’. And though the epidemic spread extremely fast in that part, it took four months before the swine fever effectively spread in the south-eastern area. Because of the extreme density of the pig population in the whole area, there seemed no other likely explanation for that phenomenon, except the differences in networks (personal observation 1997).

5 The term ‘early measures’ is an euphemism with respect to the fact that the requirement for government measures was already manifest in the 1970s (Frouws 1993).

6 They are: Vereniging Eastermars Lânsdouwe VEL, and Vereninging Natuurbeheer en Landschap Achtkarspelen VANLA.

7 The traditional Dutch Landrace went extinct quickly in the late 1960s – before the Foundation to protect Rare Domestic Breeds (Stichting Zeldzame Huisdierrassen SZH), founded in 1976, could start to protect them (personal communication ir. Dirk Zoebl, SZH 2001).

8 NL: Improved Dutch Landrace, GY: Dutch Yorkshire, LW: English Large White, Du: Duroc, Pi: Pietrain.

9 F_1: crossbreed (NL x GY)

10 In Dutch: schurft (see: Eich 1992).

11 Open-air pig farming shows a clear example of conflicting interests of the government reflected in contradicting legislation to farmers. On the one hand, the government stimulates contributions to nature management, like providing nesting places for birds. On the other hand, the government stimulates farm hygiene measures through legislation and certification for isolation of stables.

12 fowl plague: ‘Newcastle disease’

13 See also: Commandeur M.A.M.: Bij onzichtbaar vee verliest onze cultuur teveel (Dagblad Trouw, de Verdieping, Podiumpagina, 25 mei 2001).

14 The awareness of the fact that the event of a disease outbreak would require fundamentally different planning was also absent in the government and in science (personal observation 1987-1997).

15 For the regular European pork market all male pigs should be castrated within a few days after birth. Those pigs are slaughtered at an age of about 6 months (about a month before adolescence) and a body weight of 100 – 120 kg. Historically, castration was required to avoid risk of a boar-scent, which may develop in some boars from adolescence. For the English bacon market the pigs are

already slaughtered at an age of about 4 months and a body weight of about 60-kg. Males are not required to be castrated, because at that age there is no risk at all of producing a boar-scent. On the contrary boars are preferred for good meat quality and reduced feeding costs.

16 SIVA Software BV, personal communication (1997)

17 Suggested by dr. ing. Wiebe Koops, livestock farming systems expert; personal communication (1999).

18 According to prof.dr.ir. Martin Verstegen (personal communication 2002) the preferred length of the nursing period is a continuous topic of debate. After a few years of discussions about further reduction of the nursing period, the discussion is now focussing on the advantages of increasing the nursing period to five weeks.

19 original line: 'D*fl.* 5.='

20 Wagenings Universiteitsblad (WUB) 10:12 March 1998, 11: 19 March 1998, 12: 26 March 1998, and 13: 2 April 1998.

21 Average number of sows calculated through log transformation of data.

22 Average total number of produced feeder pigs calculated through log 10 transformation.

23 These patterns are in line with what Kahneman found as psychological basics for human economic behaviour (Kahneman & Tversky 2000). The consequence of the split in styles of farming is that an overall "best" farmer – in terms of efficiency – cannot be defined. There are different styles of farming that evaluate "best" with reflection to sub-systems. Optimisations can only be achieved within styles of farming. Comparisons among styles of farming reveal differences among feasible sub-optimums of the styles. This is in line with the mathematical approach of equilibria by Nash (1950 – Nobel price winner in 1998): the equilibrium is formed by a combination of sub-optimums.

24 Research on this aspect of human nature is a major reason why Dr. Daniel Kahneman (Princeton University) was awarded a Nobel-price for Economy in 2002 (source: de Volkskrant, 10 October 2002, Economie page 21). In his work (Kahneman & Tversky 2000) the term 'rule of thumb' is presented to describe repertoires.

25 see: http://www.agrovision.nl

26 There is a difference between slaughter (Dutch: slachten) and cull (ruimen). Animals are slaughtered for consumption. Animals are culled because they are no longer wanted. Animals can be culled for slaughter (like the regular culling of old sows) or culled for destruction (for example during the outbreak of a disease).

27 The utility principle is assumed to be founded by Jeremy Bentham (1748-1832); see Cliteur (2001).

28 The Schengen-agreement (1990) regulates the open-boader policy (acquis) of the associated countries within the European Union: The Netherlands, Belgium, Luxemburg, France and Germany (1990), Italy (1990), Spain and Portugal (1991), were the first countries to sign the agreement that was first implemented in 1994. Later Greece, Austria, Sweden, Finland and Denmark, Iceland and Norway joined in. See: http://www.europa.eu.int/scadplus/leg/en/cig/g4000s.htm .

29 According to Cliteur (2001) animal cull for 'instrumental reasons', for example during the outbreak of a disease, is already accepted in society. I truly doubt that farmers emotionally accept the 'instrumental principal' – particularly the styles of farming represented by craftsmen, stewards, stockmen and shifters.

30 Personal observation (and concern) during the years 1994–1997 (see also: initial study).

31 These findings were in line with personal observations (1997) made in Boekel at the crises centre in the south of the country during the first few months of the outbreak of Swine Fever.

32 In organic farming the use of hormones for oestrus synchronisation is prohibited. But practice has proven that it is possible to introduce a three-week working schedule in organic pig production

without the use of oestrus synchronisation hormones (De Heer family, organic pig producers and fatteners, Woerden, personal communication 2002).

7 Summary and Conclusions

7.1 Outline

The aim of the study was to gain knowledge about perspectives for pig production in Twente and The Achterhoek as perceived by the pig producers in relation to society and to the production results of the farms. Pig production was studied through the production processes and the constructions that support production (stables, equipment, networks and indicators). The perspectives were differentiated according to styles of farming.

A method for computerised analysis of the diversity in styles of farming was developed. With this method farms were classified in styles of farming in relation to the dimensions Intensity and Scale (resulting in farm Productivity). With this method the differences among styles of farming could be quantified.

The study resulted in the identification of five styles of farming in the study area (Twente and The Achterhoek): entrepreneurs, craftsmen, stewards, stockmen and shifters. These names are metaphors. They reflect the specific capacities of the farms in the styles of farming.

The key quality of styles of farming is the coherence of a great number of characteristics, which form a logical range of farming practices, and which contrast with other farming practices because they are based on a different logic. In this study the concept of ‘logic’ is divided into ‘foundation’, ‘ambition’, and ‘rationale’.

The concepts of ‘foundation’, ‘ambition’, and ‘rationale’ are further outlined in the thesis. The ‘foundation’ is the basis for the principal capacity of a style of farming: the goals of farmers in their orientation on technology and business. The ‘ambition’ and ‘rationale’ of farmers in their farming practices are estimated both in qualitative (with respect to capacity) and in quantitative terms (with respect to productivity).

7.1.1 The Methodology of Research

The research described in this thesis consists of an initial study and a current study. In these studies different methods were used for the identification of styles of farming. In the initial study conducted in 1996 a subjective method was used. Pig production farms throughout the country were classified into styles of farming based on open interviews. The classification was done through analysis of contrasts in the statements of farmers about their goals and motives in farming; the differences in their orientation on technology and business dimensions. A separate report was made on the initial study (Commandeur, 1998).

In the current study a computerised method was developed to objectify the analysis. Data for analysis were collected through a survey among pig producers conducted in 1998 in Twente and The Achterhoek. The relevant issues to be addressed in the survey were identified in the initial study. With this method, styles of farming were identified according to their relation to Productivity, Intensity and Scale.

A key issue in literature is that productivity is often disputed with respect to the implicit role of capital, because that presumes an unambiguous value of production. It was assumed in the study though that the value of production might differ among styles of farming. Productivity, Intensity and Scale were therefore specified as processes of physical transformation (without a monetary component).

Comparison between the classification methods revealed that the resulting classifications of farms in styles of farming were similar. It is important, however, to pay attention to the particulars of each classification method, because mixing of the methods would lead to inconsistent results. The methods also differed in their advantages and disadvantages. In both methods additional information supported the classification of the farms.

The subjective method with open interviews is flexible and therefore appropriate for explorative research. The analysis can be conducted step-by-step covering one issue after another. Computerised analysis of parameters is rigid. It requires that the parameters cover the whole of farming practices and that the data be analysed as a whole. But this method has the advantage of allowing the estimation in quantitative units of the differences among styles of farming in Productivity, Intensity and Scale.

Styles of farming were revealed as contrasts among farmers in their goals and in their perceptions of what their farming practices are or should be. The results of these methodologies were comparable. The differences in goals and perceptions show the qualitative differences in the farmers' orientations on Capacity, Technology and Business and the quantitative differences in their Productivity, Intensity and Scale as deviations from the population average.

7.1.2 Foundation, Ambition and Rationale

The foundation of farming practices is defined in a system of four domains. The four domains create the space for orientation on Technology and Business for farmers. The orientation on Technology is divided into a domain for the orientation on the production of animals (the objects of labour) and a domain for the orientation on maintenance and care for the animals. The orientation on business is divided into a domain for the labour organisation in the family and farm succession and a domain for trade and market relations.

For a style of farming the 'foundation' is the position within the domains that serves both as a point of initiation of the co-ordination of farming practices and as the goal for farming practices. However, the activities of the farms can stretch out over all domains.

The foundation of a style of farming is related to a specific capacity of the farmers. The name of a style of farming in this study is a metaphor for the capacity that is anchored in a specific foundation. In the initial study and the current study the following capacities were found:

- *Entrepreneurship* is founded in the domain of trade and market relations. It is mainly the capacity to utilise external farm indicators and universal measures as a directive for farm development towards labour efficiency.
- *Craftsmanship* is founded in the domain of production. It is the capacity to use internal farm indicators as normative guidelines for structuring labour and production, which are focussed on production efficiency.
- *Inheritorship* is founded in both domains that are related to care: the domain of labour organisation and succession and the domain of maintenance and care for the animals. It is a broad term for the capacity to build on a (family) agricultural heritage and give meaning to life as a farmer that is consistent with that heritage.
- *Stewardship* is founded in the centre of all four domains with an accent on the domain for labour organisation and succession. It reflects the tendency of farmers to base their identity and satisfaction and those of their families on the continuation of their inherited way of life; farming is seen as an income-generating activity based on family labour.
- *Stockmanship* is founded in the domain of the farm branch: maintenance and care for the animals. It reflects the tendency to enjoy the housing, keeping and caring of animals (in this case pigs), coupled with the objective to keep farm investments low.
- *Tendership* is founded in both domains of care, though with an accent on the domain of maintenance and care for the animals. It is the capacity to see the needs and requirements of animals (to live in a way that is suitable for their species) as a directive for the development of an integrated enterprise system of feeding, housing, keeping and tendering.
- *Shiftership* is an umbrella term for farmers who may still be active in pig farming, though their main focus of attention is shifting or has already shifted to other (farm or off-farm) activities.

In the current study three ambition levels are defined, related to the time-perspective of the goals in farming.

(1) Ambition level in the sphere of competition: These farmers see production and profits as the most important goals of farming. Based on calculations of future risks, they are confident that development and change will bring positive results. They seek challenge in the development of farming.

(2) Ambition level in the sphere of participation: These farmers see farm continuity for the family as the highest priority, and they base decisions on information about the context of temporal and regional perspectives. They are pragmatic in their farming practices.

(3) Ambition level in the sphere of autonomy: These farms see farming as a means to independence, and they seek security in traditions and conservation of available resources. They are composed in their farm management.

Five styles of farming were classified in the current study: two in the ambition sphere of competition (entrepreneurs and craftsmen) and three in the ambition sphere of participation and autonomy (stewards, stockmen and shifters).

The sphere of participation and autonomy could not be further divided because of a lack of farms in the segment of low Productivity. About 20% of the farmers in the study area were not connected to a management support programme, so they could not be classified by the developed methodology. These farms were predominantly extensive and small-scale. The exclusion of these farms created a bias in the data, which was also reflected in the results. Consequently the ambition level of autonomy could not be singled out from the ambition level of participation.

The population average in Productivity is not just a dot, but also a curve, reflecting combinations of Intensity and Scale. Likewise Capacity represents a curve reflecting combinations of the orientation on Technology and Business. At each of the ambition levels styles of farming can have different positions on the curves. That position reflects the connection between the ambition and the foundation of the style of farming. In quantitative terms that connection is called ‘rationale’. In the study the rationales of the styles of farming were both estimated in qualitative (Capacity) and in quantitative terms (Productivity) in comparison to the population average.

At the ambition level of competition entrepreneurs and craftsmen hold contrasting positions. Entrepreneurs connect their ambition to a foundation in trade and market relations. Therefore the rationale of this style of farming shows that scale is relatively more important than intensity. Craftsmen connect their ambition to a foundation in the domain of productivity. Therefore their rationale shows that intensity is relatively more important than scale.

At the ambition levels of participation and autonomy, the stewards, stockmen and shifters were found at different positions on the Productivity curve.

Stewards were typical family farmers, with an ambition to participate that is connected to a foundation in farm heritage and succession. They did all the work themselves, and their rationale was expressed in their focus on farm continuity by balancing Intensity and Scale close to the population average. Stewards try to achieve that with mixed farming systems.

Stockmen connected an ambition for participation and autonomy with a foundation in the farm branch. They were focussed on caring for pigs and on economy of financial investments. Consequently, many stockmen had the oldest stable equipment system – including many sows tied with girth tethers. At the same time these farmers have the most interest in switching to organic farming.

Shifters connected their ambition for participation and autonomy to a foundation in finding a new future for the family. That future is not in pig production and in some cases not in farming at all. They were shifting their attention to other activities on the farm or towards off-farm jobs. Shifters had no interest in further investments in the pig production branch (scale), but based on existing craftsmanship some of these farmers had high production levels (intensity).

> The link between the methods for analysis is found in the qualitative (capacity) and quantitative (productivity) specifications of ambitions and rationales of farming.
> There are different levels of optimisation of Productivity (caused by ambition), and differences in co-ordination of farming practices at similar levels of Productivity (caused by the rationales). Thus for each style of farming a specific optimisation of farming practices can be specified.

7.1.3 The Impact of the Study

Based on this study it can be concluded that pigs are valued differently in different styles of farming. This refers to many kinds of values such as respect, emotional attachment, cultural practice, and economic usefulness. The study indicates that it is not just the economic returns of farming that define the ambitions and rationales of farmers (such as an ambition for 'profit maximisation'), but quite the opposite, namely that farmers can strive for an optimisation of the economy of their farming practices based on their own ambitions and rationales.

> In the ambitions and rationales of farmers patterns of coherence were found. Based on these patterns of coherence the farmers could be classified into styles of farming, because logic limits the number of coherent patterns that can be found.The opportunities for economic optimisation of farming practices per style of farming are based on the fact that a limited number of patterns of logic can be specified for the co-ordination among the various subsystems for production and market interactions.

This study may contribute to the study of technical, social and economic issues in terms of the diversity in patterns of physical transformations in pig production processes and of related market relations. Styles of farming differ in every aspect of farming: in productivity, in goals for farming, in farming strategies, and in possibilities for optimisation of production. Therefore styles of farming have a varying impact on the social and physical environment, and that environment has a varying impact on the styles of farming. The diversity in styles of farming in their social and physical environment seems comparable to the appearance of biodiversity in a habitat.

Government regulations, bank loans, contacts with the industries, the specificity of education, research and extension advice, and the activities of interest groups are all perceived differently by farmers in the various styles of farming and they lead to different responses. This study is an invitation to this task environment of the farms (industry, banks, government, research institutes and interest groups) to take the diversity in styles of farming into account in approaching farmers and problems in farming practices. Taking account of styles of farming will make the effects of interventions more predictable and manageable. Based on this study, interventions from the task environment can be evaluated for the various styles of farming, and the impact of intended interventions can be predicted.

Scientists involved in technical and social pig production research (and other types of production research) should be aware of diversity in styles of farming and that they are based on differences in logic. The various styles of farming call for diversification of research questions and experiments focussed on these differences in logic. Moreover, the interpretation of results from research may vary among styles of farming, because those results might reflect specifically different values.

Farmers themselves should also be more open to the diversity among themselves. In every style of farming a feeling was expressed by the farmers that they had the best way of performing farming practices. This was even more emphasised with respect to different regions. Most farmers in the study area (Twente and The Achterhoek) considered themselves to be better farmers than the farmers in the south of the country.

Allowing more space for diversity may stimulate an open public discussion about pig production practices (and farming practices in general). Thus farmers would have more support and could abandon their isolated position and return to an integrated position in society. The discussion should not focus on the 'best' style of farming (which does not exist), but on the conservation and extension of diversity in styles of farming.

7.2 Special Issues of Interest

The concept of styles of farming was used in this techno-sociological study because this concept makes it possible to grasp the diversity in farming practices. The concept also makes it possible to explore the coherent co-ordination of various farming practices. Hence, it provides a useful approach to bridge the gap between technical and social sciences.

By the end of 1980s, intensity and scale of farming had increased dramatically. At that time styles of farming were related to technology and the market (Van der Ploeg and Van Dijk, 1995; Van der Ploeg and Long, 1994). Farming had also become increasingly disconnected from acreage – the availability of land for feedstuff. Therefore, it was interesting to continue the study of styles of farming in a farm branch with advanced industrialisation (disconnected from acreage) resulting in the production of one single standard product.

Pig breeding in the Netherlands is mainly concentrated in two regions: in the east in Twente and The Achterhoek, and in the south in the central and eastern part of the province Brabant and the northern part of the province Limburg. Because of an outbreak of swine fever in 1997, which was concentrated in the south of the country, this research was conducted in the eastern production region encompassing Twente and The Achterhoek.

In Twente and The Achterhoek most farms are not exclusively specialised in pig production. Some farms are mixed with dairy cattle production or arable farming. Some farms include pig fattening or maiden sow production as well as pig production. Some farms also include unrelated activities, like home sale of products, or nature management. And some farmers have off-farm jobs.

According to all farmers in the survey, the study area has a scenic, small-scale landscape, a genial, relaxed and pleasant atmosphere, and a vital social life both in local and regional organisations and informally. Farmers of all styles of farming appreciated the area, though some entrepreneurs had different thoughts about the geniality and relaxed way of conducting farm business in the area. According to the farmers in the study area, the pig farmers in the south of the country were less genial and relaxed (more aggressive and enterprising).

Many farmers in the study believed that family farming should be socially desired, and that a family farm should provide sufficient income for a family – and sufficient work for the available labour. This dictates a certain minimum size, intensity and scale. In the government there is no acknowledgement that farms should be primarily family farms. And there is no acknowledgement that farms should be big enough to provide a family income. As far as the government is concerned, the modern problems with manure, animal welfare, etc., are not related to the issue of family income.

Many farmers in the survey also felt powerless in society. Farmers perceived the issues around which power was concentrated in society (manure, welfare, etc.) differently than (for example) the government. Although many farmers in the survey addressed the issues of animal welfare, environmental protection and consumers' concerns extensively, they did not offer solutions to these issues that would meet societal expectations. When the subject of animal welfare was raised, for example, many farmers in the survey thought primarily of animal health and respectful treatment of animals and only secondly, or even marginally, of behavioural aspects of welfare. According to the farmers, the issue of animal welfare should be primarily addressed from the perspective of consumer behaviour and not animal behaviour.

The housing systems of pigs in the study area went through a metamorphosis in the early 1970s from labour-consuming systems of pens with straw and an outdoor run to labour-saving indoor systems with concrete. Central heating systems and integrated ventilation systems were developed to control the housing climate. Slatted floors allowing manure to pass and mechanised manure removing systems were developed. At the same time, feed quality and health care were improved. The sows themselves were secured in position by tying them with girths into single ranges or by securing them in individual boxes. These changes in constructions for pig production improved animal health and stamina for production dramatically.

After the eighth farrow (delivery) sows are usually culled, because of reduced fertility. So the predominant reason for sow culling has shifted from health (lung and leg) problems to fertility problems, which are related to increasing production speed. This shift was most prominently observed in the initial study among entrepreneurs. In contrast, among tenders who had free range and organic farming systems, in which a farrow index of about 2.0 per year was maintained, sows often remained on the farms until the eleventh or twelfth farrow, which they produced at around the age of six years. The shifting arguments for sow replacement play a role in the emerging debate in society about the justification of animal production practices.

In the study area two regional companies were popular as feedstuff suppliers: ABC (situated in The Achterhoek) and CTA (situated in Twente). These two companies fused soon after the survey into ABCTA. Most farmers were loyal in their contacts with feedstuff companies, through personal contacts with their extension workers, though loyalty was less for farms at high ambition level (entrepreneurs and craftsmen). When asked what the primary duties of the feedstuff company were, most farmers chose the answers: 'a specific combination of duties' or 'to supply fitting feed types', and not 'cheap feedstuff'.

Pig production is embedded in various ways in the farm activities of the various styles of farming. First there is the issue of farm size. Styles of farming are related to farm sizes, by defining criteria for farm size limits. A desire for work and income, as well as a desire to create a good farm size for succession and continuity determine these limits – and not the physical (or sustainable) carrying capacity of the environment. The variation in size was also related to the differences in ambition. Craftsmen and particularly entrepreneurs had bigger farms than stewards, stockmen and shifters. Entrepreneurs preferred their farms to be as big as possible because the bigger the farm, the more efficient the production and the better the income can be. Their restriction in farm size growth was that family succession should still be possible. Stewards and stockmen preferred moderate or even minimum farm size growth – to the extent that farm succession was still possible. For stewards the desire to make minimum use of hired labour and other external assistance was important. Stockmen found it particularly important to keep financial investments low.

Entrepreneurs and craftsmen were also more specialised in pig production and more dependent on pig production for their incomes than stewards, stockmen and shifters. Their strategy was the economy of specialisation. Stewards, stockmen and shifters ensured income security by diversifying sources of income: mixed farms, extra farm activities (like home sale of farm products) and additional off-farm jobs. Entrepreneurs and craftsmen had also more plans for further farm expansion, and they expected to invest more in expansion than stewards, stockmen and shifters.

Both on the farms of entrepreneurs and craftsmen there was a trend of increasing sow herd size each year; on farms of craftsmen the expansion particularly occurred in 1996. The sow herd sizes on farms of stewards, stockmen and shifters did not change in the period 1995-1997. It was expected that the farm size on farms of shifters would drop, because many were stopping with pig production. But over the three-year period studied that apparently did not (yet) happen.

Processes and Constructions

Processes are factors of farming in which one can become involved. They can be influenced, led, guided, controlled, or even blocked. The division of tasks on a farm is considered a process, as well as the social interactions in the region or a person's thoughts. In contrast, constructions are supports. Constructions can be material, like buildings and equipment. But management constructions for farm work or the construction of market and knowledge network contacts are also constructions. In addition, the definition and specification of farm indicators as management support are also termed constructions.

Labour division on the farms depended mainly on two things: the age of the children and the availability of hired labour. The role of the men on the farms was connected to the availability of hired labour: the more hired labour, the more the men became farm managers. The role of women on the farm was primarily connected to the age of their children. Women with young children performed farm activities that were more easily combined with childcare. The role of women who were less occupied by young children varied among styles of farming. On farms of stewards, and particularly of craftsmen, women were very involved in all aspects of the farm work. On farms in a process of succession, it was often the women who initiated extra farm activities.

Productivity is often called a 'proxy for income' (Van der Ploeg, 1991; Bolhuis and Van der Ploeg, 1985; Hayami and Ruttan 1985, 1971). In the current study farm income was directly related to Productivity, Scale and farm size in number of sows. Entrepreneurs had the biggest farms, the largest Scale and a high Productivity. They also had the highest income in terms of 'money that was taken from the returns on farm products for private use by the family'. Second were craftsmen and shifters and last were stockmen and stewards. After correction for Productivity, the income per hour of work input of family members was evenly distributed over the styles of farming with the exception of stewards. The corrected income of stewards was less than the population average.

Compared to entrepreneurs and craftsmen, stewards had a poor financial balance in terms of purchasing maiden sows and selling feeder pigs. As far as the costs for maiden sow purchase was concerned, this difference between stewards and entrepreneurs and craftsmen could be related to the timing of the purchases. It was shown that stewards purchased extra maiden sows at the beginning of 1997, whereas entrepreneurs purchased relatively more maiden sows at the end of 1996. For stewards the sales price of feeder pigs was lower than average. Yet all feeder pigs were of the same age and body weight when they were sold (and in theory they were sold on a completely uniform market). So the only reasonable explanation is that the feeder pigs of stewards had less market quality than feeder pigs of entrepreneurs and craftsmen. A few reasons were suggested. The breed type that entrepreneurs and craftsmen produced might lead to a better price. The chain certificates of entrepreneurs and craftsmen (Good Farming Crown or IKB^+) lead to better prices than the ordinary Good Farming or IKC certificates of the stewards. And entrepreneurs and craftsmen might do a better job of managing sales contacts and contact farms.

For stockmen and shifters there was no evaluation possible for the purchase prices of maiden sows and the sales prices for feeder pigs because of a lack of available data about these issues. Stockmen and shifters were less interested in having these data for management support.

The new government regulations for group housing were very much under dispute. Most farmers did not consider the regulations to be good for the animals, but just something that was being imposed based on government and public opinion. Among the farmers there was much discussion about the capital destruction that resulted from the new regulations for group housing, particularly for the farmers who had recently made major investments in measures for environmental care. Several farmers, mainly stewards and shifters, considered quitting pig production because of the investment requirements of these new regulations. Some stockmen considered switching altogether to free-range farming or organic farming.

In the survey, sets of statements were used to encourage interviewees to express their opinions about certain issues in pig production practices. The differences in ambitions that were found confirmed that entrepreneurs and craftsmen operate within the sphere of competition. Entrepreneurs differentiated themselves by emphasising that good automation allows more time for animal care, and that ‘At the end of the day it is the profit that counts’. Craftsmen differentiated themselves by their emphasis on animal health and production. Entrepreneurs and craftsmen ‘work as hygienically as possible’. They also put more emphasis on the ‘clean way – dirty way’ principle, vaccination, and cleaning of the means of transport. Both styles of farming approached the issue of animal concentration, and manure management from a relatively large-scale perspective. They argued for a balance between animals and acreage on a regional, national or global level and they reflected on European regulations on various issues. With regard to animal welfare, the difference in rationale between entrepreneurs and craftsmen was also revealed. Entrepreneurs emphasised a connection between animal welfare and consumer demands. They thought that ‘supermarkets should stick to their business, like we should stick to ours. Craftsmen emphasised a connection between animal welfare and production; they felt trapped by the double morality in consumer demands.

Farms of entrepreneurs are slightly more labour efficient than farms of craftsmen, at the expense of financial investments. So from an economic perspective the two styles of farming are probably in balance. This supports the hypothesis that entrepreneurs and craftsmen share the same productivity curve, but with contrasting rationales.

Farmers in the sphere of competition felt pressured by what is happening at global level, with respect to markets, food safety and animal health. Their response to this pressure is to continue increasing their farm’s Intensity and Scale. They would prefer that the national government restrict development of regulations, to ensure a level of fair economic competition with other regions in Europe and the rest of the world. They would prefer standardisation of regulations at the level of the European Union (EU). They have confidence in their ability to deal with the demands of lobbying groups about environmental pollution and animal welfare. Ultimately (some of) these farmers would be willing to take the consequence of leaving the region and settling somewhere else.

The sphere of participation and autonomy was clearly distinguished from the sphere of competition. Stewards differentiated themselves from stockmen and shifters by supporting more than average the statements ‘A good farmer always pays attention to the figures’ and ‘A good farmer knows when to be satisfied’. For stockmen, support for the rationale was found in the enjoyment of caring for new life: the piglets. Their farms were often too small for complete automation. Farmers in the sphere of participation and autonomy emphasised that 'A smaller farm that is well managed is better' (stockmen and shifters). Farmers at ambition level for participation and autonomy (stewards, stockmen and shifters) were also more open in terms of access to wildlife, visitors, etc.

Stewards, stockmen and shifters interpreted 'working as hygienically as possible' differently from entrepreneurs and craftsmen, as expressed in additional comments such as 'one should not overdo the cleaning' and 'not overcrowding stables is important'. They approached the issue of animal concentration, and manure management from a smaller-scale perspective. They argued for a balance between animals and acreage on local or farm level and reflected on national and community regulations on various issues. Stewards, stockmen and shifters perceived animal welfare as an issue that is primarily connected to animal health, respect for animals and consumer demands. They also found it hard to accommodate the double morality in the consumer demand for both behavioural welfare and cheap food. There is confusion as to whether they should focus directly on consumers or on supermarkets, and on how to perceive activist organisations for animal welfare.

Farmers in the sphere of participation and autonomy – predominantly stewards, stockmen and shifters – felt pressured by the government's push towards further expansion, which they do not see as a long-term solution for farming. They acknowledged that the ongoing expansion has created problems in terms of environmental pollution and animal housing, but they felt squeezed between the demands of lobbying groups for environmental protection and animal welfare, and developments in markets and government regulations that force further farm expansion. These farmers felt disadvantaged by what they saw as self-indulgent perpetuity of national government regulations.

Differences in housing, mechanisation and stable equipment typified the various styles of farming. These differences were related to the age of the farm in terms of succession and to the strategies for farming investments. There were clear contrasts among styles of farming between ambition levels. Entrepreneurs and craftsmen preferred labour efficiency to investment economy, while stewards, stockmen and shifters preferred the opposite. Between Intensity levels the contrasts between craftsmen (automation) and stockmen (low investments) showed different strategies with respect to equipment and mechanisation. There were also contrasts between entrepreneurs (automation) and shifters (low energy costs). Stewards had no particular 'favourite choice' for stable equipment, but they disfavoured one in particular: labour efficiency. For each style of farming there was a clear and distinct set of strategies that led to the housing mechanisation and stable equipment that they had.

Although some farmers were emotionally preoccupied with the issue of government regulations for manure, the farmers in the study area had no particular problems in meeting the regulations. Some farmers (particularly stewards) had enough land available to dispose of part of the manure, because they had mixed farms. The additional manure was disposed of through contracts with farms in the area or through Mest Bureau Oost. Farmers without any land available (particularly craftsmen) had solved the manure disposal problem essentially through contracts with other farms in the area.

Differences among styles of farming also appeared when farmers were asked what breed type they preferred. Stewards, stockmen and shifters left the choice for breed type more than average to the breeding company. This complicated the interpretation of the findings. Entrepreneurs and craftsmen had more specific preferences, particularly for (F_1 x Fin L) and the common crossbreed (NL x GY). Contacts of farmers in the chain of industries for pig production and fattening were also typified by fixed contacts, in which loyalty to specific contact persons was important.

There was a relation between styles of farming and the farmers' interest in discussing indicators for management support. Entrepreneurs and craftsmen discussed them often and with a greater variety of contacts than stewards, stockmen and shifters. Entrepreneurs mentioned the study club and the farm personnel more than average, whereas craftsmen mentioned the veterinarian and the breeding company more than average.

In pig production the differences between craftsmen (large number of piglets per litter) and stockmen (small number of piglets per litter) were the most pronounced. These differences could be explained by differences in breed type, sow age, stable equipment, and differences in management practices.

Entrepreneurs and craftsmen were both focussed on a high farrow index. This means that the conception of the sows of entrepreneurs and craftsmen is better than average and that entrepreneurs and craftsmen make more rigorous decisions with respect to fertility problems of the sows. The reduced farrow index for stockmen seems to be caused by the fact that stockmen tend to delay culling for conception problems more: one more oestrus cycle than craftsmen.

The strategies and motivations for sow replacement differ among styles of farming. The differences are massive – they even include differences in distributions of age categories of sows. Both entrepreneurs and craftsmen manage to maintain a better health standard of the sows than average, allowing them to weigh other principles for sow replacement. For entrepreneurs the market values of the sows are more important than for other styles of farming. Craftsmen are more focussed on the economic use of sows.

For stewards, stockmen and shifters lung, leg and other health problems of pigs, as well as sow condition for conception and detection of oestrus by the farmers, lead to different strategies for sow replacement. Stewards have a high sow replacement, due to a sow cull strategy that is motivated by both conception problems and health problems. Therefore the introduction rate of young sows is elevated. This strategy leads to average production results of the sows and an average farrow index. So a high farrow index is related to a high conception rate of first inseminations, accompanied by a rigorous sow cull strategy if the first insemination is unsuccessful (as demonstrated by craftsmen). However, a high conception rate of first inseminations and a rigorous sow cull strategy do not automatically lead to a high farrow index.

Stockmen have low replacement rates – which fits with their image of being economic farmers in terms of investments. Consequently stockmen have to accept lower production results. Shifters have low replacement as well. This is related to their focus on other on-farm activities and off-farm jobs, implying that in the longer term several shifters will stop producing pigs.

For individual farms no correlation was found between the 'financial balance per feeder pig in 1997', the 'trend in financial balance per feeder pig 1995-1997' and the 'fluctuations in financial balance per feeder pig 1995-1997'. Thus it cannot be assumed that individual farmers who had a good balance in 1997 were the same individuals who benefited from trends and fluctuations.

However, the picture is different for styles of farming. The current study has shown that the farming practices of entrepreneurs and craftsmen are better oriented to profit from good prices than for example the practices of stewards. The strategies of entrepreneurs and craftsmen lead to a comparable farm income. And although insufficient data were available to judge the market strategies of stockmen and shifters, the characteristics of these styles of farming indicate that they are comparable to stewards in this aspect. This again supports the suggestion that farming practices should be judged in terms of coherent combinations of decisions and not by single indicators.

In terms of constructions, the pig production process can be interpreted as a combination of subsystems. In some subsystems physical transformation processes take place, like the actual piglet production and the sow fertility cycle. In some subsystems market interactions take place like the purchase of feedstuff, of maiden sows, and the expenses for other related costs. In some subsystems there is an interrelation between physical transformation processes and market interactions, like piglet growth, and sow replacement.

Farmers in the various styles of farming co-ordinate farming practices differently in the various subsystems. And they differ in the way that they link the subsystems together to make a logical whole of their farming practices. Each style of farming seems to create a different coherence in the co-ordination of farming practices, with respect to both the physical transformation processes in producing pigs, and with respect to market interrelations. These differences in co-ordination lead to differences in the optimisation of the pig production system as a whole.

Appendix A Calculation of Deviations from the Population Average

Differences in ambition and rationales between a style of farming and a population average cannot be estimated simply by subtracting values. Nor can they be estimated directly from differences in Intensity and Scale. They should be measured in connection to the Productivity curve. To clarify how they should be measured the formulae and mathematical procedures are introduced here.

A1 Deviation in Ambition and Rationales of a Style of Farming from the Population Average

Mathematics I

Formula (2) Y/L = Y/N * N/L (Chapter 1) reflects the productivity of farms. The average productivity of farms in a population can be noted as $\overline{\mathrm{Y/L}} = \overline{\mathrm{Y/N}} * \overline{\mathrm{N/L}}$. The upper line expresses the fact that this is about population average. The productivity of individual farms or of distinct styles of farming can next be presented as a deviation from this population average: $(\mathrm{Y/L}) - \overline{\mathrm{Y/L}}$. So $(\mathrm{Y/L})_x - \overline{\mathrm{Y/L}}$ reflects the average deviation of the *x*-group of farms (*x* = 1, …*n*) classified as a style of farming, in comparison to the population average of farms (Figure A1).

The estimated difference between the Productivity curve of a style of farming and the curve of the population average is not the same as the square difference between them. The square difference, which is the gain in Productivity, is called ambition (a_x). The deviation along the curve does not change the Productivity, and is called rationale (j_x).

Figure A1 also suggests that the curves of the Productivity might differ in angle among styles of farming. This is supported by empirical material (Van der Ploeg 2003). So it is important that styles of farming are compared to the population average:

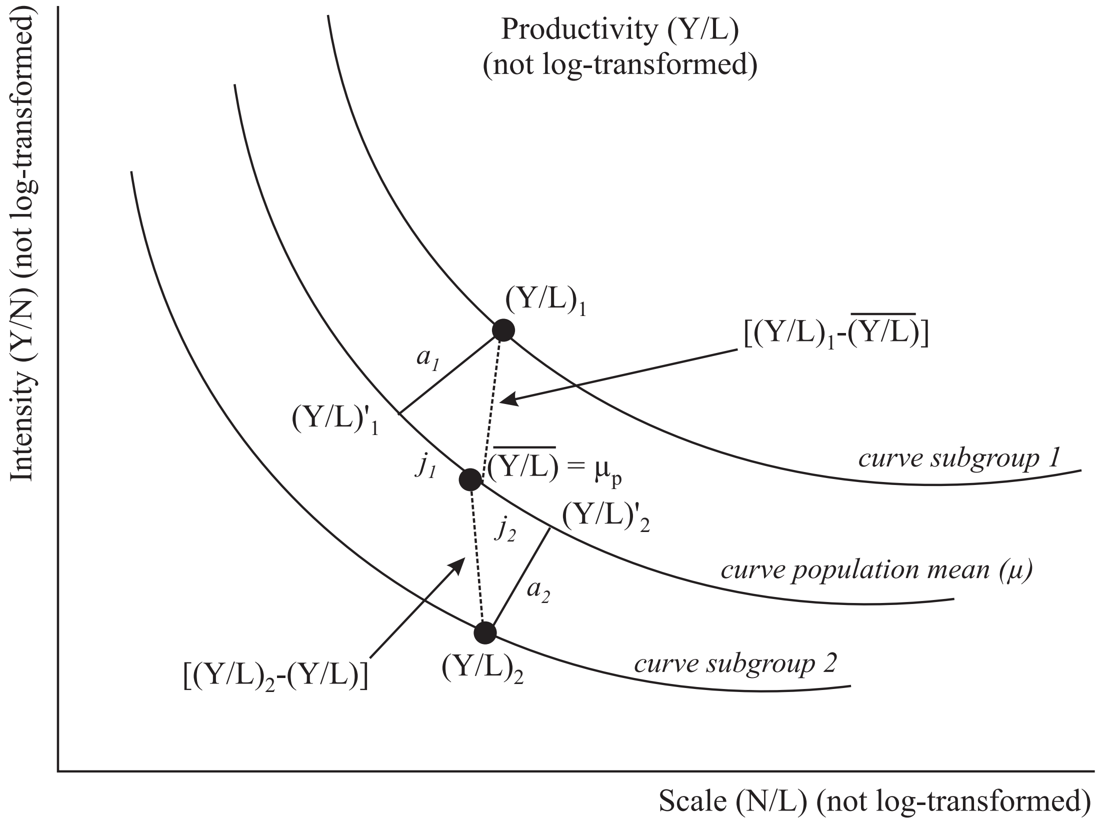
- The square difference in Productivity between a style of farming and the population average (a_x), is the distance between $(\mathrm{Y/L})_x$ and the square projection of that point on the curve of the population average $(\mathrm{Y/L})'_x$.
- The deviation along the Productivity curve (j_x) is measured on the curve of the population average, between the projection of that style of farming $(\mathrm{Y/L})'_x$ and the point of the population average $(\overline{\mathrm{Y/L}})$ or (μ_P). So:

$$a_x = \perp\left[(\mathrm{Y/L})_x - (\mathrm{Y/L})'_x\right]$$

$$j_x = \leftrightarrow \left[(\mathrm{Y/L})'_x - \overline{\mathrm{Y/L}}\right] = \left[(\mathrm{Y/L})'_x - \mu_P\right]$$

Conclusion
The projection of styles of farming on a two-dimensional system created by Intensity and Scale in the square angle from the population average away from the Productivity curve is ambition *(a_x)*. The projection of styles of farming from the population average along the Productivity curve is rationale *(j_x)*.

Figure A1 Simple theoretical example of a Productivity curve of the population average and of two curves of subgroups (styles of farming*)* measured as non-log-transformed quantities. The dots are the population mean and the means of the subgroups. The straight line-sections (a_1 and a_2) are the shortest distances to the Productivity curve of the population mean. The curved line-sections (j_1 and j_2) represent deviations along the Productivity curve.



Mathematics II
Above it was suggested that the square angle from the population average away from the Productivity curve *(a_x)* is a straight line. That is not entirely true. It is one of the complications that result from working with Productivity as a curve. Actually, the line is increasingly condensed in the square direction from the average Productivity curve. This problem can be handled through use of log-transformations of the dimensions Intensity and Scale (Figures A2 and A3).

Figure A2 Theoretical example of a Productivity curve of the population average and of a curve of a subgroup (style of farming) measured as non-log-transformed quantities. The dots are the population mean and the mean of the subgroup. The example shows a style of farming (1) with a Productivity of $(Y/L)_1$, and smaller Scale (h_1) and higher Intensity (l_1) than average (μ_P). This is due to a combination of two processes. Increase of Intensity (d_1) and reduction of Scale (k_1) determine the projection of parameters (j_1) connected to Productivity: Intensity or Scale. Increases of both Intensity (c_1) and Scale (b_1) determine the projection of parameters (a_1) connected to Productivity: Intensity and Scale.

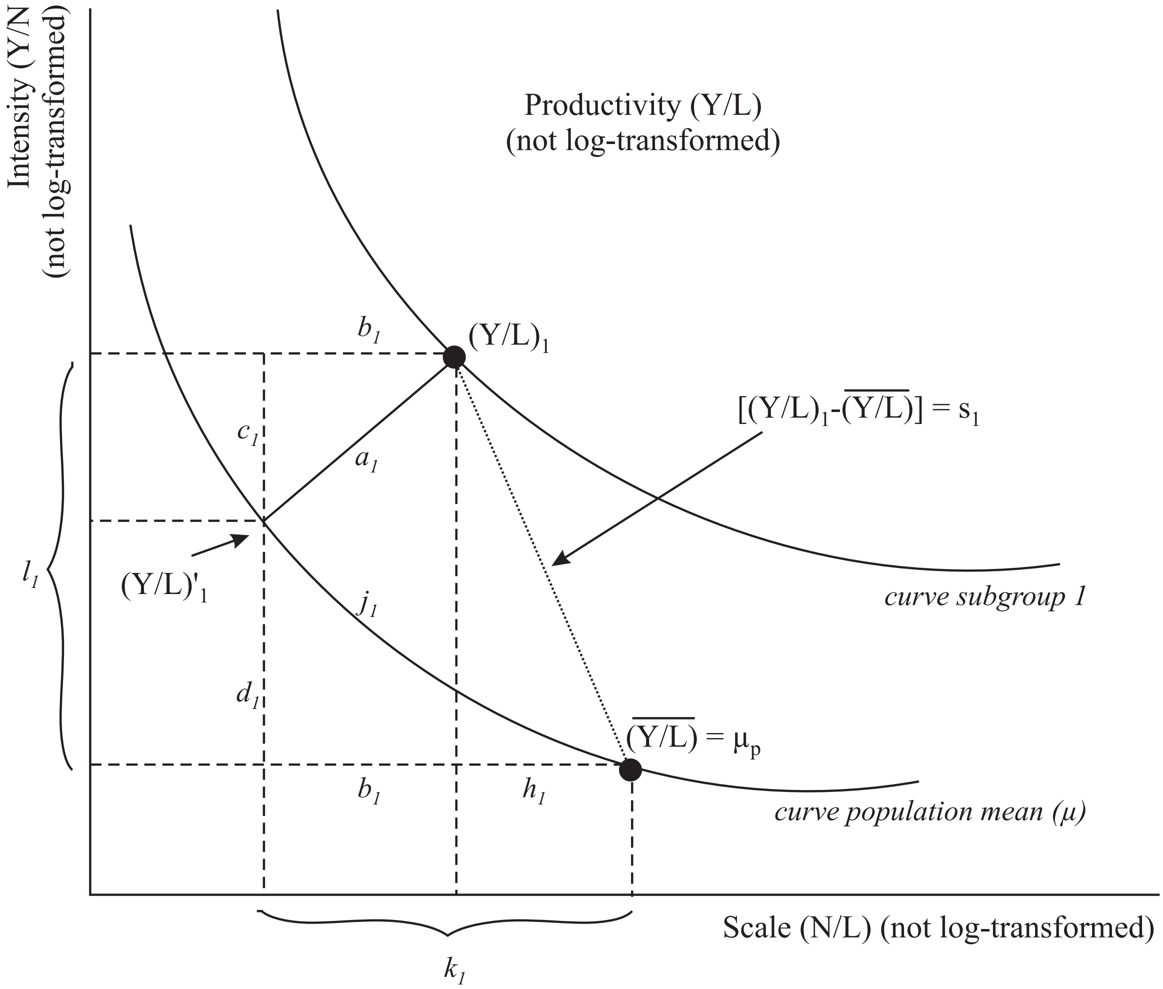
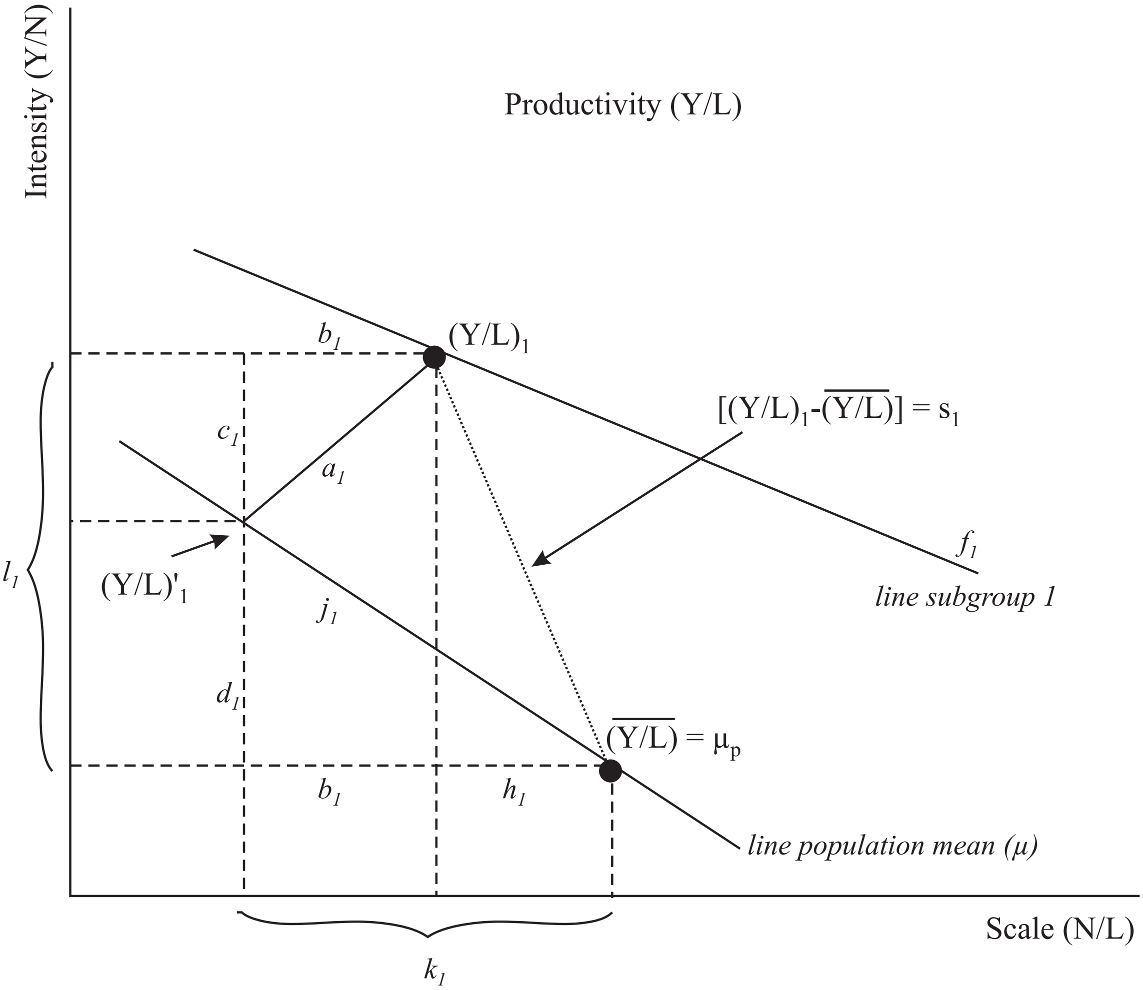


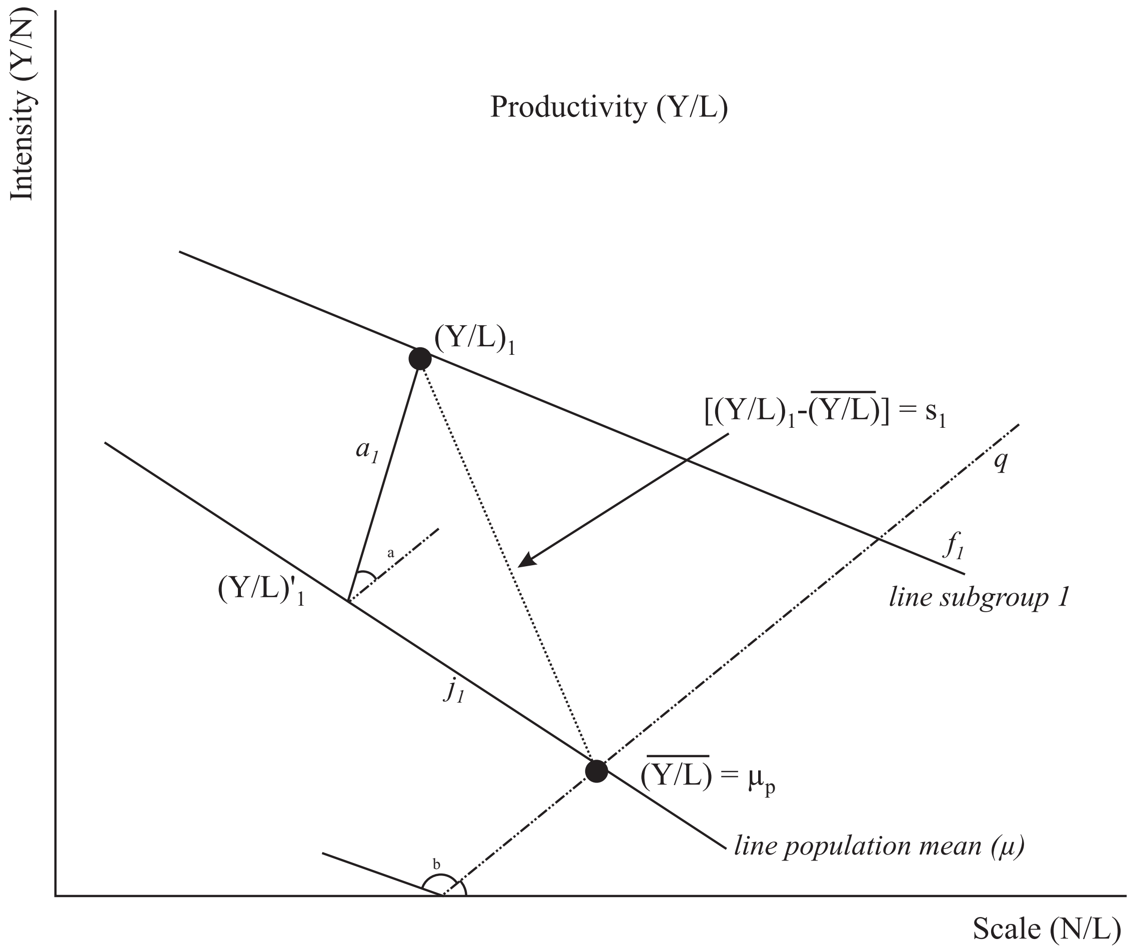
Figure A3 Theoretical example of a Productivity curve of the population average and of a curve of a subgroup (style of farming*)* measured as log-transformed quantities.



Mathematics III

In working with empirical material, however, the coherences between Intensity and Scale can be estimated from the regression of data. In the current study the angles of (a_x) and (j_x) are estimated through the regression of the components 'ambition' (a_x) and 'rationale' (j_x) to the Productivity in the population. These angles are projected in a system of Intensity and Scale. For the projection of Productivity the regression is estimated between the Intensity and Scale in the population. This regression determines the angle of Productivity in the system. The angles of the components 'ambition' (a_x) and 'rationale' (j_x) are related to the angle of the Productivity in the population (Figure A4).

Figure A4 Theoretical example of a Productivity curve of the population average and of a curve of a subgroup (style of farming) measured as log-transformed quantities. The dots are the population mean and the mean of the subgroup. The example shows a style of farming (1) with a Productivity of $(Y/L)_1$ and an average Productivity (μ_P).
The angle of (q) is measured through the regression of Intensity on Scale (β). In addition the angle between the Productivity of the population average (q) and the ambition of the style of farming (a_1) is (φ_a). The angle between the Productivity of the population average (q) and the rationale of the style of farming (j_1) is (φ_b).

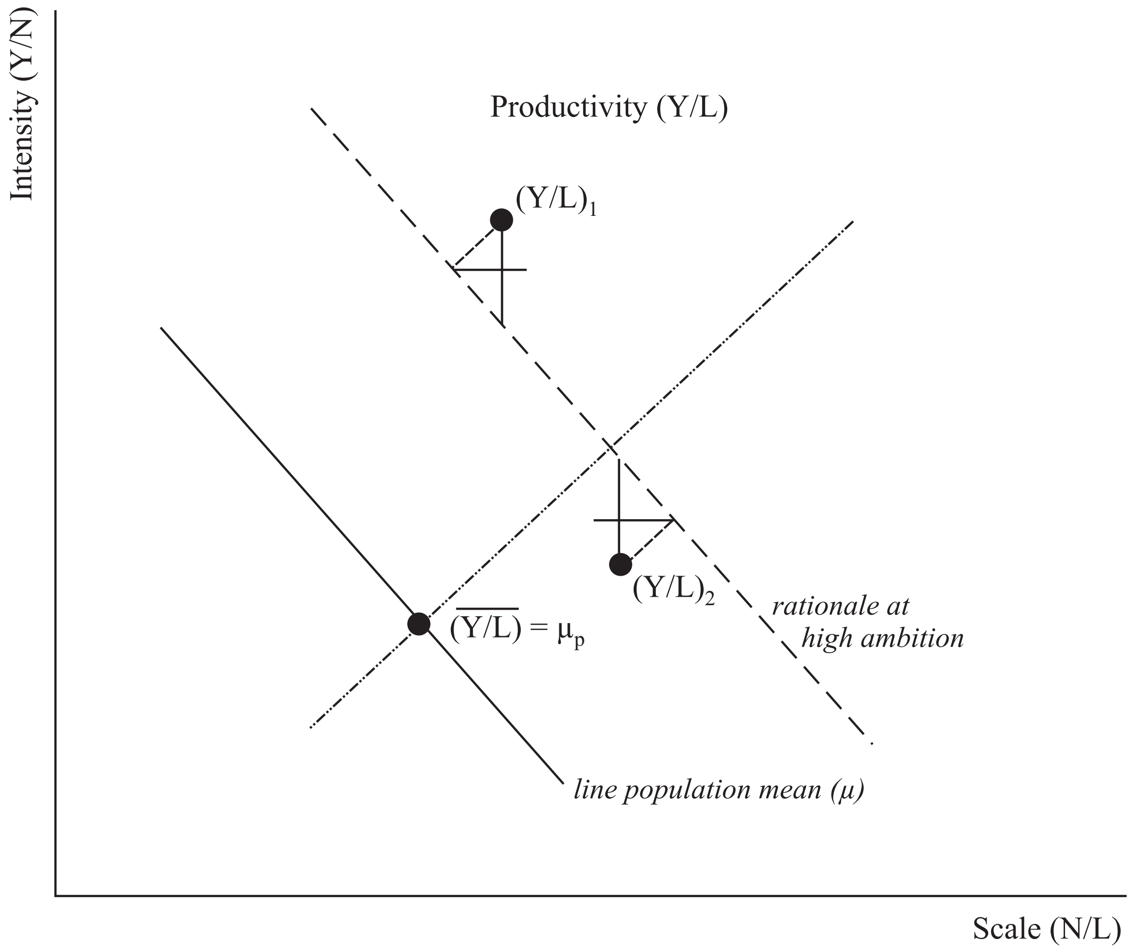


Conclusions
The quantitative deviation of styles of farming from the population average in terms of ambition and rationale can be estimated from the Productivity curve. Estimations are facilitated by log-transformation of the data, because that transforms the curves into straight lines. After log-transformation calculations of various regressions among Productivity, Intensity, and Scale do the estimates.

A.2 Differentiation in Ambition Levels

In the current study styles of farming are not just evaluated for the population average. A distinction is made in ambition level. Comparison of styles of farming with the averages at the related ambition level can be done through estimating the differences in the directions of Intensity and Scale (Figure A5). In that case the focus is not on quantification of ambition and rationale, but on the differences between the specific Productivity (as combination of Intensity and Scale). These estimates are done through the square projection of the deviation in ambition and rationales in terms of Intensity and Scale.

Figure A5 Evaluation of two styles of farming at an elevated ambition level compared to the population average. The differences are estimated through square projection of the deviation in ambition and rationales in terms of Intensity and Scale.



Appendix B
Characteristics of the Productivity Formula

As presented in Chapter 2, capital is implicitly present in the Productivity formula. The presence of capital is seen through the trade markets that are connected to the production process – including both supplies and sales. In this appendix, capital is made explicit, by making a model that describes the production process in indicators, which reflect the physical processes and the market-related activities. To make this model physical units were added to the Productivity formula. After capital was made explicit in the production process a solution was found for how to deal with the problem of combining capital and physical processes.

B.1 Productivity and Physical Units

Productivity in terms of Intensity and Scale and a production function in terms of costs and profits are similar to a large extent. They both represent balance. And they both have the shape of a curve in a two-dimensional system, in which the axes are defined by a fraction (y over x). Yet they differ in that the units represented by the axes are different. Monetary units (€ per x) represent costs and profits. But the units that represent Intensity and Scale are basically 'physical' – analogous to units in physics. So the production function in terms of costs and profits is only comparable to the Productivity function in terms of Intensity and Scale if the costs and profits would represent the same physical values of Intensity and Scale.

In is often assumed that Productivity can exclusively be expressed in monetary terms: costs and profits. But, in reference to the criticism given in Chapter 2, that assumption can be disputed. Productivity is explicitly a quantity of physical transformation. But implicitly capital is involved because trade markets are involved. The way out of this dispute is to make an explicit distinction between the aspects of physical transformation and the aspects of trade. That is done in the current study. Productivity, Intensity and Scale were explicitly specified in relation to their 'physical units'.

Physical aspects of the Productivity formula
A complex set of factors in a multidimensional system determines Productivity. These factors include at least 'space' and 'time'. A two-dimensional projection in a system of Intensity and Scale of that multidimensional system is the formula for Productivity:

Productivity = Intensity * Scale (Chapter 1), or:
Y/L = Y/N * N/L (2)
Where:
Y = Production
L = Labour
N = Sows (in number of productive animals)
Y/L = Productivity
Y/N = Intensity

N/L = Scale

In Chapter 1 only N (Sows) was given a physical unit: 'the number of productive animals'. This unit is levelled off when Productivity (Y/L) is calculated. Whether Production (Y) or Labour (L) would have a unit was not discussed. Since Productivity is assumed to be a pure balance without a unit, Production (Y) and Labour (L) must have the same unit Only in this way can the units level off in (Y/L).

Appropriate units for Production and Labour are not officially defined. To overcome this problem the assumption is that the appropriate 'techno-sociological units' for Production and Labour are similar to the standard units, which are officially defined in physical sciences.

Both Production and Labour are associated with the allocation and condensation of energy in space and time. So the most appropriate unit in physics to compare with is the unit of 'Power'[1], as defined by Newton [in: Watt (W)] (Table B1).[2]

Table B1 Overview of the units that can be related to the elements of Productivity, Intensity and Scale in similarity to units in Physics

Symbol	*Meaning*	*in units similar to:*
Y	Production	constructed 'units of Power (Watt)'
L	Labour	human 'units of Power (Watt)'
N	Sows	Numbers of productive animals
Y/L	Productivity	- none -
Y/N	Intensity	'units of Power' per Numbers
N/L	Scale	Numbers per 'units of Power'

Acreage versus Numbers

Due to industrialisation the objects of labour in modern (pig) farming have changed in characteristics. Traditionally the object of labour used to be land, measured in acreage (A in: ha). Animals and crops are in that perspective differentiated objects of labour. In the current study the objects of labour were sows, measured in numbers (N). This is a key difference between (traditional) agricultural production and industrial production.[3] In industrial production the object of labour is measured in weight (kg), or in numerical size (N). Consequently, industrial pig production has gained flexibility compared to traditional production. The production site has in principle become globalised – production can be done anywhere.[4]

In previous studies about styles of farming there was often a situation in which both acreage and animals played a role as basic objects of labour (see Chapter 2). In these studies solutions had to be found to combine animals and acreage in the analysis. The introduction of a correction factor (Roep 1988) or the addition of an extra dimension (Boonstra, 2001; Wiskerke, 1997) served as a solution.

With respect to the units representing acreage (ha) and animals (numbers), the problem can be explained as follows. Acreage (ha) and animals (numbers) are basically different. They cannot be added together as such. But there are several options available to solve the problem. The most relevant ones are:[5]

(1) Express numbers of animals in terms of land use, by calculating how much land would have been used if all feedstuff had been produced on the farm.

So: $A = (A_{(Acreage)} + A_{(Numbers\ of\ animals)})$

(2) Express land use in terms of numbers of animals, by calculating how many animals are represented by the available amount of land.

So: $N = (N_{(Acreage)} + N_{(Numbers\ of\ animals)})$

(3) Level off the physical units, by creating an estimate as standard reference in amounted costs and profits in which both are expressed, e.g. Standard Gross Margins (SGM), as defined by the European Union.

So: $SGM = (SGM_{(Acreage)} + SGM_{(Numbers)})$.[6]

The problem with both solutions (1) and (2) is the assessment – particularly if the livestock concerned are pigs. Pigs have always been fed with the remains of human food production and processing. So a 'standard reference' for the comparison between land and pigs is hard to specify. The problem with solution (3) is that in this solution the implicit assumption is made that the capital values of land and pigs are comparable. In view of the debate presented in Chapter 2, such an assumption might be considered prejudiced.
In this study, the problem was avoided by using only sows and not acreage as objects of labour. They are measured in numbers (N). This implies that all farms are assumed to be completely integrated in supply markets for all resources for production. Compared to acreage, the shift to sows as objects of labour provides a certain gain in flexibility: the maximum size of a farm is not restricted by availability of land. On the other hand, the 'flexibility' is reduced for farming practices, because the varieties of strategies for shifting markets are reduced. Switching to another agricultural product has become more complicated.

There are two important differences between sows as the object of labour versus land:

(1) sows are mobile, whereas land is fixed

(2) sows can be destroyed, whereas land can merely change in function.

In the terminology of this study (see Chapter 3) this means that sows should be approached as 'construction', whereas land should be approached as 'processes'. For convenience this is not taken strictly, in Chapter 5 (Processes) farm size is discussed first. In practice the switch from land to sows means that land is a far more reliable source as object of labour than sows. From the economic perspective of an individual farmer sows are less reliable, because potentially they can be destroyed. From an economic perspective for the region sows are less reliable because they are mobile. The source of income for the local economy can disappear without being transferred into a different source. Industrialised production for a standard bulk market can basically be done anywhere. In terms of the theory of a 'living system' (Appendix C) it means that the diversity in styles of farming in an area may become reduced – and even be at risk of suddenly disappearing in the event of excessive external dynamics.

B.2 Physical Transformations and Capital in Pig Production

Subsystems, physical intensity and markets
Pig production practices can be described as a set of indicators (see Section 6.2). Through the years ATC and other institutes have kept control over the standardisation of the indicators (ATC, 1996). Standard indicators are specified for the subsystems of feeder pig production: production and rearing of piglets, piglet growth, fertility cycles of the sows and sow replacement practices. In addition, there are indicators added about inputs and outputs of

supplies and animals, and about farm economics (Supplement Table Appendix B).[7] For the evaluation of the subsystems in pig production practices all potential indicators are specified (Figure B1).[8]

The key level in Figure B1 is represented by a line 1/3 down from the top of the diagram reflecting the balance of production, feed costs and pig prices. It is formed by a row of eleven squares, representing the basis for economic evaluation of the production process. The eleven squares are connected in groups of three, reflecting the balances of efficiency. One square is used twice: the indicator ‘average number of feeder pigs per sow [per year]’. From the balances of efficiency the financial profitability of pig production can be estimated.

Below the key level, the indicators reflecting pig production and piglet growth are concentrated to the right of the page. The fertility cycle is represented in the centre. This part of the diagram is comparable to Figure 5.5 in Section 5.1. In Figure 5.5 the purpose was to show the process of movement of the animals through various stages in the production cycle. The current diagram shows what indicators can be measured to evaluate intermediate results at various stages of the production cycle. The indicators reflecting the replacement of the sows are concentrated to the left of the diagram. At the top, the (external) market management is covered. At the right the accumulation of costs for feedstuff and other animal related and non-animal related costs (except labour) are evaluated against the returns per sow and per feeder pig. This leads to the ‘balance of pig production per year’ in the right top corner of the figure. Figure B1 reveals that there are various types of subsystems. In the internal farm management there are four subsystems of physical transformations. The combination of the units involving this transformation is the unit for ‘Power’: Watt (Table B2).

Table B2 Units belonging to the four principle processes concerning the physical intensity of pig production.

Process	*Transformation*	*Units*	*similar to*
Cyclic	Farrow cycle	Frequency [per year]	Frequency
Linear	No. of piglets per litter	Numbers [per litter]	Energy
Linear	Piglet growth (to 25 kg)	(Weight * Speed) = (Force / time)	
Cyclic	Sow replacement	Speed	
All	Feeder pig production per year	Physical intensity	Power

In the subsystems about piglet production, piglet growth, and the fertility cycle, the indicators are concerned with physical transformations – not with capital. These indicators are connected to indicators concerning capital in the central subsystem about the ‘balance of production, feed costs and pig prices’ (see also Figure 6.2). Moreover, in the subsystem of sow replacement there are both indicators about physical transformations (determining replacement speed) and indicators about sow prices involved. The subsystem sow replacement is also connected to capital in the central subsystem of ‘balance of production, feed costs, and pig prices’. The fertility cycle is indirectly connected to subsystems related to markets: through the subsystem of sow replacement and through the subsystem of piglet production.

So in the internal farm management two different types of indicators are intertwined: one connected to physical transformations, and one connected to capital. The intertwining is found both within the subsystem of sow replacement, and within the subsystem of balance of production, feed costs and pig prices.

The external market management consists basically of three subsystems: feed supply, other animal related supplies, and other supplies and costs (Table B3).

Figure B1 Overview of the indicators connected to the production of pigs. On a central horizontal line 1/3 from the top of the diagram, a line of indicators concerning the balance of production, supply costs and pig prices are given. Below that central line the (internal) farm management is covered. The indicators reflect the various subsystems for production: piglet production, piglet growth, sows fertility cycle, and sows replacement cycle. The subsystems reflecting pig production and piglet growth are concentrated to the right of the diagram. Subsystems reflecting the fertility cycle and replacement of sows are concentrated below and to the left of the diagram. At the top of the diagram, the (external) market management is covered (see also Figure 6.2).

Table B3 Subsystems in pig production in which supply markets (and therefore capital) are involved

Subsystem		*Relation to physical processes*
Feedstuff supplies	Direct	Piglet growth Condition of sows Maturation of maiden sows
Animal related costs	Direct	Prices of maiden sows (purchase) Prices of sows (sales)
	Indirect	Health care Insemination and breeding Manure disposal
Other costs	Indirect	Housing, equipment and maintenance

In these three subsystems capital is involved in terms of costs. Together with the results of the balance in production and pig prices, these systems determine the farm profits in terms of 'balance of the pig production practices'.

Productivity, Physical Transformation and Capital

If Productivity is associated with monetary units', an image emerges of allocation, conversion and (re)distribution of costs and profits. In this image the focus is on financial constructions and comparison to other products in monetary terms. But if Productivity is associated with 'physical units', it gives an image of allocation, processing, transformation and (re)distribution of physical resources. In this image the focus is on material constructions and indicators of actual production in amounts or numbers.

The difference can be specified as follows:

- Productivity of capital refers to costs and profits.
- Productivity of transformation refers to physical production processes.

Both 'Productivity of capital' and 'Productivity of transformation' can represent a balance of dimensions expressed in quantitative units ('€' versus 'units of Power'). But the representation of the combination is a problem. In the current study a solution is required for the problem that Productivity should be represented by a combination unit of '€' and 'physical Power'.

The relevance of the detailed description of the production process in indicators and subsystems is that the differentiation between monetary units and physical units is not explicitly made in the production formula (Section 1.3):

$$[Y/L] = [Y/N] * [N/L] \tag{3}$$

or:

$$\log (Y/L) = \log (Y/N) + \log (N/L) \tag{4}$$

Besides, through the specification in the current study of Intensity as 'feeder pigs per sow (per year)', the quantity Productivity is given as the unit 'feeder pigs per working hour (per week)', whereas actually Productivity should not have any unit at all (see above).

Theoretically there could be three solutions to the problem:

(1) transfer all physical processes into estimates of monetary units
(2) include all physical processes for pig production in Intensity
(3) make Productivity, Intensity and Scale relative values for comparison.

As explained below, in practice the first solution is not applicable, and the second solution is not desirable. So only the last of these solutions is actually available.

Implications of solution (1):
If the physical processes were transferred into estimates of monetary units, then the assumption should be made that the monetary values of the data of each indicator in Figure B1 are similar for all styles of farming. Such an assumption is not appropriate for this study, because it could cover up (part of) the existing diversity in styles of farming (see also Section 6.4). So if monetary values were estimated for the data of the indicators, then an independent estimation would have to be done for each style of farming.

This solution conflicts with the approach in the current study farms of classifying styles of farming based on Productivity, Intensity and Scale. This means that as long as the monetary values are not specified, Productivity, Intensity and Scale cannot be specified. And as long as Productivity, Intensity and Scale are not specified, farms cannot be classified into styles of farming. And as long as farms cannot be classified in styles of farming, the estimates of the data in monetary values per style of farming cannot be found.

A similar problem occurs for the quantity Scale. The monetary valuation of working hours is the estimate of a 'wage' for the hours of input. The hourly wage of farm hands is an available indicator, but those wages are not comparable to the valuation of an hour of work by the farmer. If a 'farmer's hourly wage' were estimated, the estimation should allow for different levels in farmers' income per style of farming. And – as shown here, those estimations cannot be made until the styles of farming are determined.

Implications of solution (2):
If all physical processes for pig production were included in Intensity, it would mean that the four internal farm processes, farrow cycle, piglet production, piglet growth and sow replacement, would be combined in one unit. The processes of piglet production and farrow cycle are actually connected. Together they determine the quantity 'feeder pigs per sow (per year)'. But in order to combine piglet growth and sow replacement into the unit, the prices of feedstuff and the prices of maiden sow purchase and sales of sows should be transferred into physical terms.

This problem is similar to the problem of combining animals and acreage in one unit. The solutions for dealing with that problem were either to find a correction factor (Roep 1988) or add an extra dimension (Boonstra, 2001; Wiskerke, 1997) for 'mobilisation of resources' (see above).

Since a correction factor would have the same disadvantage as described for the monetary valuation, the choice would be to add an extra dimension. For the current study this would imply that the quantity Intensity would consist of three dimensions. This would make the Productivity model very complicated to describe, because in connection with Scale, the model would be four-dimensional. On top of these four, the two dimensions for orientation on Technology and Business should be handled. That would make all estimates very complicated.

Implications of solution (3)
Solution 3 is the chosen solution for this study. In the study Intensity is specified as 'the number of feeder pigs per sow (per year)'. This means that Productivity ignores monetary terms. Productivity expresses the product of Intensity in terms of part of the physical transformation processes: the production of feeder pigs per sow (per year), and Scale in terms of physical labour input in pig production. This means that the possibility of differences

among the styles of farming in labour input for the aspects piglet growth, sow replacement, farm feedstuff supply, other animal related supplies and other supplies are all ignored. The implication is that the diversity in styles of farming is based only on differences among farms which are related to the physical feeder pig production and not on differences in market management. Monetary units are thus explicitly excluded from the Productivity formula. To that extent the value of the classification is therefore limited.

Another limitation to this solution is the fact that Productivity still has a unit: feeder pigs per working hour (per week). So it is not a balance for economic evaluation in itself. To create an economic balance, Productivity would have to be divided by a reference Productivity (like the population average):

$$\text{Balance in Productivity} = \frac{\text{specified Productivity}}{\text{average Productivity}}$$

or by another specified Quantity with a similar unit, for example:

$$\text{Balance in Productivity} = \frac{\text{specified Productivity}\left(unit_{\text{'}frequency\text{'}} / unit_{\text{'}Power\text{'}}\right)}{\text{specified Quantity}\left(unit_{\text{'}Energy\text{'}}\right)}$$

In the current study it is assumed in the hypothesis that Capacity – in terms of orientation on Technology and Business, can serve as the required Quantity. Capacity is therefore connected to a ‘unit of Energy’, similar to the unit ‘Joule’ in physics. The ‘Energy’ is related to the goals that farmers have in their orientation on Technology and on Business.[9]

The hypothesis means that the deviation of the specified Productivity of a style of farming from the population average also represents the balance between Productivity and Capacity for that style of farming. The deviation of the specified Productivity of a style of farming from the population average is expressed in terms of ambition and rationale. So ambition and rationale also represent the deviation of the Capacity of that style of farming from the population average. This deviation is expressed in goals in farming and in activities in farming practices.

Conclusions

Capital can be made explicit in the Production formula for pig production through a meticulous description of the steps in the process using indicators. The problem of how to deal with the Productivity if capital and physical processes are intertwined is complex. The option that was chosen for this study was eliminating capital from the formula and reducing the specification of Intensity to ‘the number of feeder pig per sow (per year)’. Similarly Scale was expressed in hours of labour (and not in wages). Thus Productivity was based only on physical processes.

Capacity and energy

Above it is explained that Capacity – as a product of the orientation on Technology and Business, and expressed in terms of ‘goals’ in these orientations, is connected to a unit, which is similar to the ‘unit for Energy (Joule)’ in physics. In those terms Capacity represents a combination of different types of energy. From physics it is known that the total amount of energy in the system is by definition constant. This was shown by Newton and is commonly known as the ‘principle of the conservation of energy’. Energy can present itself in many forms though: later Einstein described the relation between energy of matter and light, and Bohr typed the characteristics of particles of energy.

With respect to the model Capacity can be described in differences in ambition levels and differences in rationales. Ambition levels are comparable to differences in energy levels. Differences in rationales are comparable to contrasts in types of energy at the same energy level.

So the curves of levels of Capacity in orientations on Technology and Business are similarly shaped as the curves that represent Productivity. Both models are determined by 'energy', which is differentiated in ambition levels (energy levels) and rationales (contrasts in types of energy).

Notes

1 In Dutch: 'Vermogen' [in Watt].

2 Power (P) = F/t [in: J/s = Watt (W)], in which: Force (F) = m*a [in: Nm = kgm^2/s^2 = Joule (J)].

3 In the current study the term industrialisation of livestock farming is used to express the independence of livestock production from on-farm feedstuff production.

4 If an object of labour is also disconnected from site in industrial production, it is often referred to as 'factory production'.

5 It used to be practical to express all kind of things in amounts of manual labour. For example: a traditional measure for land was a 'morning'. A 'morning' was defined as the acreage of land that a skilled labourer could mow by scythe on an average summer morning before midday. (lit. ref.). Since machines largely replaced manual labour, such measures are no longer practical.

6 The European Standard Gross Units (SGM) has now replaced the Dutch Standard Units (sbe), for reasons of international comparison – not for reasons of accuracy. On the contrary it is less accurate (see: http://www.lei.wageningen-ur.nl/lei_engels/HTML/home.htm and click 'statistics'). Note that either way comparison is based on an assumption of financial comparability of a defined group of farmers – in the LEI-statistics: all Dutch farmers.

7 The complete standard list of indicators is inserted as Supplement Table Appendix B in this thesis:

26 farm management indicators about production: numbered [001] to [026] by ATC

(The indicator 'mean farrow number of sows' is not included in the standard list, although it is often given in commercial lists. Whenever used in this study it is referred to as 'number 050'.)

21 indicators about inputs and outputs: numbered [101] to [121] by ATC

37 indicators about farm economics: numbered [201] to [237] by ATC

(In 1998 number 238 was added to the standard list, referring to the economy of manure management.)

8 Figure B1 was developed after finding the diagram created by Huirne (1990; page 34). It inspired the development of Figure B1.

9 If the object of labour would was not 'sows' but 'soil', the equations would still lead to a quantity with a 'unit of Energy' ('Joule'). But if both sows and soil would be involved, than an additional dimension would be required to level off the units 'numbers of sows' and 'ha'.

Appendix C
Styles of Farming and Farming Systems Approaches

Approaching the issue of farming with the concept of styles of farming is not the same as applying a so-called 'farming systems approach'. There are different types of farming systems approaches though, and the application of the concept of styles of farming has interesting similarities with some types of farming systems approaches.

In livestock farming approaches a distinction is made of three methodological approaches: hard, soft and complex (Schiere and Ibrahim 1999).[1]

In the hard system approach a system is… … a unit in space which consists of subsystems that together form one coherent whole with a clear goal and with clearly defined boundaries that convert inputs into outputs. (source: Schiere and Ibrahim 1999)

In the soft system approach a system is… …a construct with arbitrary boundaries for discourse about complex phenomena to emphasise wholeness, interrelationships and emergent properties. (source: Schiere and Ibrahim 1999)

In the complex system approach a system is… …a system with innumerable emergent properties, hard or even impossible to be defined boundaries and characteristics that are open for an infinite number of different interpretations. (source: Schiere and Ibrahim 1999)

Traditionally the study of livestock farming systems followed the methodological principles of hard systems. More recently the concepts of soft systems and complex systems were developed. In that development Ruthenberg (1980) stated in his work on crop farming systems in the tropics that he preferred to refer to systems as 'modes' – organised or established procedures. This reference can be associated with the term 'modes of farming', which Bennett (1982) used in his work to classify styles of farming in Saskatchewan in Canada. The soft system approach, is usually associated with the concept of styles of farming.

Yet the link between farming systems approaches and styles of farming approaches is not straightforward. A major reason is that farming system approaches are very preoccupied with boundaries, which are apparent in hard systems, which have to be specified in soft systems, and which have to be avoided by definition in complex systems. In the concept of styles of farming the definition of boundaries is not an issue. Styles of farming are specified as contrasts among groups or as contrasts from the population average.

Farming system approaches are also preoccupied with the optimisation of systems. Both in the hard system approach and the soft system approach a search for system optimisation starts after the boundaries are defined or specified. In the concept of styles of farming there is no presumption of general optimisation. On the contrary, in the concept of styles of farming the 'optimisation' is in the whole of diversity of styles, and not within a single style or a theoretical 'best' combination of styles.

Specifically with respect to soft systems, there is a third contrast between the soft system approach and the concept of styles of farming. In the soft system approach the objective of the study is within the system: the problem and the goal belong to the system. And it is widely argued – for example by Röling and Wagemakers (1998), that the observer is part of the problem of the system by choosing the type of measurements. In the concept of styles of farming the objective of the study does not necessarily belong to the system. It might also be specifically related to the observer.

There is no dispute in the concept of styles of farming though, about the mutual influence between the observer and the observed. But the owner of the problem and the goal might vary, putting the matter of mutual influence of system and observer in different perspectives. At the level of interaction between farmers and farm animals there is a remarkable connection between the soft systems approach and the styles of farming approach. The behaviour of the stock-keeper has influence on the behaviour, stress level and the productivity of livestock (Van Stuivenberg 2002, Hemsworth and Coleman 1998).[2] This type of scientific work supports the suggestion that the soft systems approach and the concepts styles of farming could well combine in the scientific approach of socio-material co-production.

The fact that the concept of styles of farming does not necessarily fit with the soft systems approach does not implicitly mean that the concept of styles of farming should fit in the complex system approach. The rules that Schiere and Ibrahim (1999) outlined for coping with complexity, though, apply to the concept of styles of farming too:

- look for variation and patterns
- work with different perceptions rather than against them
- classify along relevant lines
- think in wholes
- think in hierarchies
- use analogy, also from other levels in the system-hierarchy
- work with variations and system dynamics
- think in terms of multiple solutions.

A very fundamental difference between the complex farming systems approach and the concept of styles of farming is that the farming system approach allows for '… an infinite number of different interpretations'. In contrast, in the concept of styles of farming differences in interpretations of details may be infinite, but the problem-solution is a very limited number of distinct styles of farming. In the model of this study, the maximum number of styles of farming was theoretically nine with respect to a single standard farm product in a culturally uniform region. In empirical research so far, the maximum number that was found in one study was six styles of farming.

Diversity in Living Systems as a Model for Understanding Styles of Farming

In complex farming systems approaches thermodynamic theories have appeared to be useful for studying the dynamics of farming systems, in particular the second law in thermodynamics (Schiere *et al.* 1999): *'...Any system, if left on its own, tends towards a state of maximum entropy (or chaos)'*.

The laws of thermodynamics assist in understanding the evolution of farming systems. Schiere *et al.* (1999) distinguishes five criteria for understanding this evolution:

1. Resources turn slowly but surely into less accessible forms; i.e. entropy increases. Neither matter nor energy is lost but it becomes less available.
2. There should be a distinction between types of energy. This should also be expressed in distinct units for energy densities.
3. Energy may not be the limiting factor for agriculture. Water and space may eventually limit the development.
4. Order outside the boundaries of a system must necessarily decrease.
5. It is incorrect to compare 'average resource efficiency' of systems that occupy different niches.

The laws of thermodynamics are very useful to study the evolution of non-living systems. It is therefore useful in studies of farming systems, because of the preoccupation of the farming systems approach on limitations and boundaries. This includes the complex systems in which limitations and boundaries should be known in order to avoid them in the analysis.

Studies of styles of farming are hardly preoccupied with outward boundaries. In studies of styles of farming the focus is inwards, towards the population average of the farmers and the contrasts among them. Styles of farming are the coherent conglomerates of farms that deviate from the population average in contrasting directions. This opposite focus between the farming systems and farming styles is comparable to the opposite focus between the dynamics of non-living systems and the dynamics of living systems. Focussing on the dynamics of living systems for the comparison of farming systems approaches and the concept of styles of farming fills the final discrepancy between '… an infinite number of different interpretations' and a limited number of problem-solutions. Life has the capacity to create order out of chaos, because it incorporates the capacity to create coherent co-ordination within a system. So the concept of styles of farming can be perceived as (simple) forms of life in a complex (thermodynamic) system.

The aspect of life that is required for understanding styles of farming with respect to farming systems is the fact that life co-ordinates, creates order, and integrates.

Westhoff wrote about this:

> *...Life is an everlasting pursuit for order in a persistent and hostile environment of chaos. Life is an everlasting pursuit for peace in a persistent and hostile environment of war threats. Life is struggling to integrate at the edge of disintegration.* (Interpreted translation from: Westhoff *et al.* 1970)

Westhoff wrote these lines in an introduction about the interaction between plants in nature and natural environments. But the laws of evolution of biodiversity may well apply to social constructions, like styles of farming. If so, the status quo in diversity of styles of farming may well reflect the health of social subsystems, just as diversity reflects the dynamics in biological systems.

For a plant variety there are limits to the environmental dynamics that it can handle, and there is an optimum. The closer the dynamics are to the minimum, the more reduced the variety's performance will be – down to deformed and discoloured growth. But the closer the dynamics are to the maximum the more abundant the variety's performance will be – both in size and in number of plants. But beyond the maximum of environmental dynamics the plant variety vanishes abruptly (Figure C1a).

Figure C1a and C1b Schematic curve showing how much environmental dynamics is allowed for a plant variety to grow at a site. At optimum dynamics the performance of the plant variety is optimum and the biodiversity in the environment is optimum. The number of plants at the site is stable. Below optimum dynamics the plant variety is reduced in size, and variable in numbers until it (slowly) vanishes at minimum dynamics. Beyond optimum dynamics the plant variety is increased in size, and variable in numbers until it (abruptly) vanishes at maximum dynamics. On both sides of the optimum, biodiversity is reduced and competition between plants is increased. (Figure is a modification from: Westhoff *et al.* 1970).

Figure C1a

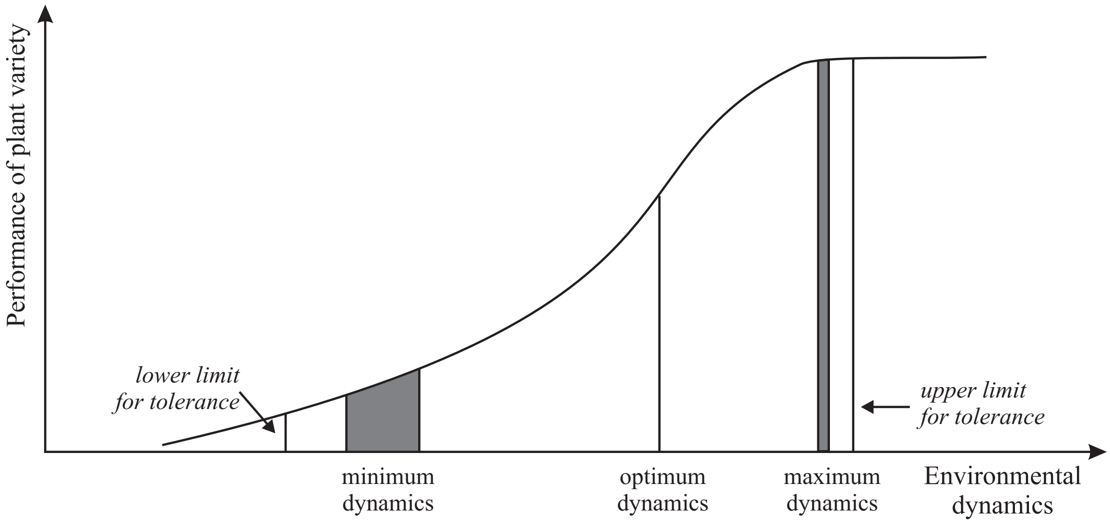


Figure C1b

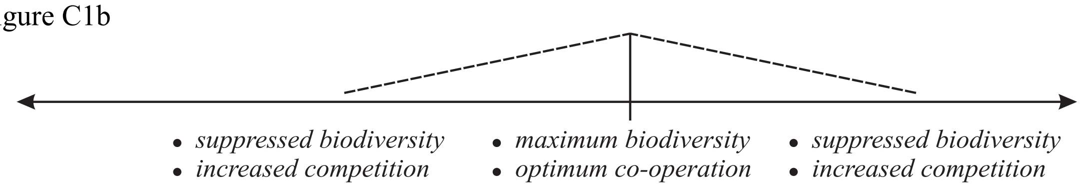
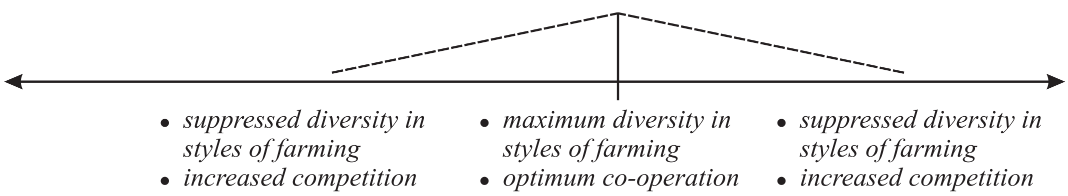


Figure C1c Similar; at optimal dynamics farm performance and diversity in styles of farming are optimal, and the number of farms in the area is stable.



The optimum conditions for growth of a plant variety are the same as the optimum for biodiversity. It is a fragile position: both sub-optimum and super-optimum conditions lead to suppressed biodiversity. In other words: optimum biodiversity = maximum biodiversity under optimal external conditions.

The model about dynamics in living systems is a useful model to understand the performance and diversity in styles of farming in complex farming systems. Under optimum dynamic conditions styles of farming flourish at an optimum performance in size and numbers. Both sub-optimum and super-optimum conditions lead to depression in diversity of styles of farming (Figure C1b and C1c). Thus according to Westhoff *et al.* (1970):

> *'...The road from competition to co-operation leads through additions of increasing diversity to the whole.*[3] (transcripted from Dutch)

For plant life environmental dynamics are created by temperature, wind, sunlight, soil texture and acidity, rainfall, etc. Plants can influence their environmental dynamics barely or not at all, because they are immobile except for their seeds. If the required dynamics reaches the upper or lower limits, a variety will ultimately disappear from a specific area. This process is particularly shown through a lack of succession: new generations of plants will no longer emerge at that site.

The environment for farming is to a large extent man-made. The major sources for dynamics in industrial farming (like pig production) are dynamics in supply markets and markets for sales products, government regulations, consumer concerns, etc. These dynamics are not made or controlled by a particular person or organisation. The influence that farmers have on the system at a certain location is limited. They can influence the environment they are in somewhat by adapting to new markets. The alternative is to move to another area with different cultures and policy regulations. And the ultimate alternative is to quit farming. This is exactly what is going on at present in (pig) farming in The Netherlands. The number of farms is declining rapidly.[4] Lack of farm successions in one of the major signs. The remaining farms are rapidly increasing in size, which may be a sign of excessive dynamics and super-optimal conditions. Some farms diversify their activities by adapting to new markets. The super-optimal environmental conditions are associated with the temporarily enriched 'space to manoeuvre' as outlined in Section 2.1. In the period of change in farm business security from past savings to confidence in avoiding risks future, the space to manoeuvre is temporarily enriched due to the extra availability of funds.

The major conclusion from the analysis of this aspect in literature is that the concepts of styles of farming and farming systems approaches meet at the levels of 'soft systems' and 'living systems'. The models developed for understanding biodiversity can be used in analogy for understanding diversity in styles of farming. The key to optimisation of 'living systems' is creating the most profitable circumstances (habitat) for maximisation of diversity in life forms: modes of ordering that entail a coherent logic in the co-ordination of the surrounding elements in the system. This key for optimising of 'living systems' might be useful for similar applications to support diversity in styles of farming. The 'living farming systems approach' might therefore become the fourth type of farming systems approaches with strong links to the notion of styles of farming.

From this insight in biodiversity dynamics an answer is found to the often-raised question: 'What is the best style of farming?' According to the acquired insights here the answer should be: 'It is best for each and all farmers to have the maximum number of styles of farming possible under the circumstances!' This answer gives rise to associations with the equilibrium theory of Nash (1950), which created a dramatic change in modern thinking about economy. In his theory, Nash gives mathematical evidence for equilibrium where the most profitable situation for the individual is at the same level as the most profitable situation for all: a win-win situation.

Notes

1 This literature was quoted with permission of dr.ir. Hans Schiere (2003).

2 19Van Stuivenberg gave the following example in her study: When housing systems change – for example from individual housing to group housing extension should not just be given on the 'hardware' – like adaptation of housing, feeding and hygiene, but also on the mentality of the farmer. Such change does not just implicate a stress factor for the farmer, but also for the animals. The whole of the farm management should be balanced anew.

3 Original lines: De weg van concurrentie naar coöperatie verloopt via toevoeging van steeds meer verscheidenheid aan het geheel.

4 see: : http://www.lei.dlo.nl/binternet/showtable.exe

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Samenvatting

Het doel van de studie was om kennis te vergroten over de perspectieven van de zeugenhouderij in Twente en de Achterhoek, zoals de boeren die ervaren en dat in relatie tot de wensen die leven in de maatschappij en de productieresultaten op de bedrijven. De zeugenhouderij is vooral bestudeerd als proces van productie en bedrijfsvoering en als stelsel van constructies om de productie te ondersteunen (stallen, stalinrichting, netwerk van bedrijfscontacten en bedrijfskengetallen). De perspectieven zijn gedifferentieerd naar bedrijfsstijlen.

Er is een methode ontwikkeld voor gecomputeriseerde analyse van gegevens. Met deze methode zijn bedrijven geclassificeerd naar bedrijfsstijlen in relatie tot de dimensies Intensiteit en Schaal (met als relatie Productiviteit), waarmee tevens kwantificering van de verschillen tussen bedrijfsstijlen mogelijk werd.

Het onderzoek leverde vijf bedrijfsstijlen op voor de zeugenhouderij in Twente en De Achterhoek: ondernemers, vaklieden, erfhouders, takhouders en afbuigers. Deze benamingen zijn gekozen metaforen. Zij zijn afgeleid van de specifieke capaciteiten van de bedrijven in deze bedrijfsstijlen.

Het wezenlijke kenmerk van bedrijfsstijlen is de samenhang die bestaat in een groot aantal karakteristieken van de bedrijfsvoering, die met elkaar een logisch geheel vormen en die contrasteren met andere bedrijfsstijlen, omdat daar een andere logica wordt gebruikt. In het huidige onderzoek is het begrip van ‘logica’ onderverdeeld in ‘grondslag’, ‘ambitie’ en ‘zingeving’.

De begrippen ‘grondslag’, ‘ambitie’ en ‘zingeving’ worden nader toegelicht in het proefschrift. De ‘grondslag’ vormt de basis voor de capaciteit van een bedrijfsstijl: de doelen van de boeren in hun oriëntatie op de technologische mogelijkheden en op de bedrijfszaken. De ‘ambitie’ en de ‘zingeving’ van de boeren in hun bedrijfsvoering worden met behulp van de ontwikkelde methode zowel kwalitatief als kwantitatief gemeten.

De Methodologie van het Onderzoek

De studie bestaat uit een voorstudie en een vervolgstudie. Daarin zijn verschillende methoden gebruikt voor de identificatie van bedrijfsstijlen. De methode die in de voorstudie is gebruikt in 1996 is subjectief. In de voorstudie zijn zeugenhouderijbedrijven in het gehele land bezocht met open interviews. De classificatie vond toen plaats op basis van de contrasten in de uitspraken van de boeren over hun doelen en motieven ten opzichte van elkaar: hun verschillen in oriëntatie op technologie en bedrijfszaken. Van dit vooronderzoek is een apart verslag verschenen in boekvorm (Commandeur, 1998).

In de vervolgstudie is een nieuwe methode ontwikkeld die de analyse objectiveert. De gegevens voor de classificatie van boeren in de vervolgstudie zijn verzameld met behulp van een enquête onder zeugenhouders in 1998 in Twente en de Achterhoek. De enquête was opgesteld op basis van de informatie die in het vooronderzoek was verkregen. In deze methode zijn bedrijfsstijlen geïdentificeerd met een computer methode op basis van relaties met Productiviteit, Intensiteit en Schaal.

In de literatuur is de impliciete rol van kapitaal in de Productiviteit vaak een punt van discussie, (onder andere) omdat kapitaal in die rol eenduidigheid veronderstelt in de waarde van productie. In de studie was er reden om te veronderstellen dat de waarde van productie misschien niet eenduidig is vast te stellen. Daarom zijn Productiviteit, Intensiteit en Schaal in deze studie expliciet gedefinieerd als uitkomsten van fysieke transformaties; van zaken die op het bedrijf gebeuren (zonder monetaire component).

De methoden die gebruikt zijn in de voorstudie en de vervolgstudie benaderen de problematiek volledig verschillend, maar de resultaten zijn goed vergelijkbaar. Het is evenwel belangrijk om aandacht te hebben voor de verschillen in de classificatiemethoden, omdat zij niet door elkaar heen kunnen worden gebruikt – dat geeft inconsistente resultaten. De methoden hebben ook verschillende voor- en nadelen.

De subjectieve methode in de voorstudie met open interviews is flexibel en daardoor geschikt voor exploratief onderzoek. De analyse kan stapsgewijs per deelonderwerp worden uitgevoerd. De analyse van parameters met behulp van computermethoden is rigide. De parameters dienen het geheel van de bedrijfsvoering te betreffen en als geheel geanalyseerd worden. Maar deze methode heeft het voordeel dat de verschillen in Productiviteit, Intensiteit en Schaal rechtstreeks in kwantitatieve eenheden kunnen worden geschat ten opzichte van het populatiegemiddelde.

Bij het gebruik van beide methoden ondersteunen de aanvullend verworven gegevens de classificatie van de bedrijven. Daardoor kunnen verschillen tussen bedrijfsstijlen die niet in de classificatie zijn meegenomen (indirect) worden meegenomen als ondersteuning en toelichting.

Bedrijfsstijlen zijn volgens twee verschillende methoden aan het licht gebracht, als contrasten tussen boeren in de logica achter hun doelen en opvattingen over wat hun bedrijfsvoering is – of volgens hen zou moeten zijn. De verschillen in doelstellingen en opvattingen laten de kwalitatieve verschillen in oriëntaties van de boeren zien op Capaciteit, Technologie en op Bedrijfszaken. Deze verschillen kunnen in de ontwikkelde analysemethode ook kwantitatief weergegeven worden als afwijkingen ten opzichte van het populatiegemiddelde in termen van Productiviteit, Intensiteit en Schaal.

Grondslag, ambitie en zingeving

De grondslag voor bedrijfsvoering is gedefinieerd in een stelsel van vier domeinen. Die vier domeinen vormen samen de ruimte voor de oriëntatie van boeren op Technologie en op Bedrijfszaken. De oriëntatie op Technologie is verdeeld in een domein waarin de oriëntatie op de productie van de dieren (de 'arbeidsobjecten') centraal staat en een domein waarin de oriëntatie op de verzorging van de dieren centraal staat. De oriëntatie op Bedrijfszaken is verdeeld in een domein dat uitdrukking geeft aan handel en marktrelaties en een domein dat uitdrukking geeft aan de arbeidsorganisatie binnen de familie en de organisatie van bedrijfsovername.

Voor een bedrijfsstijl is de 'grondslag' de plaats binnen de domeinen die zowel geldt als het vertrekpunt voor de coördinatie van de bedrijfsvoering als het uiteindelijke doel voor de bedrijfsvoering. De activiteiten van de bedrijfsstijlen strekken zich overigens over alle domeinen uit. Die grondslag van een bedrijfsstijl valt te benoemen als specifieke capaciteit.

De benaming van een bedrijfsstijl slaat in deze studie dus op een capaciteit van de boeren, die verankerd is in een bepaalde grondslag.

In het vooronderzoek en het vervolgonderzoek tezamen zijn de volgende capaciteiten gevonden:

- Ondernemerschap is gefundeerd in het marktgerichte domein. Het is de capaciteit om vooral externe indicatoren en algemene gegevens te gebruiken om de bedrijfsontwikkeling te richten op voortgaande arbeidsefficiency ('van buiten naar binnen').
- Vakmanschap is gefundeerd in het productiegerichte domein. Het is de capaciteit om bedrijfskengetallen te gebruiken als normen om daarop de structuur van arbeid en productie af te stemmen, gericht op productieverhoging ('van binnen naar buiten').
- Overleverschap is gefundeerd in de beide zorgdomeinen; dat wil zeggen zowel het bedrijfsorganisatiegerichte domein als in het dierverzorgingsgerichte domein. Het is een brede term voor de capaciteit van boeren om voort te bouwen op het bedrijf als familie-erfgoed en betekenis te geven aan het leven als boer(in) in overeenstemming met dat erfgoed.
- Erfhouderschap is gefundeerd in het centrum van de domeinen, maar met een accent naar het bedrijfsorganisatiegerichte domein. Het is de term die gekozen is om te verwijzen naar familiegerichte boeren; de neiging van boerenfamilies om hun identiteit en voldoening met het bedrijf te relateren aan de verworven manier van leven als boer: landbouwbeoefening als familie-arbeid om een inkomen te genereren voor het gezin.
- Takhouderschap is gefundeerd in het dierverzorgingsgerichte domein. Het is de term die gekozen is om te verwijzen naar de bedrijfstakgerichte boeren; de neiging van boeren om zich verbonden te voelen met een bepaalde bedrijfstak, zoals het centraal stellen van het houden, huisvesten en verzorgen van bepaalde dieren (in dit geval varkens) in hun identificatie als boer. Dit wordt gecombineerd met een ambitie voor lage bedrijfsinvesteringen.
- Hoederschap is gefundeerd in beide zorgdomeinen maar met een accent naar het dierverzorgingsgerichte domein. Het is de capaciteit om de specifieke behoeften van de dieren om een leven te leiden dat past bij de betreffende diersoort, als leidraad te gebruiken voor de implementatie van een geïntegreerd bedrijfssysteem voor de voeding, huisvesting, verzorging en beheer van die dieren.
- Afbuigerschap is gekozen als een paraplubegrip voor boeren die weliswaar (nog steeds) actief zijn in een bepaalde bedrijfstak (in dit geval de zeugenhouderij), maar wiens aandacht primair uitgaat naar andere (agrarische) bedrijfstakken op het bedrijf of naar andere (niet-agrarische) activiteiten op het bedrijf of activiteiten buiten het bedrijf. (In het laatste geval kan men ook spreken van afbouwerschap).

In de studie zijn drie ambitieniveaus (sferen) gedefinieerd die elk een relatie hebben met het bedrijfsperspectief in tijd en in bedrijfsdoelen:

(1) Het ambitieniveau in de sfeer van concurrentie. Deze boeren zien productie en winst maken als de belangrijkste doelen van het bedrijf en zij hebben vertrouwen in bedrijfsontwikkeling en verandering op basis van berekende schattingen van risico in het toekomstperspectief van het bedrijf. Deze boeren zoeken uitdaging in de verdere ontwikkeling van hun bedrijfsvoering.

(2) Het ambitieniveau in de sfeer van deelname. Deze boeren zien bedrijfscontinuïteit voor de familie als hoogste prioriteit. Zij baseren hun beslissingen op het verband dat zij zien in de

gebeurtenissen in hun omgeving en in de heersende tijdsgeest. Zij zijn pragmatisch in hun beslissingen voor de bedrijfsvoering.

(3) Het ambitieniveau in de sfeer van autonomie. Deze boeren zien het boer-zijn als een middel tot onafhankelijkheid. Die onafhankelijkheid zoeken zij voorts in het vertrouwen op zekerheden vanuit besparing en overlevering en het behoud van beschikbare middelen. Zij gaan kalm en weloverwogen te werk in hun beslissingen over de bedrijfsvoering.

In de onderhavige (vervolg) studie zijn vijf bedrijfsstijlen benoemd: twee in de ambitiesfeer van concurrentie (ondernemers en vaklieden) en drie in de ambitiesfeer van deelname en autonomie (erfhouders, takhouders en afbuigers).

De sfeer van deelname en autonomie kan in deze studie niet verder onderverdeeld worden vanwege het gebrek aan deelnemers aan dit onderzoek in het segment van lage Productiviteit. Ongeveer 20% van de zeugenhouders in het onderzoeksgebied (Twente en de Achterhoek) nam geen deel aan een management ondersteuningsprogramma voor het verkrijgen van bedrijfskengetallen. Op deze bedrijven was het onmogelijk om standaardgegevens te verkrijgen over de intensiteit en de productiviteit. Zij zijn daarom niet met enquêtes bezocht. Er is van deze niet-bezochte bedrijven bekend dat zij voornamelijk (relatief) extensief en kleinschalig zijn. Het uitsluiten van deze bedrijven voor dit onderzoek creëerde dus een scheefheid (bias) in de verzamelde gegevens. Als gevolg hiervan kon de ambitiesfeer van autonomie niet goed onderscheiden worden van die van deelname.

In de methode die in de vervolgstudie is gebruikt zijn deze ambitieniveaus zowel kwalitatief als kwantitatief bepaald voor de bedrijven in de studie. De kwalitatieve bepaling reflecteert de doelen van boeren in termen van ‘capaciteit’. De kwantitatieve bepaling reflecteert de bedrijfsresultaten in termen van ‘productiviteit’.

Productiviteit vertegenwoordigt echter niet een puntwaarde, maar een curve van combinaties van Intensiteit en Schaal. Evenzo vertegenwoordigt de Capaciteit een curve van combinaties van doelen in de oriëntatie op Technologie en op Bedrijfszaken. Op de ambitieniveaus kunnen bedrijfsstijlen contrasterende posities innemen op de curve. Die positie wordt bepaald door de verbinding tussen de ambitie en de grondslag. Die verbinding wordt ‘zingeving’ genoemd. In de studie is de zingeving eveneens zowel kwalitatief als kwantitatief gemeten voor de bedrijfsstijlen.

Op het ambitieniveau van concurrentie contrasteren de bedrijfsstijlen: ondernemers en vaklieden. Die is te zien aan hun verschoven posities op de productiviteitscurve (en op de capaciteitscurve).

Doordat ondernemers hun ambitie verbinden met een marktgerichte grondslag, toont de zingeving dat schaalgrootte voor deze bedrijfsstijl relatief belangrijker is dan intensiteit. Ondernemers houden ook van investeren in vernieuwing. Dat onderwerp houdt hen bezig, evenals de internationale beleidsontwikkelingen.

Doordat vaklieden hun ambitie verbinden een productiegerichte grondslag, toont de zingeving dat intensiteit voor deze bedrijfsstijl relatief belangrijker is dan schaalgrootte. Vaklieden investeren graag in productieverhoging: goede beesten, goede conditie van de dieren, enzovoorts.

Op het ambitieniveau van deelname en autonomie zijn de bedrijfsstijlen erfhouders, takhouders en afbuigers ook op verschillende posities op de betreffende curve gevonden.

Erfhouders verbinden hun ambitie tot deelname met een grondslag in hun erf en erfelijkheid; met het behouden van de boerderij en bedrijfsvoering voor de familie. In hun zingeving zoeken zij naar evenwicht tussen schaal en intensiteit op een middelgroot bedrijven. Erfhouders hebben bij voorkeur gemengde bedrijven.

Takhouders verbinden hun ambitie tot deelname en autonomie met een grondslag in de bedrijfstak (varkens). Varkens zijn voor hen belangrijker voor hun identiteit dan productie. Deze boeren zijn dus meer schaalgericht dan intensiteitgericht, maar dat is (meestal) niet ‘grootschalig’. Takhouders zijn ook zuinige boeren. Zij zullen niet eerder stallen of staluitrusting vervangen dan wanneer dat door slijtage nodig is. Daarom hebben zij vaak hun zeugen nog aangebonden aan de band. Tegelijkertijd is de bedrijfsstijl met de meeste belangstelling voor de biologische varkenshouderij.

Afbuigers verbinden hun ambitie tot deelname en autonomie met een grondslag in de toekomst voor familie en gezin. Die toekomst zit niet in de varkenshouderij en in sommige gevallen überhaupt niet in het bedrijf. Daarom zijn deze boeren in ieder geval niet geïnteresseerd in uitbreiding (schaal). Maar op basis van het verworven vakmanschap kunnen sommige van deze boeren best hoge productieresultaten (intensiteit) hebben.

De verbinding tussen de analysemethoden is gevonden in de kwalitatieve (capaciteit) en kwantitatieve (productiviteit) specificatie van de begrippen ‘ambitie’ en ‘zingeving’ in de bedrijfsvoering van boeren. De ‘ambitie’ wordt weergegeven door de afstand tussen de curven. De ‘zingeving’ wordt weergegeven door de afstand tussen posities op een zelfde curve. Het populatiegemiddelde is de referentie voor de verschilbepalingen.

Doorwerking van deze Studie

Op basis van deze studie kan geconcludeerd worden dat varkens een verschillende waarde hebben voor boeren in de verschillende bedrijfsstijlen. Daarmee worden allerlei soorten van waarden bedoeld, zoals respect voor dieren, emotionele waarde en culturele waarde, maar ook de economische nutswaarde. Deze studie toont aan dat het niet gewoon de economische opbrengst van het boeren is die de ambitie en de zingeving van de bedrijfsvoering bepaalt (zoals bijvoorbeeld een ambitie naar ‘winstmaximalisatie’). Het is omgekeerd: boeren streven naar de economische optimalisatie van hun bedrijfsvoering voor zover die tegemoet komt aan hun ambitie en zingeving.

In de ambities en zingeving van boeren zijn samenhangende patronen te herkennen, op basis waarvan zij ingedeeld kunnen worden naar bedrijfsstijlen. Dat komt omdat het aantal logische patronen om de bedrijfsvoering uit te voeren beperkt is. De mogelijkheid voor economische optimalisatie van de bedrijfsvoering per bedrijfsstijl is gebaseerd op het feit dat er een beperkt aantal logische patronen aangeduid kunnen worden voor de coördinatie van de verschillende subsystemen in het productieproces, de verzorging van de dieren (onderhoud van de arbeidsobjecten), de arbeidsorganisatie en de marktrelaties.

Deze studie draagt bij aan de kennis over technische, sociale en economische onderzoeksthema’s in termen van het aangeven van logica in de verscheidenheid van patronen, zowel in de fysieke transformaties bij productieprocessen als in de gerelateerde markrelaties. Bedrijfsstijlen verschillen in elk aspect van de bedrijfsvoering: in de productiviteit, in de bedrijfsdoelen, in de strategieën voor bedrijfsvoering en in mogelijkheden voor optimalisatie van de productie. Daardoor hebben bedrijfsstijlen ook een verschillende invloed op hun fysieke en sociale omgeving. En die omgeving heeft een verschillende invloed op de bedrijfsstijlen. Daarom lijkt de verscheidenheid van bedrijfsstijlen in hun fysieke en sociale omgeving op de verschijningsvormen van biodiversiteit in een habitat.

De regelgeving van de overheid, de voorwaarden voor leningen van banken, de contracten en contacten met de toe- en afleverende industrie, de specifieke waarde van onderwijs, onderzoek en het advies van de agrarische voorlichting en de acties van belangengroepen komen op een verschillende manier aan bij de bedrijfsstijlen en leiden daardoor ook tot verschillende reacties. Deze studie is een uitnodiging aan de gehele technische en administratieve 'taakomgeving' van de boeren (toe- en afleverende industrie, banken, overheid, instituten en belangengroepen) om rekening te houden met verschillen in bedrijfsstijlen bij hun manier van omgaan met boeren en met problemen in de landbouw. Rekening houden met bedrijfsstijlen betekent dus ook dat de effecten van interventies beter voorspelbaar en hanteerbaar zullen worden.

Op basis van deze studie kunnen bestaande interventies van de taakomgeving met de agrarische bedrijfsvoering geëvalueerd worden voor de verschillende bedrijfsstijlen en de invloed van voorgenomen interventies kunnen worden voorspeld. Onderzoekers op technisch en sociaal terrein van de zeugenhouderij (en breder in de landbouw) zouden zich meer bewust moeten zijn van de diverse bedrijfsstijlen en dat die zijn gegrond op verschillen in logica. De verschillende bedrijfsstijlen vragen om een diversificatie van onderzoeksvragen en experimenten die gericht zijn op die verschillen in logica. En dat niet alleen. De interpretatie van de onderzoeksresultaten kan eveneens verschillen per bedrijfsstijl, omdat die resultaten per bedrijfsstijl verschillende waarden kunnen vertegenwoordigen.

En tenslotte zouden de boeren zelf wat meer open moeten staan voor verscheidenheid. In elke bedrijfsstijl leek een gevoel bij de boeren te overheersen dat hun wijze van bedrijfsvoering de beste is. Dit kwam zelfs versterkt naar voren in de discussie over verschillen tussen regio's. De meeste boeren vonden hun wijze van bedrijfsvoering beter dan die van de boeren in Brabant. Het accepteren van ruimte voor verscheidenheid stimuleert de maatschappelijke discussie over de bedrijfsvoering in de zeugenhouderij (en breder, in de landbouw). Daardoor zouden boeren weer uit hun maatschappelijk isolement kunnen treden en vanuit hun geïsoleerde positie kunnen terugkeren naar een geïntegreerde positie in de samenleving. Die discussie moet dan niet gaan over de 'beste' bedrijfsstijl (die overigens niet bestaat), maar over het verbeteren en uitbouwen van perspectieven voor verscheidenheid van stijlen.

Zusammenfassung

Diese Studie hat das Ziel, das Wissen über die Perspektiven der Schweineproduzenten in Twente und Achterhoek in die Niederlande zu erweitern. Die Perspektiven werden hierbei aus der Sicht der Schweineproduzenten definiert, unter Berücksichtigung der von den Bauern geäußerten Unternehmensziele und der in den Betrieben erreichten Produktionsergebnisse.

Die Untersuchung der Schweinebetriebe berücksichtigte die Produktionsprozesse, die Betriebsführung und das für die Produktion notwendiges Konstrukt (z.B. Ställe, Stalleinrichtung, Netzwerk von Kontakten und Betriebskenndaten). Die Perspektiven wurden nach Betriebsführungsstil differenziert.

Es wurde eine computergestützte Analysemethode entwickelt, mit der Unterschiede in der Bewirtschaftungsweise landwirtschaftlicher Betriebe erkannt und quantifiziert werden können. Mit dieser Methode können landwirtschaftliche Betriebe nach Bewirtschaftungsstil klassifiziert werden, die sich hinsichtlich Bewirtschaftungsintensität und Größe der Bewirtschaftungseinheit (also durch produktivitätsrelevante Faktoren) unterscheiden. Unterschiede im Bewirtschaftungsstil lassen sich mit dieser Methode quantifizieren.

Im Untersuchungsgebiet von Twente und Achterhoek konnten fünf Betriebsführungsstile identifiziert werden, die sich metaphorisch mit den folgenden Begriffen umschreiben lassen: der Unternehmer, der Handwerksmeister, der Erbhalter, der Züchter und der Wechsler. Diese Begriffe sollen die spezifischen Kapazitäten dieser Landwirtschaftsbetriebe kennzeichnen, die sich aus einem speziellen Betriebsführungsstil ergeben.

Die Bedeutung dieser erkannten Betriebsführungsstile liegt in einem spezifischen logischen Cluster vieler Betriebskennzahlen. Jeder Betriebsführungsstil unterscheidet sich hinsichtlich dieser Betriebskennzahlen deutlich von den anderen Betriebsführungsstilen. Damit wurde es notwendig, für jeden Betriebsführungsstil einen speziellen Begriff zu nutzen. In dieser Arbeit wird der Begriff „logisch“ untersetzt mit den Begriffen ’Grundlagen’, ’Ambition’ und ’Leitmotiv’.

Einzelheiten der dieser Untersuchung zu Grunde liegenden Konzepte ’Grundlagen’, ’Ambition’ und ’Leitmotiv’ sind in der Dissertation beschrieben. Die ’Grundlagen’ umfassen die gesamte materiell-technische Unternehmensbasis bzw. bilden die Kapazität um die technologischen bzw. ökonomischen Ziele einer Betriebsführungsstile zu erreichen. ’Ambition’ und ’Leitmotiv’ der Unternehmensführung eines Landwirtes können mit der entwickelten Methode qualitativ (in Hinblick auf Kapazität) und quantitativ (in Hinblick auf Produktivität) geschätzt werden.

Methodik
Diese Dissertation basiert auf einer Vorstudie und einer Hauptstudie. Dabei wurden unterschiedliche Methoden für die Identifikation verschiedener Betriebsführungsstile ausgenutzt. In der Vorstudie von 1996 wurde eine subjektive Methode genutzt.

Schweinebetriebe aus dem gesamten Land wurden nach Führungsstilen klassifiziert, die sich aus offenen Interviews ableiten ließen.

Die Klassifikation basierte auf einer Kontrastanalyse der von den Landwirten gemachten Aussagen zu den Zielen und Motiven ihrer landwirtschaftlichen Aktivitäten sowie zu den Unterschieden in ihrer technologischen bzw. geschäftlichen Orientierung. Die Ergebnisse der Vorstudie wurden bereits in einem Forschungsbericht veröffentlicht (Commandeur 1998).

In der zweiten Studie wurde eine computergestützte Methode entwickelt, mit der die Analyse objektiviert werden konnte. Die Daten für diese Analyse wurden im Rahmen einer Felderhebung unter Schweineproduzenten aus der Region Twente und Achterhoek im Jahre 1998 erhoben. Die Liste der für die Klassifikation der Betriebsführungsstile relevanten Untersuchungsgegenstände konnte aus der Vorstudie abgeleitet werden. Mit dieser Methode konnten Betriebsführungsstile erkannt werden, die eine klare Beziehung zur Produktivität, Intensität und Bewirtschaftungsgröße der Schweinebetriebe aufwiesen.

In der Literatur wird häufig die Beziehung zwischen dem Kapital und der Produktivität eines landwirtschaftlichen Unternehmens diskutiert. In dieser Studie wurde unterstellt, dass der Wert der Produktion je nach Betriebsführungsstil unterschiedlich beurteilt wird. Deshalb werden in dieser Studie Produktivität, Intensität und Betriebsgröße explizit als Ergebnis einer physischen Transformation verstanden (also ohne monetäre Komponente).

Obwohl die in Vor- und Hauptstudie genutzten Methoden unterschiedlich sind, so sind die erzielten Ergebnisse dennoch vergleichbar. Es ist jedoch wichtig, dass bei derartigen Untersuchungen kein Mix methodischer Elemente geschieht, um Unstetigkeiten in der Klassifikation zu vermeiden. Jede Methode hat spezifische Vor- und Nachteile.

Die subjektive Methode auf der Grundlage offener Interviews ist flexibel und gut für explorative Untersuchungen geeignet. Die Analyse kann schrittweise erfolgen und erlaubt eine sequentielle Ausarbeitung wichtiger Aspekte.

Die computergestützte Klassifikation der untersuchten Unternehmen ist wesentlich strikter. Diese verlangt ein vollständiges Abdecken aller Aspekte der landwirtschaftlichen Unternehmen und eine komplette Analyse vollständiger Datensätze. Dieser methodische Ansatz hat den Vorteil, dass Unterschiede in den Betriebsführungsstilen quantitativ dargestellt werden können in Einheiten der Produktivität, Intensität oder Farmgröße.

Bewirtschaftungsstile offenbaren sich als Kontrast zwischen den Bewirtschaftungszielen der Landwirte bzw. deren Wahrnehmung ihre Bewirtschaftungspraxis. Die Ergebnisse dieser Methoden sind vergleichbar. Die Unterschiede in den Zielen und in der Wahrnehmung zeigen die qualitativen Unterschiede in Kapazität, Technologie und geschäftlicher Orientierung, während quantitative Unterschiede der Betriebe im Vergleich zum Durchschnitt der Population Unterschiede in Produktivität, Intensität und Betriebsgröße reflektieren

Grundlage, Ambition und Leitmotiv

Die Grundlage eines landwirtschaftlichen Unternehmens definiert sich aus vier Domänen (Domäne verstanden als Bereich, in denen die Landwirte überdurchschnittliche Fähigkeiten entwickelt haben). Die vier Domänen bilden den Raum für die technologische und geschäftliche Orientierung eines Landwirtes. Die technologische Orientierung ist unterteilt in eine Domäne für die Produktionstiere (die Objekte der Arbeit) und einer Domäne für die Erhaltung der Tiere und deren Fürsorge. Die geschäftliche Orientierung ist unterteilt in eine

Domäne, in der die Arbeitskraft und die Zukunft der Familienbetriebes organisiert werden, und eine Domäne für Handel und Marktbeziehungen.

Die „Grundlage“ für einen Bewirtschaftungsstil bildet die Position innerhalb der Domänen, die als Ausgangspunkt für die Koordination der Bewirtschaftungspraktiken dient und aber gleichzeitig das Ziel der Bewirtschaftungspraktiken darstellt. Die landwirtschaftliche Bewirtschaftung kann jedoch erfordern, dass die Aktivitäten sich auf alle Domänen erstrecken. Die Bezeichnung der Bewirtschaftungsstile in dieser Arbeit hat einen metaphorischen Charakter und beschreibt die Kapazität der spezifischen Grundlagen eines Bewirtschaftungsstiles. Auf der Grundlage der Vor- und Hauptstudie konnten folgende Kapazitäten erkannt werden:

- *'Der Unternehmer'* hat seine Domäne in den Handels- und Marktbeziehungen. Er hat die Fähigkeit, externe ökonomische sowie allgemeine Indikatoren auszunutzen und den Betrieb so zu entwickeln, dass die Effizienz der Arbeit verbessert wird.

- *'Der Fachmann'* hat seine Domäne in der Produktion. Er hat die Fähigkeit mit betriebsinternen Indikatoren Normative zu schaffen, die es erlauben, Arbeitskräfte und Produktion so abzustimmen, dass die Produktion erhöht werden kann (ein von innen nach außen gerichteter Prozess).

- '*Der Überleber'* hat zwei Domänen im Bereich Fürsorge: eine Domäne in der Organisation der familiären Arbeitskräfte bzw. der Erbnachfolge und eine Domäne in der Erhaltung und Betreuung der Tiere. Der gewählte Begriff steht für die Fähigkeit, ein landwirtschaftliches Familienerbe auf zu bauen und das Leben auf die Fortführung der Familientraditionen zu orientieren.

- *'Der Erbhalter'* nutzt im Zentrum aller vier Domänen die Domäne der Arbeitsorganisation und Nachfolge. Der Erbhalter reflektiert eine allgemeine Tendenz unter Bauern und deren Familien, die Identität und Zufriedenheit von der Fortsetzung des geerbten Lebensstiles abhängig zu machen. Landwirtschaft wird als Einkommen generierende Aktivität der Familie betrachtet.

- '*Der Herdenhalter'* nutzt die Domäne der Erhaltung und Pflege der Tiere. Dies reflektiert den Stolz dieser Landwirte, Ställe zu nutzen, Tiere zu halten und für diese Tiere zu sorgen. Der Ehrgeiz dieser Bauern liegt nicht selten in großen Investitionen.

- *'Der Hüter*' nutzt beide Domänen der Fürsorge, mit Schwerpunkt auf Zucht und Pflege der Tiere. Er kennt die Bedürfnisse der Tiere und hat die Fähigkeit, integrierte Produktionssysteme zu entwickeln.

- '*Der Wechsler*' ist ein Oberbegriff für Landwirte, die noch in der Schweineproduktion tätig sind, jedoch den Schwerpunkt ihres Einkommens aus anderen Einkommensquellen beziehen möchten oder bereits beziehen (z.B. auch aus nicht landwirtschaftlichen Erwerbsquellen).

In dieser Studie werden drei Niveaus für Ambitionen definiert, die mit der Zeitperspektive der Bewirtschaftungsziele verbunden sind:

(1) Ambitionen auf der Wettbewerbsebene: Diese Landwirte betrachten Produktion und Profit als die wichtigsten Ziele ihrer Landwirtschaftsbetriebe. Auf der Grundlage ihrer

Kalkulationen zukünftiger Risiken sind sie überzeugt, dass Entwicklungen und Veränderungen zu positiven Ergebnissen führen. Diese Landwirte suchen Herausforderungen in der Entwicklung ihrer Betriebe.

(2) Ambitionen auf der Ebene der Partizipation: Für diese Landwirte hat die Fortführung der Familienbetriebe die höchste Priorität. Diese Landwirte treffen Entscheidungen auf der Grundlage aktueller Informationen aus ihrer Umgebung. Sie treffen meist pragmatische Entscheidungen.

(3) Ambitionen auf der Ebene der Autonomie: Diese Landwirte betrachten Landwirtschaft als einen Weg zur Unabhängigkeit, sie suchen Sicherheit in Traditionen und schützen ihre Ressourcen. Sie sind sorgfältig und umsichtig bei Entscheidungen über die Unternehmensführung.

In dieser Arbeit werden fünf Bewirtschaftungsstile klassifiziert, zwei durch Unterschiede in den Ambitionen auf der Wettbewerbsebene (Geschäftsmann und Fachmann) und drei durch Unterschiede in den Ambitionen auf der Ebene von Partizipation bzw. von Autonomie (Erbhalter, Herdhalter und Wechsler).

Die Ebene von Partizipation und Autonomie konnte in dieser Arbeit nicht weiter unterteilt werden, weil nicht genügend Betriebe aus dem Segment mit niedrigem Produktionsniveau untersucht werden konnten. Rund 20% der Landwirte des Untersuchungsgebietes nahmen an keinem Beratungsprogramm teil und konnten deshalb nicht mit der entwickelten Methodik klassifiziert werden. Das waren hauptsächlich extensiv wirtschaftende Kleinbetriebe. Die ungenügende Erhebung dieser Betriebe führte zu einem Fehler in der Datengrundlage, der sich in den Ergebnissen widerspiegelt. Folglich konnten die Segmente mit unterschiedlichen Ambitionen in Autonomie und Partizipation nicht differenziert werden.

Die durchschnittliche Produktivität ist in der untersuchten Population kein Punkt sondern eine Funktion von Intensität und Maßstab. So repräsentiert auch Kapazität eine Funktion, die von der Orientierung der Landwirte auf Technologie bzw. Business abhängig ist. Für jedes Ambitionsniveau können Bewirtschaftungsstile unterschiedliche Positionen auf diesen Funktionen einnehmen. Diese Positionen reflektieren den Zusammenhang zwischen Ambition und Grundlage und bilden das Leitmotiv des Bewirtschaftungsstiles. Die Quantifizierung dieser Beziehung ergibt die „Grundlage". In dieser Studie wurden die Grundlagen der Bewirtschaftungsstile qualitativ (Kapazität) und quantitativ (Produktivität) mit dem Durchschnitt der gesamten Population verglichen.

Auf dem Ambitionsniveau Konkurrenz haben 'Unternehmer' einen deutlichen Kontrast zum 'Fachmann'. Unternehmer verbinden ihren Ehrgeiz mit Grundlagen in Handel und Marktbeziehungen. Das Grundprinzip dieses Bewirtschaftungsstiles verdeutlicht, dass die Größe der Produktionseinheit (Schale) eine größere Bedeutung hat als die Intensität. Fachmänner begründen ihre Ambitionen auf der Domäne der Produktivität. Folglich ist für Landwirte von diesem Bewirtschaftungsstil die Intensität wichtiger als die Größe der Produktionseinheiten.

Auf dem Ambitionsniveau Partizipation bzw. Autonomie haben Erbhalter, Herdenhalter und Wechsler unterschiedliche Positionen auf der Produktionsfunktion.

Erbhalter sind typische Familienbetriebe mit Ambitionen im Bereich Partizipation. Sie gründen ihre Bewirtschaftung auf Erbfolge und Erbnachfolge. Sie erledigen alle Landwirtschaftliche Arbeiten selbst und ihre konzeptionelle Grundlage ist die Kontinuität des

Betriebes durch Management von Intensität und Produktionsgröße im Bereich des Populationsdurchschnittes. Erbhalter erreichen dies mit einer Kombination verschiedener Produktionsrichtungen.

Die Verbindung zwischen den Analysemethoden wurde in der qualitativen (Kapazität) und quantitativen (Produktivität) Spezifikation der Begriffe “Ehrgeiz” und “Grundlagen” der Betriebsführung entdeckt. Es existieren unterschiedliche Optimierungsniveaus für eine Produktion (je nach Ambition) und Unterschiede in der Koordination des Betriebes auf vergleichbarem Produktionsniveau. Damit kann für jeden Bewirtschaftungsstil eine spezifische Optimierung der Bewirtschaftung abgeleitet werden.

Herdhalter verbinden ihre Ambitionen im Bereich Partizipation bzw. Autonomie mit der Entwicklung eines speziellen Produktionsbereiches. Die Tiere (Schweine) und die Ökonomie von Investitionen stehen für sie im Mittelpunkt. Folglich findet man in dieser Gruppe oft alte Anlagen und Ställe. Diese Landwirte zeigen ein großes Interesse an der biologischen Landwirtschaft.

Wechsler verbinden ihre Ambitionen im Bereich der Partizipation bzw. Autonomie mit der Suche nach Alternativen zur Sicherung der familiären Zukunft. Diese Zukunft ist nicht in der Schweineproduktion und in einigen Fällen nicht in der Landwirtschaft gelegen. Sie verlagern Ihr Interesse bereits auf andere landwirtschaftliche Aktivitäten oder sogar auf Aktivitäten außerhalb der Landwirtschaft. Wechsler haben kein Interesse an Investitionen in der Schweineproduktion. Dank ihrer Erfahrung erreichen einige Wechsler dennoch ein hohes Produktionsniveau.

Die Auswirkung dieser Studie

Auf der Grundlage dieser Studie kann man schlussfolgern, dass Schweine je nach Betriebsführungsstil eine unterschiedliche Wertschätzung durch Landwirte erfahren. Dies können Werte wie Respekt des Lebewesens, emotionale Werte, kulturhistorische Zuchtwerte oder die ökonomische Eignung der Tiere sein. Die Studie belegt, dass eben nicht nur das ökonomische Ergebnis die Ziele der Farmer und deren Bewirtschaftungskonzepte bestimmen, sondern im Gegenteil Landwirte eine Optimierung der ökonomischen Ergebnisse auf der Grundlage eigener Ziele und Bewirtschaftungskonzepte anstreben können.

Untersuchungen zu der Ambitionen der Landwirte und den Grundlagen ihrer Produktion führten zur Aufdeckung von Unternehmen mit deutlichen Unterschieden. Diese erkannten Unterschiede erlauben eine Klassifikation von unterschiedlichen Betriebsführungsstilen. Dies eröffnet Möglichkeiten für eine Optimierung der Bewirtschaftungsstile.

Diese Studie ist ein Beitrag zum Verständnis technischer, sozialer und ökonomischer Aspekte der physischen Veränderungen in der Schweineproduktion und der sich verändernden Marktbeziehungen. Durch unterschiedliche Betriebsführungsstile differenzieren sich Betriebe in jedem Bewirtschaftungsaspekt: in der Produktivität, in der Zielsetzung der Betriebe, in den Bewirtschaftungsstrategien, und in den Möglichkeiten der Produktionsoptimierung. Folglich haben Betriebsführungsstile unterschiedliche Effekte auf das soziale und physische Umfeld und das Umfeld hat unterschiedliche Effekte auf unterschiedliche Betriebsführungsstile. Die Vielfalt von Betriebsführungsstilen in einem variabler sozialen und physischen Umfeld scheint mit der Biodiversität in der Natur vergleichbar zu sein.

Regierungsverordnungen, Angebote von Banken, Industrie oder Bildungsträgern, Empfehlungen von Forschungs- und Beratungsdiensten sowie Verbandsaktivitäten werden von Landwirten unterschiedlicher Betriebsführungsstile unterschiedlich wahrgenommen und führen folglich zu unterschiedlichen Reaktionen. Die Ergebnisse dieser Studie sind eine Einladung an Akteure im landwirtschaftlichem Umfeld (wie Industrie, Banken, Regierung, Forschungseinrichtungen und Verbände), Unterschiede in der Betriebsführung der Landwirte zu respektieren sowohl im Umgang mit den Landwirten berücksichtigen wie auch bei der Gestaltung von Problemlösungen. Die Berücksichtigung unterschiedlicher Betriebsführungsstile wird die Effekte von Interventionen in der Landwirtschaft besser kalkulier- und führbar machen. Auf der Grundlage dieser Forschungsergebnisse lassen sich sogar Effekte von Interventionen aus dem landwirtschaftlichen Umfeld auf Betriebe mit unterschiedlichem Führungsstil bewerten und sogar vorhersagen.

Wissenschaftler, die in Forschung über technische oder soziale Aspekte der Schweineproduktion involviert sind, sollten sich bewusst machen, dass es verschiedene Betriebsführungsstile gibt und das diese auf verschiedenen Denkweisen beruhen. Die Berücksichtigung unterschiedlicher Betriebsführungsstile erfordert unterschiedliche Forschungsansätze und differenzierte Experimente, die den unterschiedlichen Denkweisen angepasst sind. Wichtig ist aber auch, dass die Interpretation der Forschungsergebnisse je nach Betriebsführungsstil verschieden sein sollte, weil diese Forschungsergebnisse je nach Betrachtung der Landwirte unterschiedliche Werte reflektieren.

Landwirte sollten gegenüber anderen eine offener Haltung formen der Betriebsführung einnehmen. Landwirte sind von der Überlegenheit ihres Betriebsführungsstiles überzeugt. Diese Überzeugung verstärkt sich sogar, wenn Landwirte die Führung von Betrieben aus anderen Regionen beurteilen. Die meisten Schweinehalter aus dem Untersuchungsgebiet (Twente und Achterhoek) glauben, dass sie im Vergleich zu Landwirten aus Südholland besser wirtschaften.

Schafft man in der Gesellschaft mehr Verständnis für die existierende Unterschiede in der Führung landwirtschaftlicher Betriebe, so stimuliert man möglicherweise auch eine öffentliche Diskussion über unterschiedliche Praktiken in der Schweineproduktion (und in der Landwirtschaft generell). Dies würde vielen Landwirten helfen, einen Ausweg aus der gesellschaftlichen Isolation zu finden. Die Diskussion deshalb nicht auf den “besten” Betriebsführungsstiel ausgerichtet sein (der nicht existiert), sondern auf die Erhaltung und Erweiterung verschiedener Betriebsführungsstile.

Résumé

L'objectif de cette étude est de trouver de nouvelles perspectives de développement en matière de production porcine dans les régions de *Twente* et de *Achterhoek*. Les résultats économiques et l'analyse du discours des producteurs porcins ont été essentiels dans la mise en œuvre de l'étude. A cet effet, nous avons procédé à l'analyse des processus de production et de la diversité des installations (étables, équipements, réseaux et indicateurs). La distinction entre les différents producteurs s'est basée sur le concept de style d'exploitant agricole (s*tyles of farming)*.

Afin d'analyser la diversité des différents types de producteurs, une méthode d'analyse informatique a été mise au point. Elle a permis de classifier les différentes structures selon les dimensions d'Echelle et d'Intensité de la production (équivalant à la Productivité de l'exploitation). Cette méthode a permis de quantifier les différences entre les styles de producteurs rencontrés.

Cinq styles de producteurs porcins ont été identifiés dans la zone étudiée : l'entrepreneur, le producteur qualifié, l'intendant, le producteur attentionné et le producteur diversifié. Ces attributs sont bien entendusmétaphoriques. Ils reflètent les aptitudes spécifiques à chacun des types d'exploitants.

Chacun des types d'exploitation est caractérisé par une combinaison d'un grand nombre de caractéristiques qui entrent en cohérence les unes par rapport aux autres. Chaque modèle résulte d'un assortiment logique de pratiques, et se différencie des autres de part une logique d'ensemble distincte. Le concept de « logique » est ici divisé en trois autres notions : le « fondement », l'« ambition » et la « rationalité ».

Les concepts de « fondement », d'« ambition » et de « rationalité » sont plus longuement exposés dans le corps de la thèse. Le « fondement » est à la base de la principale capacité du style d'exploitant : les objectifs du producteur vis-à-vis du marché et de l'orientation technologique de son exploitation. L'« ambition » et la « rationalité » sont évaluées qualitativement (du point de vue de la capacité) et quantitativement (du point de vue de la productivité).

La Méthodologie de Recherche
Les travaux de recherche sont le résultat de deux études ; une première étude a été menée en 1996, et une seconde étude est actuellement en cours. Différentes méthodes ont été mobilisées pour identifier la gamme des différents styles d'exploitants. Dans l'étude initiale, une méthode subjective a été utilisée. Les structures d'exploitation porcine furent alors catégorisées en styles différents à partir d'entretiens non directifs. Cette classification était alors basée sur l'analyse des contrastes relatifs notamment aux objectifs des exploitants et des motifs invoqués dans l'orientation de leur atelier de production porcine; ces différences sont précisément basées sur leurs choix technologiques et leurs stratégies commerciales. Un premier rapport est sorti de cette étude initiale (Commandeur 1998).

Dans le cadre des travaux de recherche en cours, une méthode d'analyse par ordinateur – plus objective – a été développée. Des données ont été collectées lors d'une enquête menée en 1998 sur les producteurs porcins dans les régions de Twente et de Achterhoek. Les items abordées dans le questionnaire ont été identifiés préalablement dans l'étude initiale. Grâce à cette méthode, différents styles d'exploitants ont pu être identifiés; les distinctions portent sur des différences de Productivité, d'Intensité de la production et d'Echelle de structure d'exploitation.

Un des éléments majeurs, souligné à maintes reprises dans la littérature, est que la productivité est souvent discutée quant au rôle implicite du capital – cela a le mérite de mettre en évidence le caractère équivoque de la valeur de la production. Nous avons supposé dans cette étude que la valeur de la production pouvait varier selon les styles de producteurs. Productivité, Intensité et Echelle ont donc été définis comme autant de procès de transformation d'ordre « physique » (c'est-à-dire non monétaire).

Une comparaison entre les méthodes de classification a démontré une similarité dans des résultats obtenus. Il est important cependant de prêter une attention particulière aux méthodes de classification, car confondre les méthodes donne des résultats inconsistants. Ces méthodes comportent chacune des avantages et des inconvénients. Dans les deux cas, des informations supplémentaires ont été nécessaires à une meilleure mise en forme de la classification.

La méthode subjective, basée sur les entretiens non directifs, est plus flexible et donc plus appropriée à une recherche à vocation exploratoire. L'ensemble des thèmes a dès lors pu être abordés progressivement. L'analyse informatique des paramètres est plus rigide. Les paramètres sont alors supposés recouvrir l'ensemble des pratiques de production, et les données doivent être analysées de façon globale. L'avantage de cette méthode est qu'elle permet une estimation quantitative des différences entre styles de producteurs par rapport à des critères tels que la Productivité, l'Intensité et l'Echelle.

La typologie des styles d'exploitants a été mise au jour via différents critères discriminants. Ces critères sont relatifs aux objectifs de l'exploitant, à la perception que celui-ci a de son métier et de ce que doivent recouvrir ses pratiques de production. Les résultats des deux méthodologies choisies sont comparables. Les différences d'objectifs et de perception chez ces exploitants sont perceptibles qualitativement – on y décèle des différences dans l'Aptitude, l'orientation technologique et la stratégie commerciale – et quantitativement – les critères de Productivité, d'Intensité et d'Echelle sont discriminants par rapport aux populations moyennes.

Fondement, Ambition et Rationalité

Le fondement des pratiques est défini par quatre domaines. Ces quatre domaines participent de l'orientation technologique et commerciale des exploitants. L'orientation technologique comporte un domaine concernant la production animale et un autre domaine concernant la maintenance et le soin apporté aux animaux. L'orientation commerciale comporte un domaine concernant l'organisation du travail, des relations familiales et de la transmission de l'exploitation, et un autre domaine concernant les relations commerciales et l'inscription de l'exploitation sur le marché.

Le positionnement d'un style vis-à-vis de ces domaines nous donne une idée des objectifs et de la coordination des pratiques. Cependant, l'ensemble des activités peut se déployer sur les quatre domaines. Le fondement d'un style d'exploitant repose une aptitude (ou capacité) qui lui est spécifique. L'attribut donné à chacun des styles est métaphorique. Chaque style a un fondement propre. Dans l'étude initiale mais aussi dans l'étude en cours, les capacités suivantes ont été repérées:

- Le modèle de l'entrepreneur (e*ntrepreneurship*) est fondé dans le domaine du commerce et des relations de marché. C'est principalement la capacité à utiliser les indicateurs externes d'exploitation et les mesures universelles comme des outils pour le développement de l'exploitation et de l'efficacité du travail.
- Le modèle de l'exploitant qualifié (*craftmanship*) est fondé dans le domaine de la production. C'est la capacité à utiliser des indicateurs internes d'exploitation comme des directives normatives permettant de structurer plus efficacement le travail et la production.
- Le modèle de l'exploitant héritier (*inheritorship*) est fondé dans deux domaines intimement liés : le domaine de l'organisation du travail et de la transmission de l'exploitation, et le domaine de la maintenance et du soin donné aux animaux. Ce terme désigne la capacité à s'identifier soi-même comme exploitant agricole en tant que bénéficiaire d'un héritage agricole, et de fonder une famille à partir de cet héritage.
- Le modèle du producteur intendant (*stewardship*) est fondé dans l'ensemble des quatre domaines. Un accent cependant est mis sur le domaine de l'organisation du travail et de la transmission de l'exploitation. Il reflète une tendance de la part des agriculteurs de baser leur identité et leur satisfaction – et celle de leur famille – sur la perpétuation d'un style de vie hérité. Le métier d'agriculteur est alors perçu comme une activité génératrice de revenus fondée sur le travail familial.
- Le modèle de l'exploitant soucieux de la qualité de vie de son élevage (stockmanship) est basé dans le domaine de la maintenance et du soin donné aux animaux. Nous l'appellerons le producteur attentionné. Il attache un intérêt particulier à son logement, à l'élevage et aux soins apportés aux animaux, et conserve autant que possible un taux d'investissement relativement faible.
- Le modèle du producteur « sensible » (*tendership*) est fondé dans les deux domaines du soin, et plus particulièrement dans le domaine de la maintenance et de l'attention donnée aux animaux. C'est la capacité de prévoir les besoins et les exigences des animaux, de vivre de telle sorte que les particularités de chacune des espèces soient prises en compte. Chacune de ces exigences est autant de directives pour le développement d'un système entreprise intégrant l'alimentation, les bâtiments d'élevage et le soin apporté aux animaux.
- Le modèle du producteur diversifié (*shiftership*); c'est un terme général permettant de regrouper l'ensemble des autres producteurs dont l'activité principale n'est plus la production porcine. Ils ont diversifié leur activité agricole ou bien exercent même une autre activité par ailleurs.

Dans l'étude en cours, trois niveaux d'ambition ont été définis. Ces niveaux sont liés à la représentation du temps passé dans la réalisation de chacun des objectifs de l'exploitation.

(1) Le niveau d'Ambition dans la sphère de la compétition: ces agriculteurs se représentent la production et le profit comme l'objectif le plus important. Ils s'appuient sur des calculs de risque et sont assurés que le développement de leur exploitation leur garantira des résultats positifs. Ils sont à la recherche de nouveaux défis.

(2) Le niveau d'Ambition dans la sphère de la participation: ces exploitants considèrent que la continuité entre la famille et l'exploitation agricole est l'une des plus grandes priorités. Ils

prennent leur décision en fonction des perspectives conjoncturelles régionales. Ils se montrent pragmatiques dans la gestion des pratiques agraires.

(3) Le niveau d'Ambition dans la sphère de l'autonomie: ces exploitants se représentent le métier d'agriculteur comme une source d'indépendance. Ils recherchent la sécurité dans les traditions et dans la conservation des ressources disponibles.

Cinq styles d'exploitants ont été classifiés dans l'étude en cours: deux dans la sphère de la compétition (entrepreneurs et exploitants qualifiés) et trois dans la sphère de l'autonomie et de la participation (Producteurs intendants, producteurs attentionnés et producteurs diversifiés).

La sphère de la participation et de l'autonomie ne peut pas être divisée car le nombre d'exploitations agricoles dont la Productivité est faible est relativement restreint. Environ 20% des exploitants de la zone d'étude n'ont participé à aucun des programmes d'accompagnement de gestion d'entreprise et n'ont donc pas pu être pris en compte dans la méthode de classification. Ces exploitations étaient en grande partie des fermes extensives de petite taille. L'exclusion de ces petites structures d'exploitations crée un biais dans la constitution des données et dans les résultats obtenus. Par conséquent, le niveau d'autonomie ne peut être séparé du niveau de participation.

La productivité de la population moyenne n'est pas seulement représentée par un point ; c'est une courbe reflétant les combinaisons entre l'Intensité et l'Echelle. De plus, la Capacité est représentée par une courbe qui reflète les combinaisons entre les orientations technologiques et commerciales. Pour chacun des niveaux d'ambition, les styles de producteurs peuvent être positionnés différemment sur les courbes. Ce positionnement témoigne de la connexion entre l'ambition et le fondement du style d'exploitant considéré. Quantitativement, cette connexion est appelée la « rationalité ». Dans l'étude, cette notion a été estimée qualitativement (Capacité/Aptitude) et quantitativement (Productivité) par rapport à la population moyenne.

Concernant le niveau d'ambition de type « compétition », les entrepreneurs et les producteurs qualifiés (*stockmen*) ont des positions opposées. L'ambition des entrepreneurs est liée au fondement relatif au marché et aux relations commerciales. Par conséquent, le caractère rationnel de ce style d'exploitant montre que l'échelle est relativement plus importante que l'intensité. L'ambition des producteurs qualifiés est liée au fondement relatif au domaine de la Productivité. Leur rationalité montre donc que l'intensité est relativement plus importante que l'échelle.

Concernant le niveau d'ambition de type « participation et autonomie », les producteurs intendants (*stewards*), les producteurs attentionnés (*stockmen*) et les producteurs diversifiés (*shifters*) occupent des positions différentes sur la courbe de Productivité. Les producteurs intendants ont une exploitation familiale typique et leur ambition de participation sont liée aux fondements relatifs à l'héritage et à la transmission de l'exploitation. Ils font tout le travail eux-mêmes, et leur rationalité s'exprime dans leur sensibilité au maintien d'un certain niveau de continuité entre l'exploitation et la maisonnée. Cette caractéristique est perceptible notamment dans le relatif équilibre entre l'Intensité et l'Echelle, toutes deux proches de la population moyenne.

Les producteurs attentionnés (*stockmen*) ont une ambition de participation et d'autonomie liée au fondement relatif à la maintenance et au soin donné aux animaux. Ils sont particulièrement impliqués dans le soin donné aux bêtes et dans la gestion des investissements financiers. Par conséquent, beaucoup d'entre eux possèdent des porcheries parmi les plus vieilles – certaines truies sont même parfois attachées par de simples sangles. Ces producteurs sont à la fois les plus susceptibles de convertir leur exploitation à l'agriculture biologique.

L'ambition de participation et d'autonomie des producteurs diversifiés (*shifters*) est liée au fondement relatif à la recherche de nouvelles perspectives futures pour la famille. Pour eux, l'avenir ne réside pas forcément dans la production porcine. Ils prêtent plus d'attention à d'autres activités sur la ferme ou même en dehors de la ferme. Ils ne souhaitent pas investir plus encore dans la production porcine (échelle), mais, pour certains, leur savoir faire leur permet d'atteindre des bons niveaux de productivité (intensité).

Il existe un lien entre les différentes méthodes d'analyse. Ce lien relatif aux niveaux d'ambition et de rationalité des producteurs porcins est à la fois de nature qualitative (Capacité/Aptitude) et quantitative (Productivité). Différents niveaux d'optimisation de la Productivité (dus aux différences d'ambition) ont été rencontrés. On note aussi des différences dans la coordination des pratiques de production (dues aux différences de rationalités) pour des niveaux de productivité similaires. Pour chaque type de producteur, une optimisation des pratiques peut être spécifiée.

L'impact de l'Etude

Cette étude nous permet de conclure que la valeur du porc diffère selon les styles de producteurs. Nous référons ici à différents types de valeurs telles que le respect, l'attachement, les pratiques culturelles ou encore l'usage économique. Cette étude montre que la valeur économique ne joue pas à elle seule sur l'ambition et la rationalité – même si cette option est possible dans le cas, par exemple, de l'ambition de type « maximisation du profit ». Au contraire, les producteurs porcins peuvent chercher à optimiser économiquement leur exploitation selon leurs propres types d'ambition et de rationalité.

Parmi les différents types d'ambition et de rationalité, des modèles cohérents ont été repérés. Cela a permis de catégoriser l'ensemble des producteurs en un nombre fini de styles d'exploitants, car la logique veut que le nombre de modèles trouvés ne peut être que restreint. Les opportunités d'optimisation des pratiques selon le style d'exploitant sont liées au fait qu'un nombre limité de modèles rationnels, dont la coordination entre la production et le marché est spécifique, peuvent être précisé.

Cette étude contribue à la compréhension des problématiques techniques, sociales et économiques, relatives à la diversité des structures de production porcine, aux transformations dont elles font l'expérience, et à leurs relations au marché. Les styles d'exploitants diffèrent selon : les niveaux de Productivité, les objectifs principaux des exploitants, leurs stratégies, et leurs possibilités d'optimiser la production. Chaque style a donc un impact spécifique sur l'environnement social et physique, et, réciproquement, l'environnement a une influence sur le style d'exploitant. La biodiversité (et notamment la qualité des habitats) est partie intégrante du système d'interrelations.

La législation, les prêts bancaires, les rapports avec les industries, l'éducation, la recherche et le conseil agricole, et la présence active des groupes d'intérêts sont autant de sujets de discussion sur lesquels chacun des styles adoptera une position particulière. Cette étude est une invitation à prendre en compte la grande diversité des styles d'exploitants par rapport à leur environnement (industrie, banques, gouvernement, instituts de recherche, groupes d'intérêt) afin de mieux comprendre et prendre en compte leurs problèmes. L'appréciation de cette diversité permet d'anticiper les transformations susceptibles de se produire sur les exploitations et d'ajuster au mieux les interventions. Grâce à cette étude, les interventions portant sur l'environnement global de l'exploitation pourront être évaluées au regard de la diversité des styles d'exploitants ; l'impact de ces interventions sera alors plus finement prévisible et appréhensif.

Les chercheurs en sciences sociales dont les thèmes de prédilection sont relatifs à la production porcine (mais aussi les chercheurs impliqués dans d'autres productions) doivent être conscients de la grande diversité des styles d'exploitants. Leur logique de production est différente. La mise au jour de cette diversité ouvre de nouvelles questions de recherche et d'expérimentation.

Les producteurs eux-mêmes devraient se montrer plus ouverts à cette diversité. Chacun des styles a le sentiment de pratiquer excellemment son métier, d'autant plus dans notre zone d'étude (*Twente* et le *Achterhoek*). Ils se considèrent plus performants que leurs semblables du sud des Pays Bas.

Accorder plus de marge de manœuvre à la diversité des exploitations peut stimuler un débat public sur les pratiques de production. Les producteurs porcins seraient alors plus soutenus qu'ils ne le sont, et pourraient ainsi revaloriser leur image auprès du reste de la société. La discussion ne doit donc pas se centrer sur le « meilleur » modèle d'exploitant (ce qui au demeurant n'existe pas), mais plutôt sur la perpétuation et le renforcement de cette diversité.

Supplements

Supplement Table 4a Calculation of ambition (*a*) and rationale (*j*) in terms of Productivity, Intensity and Scale of pig producers in Twente and The Achterhoek. Farms were classified in high (competition) and low (participation and autonomy) ambition, based on values of a component from principal component factor analysis of parameters, which were selected from the 1998 questionnaire.[1]

Variable[2]		*Ambition sphere high*	*Ambition sphere low*	*All*[3]
N		37	33	N
Mean (μ)	N	*μ*	*μ*	*μ*
[log Y/L] log10 (1997 Productivity)	70	log-high 1.866	log-low 1.644	LogQ 1.750
[Y/L] 1997 Productivity calculated from log-transform.	70	high 73.5	low 44.1	Q 56.2
[log Y/N] log10 (1997 Intensity)	70	log-high 1.359	log-low 1.321	LogQ 1.341
[Y/N] 1997 Intensity calculated from log-transformation	70	high 22.9	low 20.9	Q 21.9
[log N/L] log10 (1998 Scale)	82	log-high .507	log-low .323	LogQ .409
[N/L] 1998 Scale calculated from log-transformation	82	high 3.21	low 2.10	Q 2.56
log (Ambition for Productivity in pigs / working hr/week)’	70	log-high’ 1.821	log-low’ 1.691	LogQ’ 1.750
(Ambition for Productivity in pigs / working hr/week)’	70	high’ 66.2	low’ 49.1	Q’ 56.2
Ambition: difference in Productivity from average	70	high – high’ 7.2	low – low’ -5.0	
log (Ambition for Intensity in feeder pigs / sow / year)’	70	log-high’ 1.330	log-low’ 1.350	LogQ’ 1.341
(Ambition for Intensity in feeder pigs / sow / year)’	70	high’ 21.4	low’ 22.4	Q’ 21.9
Ambition: difference in Intensity from average	70	high – high’ 1.5	low – low’ -1.5	
log (Ambition for Scale in sows / working hour / week)’	70	log-high’ .491	log-low’ .341	LogQ’ .409
(Ambition for Scale sows / working hour / week)’	70	high’ 3.10	low’ 2.19	Q’ 2.56
Ambition: difference in Scale from average	70	high – high’ .11	low – low’ -.09	
Rationale: difference in Productivity from average	70	high’ – Q 10.0	low’ – Q -7.10	Q - Q .0
Rationale: difference in Intensity from average	70	high’ – Q -.5	low’ – Q .5	Q - Q .0
Rationale: difference in Scale from average	70	high’ – Q .54	low’ – Q -.37	Q - Q .0

[1] See also: Figure 4.3

[2] High: ambition level of competition; only farms with positive scores on ambition are included. Low: ambition level of participation and autonomy; only farms with negative values for ambition are included. Addition of ’-sign refers to projection on population average.

[3] Q: All (population average)

Supplement Table 4b Calculation of ambition (*a*) and rationale (*j*) in terms of Productivity, Intensity and Scale of pig producers in Twente and The Achterhoek. Farms were classified in styles of farming. Data based on principal component factor analysis of parameters selected from the 1998 questionnaire.[1]

Variable[2]		*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N		19	10	13	12	16	N
Mean (μ)	N	*μ*	*μ*	*μ*	*μ*	*μ*	*μ*
[log Y/L] Log10 (1997 Productivity)	70	LogE 1.931	LogC 1.833	LogW 1.688	LogK 1.725	LogF 1.603	LogQ 1.750
[Y/L] 1997 Productivity calculated from log-transform.	70	E 85.3	C 68.1	W 48.8	K 53.1	F 40.1	Q 56.2
[log Y/N] Log10 (1997 Intensity)	70	LogE 1.356	LogC 1.368	LogW 1.329	LogK 1.313	LogF 1.337	LogQ 1.341
[Y/N] 1997 Intensity calculated from log-transform.	70	E 22.7	C 23.3	W 21.3	K 20.6	F 21.7	Q 21.9
[log N/L] log10 (1998 Scale)	82	LogE .575	LogC .465	LogW .359	LogK .412	LogF .266	LogQ .409
[N/L] 1998 Scale calculated from log-transformation	82	E 3.76	C 2.92	W 2.29	K 2.58	F 1.85	Q 2.56
Log (Ambition for Productivity in pigs / working hr / week)’	70	LogE’ 1.877	LogC’ 1.784	LogW’ 1.716	LogK’ 1.764	LogF’ 1.634	LogQ’ 1.75
(Ambition for Productivity in pigs / working hr / week)’	70	E’ 75.3	C’ 60.8	W’ 52.0	K’ 58.1	F’ 43.1	Q’ 56.2
Ambition: difference in Productivity from average	70	E - E’ 10.0	C – C’ 7.3	W – W’ -3.2	K – K’ -5.0	F – F’ -3.0	
log (Ambition for Intensity in feeder pigs / sow / year)’	70	LogE’ 1.321	LogC’ 1.336	LogW’ 1.347	LogK’ 1.338	LogF’ 1.358	LogQ’ 1.341
(Ambition for Intensity in feeder pigs / sow / year)’	70	E’ 20.9	C’ 21.7	W’ 22.2	K’ 21.8	F’ 22.8	Q’ 21.9
Ambition: difference in Intensity from average	70	E – E’ 1.8	C – C’ 1.6	W – W’ -.9	K – K’ -1.2	F – F’ -1.1	
Log (Ambition for Scale in sows / working hour / week)’	70	LogE’ .556	LogC’ .448	LogW’ .369	LogK’ .426	LogF’ .276	LogQ’ .409
(Ambition for Scale sows / working hour / week)’	70	E’ 3.60	C’ 2.81	W’ 2.34	K’ 2.76	F’ 1.98	Q’ 2.56
Ambition: difference in Scale from average	70	E – E’ .16	C – C’ .11	W – W’ -.05	K – K’ -.18	F – F’ -.13	
Rationale: difference in Productivity from average	70	E’ – Q 18.6	C’ – Q 4.6	W’ – Q -4.2	K’ – Q 1.9	F’ – Q -13.1	Q - Q .0
Rationale: difference in Intensity from average	70	E’ – Q -1.0	C’ – Q -.2	W’ – Q .3	K’ – Q -.1	F’ – Q .9	Q - Q .0
Rationale: difference in Scale from average	70	E’ – Q	C’ – Q .25	W’ – Q -.22	K’ – Q .20	F’ – Q -.58	Q - Q .0

		1.04					

[1] See also: Figure 4.5 and 4.6

[2] <E>: Entrepreneur, <C>: Craftsman, <W>: Steward, <K>: Stockman, <F>: Shifter, <Q>: All (population average). Addition of ’-sign refers to projection on population average.

Supplement Table 4c Calculation of ambition (*a*) and rationale (*j*) in terms of Productivity, Intensity and Scale at high (competition) and low (participation and autonomy) levels of ambition of pig producers in Twente and The Achterhoek. Farms were classified in styles of farming. Data based on principal component factor analysis of parameters selected from 1998 questionnaire.[1]

Variable[2]		<E>	<C>	<W>	<K>	<F>
N		19	10	13	12	16
mean (μ)	N	μ	μ	μ	μ	μ
Log (Ambition for Productivity in pigs / working hr/week)’	70	logE’’ 1.908	logC’’ 1.835	logW’’ 1.662	logK’’ 1.710	LogF’’ 1.592
(Ambition for Productivity in pigs / working hr / week)’	70	E’’ 80.9	C’’ 68.4	W’’ 45.9	K’’ 51.3	F’’ 39.1
Ambition: difference in Productivity from sphere av.	70	E – E’’ 4.4	C – C’’ -.3	W – W’’ 2.9	K – K’’ 1.8	F – F’’ 1.0
Log (Ambition for Intensity in feeder pigs / sow / year)’	70	logE’’ 1.344	logC’’ 1.369	logW’’ 1.315	logK’’ 1.305	LogF’’ 1.330
(Ambition for Intensity in feeder pigs / sow / year)’	70	E’’ 22.1	C’’ 23.4	W’’ 20.7	K’’ 20.1	F’’ 21.4
Ambition: difference in Intensity from sphere av.	70	E – E’’ .6	C – C’’ -.1	W – W’’ .6	K – K’’ .5	F – F’ .3
Log (Ambition for Scale in sows / working hour / week)’	70	logE’’’ .564	logC’’ .466	logW’’ .347	logK’’ .405	LogF’’ .262
(Ambition for Scale sows / working hour / week)’	70	E’’ 3.66	C’’ 2.92	W’’ 2.22	K’’ 2.54	F’’ 1.83
Ambition: difference in Scale from sphere average	70	E – E’’ .10	C – C’’ .0	W – W’’ .07	K – K’’ .04	F – F’’ .02
Rationale: difference in Productivity from sphere av.	70	E’’ – high 7.2	C’’ – high 5.1	W’’ – low 1.8	K’’ – low 7.2	F’’ – low -5.0
Rationale: difference in Intensity from sphere av.	70	E’’ – high -.8	C’’ – high .5	W’’ – low -.2	K’’ – low -.8	F’’ – low .5
Rationale: difference in Scale from sphere average	70	E’’ – high .45	C’’ – high -.29	W’’ – low .12	K’’ – low .44	F’’- low -.17

[1] See also: Figure 4.7 and Supplement Tables 4a and 4b.

[2] <E>: Entrepreneur, <C>: Craftsman, <W>: Steward, <K>: Stockman, <F>: Shifter. Addition of ‘‘-sign refers to projection on high (competition) or low (participation and autonomy) ambition levels.

5. Processes

5a: Pig production at farm level
5b: Pig production in temporal and regional perspective
5c: Perceptions of farming practices
5d: Outlook on current prices and policies

6. Constructions

6a: Technical constructions of feeder pig production
6b: Indicators for pig production management
6c: Attitudes towards the indicators

Values of the parameters from a questionnaire in 1998 of pig producers in Twente and The Achterhoek for each style of farming. Data are either expressed as the sub-population mean (μ) and standard deviation (σ) for each style of farming, or as the number of farms in the sub-population (n) that answered positively to a certain question. For each parameter information is added if there was a significant ($p < .1$ to $p < .005$) correlation between the values for that parameter and the styles of farming. The headings of the sections in the tables coincide with the sections in the text.
Abbreviations:
<E> Entrepreneur
<C> Craftsman
<W> Steward
<K> Stockman
<F> Shifter
<U> Unclassified
<Q> All; Population average (only in Supplement Table 6b)

Supplement Table Chapter 5

Supplement Table 5a: Pig production at farm level								
Variable[1]			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
	[2]							
Section 5.1.1 Farm size								
[N] No. of sows present at the time of the interview [3]	*μ* *σ* *r*	82	310 111 .636**	253 54 $.218^{+}$	134 72 -.251*	153 66	95 22 -.476**	223 198
[logN] log10 (No. of sows present at the time of the interview)	*μ* *σ* *r*	82	3.89 1.04 .619**	2.40 .11 .288*	2.07 .23 -.271*	2.15 .17	1.97 .11 -.541**	2.24 .30
Section 5.1.2 Other farm activities								
[04a1] Sow farm including rearing of maiden sows	*n* *r*	11	3	2	0	1	2	3
[04 a2] Sow farm including (part of the) fattening pigs	*n* *r*	33	5	5	4	5	8	6
[04a3m] Mixed farm	*n* *r*	55	11	5	10	7	14 .236*	8
[04a3c] Mixed farm with (dairy) cattle	*n* *r*	41	8	3	8	6	11	5
[04a3s] Mixed farm with sheep	*n* *r*	14	2	2	3	4	2	1
[04a3o] Mixed farm with other livestock	*n* *r*	12	2	2	2	3	2	1
[04a3a] Mixed farm with arable production	*n* *r*	16	5	4 $.225^{+}$	1	1	2	3
[04btp] More than 1 farm location	*n* *r*	32	9	6	3	4	2 -.241*	8
[04c] Are there non-agricultural branches on the farm? (Yes)	*n* *r*	2	0	1	0	1	0	0
[05a] No. of ha of land in use by the farm	*μ* *σ* *r*	82	14 14	10 7	16 18	10 8	17 5	13 13
[05b] Any land (also) in use for sow feed / bedding? (Yes)	*n* *r*	12	0	2	5	2	1	2
Section 5.1.3 Formal farm organisation and succession								
[02xp] Personal enterprise of one male farmer	*n* *r*	10	3	0	1	5 .391**	0	1
[02xmv] Husband & wife partnership agreement	*n* *r*	37	11	3	6	5	9	3
[02xfs] Other family partnership agreement (parent(s) / child)	*n* *r*	28	4	4	5	2	7	6
[02xo] Other formal organisation (Inc, Partnership firm, etc.)	*n* *r*	6	1	3	1	0	0	1
[02…] Missing values formal farm organisation	*n* *r*	1	0	0	0	0	0	1
ΣN		82	19	10	13	12	16	12
[02x21 Age of eldest partner	*μ* *σ* *r*	82	49 10	55 10	51 12	47 9	56 14 $.224^{+}$	54 12
[02x22] Age of youngest partner	*μ* *σ* *r*	82	39 6 $.234^{+}$	32 9	33 9	36 10	34 10	37 9
[03x] Is there a farm successor known / present? (Yes)	*n* *r*	34	4 -.236*	6	7	2 $-.217^{+}$	9	6

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[06a0] Are there more than 1 families heading the farm? (Yes)	*n* *r*	10	3	1	2	0	3	1
[0406] No. of sows per family	*μ* *σ* *r*	82	268 124 .542**	237 55 .244*	118 52 -.259*	153 66	69 29 -454**	217 124
0406l] Log10 (no. of sows per family)	*μ* *σ* *r*	82	2.39 .18 .525**	2.36 .11 .307**	2.03 .21 -.261*	2.15 .17	1.91 .18 -.544**	2.27 .27
Section 5.1.4 Availability of labour								
[06a1] Husband in 1st family: no. of working hours	*μ* *σ* *r*	82	61 16	63 23	60 13	55 11	56 11	60 8
[06a2] Wife in 1st family: no. of working hours	*μ* *σ* *r*	82	16 11	31 20 .350**	15 12	16 15	18 12	19 14
[06a3] Additional workers in the 1st family? (Yes)	*n* *r*	31	6	3	5	3	9	5
[06at] Additional 1st family: no. of working hours	*μ* *σ* *r*	82	11 19	9 19	7 11	5 10	23 29 .311**	24 36 .191$^+$
[06b1] Husband 2nd family: no. of working hours	*μ* *σ* *r*	82	8 21	7 22	5 17	0 0	6 13	4 14
[06b2] Wife 2nd family: no. of working hours	*μ* *σ* *r*	82	0 1	0 1	3 8 .229$^+$	0 0	2 5	0 0
[06a3] Additional workers in the 2nd family (Yes)	n r	1	0	0	0	0	1 .221$^+$	0
[06bt] Additional 2nd family: no. of working hours	*μ* *σ* *r*	82	2 9	0 0	0 0	0 0	1 5	0 0
[07a] Hired labour present? (Yes)	*n* *r*	28	10 .236*	5	1 -.268*	5	3	4
[07am] Hired labour: no. of men	*n* *r*	25	9 .210$^+$	4	1 -244*	5	3	3
[07av] Hired labour: no. of women	*n* *r*	7	2	3	0	0	0	2
[07at] Hired labour: no. of working hours	*μ* *σ* *r*	82	16 23	22 30 .247*	1 3 -.227$^+$	10 20	4 10	13 25
[08a1] Personnel selection: own contacts	*n* *r*	10	3	0	0	3	2	2
[08a2] Personnel selection: technical care service (STAB)	*n* *r*	16	5	3	2	3	2	1
[08a3] Personnel selection: target selection (by application)	*n* *r*	21	6	5 .210$^+$	3	3	2	2
[08ao] Personnel selection: other (e.g. school)	*n* *r*	8	3 .225$^+$	2	1	0	0	2
[09x1] % of all working hours spent in the pig production section	*μ* *σ* *r*	82	82 16 .272*	80 18	69 24	77 23	53 20 -.444**	78 20
[092f] Total no. of working hours spent in the pig production section	*μ* *σ* *r*	82	83 28 .306**	91 34 .323**	56 22 -.208$^+$	60 25	54 17 -.281*	91 50 2.36*

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[09x2fl] Log10 (total no. of working hours in pig production)	*μ* *σ* *r*	82	1.90 .15 .313**	1.93 .18 .277*	1.71 .18	1.74 .20	1.70 .18 -.264*	1.90 .24
[10a11] Off farm job: husband	*n* *r*	13	2	0	4	3	4	0
[10a12] Off-farm job: wife	*n* *r*	17	3	1	3	4	4	2
[10a14] Off-farm jobs: other family members	*n* *r*	2	0	0	1	0	1	0
[10c] Total no. of working hours in off-farm jobs	*μ* *σ* *r*	82	4 7	10 0 -.249*	12 13 .241*	11 15	7 8	7 13
Section 5.1.5 Income from pig production								
(in €) [11x] Average income / year (95/96/97) from the whole farm	*μ* *σ* *r*	76	26,000 9,000 .400**	21,000 10,000	16,000 5,000 -.283*	17,000 8,000	21,000 8,000	24,000 6,000
[12b] Estimated % income from pig production	*μ* *σ* *r*	82	88 16 .398**	88 18 .256*	68 21	65 30	53 18 -.429**	75 19
(in €) [12c] Estimated income / year from pig production	*μ* *σ* *r*	76	24,000 10,000 .501**	18,000 1,000	11,000 5,000 -.246*	11,000 6,000	12,000 9,000 $-.223^{+}$	18,000 9,000
(in €) [12d] Income / working hour of family members	*μ* *σ* *r*	65	6.81 3.01 .325**	5.57 2.68	4.35 1.78 -.251*	4.72 2.96	5.28 5.62	4.88 2.00
(in €) [ink_prod] Income / working hour (family) corrected for Productivity	*μ* *σ* *r*	64	5.41 2.71	5.21 2.41	4.12 1.91	5.46 2.66	5.51 3.71	n.a.[4]
Section 5.1.6 Labour division								
[16am] Husband: feeding of sows	*n* *r*	56	16 $.222^{+}$	7	6 $-.213^{+}$	7	11	9
[16bm] Husband: feeding of piglets	*n* *r*	55	11	7	8	8	10	11 .217*
[16cm] Husband: choice of boars	*n* *r*	64	14	8	12	10	12	8
[16dm] Husband: application of inseminations	*n* *r*	56	10	4 -.236*	11	9	13	9
[16em] Husband: assisting sows at farrowing	*n* *r*	61	14	7	11	9	13	7
[16fm] Husband: contacts with traders	*n* *r*	74	17	9	9 -.290*	11	16	12
[16gm] Husband: receiving of service people	*n* *r*	71	15	9	12	11	14	10
[16hm] Husband: technical management administration	*n* *r*	65	14	7	9	10	13	12
[16im] Husband: general farm administration	*n* *r*	54	12	7	9	5 $-.230^{+}$	13	8
[16jm] Husband: manure administration	*n* *r*	48	11	7	10	4 -.287*	12	4 -.212
[16km] Husband: tax administration	*n* *r*	24	3	2	6	1	8	4
[16lm] Husband: study club	*n* *r*	59	14	7	9	7	12	10
[16mm] Husband: technical courses	*n* *r*	56	14	6	7	7	12	10
[16nm] Husband: washing & cleaning	*n* *r*	41	8	6	8	6	9	4

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[16om] Husband: yard maintenance	*n* *r*	61	13	7	13 .281*	8	11	9
[16pm] Husband: building maintenance	*n* *r*	58	9 -.301*	6	12 $.232^{+}$	8	14 $.204^{+}$	9
[16bv] Wife: feeding of piglets	*n* *r*	18	4	3	4	2	3	2
[16cv] Wife: choice of boars	*n* *r*	2	1	0	0	0	1	0
[16dv] Wife: application of inseminations	*n* *r*	5	1	1	0	1	1	1
[16ev] Wife: assisting sows at farrowing	*n* *r*	15	3	1	3	2	3	3
[16fv] Wife: contacts with traders	*n* *r*	10	2	2	2	2	1	1
[16gv] Wife: receiving of service people	*n* *r*	18	5	3	4	2	2	2
[16hv] Wife: technical management administration	*n* *r*	20	3	5 $.210^{+}$	3	3	5	1
[16iv] Wife: general farm administration	*n* *r*	31	3	5	4	6	5	8
[16jv] Wife: manure administration	*n* *r*	15	3	3	2	2	3	2
[16kv] Wife: tax administration	*n* *r*	10	0	1	1	3	3	2
[16lv] Wife: study club	*n* *r*	7	3	0	0	0	2	2
[16mv] Wife: technical courses	*n* *r*	12	4	1	2	0	3	2
[16nv] Wife: washing & cleaning	*n* *r*	38	6	5	7	5	7	8
[16ov] Wife: yard maintenance	*n* *r*	24	6	4	4	3	5	2
[16pv] Wife: building maintenance	*n* *r*	8	2	2	1	0	3	0
[16az] Son: feeding of sows	*n* *r*	10	1	2	1	0	4 $.232^{+}$	2
[16bz] Son: feeding of piglets	*n* *r*	9	2	1	1	0	3	2
[16cz] Son: choice of boars	*n* *r*	6	3	2	0	0	0	1
[16dz] Son: application of inseminations	*n* *r*	6	3	1	0	0	0	2
[16ez] Son: assisting sows at farrowing	*n* *r*	11	1	3 .238*	0	1	3	3
[16fz] Son: contacts with traders	*n* *r*	12	3	2	2	0	2	3
[16gz] Son: receiving of service people	*n* *r*	10	2	2	1	0	2	3
[16hz] Son: technical management administration	*n* *r*	11	3	1	2	1	1	3
[16iz] Son: general farm administration	*n* *r*	5	2	1	1	0	0	1
[16jz] Son: manure administration	*n* *r*	5	2	1	0	1	1	0
[16kz] Son: tax administration	*n* *r*	6	2	1	0	2	0	1
[16lz] Son: study club	*n* *r*	10	3	2	2	0	0	3

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[16mz] Son: technical courses	*n* *r*	10	3	2	2	0	0	3
[16nz] Son: washing & cleaning	*n* *r*	4	1	2	0	0	1	0
[16oz] Son: yard maintenance	*n* *r*	11	3	1	0	0	4 .232^{+}	3 .213^{+}
[16pz] Son: building maintenance	*n* *r*	8	2	1	0	0	0	3
[16af] Various family members: feeding of sows	*n* *r*	2	1	0	0	0	0	1
[16bf] Various family members: feeding of piglets	*n* *r*	6	1	1	1	0	0	3
[16ff] Various family members: contacts with traders	*n* *r*	2	1	1	0	0	0	0
[16if] Various family members: general farm administration	*n* *r*	4	0	1	2	0	1	0
[16of] Various family members: yard maintenance	*n* *r*	12	1	1	4 .225^{+}	1	3	2
[16pf] Various family members: building maintenance	*n* *r*	10	0 -.219^{+}	1	3	0	4 .232^{+}	2
[16ao] Hired or external labour: feeding of sows	*n* *r*	15	5	1	2	4	1	2
[16bo] Hired or external labour: feeding of piglets	*n* *r*	12	5	1	2	3	1	0
[16co] Hired or external labour: choice of boars	*n* *r*	6	1	1	0	0	3	1
[16do] Hired or external labour: application of inseminations	*n* *r*	19	6	4	1	3	4	1
[16eo] Hired or external labour: assisting sows at farrowing	*n* *r*	14	6	2	1	3	0	1
[16fo] Hired or external labour: contacts with traders	*n* *r*	5	2	0	0	0	0	1
[16go] Hired or external labour: receiving service people	*n* *r*	5	3	0	0	0	1	1
[16io] Hired or external labour: general farm administration	*n* *r*	7	0	1	1	2	1	2
[16jo] Hired or external labour: manure administration	*n* *r*	23	3	2	3	5	3	6
[16ko] Hired or external labour: tax administration	*n* *r*	51	14	7	7	8	11	6
[16lo] Hired or external labour: study club	*n* *r*	4	2	0	1	0	0	0
[16mo] Hired or external labour: technical courses	*n* *r*	2	1	0	0	0	0	0
[16no] Hired or external labour: cleaning of the pens	*n* *r*	10	4	2	0	2	1	1
[16oo] Hired or external labour: yard maintenance	*n* *r*	13	4	2	0 -.228^{+}	5	1	1
[16po] Hired or external labour: building maintenance	*n* *r*	19	10	4	1	4	1	3

Supplement Table 5b: Pig production in temporal and regional perspective

Interview setting								
[at01] Twente or The Achterhoek? (1 = Twente)	*n* *r*	21	7 .229^{+}	1	2	2	3	6 .231*
[01v] Wife was involved with the questioning	*n* *r*	29	5	3	5	5	8	3

Variable			<E>	<C>	<W>	<K>	<F>	<U>
N			19	10	13	12	16	12
[01i] Questioning done by others or by me (1 = me)	*n* *r*	29	4	5	8	5	5	2
Section 5.2.1 History of the farms								
[35a1] Husband was born in the area	*n* *r*	71	16	7 -.238*	12	11	16	9
[35a2] Wife was born in the area	*n* *r*	71	16	7 -.238*	12	11	16	9
[35b1] Husband's ancestors were from the area	*n* *r*	70	14 -.245*	8	13	10	16	9
[35b2] Wife's ancestors were from this area	*n* *r*	70	14 -.245*	8	13	10	16	9
[30x1a] Farm founded before or after 1900 (1 = before)	*n* *r*	36	7	6	5	3 -.207^{+}	8	7
[30x2] Was the farm originally mixed or specialised? (1 = specialised)	*n* *r*	11	3	1	1	1	1	4 .242^{+}
[31x1] Was the farm taken over or bought? (1 = bought)	*n* *r*	3	1	0	0	0	0	2
[31x2] Year of start (take over) by the present owner	μ σ *r*	82	1984 8	1975 12 -.308**	1983 10	1983 9	1985 10	1981 11
[31x1] Initial size at start (take over) of the present owner	μ σ *r*	82	153 108 .412**	76 76	72 82	87 46	76 35	81 92
[31x1l] Log10 (Initial size at start of present owner)	μ σ *r*	82	2.06 .40 .324**	1.62 .55	1.62 .53 -.224^{+}	1.87 .29	1.81 .29	1.44 .85 -.257*
[32x0] Major investments after the start or take over? (1 = no)	*n* *r*	10	3	2	1	2	2	0
[32xs] Investments made in large steps since the start	*n* *r*	48	13	6	8	6	6 -.200^{+}	9
[32x1] 1 Major investment step since the start	*n* *r*	18	4	1	2	3	2	6 .281*
[32x2] 2 Major investment steps since the start	*n* *r*	10	2	3	2	2	2	1
[32x3] 3-4 Major investment steps since the start	*n* *r*	19	7	2	4	1	3	2
[32xj] Average no. of years between investment steps	μ σ *r*	57	7 5	10 7 .223^{+}	7 6	6 8	5 4	10 7 .208
[32xg] Gradual investments since the start	*n* *r*	23	3	2	4	4	7	3
Section 5.2.2 Satisfaction with the farm								
[33a] Satisfied with the farm branches	*n* *r*	68	17	9	12	9	11 -.204^{+}	10
[33b] Satisfied with the farm size	*n* *r*	57	13	10 .276*	10	7	8	9
[33c] Satisfied with the farm modernity	*n* *r*	70	15	9	11	10	14	11
[33d] Satisfied (in general) with the income from the farm	*n* *r*	62	18 .286*	7	11	6 -.253*	10	10
Section 5.2.3 Desired and expected developments in the next ten years								

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[34a0] Next 10 years: changes in farm branches? (1 = no)	*n* *r*	27	5	5	4 -.285*	4	5	4
[34a1] Next 10 years: towards combination of production and fattening	*n* *r*	21	8 .254*	2	0 -.270*	3	4	4
[34a2] Next 10 years: various adjustments to farm branches	*n* *r*	27	5	3	4	5	7	3
[34b1] Next 10 years: farm size adjustment? (1 = no)	*n* *r*	25	6	5	3	3	4	4
[34bm] Next 10 years: expansion expected	*n* *r*	56	13	5	10	9	12	7
[34b2] Next 10 years: small expansion expected	*n* *r*	30	5	4	6	5	7	3
[34b3] Next 10 years: important expansion expected	*n* *r*	8	4	0	1	2	1	0
[34b7] Next 10 years: reduction to stop expected	*n* *r*	1	0	0	0	0	0	1
[34b8] Next 10 years: varied plans for expansion and reduction	*n* *r*	9	2	0	3	0	3	1
[34c0] Next 10 years: adaptations to new regulations? (1 = no)	*n* *r*	8	0 -.219^{+}	0	4 .290*	2	2	0
[34c1] Next 10 years: adaptation to group housing? (1 = yes)	*n* *r*	45	14 .238*	6	4 -.225^{+}	5	9	7
[34c2] Next 10 years: various adaptations to new regulations	*n* *r*	25	5	2	5	5	5	3
[43b] This farm is economically sustainable (1 = yes)	*n* *r*	62	16	9	11	8	8 -.302*	10
[34d0] Next 10 years: change in income level expected? (1 = no)	*n* *r*	33	8	3	7	4	7	4
[34d1] Next 10 years: increase in income level expected	*n* *r*	12	3	1	3	2	1	2
[34d2] Next 10 years: decrease in income level expected	*n* *r*	15	3	3	3	3	3	0 -.196^{+}
Section 5.2.4 Investments in the next three years								
[44a1a] Investments expected in pigs in the next three years? (1 = no)	*n* *r*	19	3	1	2	2	8 .352**	3
(in €) [44a1] Investment level in the next 3 years in pigs (all farms)	*μ* *σ* *r*	82	181000 172000	162000 269000	123000 121000	136000 198000	91000 234000	150000 195000
(in log10 €) [44a1l] Log10 (investment level of investors in the next 3 years in pigs)	*μ* *σ* *r*	63	5.53 .40 .235^{+}	5.31 .49	5.27 .61	5.22 .65	4.99 .81	5.46 .43
[44b1] Next 3 years: investments in modernisation	*n* *r*	29	11 .262*	2	7	3	3 -.207^{+}	3
[44b2] Next 3 years: investments in expansion	*n* *r*	29	8	3	7	5	2 -.264*	4
[44b3] Next 3 years: investments in free range or organic farming	*n* *r*	1	0	0	0	1	0	0
[44b4] Next 3 years: investments in environmental care	*n* *r*	15	4	4	2	2	1	2
[44b5] Next 3 years: investments in animal welfare	*n* *r*	42	12	5	7	7	5 -.220^{+}	6
[44c] Is capital a problem for the required investments? (1 = yes)	*n* *r*	21	2	4	4	5	3	3

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
Section 5.2.5 Regional culture in pig produciton								
[42a] Are pigs important for the economy of the area? (1 = yes)	*n* *r*	61	14	9	6 -.287*	8	14	10
[37ba] Is farming culture in this area distinct form other areas? (1 = yes)	*n* *r*	41	13 .208$^+$	5	8	6	4 -.288*	5
Section 5.2.6 Social appreciation of the study area								
[36x0] Are you active in social organisations in the area? (1 = yes)	*n* *r*	65	14	8	9	8	14	12 .212$^+$
[36a1] Social activities in church	*n* *r*	5	2	1	0	1	0	1
[36a2] Social activities in the neighbourhood	*n* *r*	39	7	6	6	5	10	5
[36a3] Activities in a farmers' organisation (GLTO, NVV, etc)	*n* *r*	9	4	2	1	1	1	0
[36a9] Various / unspecified social activities	*n* *r*	19	4	1	2	2	4	6 .263*
[36b] Average no. of social activities mentioned (average of counts, in which 3 = 3 or more)	*μ* *σ* *r*	82	1.0 1.0	1.7 1.3	1.5 1.3	1.0 1.2	1.6 1.1	1.0 1.1
[28x] Open for visits by other pig farmers (at least 1x per year)	*n* *r*	33	9	6	7	4	2 -.306*	5
[29x] Open for visits by the general public (at least 1 x per year)	*n* *r*	18	4	3	5	3	2	1
[38a] Contacts with a study club in the area	*n* *r*	67	18 .209$^+$	9	12	8	10 -.265*	10
[38b] Nation-wide contacts with other pig producers	*n* *r*	18	9 .329*	3	2	1	2	1
[38c] Contacts with other pig producers (nearby) in Germany	*n* *r*	7	3	0	2	1	0	1
Section 5.2.7 Appreciation of scenic and structural aspects of the area								
[37a0] Do you consider this area attractive? (1 = no)	*n* *r*	5	2	0	0	1	1	1
[37a1] This area is attractive for social reasons	*n* *r*	32	7	6	7	4	3 -.222$^+$	5
[37a2] This area is attractive for its scenic environment	*n* *r*	42	11	8 .211$^+$	7	6	6	4
[37a3] This area is attractive for its infrastructure	*n* *r*	11	2	1	0	1	4 .232$^+$	3
Section 5.2.8 Societal values of the farm								
[39a] This farm has landscape value	*n* *r*	67	17	9	9	10	15	7 -.250*
[39b1] This farm has historical value	*n* *r*	21	6	3	3	2	6	1
[39b2] This farm is attractive for its position and shape	*n* *r*	37	9	2 -.211$^+$	5	4	12	5
[39b3] This farm has an attractive yard and garden	*n* *r*	42	15	8 .211$^+$	5	4	6	4
[39b4] This farm is attractive for being clean and neat	*n* *r*	38	11	7	1 -.377*	7	7	5
[40a] This farm has environmental value	*n* *r*	53	14	3 -.323**	9	9	12	6
[40b1] The environmental value of this farm is in its small scale	*n* *r*	26	7	2	7	2	6	2
[40b2] The environmental value of this farm is in the brooks and woods	*n* *r*	33	8	2	7	5	7	4

Variable			<E>	<C>	<W>	<K>	<F>	<U>
N			19	10	13	12	16	12
[40b3] The environmental value of this farm is in the ditches	*n* *r*	14	3	2	2	1	4	2
[40b4] The environmental value of this farm is for the birds and wildlife	*n* *r*	36	8	2 -.222^{+}	5	7	11 .236*	3
[40b5] This farm could offer commercial recreation opportunities	*n* *r*	12	2	1	0 -.206^{+}	2	6 .326**	1
[41a] This location is suitable for pig production	*n* *r*	64	14	8	11	10	14	7 -.197^{+}
[41b1] The problem with this location is its proximity to other buildings	*n* *r*	21	7	4	1	1	4	4
[41b2] The problem with this location is its proximity to other pig farms	*n* *r*	10	5 .332**	1	0	0	1	3
[41b3] The problem with this location is the local infrastructure	*n* *r*	18	7	2	1	6 .273*	1	1
[41b4] The problem with this location is manure disposal	*n* *r*	13	2	0	3	3	4	1
[41b5] The problem with this location is its proximity to a nature area	*n* *r*	24	5	2	7 .249*	3	4	3

Supplement Table 5c: Perceptions of farming practices

5.3.1 Farmers responses

Variable			<E>	<C>	<W>	<K>	<F>	<U>
N			19	10	13	12	16	12
Farmers were asked to pick only one answer per group (occasionally some of them picked more than one answer; see in N: n/n below)								
The enjoyment of pig production is…								
[61a1] … the management	*n* *r*	15	7	1	3	1	1	2
[61a2] …caring for new life; the piglets	*n* *r*	26	2 -.275*	1	6	7 .264*	6	4
[61a3] … the competition for results	*n* *r*	3	1	1	0	0	0	1
[f61a4] … the freedom of time management	*n* *r*	29	4	5	4	5	7	4
[61a5] … in the technical developments	*n* *r*	6	3	1	0	0	0	2
[61a9] None of the above	*n* *r*	8	2	1	0	2	3	0
ΣN	87/ 82		19	10	13	15/12	17/16	12
Goals and strategies:								
[61d1] Every investment should be completely economic	*n* *r*	23	9 .278*	2	3	1	4	4
[61d2] I don't mind working an extraordinary number of hours a week	*n* *r*	7	1	2	0	0	2	2
[61d3] We like to keep up with the average farm size growth	*n* *r*	18	4	2	1	3	3	5 .197^{+}
[61d4] We are in to the process of stopping farming	*n* *r*	5	1	0	1	1	1	1
[61d5] We hate to be dependent on others	*n* *r*	3	0	2	0	1	0	0
[61d6] We would rather have (or keep) a mixed farm	*n* *r*	19	1 -.286*	0 -.240*	7 .307**	5	5	1
[61d9] None of the above	*n* *r*	10	3	2	1	2	2	0
ΣN	85/ 82		19	10	13	13/12	17/16	13/12

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
Strategies in automation:								
[61e1] Automation should be implemented as much as possible	*n* *r*	7	2	1	1	3 .227^{+}	0	0
[61e2] This farm is too small for complete automation	*n* *r*	17	0 -.305*	1	1	4	8 .408**	3
[61e3] A good farmer always pays attention to the figures	*n* *r*	40	11	7	9	2 -.316**	7	4
[61e4] I don't need a computer to see how my animals are doing	*n* *r*	5	1	0	1	3	0	0
[61e9] None of the above	*n* *r*	14	5 .245*	1	1	1	1	5 .271*
ΣN		83/ 82	19	10	13	13/12	16	12
Time and labour management:								
[61f1] We do our work by a strict work schedule	*n* *r*	12	2	3 .209^{+}	2	1	1	3
[61f2] We plan our work, but are also flexible when we have to be	*n* *r*	61	19 .224*	6	8	10	9	9
[61f3] Our farm management is more flexible than fixed	*n* *r*	12	0 -.264*	1	3	1	6 .326**	1
[61f4] The animals create our work schedule; that is never fixed	*n* *r*	0	0	0	0	0	0	0
[61f9] None of the above	*n* *r*	0	0	0	0	0	0	0
ΣN		85/ 82	21/19	10	13	12	16	13/12
Investments and labour inputs:								
[61g1] Efficiency is more important than saving the last piglet	*n* *r*	14	4	3	1	2	3	1
[61g2] Investments in automation are always profitable	*n* *r*	3	2	1	0	0	0	0
[61g3] Good results require a lot of time input	*n* *r*	53	13	5	6	8	11	10
[61g4] A good farmer knows when to stop investing / working	*n* *r*	5	0	0	2	1	`2	0
[61g5] It is the eye for details that matters the most	*n* *r*	2	1	0	0	0	0	1
[61g7] It is better to keep the bank and the government at a distance	*n* *r*	6	0	1	3	1	0	1
[61g9] None of the above	*n* *r*	2	0	0	1	0	0	1
ΣN		85/ 82	20/19	10	13	12	16	14/ 12
Entrepreneurship and craftsmanship:								
[61c1] A smaller farm that is well managed is better	*n* *r*	31	5	3	5	7	9	2
[61c2] A good farmer knows the value of being satisfied	*n* *r*	22	5	3	6 .223^{+}	1	3	4
[61c3] Organic pig farmers are better craftsmen than regular farmers	*n* *r*	0	0	0	0	0	0	0
[61c4] At the end of the day it is the profits that count	*n* *r*	27	8	3	2	4	5	5
[61c9] None of the above	*n* *r*	3	1	1	0	0	0	1
ΣN		83/ 82	19	10	13	12	17/16	12
Position of women:								
[61j0] *No response to this topic*	*n* *r*	1	0	0	0	0	0	1

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[61j1] The woman should work in the house, the man on the farm	*n* *r*	20	4	2	3	4	3	4
[61j2] Without external labour, man and woman are more equal	*n* *r*	19	4	0 -.249*	4	5	6	0 -.227^{+}
[61j3] Pig farming is a suitable business for a woman	*n* *r*	21	5	2	3	3	4	4
[61j4] Women in pig farming are more focussed on the animals	*n* *r*	6	2	1	2	0	1	0
[61j5] This farm is a man's world – and we like it that way	*n* *r*	0	0	0	0	0	0	0
[61j9] None of the above	*n* *r*	17	5	5 .306**	1	1	2	3
ΣN	84/ 82		20/19	10	13	13/12	16	12
Availability and ownership of land:								
[61k1] Land of your own is important for manure management	*n* *r*	12	2	1	4	1	4	0
[61k2] Land ownership is like life insurance	*n* *r*	9	2	2	1	2	1	1
[61k3] It is not important for a pig farmer to own land	*n* *r*	34	10	4	2 -.227^{+}	6	5	7
[61k4] There should be a balance between animals and land	*n* *r*	19	5	2	3	2	5	2
[61k5] I would rather be in a co-operative operation of 3 – 4 farms	*n* *r*	2	0	0	1	0	1	0
[61k9] None of the above	*n* *r*	9	1	1	2	1	1	3
ΣN	85/ 82		20/19	10	13	12	17/16	13/12
Environmental care and manure:								
[61l0] No answer to this question about manure	*n* *r*	1	0	0	0	0	0	1
[61l1] Efficient manure management is best for the environment	*n* *r*	30	5	6	4	4	7	4
[61l2] There should be regional balance between animals and manure	*n* *r*	8	2	0	1	0	2	3
[61l3] Less soya should be used, both for smell and the environment	*n* *r*	0	0	0	0	0	0	0
[61l4] New technologies will soon solve the manure and NH_3 problems	*n* *r*	22	8 .208^{+}	2	3	2	4	3
[61l5] The real problem is not the manure, but the current farm practices	*n* *r*	10	1	1	3	2	3	0
[61l9] None of the above	*n* *r*	13	4	1	2	4 .220^{+}	0 -.235^{+}	2
ΣN	84/ 82		20/19	10	13	12	16	13/12
Farm hygiene:								
[61h1] We work as hygienically as possible	*n* *r*	43	15 .302*	8 .211^{+}	5	4	6	5
[61h2] We try to be hygienic, but theory and practice are often different	*n* *r*	8	1	0	3 .211^{+}	1	2	1
[61h3] Too much hygiene is not good; it disturbs the bacterial balance	*n* *r*	9	0	0	2	2	5 .299*	0
[61h4] Not overcrowding stables is more important than hygiene	*n* *r*	19	2	2	2	5 .224^{+}	4	4
[61h9] None of the above	*n* *r*	4	1	0	1	0	0	2
ΣN	83/ 82		19	10	13	12	17/16	12
Animal welfare:								

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
number (n) correlation (r)		N	n r	n r	n r	n r	n r	n r
N			19	10	13	12	16	12
[61b1] When the production is good the welfare must be good as well	*n* *r*	34	6	6	6	5	9	2 -.208+
[61b2] Group housing on straw beds is better for the animals	*n* *r*	14	2	1	1	4 .220+	3	3
[61b3] A pig has no more value than as a commercial commodity	*n* *r*	8	2	1	2	1	1	1
[61b4] We only replace a sow when she is really old	*n* *r*	7	1	0	1	1	1	3
[61b9] None of the above	*n* *r*	19	8 .280*	2	3	1	2	3
ΣN		82	19	10	13	12	16	12
Consumer markets:								
[61i0] No answer to this question about consumers	*n* *r*	1	1	0	0	0	0	0
[61i1] Farmers are the victims of the power of supermarkets	*n* *r*	17	4	2	3	2	1	5 .214+
[61i2] Supermarkets should conduct their business, like we should conduct ours	*n* *r*	14	8 .369**	0	1	2	2	1
[61i3] The trap is that supermarkets do not know the consumers	*n* *r*	16	4	1	2	2	4	3
[61i4] In future bulk production will shift to a special products market	*n* *r*	8	1	0	1	2	3	1
[61i5] Unfortunately farmers do not know the consumers at all	*n* *r*	6	1	2	1	1	1	0
[61i9] None of the above	*n* *r*	20	0 -.300*	5 .210+	5	3	5	2
ΣN		82	19	10	13	12	16	12
Supplement Table 5d: Outlook on current prices and policies								
[45a] Did you foresee the dramatic drop of pig prices? (1 = yes)	*n* *r*	41	8	6	8	5	8	6
The following comments were open additions (not pre-suggested):								
[45b1] yes/no: regular price cycle caused drop in pig prices	*n* *r*	15	8 .337**	2	1	2	1	1
[45b2] yes/no: restart after swine fever caused drop in pig prices	*n* *r*	16	7 .257*	0 -.204+	3	3	1	2
[45b3] yes/no: new laws (10 July 1997) caused drop in pig prices	*n* *r*	2	0	0	1	0	0	1
[45b4] yes/no: investments abroad caused drop in pig prices	*n* *r*	36	11	5	5	5	5	5
[45b5] yes/no: economic crisis in Asia caused the drop in pig prices	*n* *r*	5	3	0	0	0	1	1
ΣN		74/ 82	29/19	7/10	10/13	10/12	8/16	10/12
In %		90%	153%	70%	82%	83%	50%	83%
[45c] Could the dramatic drop in pig prices have been prevented?(1=yes)		36	6	3	6	10 .330**	8	3
The following comments were open additions (not pre-suggested):								
[45d1] no: the drop in pig prices is a result of the free market	*n* *r*	24	7	4	3	2	4	4
[45d2] yes: farmers should have acted differently	*n* *r*	6	2	1	2	0	1	0

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[45d3] yes: new laws (10 July 1997) should have been different	*n* *r*	14	1 -.225^{+}	3	5 .220^{+}	2	3	0 -.188^{+}
[45d4] yes/no: the law should have been different since 1986	*n* *r*	7	1	1	0	3	1	1
[45d5] yes/no: European policies should have been different	*n* *r*	24	7	3	5	2	4	3
[45d6] yes: policy on swine fever outbreak should have been different	*n* *r*	14	4	0	2	3	4	1
ΣN		89/ 82	22/19	12/10	17/13	12/12	17/16	9/12
In %		109%	116%	120%	131%	100%	106%	75%

Supplement Table 6a: Technical construction of feeder pig production

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
Section 6.1.1 Housing and mechanisation								
[18a1] No building renovation or renewal since 1990	*n* *r*	13	2	2	2	2	2	4
[18a2] Partial building renovation or renewal since 1990	*n* *r*	58	14	7	9	9	12	6 -.198^{+}
[18a3] All buildings new or renovated after 1990	*n* *r*	11	3	1	2	1	2	2
ΣN		82	19	10	13	12	16	12
[18b] Happy with the present housing system	*n* *r*	67	16	10	9	9	14	9
[17a1] Barren and gestating sows single ranged (at girth tether)	*n* *r*	27	5	1 -.199^{+}	3	7 .247*	7	4
[17a2] Barren and gestating sows in individual boxes	*n* *r*	47	13	9 .271*	8	2 -.372**	8	7
[17ag] Barren and gestating sows in group housing	*n* *r*	8	1	0	2	3 .227^{+}	1	1
ΣN		82	19	10	13	12	16	12
[19x1] Equipment: mechanical feedstuff supply	*n* *r*	53	17 .306*	10 .295*	7	6	6 -.324**	7
[19x2] Equipment: computer-directed feedstuff supply	*n* *r*	21	7	2	3	2	3	4
[19x4] Equipment: floor heating system	*n* *r*	73	19 .203^{+}	9	10	10	15	10
[19x5] Equipment: sensor-directed heating system	*n* *r*	54	15	7	9	6	9	8
[19x6] Equipment: mechanical shaft ventilation	*n* *r*	26	6	3	2	5	5	5
[19x7] Equipment: bunk feeder ventilation	*n* *r*	70	17	9	11	9	14	10
[19x8] Equipment: turbo ventilation	*n* *r*	31	10 .236*	5	2	4	3	7
[19x9] Equipment: sensor and time-regulated lighting system	*n* *r*	18	8 .254*	3	3	0 -.258*	3	1
In the questionnaire 3 of the following answers per farm were requested:								
[50y1] Most important aspect of stable equipment: low investments	*n* *r*	34	3 -.334**	4	5	10 .372**	8	4
[50y2] Most important aspect of stable equipment: labour efficiency	*n* *r*	53	17 .290*	8	6 -.213^{+}	10	6 -.334**	6

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[50y3] Most important aspect of stable equipment: good automation	*n* *r*	27	9 .210^{+}	5	4	1 -.226^{+}	3	5
[50y4] Most important aspect of stable equipment: low energy costs	*n* *r*	22	4	4	4	1 -.215^{+}	8 .238*	1
[50y5] Most important aspect of stable equipment: group housing	*n* *r*	15	2	1	3	5 .296*	1	3
[50y6] Most important aspect of stable equipment: good floors	*n* *r*	17	2	1	3	2	4	5 .214^{+}
[50y7] Most important aspect of stable equipment: free run outdoors	*n* *r*	2	0	0	0	0	2	0
[50y8] Most important aspect of stable equipment: all-in-all-out system	*n* *r*	17	6	3	2	0 -.227^{+}	3	3
[50y9] Most important aspect of stable equipment: flexible equipment	*n* *r*	4	0	2	1	0	1	0
[50y10] Most important aspect of stable equipment: good stable climate	*n* *r*	51	13	2 -.333**	8	7	12	9
ΣN		242/ 246	56/57	30	36/39	36	48	36
Section 6.1.2 Feedstuff supply								
[20x45] Feed supplier: CTA / ABC or combination of only those two	*n* *r*	47	9	4	7	8	12	7
[20x5] Feed supplier: ABC	*n* *r*	37	6 -.208^{+}	4	7	7	10	3
[20x4] Feed supplier: CTA	*n* *r*	14	5 .210^{+}	0	1	1	3	4
[20x1] Feed supplier: Hendrix – UTD (Nutreco)	*n* *r*	7	3	2	0	0	0	2
[20x2] Feed supplier: Cehave	*n* *r*	5	1	1	0	0	2	1
[20x3] Feed supplier: Brokking - de Heus	*n* *r*	1	1	0	0	0	0	0
[20x9] Feed supplier: other suppliers / combinations	*n* *r*	22	6	3	5	4	2	2
ΣN		86/ 82	22/19	10	13	12	17/16	12
[21a1] Barren and gestating sows: standard or special feed (1 = special)	*n* *r*	9	2	1	1	2	1	2
[21b1] Sows with piglets: standard or special feed (1 = special)	*n* *r*	9	3	1	1	1	2	1
[21c1] Piglets: standard or special feed (1 = special)	*n* *r*	13	4	2	1	3	1	2
[21c2g] Mean number of types of feedstuff for piglets	*μ* *σ* *r*		2.60 .77 .275*	2.20 .63	2.31 1.03	2.08 .79	1.81 .66 -.270*	2.25 1.14
[21c21] 1 type of feedstuff for piglets	*n* *r*	16	1	1	3	3	5	3
[21c22] 2 types of feedstuff for piglets	*n* *r*	38	8	6	5	5	9	5
[21c23] 3 types of feedstuff for piglets	*n* *r*	23	8	3	3	4	2	3
[21c24] 4 – 5 types of feedstuff for piglets	*n* *r*	5	2	0	2	0	0	1
ΣN		82	19	10	13	12	16	12
[22x1] Prime duty of feed company is to: supply cheap food	*n* *r*	13	4	3	3	1	1	1

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[22x2] Prime duty of feed company is to: supply good extension	*n* *r*	13	3	1	2	1	2	4
[22x3] Prime duty of feed company is to: supply new ideas	*n* *r*	2	0	1	0	0	1	0
[22x4] Prime duty of feed company is to: supply fitting feed type	*n* *r*	26	4	3	3	6	6	4
[22x8] Prime duty of feed company is to: none of the above	*n* *r*	28	8	2	5	4	6	3
ΣN		82	19	10	13	12	16	12
Section 6.1.3 Manure management								
[23aa] More than 10% of the manure: stays on the farm	*n* *r*	51	12	5	12 265*	7	11	4 -.246
[23bb] More than 10% of the manure: stays in the area	*n* *r*	35	7	7 .211^{+}	5	6	6	4
[23cc] More than 10% of the manure: is sent elsewhere in the country	*n* *r*	15	2	3	3	2	1	4
[23dd] More than 10% of the manure: is sent to distribution centre MBO	*n* *r*	32	9	2	4	5	7	5
[23a] Average % of manure that stays on the farm	*μ* *σ* *r*	82	27 31	23 29	54 29 .285*	27 31	41 36	16 21 -.211^{+}
[23b] Average % of manure that stays in the area	*μ* *σ* *r*	82	27 37	40 38	16 22	28 31	25 39	26 41
[23c] Average % of manure sent elsewhere in the country	*μ* *σ* *r*	82	11 32	20 38	11 23	11 29	2 9	25 41
[23d] Average % of manure sent to distribution centre MBO	*μ* *σ* *r*	82	35 43	17 37	19 35	34 44	32 40	33 44
Section 6.1.4 Rearing and selective breeding								
[14a1] Breeding company: NVS-co-operation	*n* *r*	32	8	6	5	3	5	5
[14a2] Breeding company: Dalland	*n* *r*	7	1	0	3	2	0	1
[14a3] Breeding company: Dumeco	*n* *r*	42	10	4	4	7	11	6
[14a4] Breeding company: Euribrid	*n* *r*	1	0	0	1	0	0	0
ΣN		82	19	10	13	12	16	12
[14b1] Preferred boar type: Improved Dutch Landrace (NL)	*n* *r*	2	0	1	0	1	0	0
[14b2] Preferred boar type: Dutch York (GY)	*n* *r*	23	5	1	4 .208^{+}	4	6	3
[14b3] Preferred boar type: English Large White (LW)	*n* *r*	1	0	0	0	0	1	0
[14b5] Preferred boar type: Pietrain	*n* *r*	7	1	0	3	2	0 -.254*	1
[14b7] Preferred boar type: advice of breeding company	*n* *r*	44	13	6	6	3	9	7
[14b8] Preferred boar type: own boar	*n* *r*	1	0	0	0	1	0	0
[14b10] Preferred boar type: rotation crossbreed	*n* *r*	1	0	1	0	0	0	0
[14b9] Preferred boar type: different	*n* *r*	3	0	1	0	1	0	1
ΣN		82	19	10	13	12	16	12

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[14c0] Considerations for selecting boar type? (1 = no)	*n* *r*	9	1	1	2	3	1	1
[14c1] Selection of boar type: advice of breeding company	*n* *r*	14	3	2	0 -.228^{+}	2	6 .265*	1
[14c2] Selection of boar type: request of pig fattener	*n* *r*	16	3	1	4	4	1	3
[14c3] Selection of boar type: personal considerations	*n* *r*	35	10	4	6	1 -.306*	8	6
[14c9] Selection of boar type: different reasons	*n* *r*	8	2	2	1	2	0	1
ΣN		82	19	10	13	12	16	12
[13a1] Maiden sows are produced and reared at the farm	*n* *r*	11	4	2	1	2	0 -.209^{+}	2
[13b1] Maiden sows purchased from a fixed contact	*n* *r*	12	2	1	1	1	2	5 .317**
[13b2] Maiden sows purchased through chain contact (Dumeco)	*n* *r*	38	8	4	4	7	10	5
[13b3] Maiden sows purchased through NSV co-operation	*n* *r*	17	6	3	3	1	4	0 -.212
[13b7] Maiden sows purchased through Dalland Breeding Company	*n* *r*	6	1	0	3	1	0	1
ΣN		84/ 82	21/19	10	12/13	12	16	13/12
[13c0] Purchase of maiden sows is irrelevant (e.g. farm reared)	*n* *r*	10	2	2	3	2	0	1
[13c1] Maiden sows purchased at 25 kg	*n* *r*	5	3	1	0	1	0	0
[13c2] Maiden sows purchased at 6 – 7 months (or older)	*n* *r*	67	14	7	10	9	16	11
ΣN		82	19	10	13	12	16	12
[14e0] Selection of sow type: no / no answer	*n* *r*	11	1	1	3	2	2	2
[14e1] Selection of sow type: advice of the breeding company	*n* *r*	17	5	1	2	4	4	1
[14e2] Selection of sow type: request of the pig fattener	*n* *r*	5	0	0	1	1	1	2
[14e3] Selection of sow type: personal considerations *(see below)*	*n* *r*	41	11	6	4	5	8	7
[14e9] Selection of sow type: different reasons	*n* *r*	8	2	2	3	0	1	0
ΣN		82	19	10	13	12	16	12
Specification of personal considerations (41 farmers):								
[14e3a] Specification: big litters	*n* *r*	10	3	1	1	0	2	3
[14e3b] Specification: strong piglets	*n* *r*	3	0	3	0	0	0	0
[14e3c] Specification: good maternity qualities	*n* *r*	16	7 .229^{+}	1	2	2	3	1
[14e3d] Specification: none, or different characteristic	*n* *r*	12	1	1	1	3	3	3
ΣN (Personal considerations)		41	11	6	4	5	8	7
[14d1] Preference for type of sow breed? (1 = no)	*n* *r*	1	0	0	0	0	0	1
[14d2] Preference for sow breed: Improved Dutch Landrace (NL)	*n* *r*	1	0	0	0	0	0	1

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[14da] Preference sow breed type:' pure' NL, GY, Du or Pi	*n* *r*	0	0	0	0	0	0	0
[14d3] Preference sow breed type: 'pure' Large White (LW)	*n* *r*	2	1	0	1	0	0	0
[14d6] Preference sow breed type: common crossbreed (NL x GY)	*n* *r*	22	2 -.228^{+}	6 .302*	5	3	3	3
[14d7] Preference sow breed type: F1 x Norwegian L	*n* *r*	8	0	0	2	2	3	1
[14d8] Preference sow breed type: F1 x Fin L	*n* *r*	15	11 .617**	2	0 -.228^{+}	0	0 -.260*	2
[14d9] Preference sow breed type: advice breeding company	*n* *r*	27	3 -.222^{+}	0 -.286*	5	6	9 .271*	4
[14d10] Preference sow breed type: rotation crossbreed	*n* *r*	6	2	2	0	1	1	0
ΣN		82	19	10	13	12	16	12
Section 6.1.5 Animal health management								
In the questionnaire 3 of the following answers per farm were requested:								
[46f1] Important health costs: prevention (vaccination and control)	*n* *r*	81	19	10	13	12	15	12
[46f2] Important health costs: curative treatment (cure and medication)	*n* *r*	53	12	6	8	9	8	10
[46f3] Important health costs: disinfection	*n* *r*	21	7	5	3	2	2	2
[46f4] Important health costs: worm treatment	*n* *r*	44	10	3	6	7	11	7
[46f5] Important health costs: scabies treatment	*n* *r*	34	8	5	5	6	6	4
ΣN		233/ 246	56/57	29/30	35/39	36	42/48	35/36
In the questionnaire 3 of the following answers per farm were requested:								
[47b1] Important for prevention: separation clean way / dirty way	*n* *r*	23	8	4	3	1 -.204^{+}	4	3
[47b2] Important for prevention: reduced admittance of visitors	*n* *r*	44	11	5	8	7	7	6
[47b3] Important for prevention: vaccination	*n* *r*	24	6	5	5	1 -.204^{+}	4	3
[47b4] Important for prevention: combine pig production and fattening	*n* *r*	27	2 -.321**	6 .207^{+}	4	6	7	2
[47b5] Important for prevention: reduction of no. of farm locations	*n* *r*	3	1	0	1	0	0	1
[47b6] Important for prevention: reduced no. of trade contacts	*n* *r*	28	9	3	8 .257*	5	0 -.406**	3
[47b7] Important for prevention: reduced transport distances	*n* *r*	2	1	0	0	1	0	0
[47b8] Important for prevention: more disinfection	*n* *r*	5	0	1	0	2	2	0
[47b9] Important for prevention: more cleaning (not disinfection)	*n* *r*	5	1	0	2	1	1	0
[47b11] Important for prevention: improved housing	*n* *r*	10	3	1	2	0	1	3
[47b12] Important for prevention: disinfection of means of transport	*n* *r*	36	10	3	3 -.204^{+}	7	8	5
ΣN		207/ 246	52/57	28/30	36/39	31/36	34/48	26/36
In %		84%	91%	93%	92%	86%	71%	72%
[27a1] Same people work at different farm locations with pigs	*n* *r*	15	3	3	3	1	1	4 .329**

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[27a2] Same people work at different farms with pigs	*n* *r*	15	4	3	4	2	2	0 -.196^{+}
[27a3] Same people work at different farms without any animals	*n* *r*	8	3	2	2	1	0	0
[27a4] Same people work at different farms with other animals	*n* *r*	28	6	5	7	3	3	4
[48x] Was farm transport blocked during swine fever outbreak? (1 = yes)	*n* *r*	17	5	3	2	3	4	0 -.212^{+}
Section 6.1.6 Market-oriented management								
[24x1] Destination of feeder pigs is: this farm (same or other location)	*n* *r*	17	0 -.291^{+}	3	2	1	7 352*	4
[24x3] Destination of feeder pigs is: another farm in the area	*n* *r*	19	8 .301*	3	3	4	0 -.356*	1
[24x6] Destination of feeder pigs is: a fixed contact abroad (Germany)	*n* *r*	7	2	0	1	4	0	0
[24x6] Destination of feeder pigs is: a Dumeco contact farm	*n* *r*	27	7	2	3	3	7	5
[24x7] Destination of feeder pigs is: a fixed free trader	*n* *r*	12	2	2	4	0	2	2
ΣN		82	19	10	13	12	16	12
[25x0] Chain certificate: [1= farmer does not have a certificate]	*n* *r*	1	0	0	0	0	1	0
[25x1] Chain certificate: IKB / Good Farming	*n* *r*	60	10 -.254*	7	10	12 .288*	11	10
[25x2] Chain certificate: IKB^{+} / Good Farming Crown	*n* *r*	21	9 .278*	3	3	0 -.287*	4	2
[25x3] Chain certificate: AH2000^{+}	*n* *r*	1	0	0	1	0	0	0
ΣN		83/ 82	19	10	14/13	12	16	12

Supplement Table 6b: Indicators for pig production management

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*[5]
N			19	10	13	12	16	12
Section 6.2.2 Indicators of production intensity [6]								
Litter size 1997								
[006] Piglets born alive per litter	*μ* *σ* *r*	70	11.0 .4	11.5 .5 .409**	10.8 .5	10.5 .4 -.363**	11.0 .5	10.9 .5
[007] Piglets born dead per litter	*μ* *σ* *r*	70	.7 .1 -.231^{+}	.8 .2	.8 .2	.8 .2	.8 .2	.8 .2
[008] % Pre-weaning piglet mortality	*μ* *σ* *r*	70	10.5 2.2	11.7 2.7	11.7 1.8	10.8 3.4	10.7 3.3	11.0 2.7
[009] Number of weaners per litter	*μ* *σ* *r*	70	9.9 .4	10.2 .4 .384**	9.6 .3	9.4 .4 -.391**	9.8 .3	9.8 .4
Litter size 1995 – 1997 [7]								
[006] Piglets born alive per litter	*μ* *σ* *r*	64	11.0 .3	11.4 .3 .421**	10.9 .5	10.5 .4 -.428**	11.0 .4	11.0 .5
[007] Piglets born dead per litter	*μ* *σ* *r*	64	.7 .1 -.269*	.8 .2	.8 .2	.8 .2	.8 .2	.8 .2

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*[8]
N			19	10	13	12	16	12
[008] % Pre-weaning piglet mortality	*μ* *σ* *r*	64	10.6 2.0	11.4 2.4	12.2 2.0 .233^{+}	10.7 2.5	10.6 3.2	11.1 2.5
[009] Number of weaners per litter	*μ* *σ* *r*	64	9.9 .2	10.1 .3 .424**	9.6 .3 -.239^{+}	9.4 .3 -.425**	9.8 .3	9.8 .4
Trend in litter size 1995 – 1997 [9]								
[t006] Trend in piglets born alive per litter	*μ* *σ* *r*	67	-.2 .4 -.204^{+}	.0 .5	.1 .4	.1 .4	.1 .5	-.0 .4
[t007] Trend in piglets born dead per litter	*μ* *σ* *r*	67	.0 .1	.1 .1	-.0 .2 -.223^{+}	.1 .2	.1 .2	.1 .2
[t008] Trend in % pre-weaning piglet mortality	*μ* *σ* *r*	67	0 2	.2 1.8	-.9 2.2 -.257*	.6 2.1	.6 2.2	.2 2.1
[t009] Trend in no. of weaners per litter	*μ* *σ* *r*	67	-.2 .3	.0 .5	.1 .5	.0 .3	-.1 .4	-.1 .4
Fluctuation in litter size 1995 – 1997 [10]								
[sq006] Fluctuation in piglets born alive per litter	*μ* *σ* *r*	64	-.0 .3	-.3 .6	.0 .7	.3 .6 .226^{+}	-.0 .6	.0 .6
[sq007] Fluctuation in piglets born dead per litter	*μ* *σ* *r*	64	-.0 .2	.1 .2	-1.5 .2	.0 .2	.1 .2 .218^{+}	.0 .2
[sq008] Fluctuation in % pre-weaning piglet mortality	*μ* *σ* *r*	64	-.7 1.9	-1.1 1.7	.1 2.5	-.8 3.2	.0 4.2	-.4 2.8
[sq009] Fluctuation in no. of weaners per litter	*μ* *σ* *r*	64	-.0 .3	-.1 .5	.1 .5	.3 .7 .241^{+}	-.1 .5	.0 .5
Farrow cycle 1997								
[003] Farrow index: farrows per year (per sow)	*μ* *σ* *r*	70	2.33 .08	2.37 .06 .266*	2.34 .09	2.26 .09 -.353**	2.30 .04	2.32 .08
[012] Interval weaning to first insemination (in days)	*μ* *σ* *r*	68	6.6 1.0	6.2 .5 -.202^{+}	6.8 1.0	6.9 1.2	6.8 1.0	6.6 1.0
[019] % Farrows of first insemination	*μ* *σ* *r*	68	86 3	87 2 .244*	87 4 .293*	80 5 -.584**	84 3	85 4
[018] % Re-inseminations (of all inseminations)	*μ* *σ* *r*	68	10 3	10 2	9 3 -.250*	15 6 .418**	12 4	11 4
[013] Interval first to last insemination (in days)	*μ* *σ* *r*	68	3.8 1.5	3.4 1.5	3.2 1.6 -.229^{+}	6.3 3.6 .406**	4.8 1.7	4.3 2.3
Farrow cycle 1995 – 1997								
[003] Farrow index: farrows per year (per sow)	*μ* *σ* *r*	64	2.35 .05 .304*	2.33 .08	2.32 .09	2.28 .06 -.217^{+}	2.27 .05 -.328**	2.31 .07
[012] Interval weaning to first insemination (in days)	*μ* *σ* *r*	62	6.6 .7	6.4 .7	6.7 .8	7.0 1.4	7.0 1.1	6.8 1.0

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
[019] % Farrows of first insemination	μ	62	87	87	87	82	85	86
	σ		3	3	4	4	3	4
	r					-.481**		
[018] % Re-inseminations (of all insemination)	μ	62	10	9	9	13	12	10
	σ		3	2	3	4	3	3
	r				-.252*	.362**		
[013] Average interval first to last insemination (in days)	μ	62	3.5	3.6	3.4	5.6	4.8	4.1
	σ		1.3	1.2	1.4	2.6	1.7	1.8
	r				-.211^{+}	.354**		
Tend in farrow cycle 1995 – 1997								
[t003] Trend in farrow index	μ	67	-.02	.06	.02	-0.2	.02	.01
	σ		.08	.10	.10	.16	.11	.11
	r			.208^{+}				
[t012] Trend in interval weaning to first insemination	μ	65	-0	-.3	.2	-.3	-.4	-.2
	σ		1	.7	.9	.7	.9	.9
	r				.238^{+}			
[t019] Trend in % farrows of first inseminations	μ	65	-2	-0	0	-2	-2	-1
	σ		3	6	4	6	6	5
	r							
[t018] Trend in % re-inseminations	μ	65	3	5	1	2	1	1
	σ		2	3	3	6	5	4
	r							
[t013] Trend in interval first – last insemination	μ	65	.9	.0	-.3	1.0	.2	.4
	σ		1.0	1.7	1.3	3.3	2.7	2.1
	r							
Fluctuation in farrow cycles 1995 – 1997								
[sq003] Fluctuation in farrow index	μ	64	.02	-.04	-.08	.04	-.08	-.03
	σ		.14	.11	.13	.18	.14	.15
	r					.211^{+}		
[sq012]Fluctuation in interval weaning to first insemination	μ	62	-0	.5	.3	.9	.2	.3
	σ		1	1.7	.8	2.5	1.5	1.3
	r							
[sq019] Fluctuation in % farrows of first inseminations	μ	62	1	-4	-4	3	-0	-1
	σ		4	7	5	5	5	6
	r			-.259*	-.250^{+}	285*		
[sq018] Fluctuation in % re-inseminations	μ	62	0	1	1	-1	1	1
	σ		5	5	4	5	7	5
	r							
[sq013]Fluctuation in interval first to last insemination	μ	62	-0	1.1	.1	-.9	.3	.1
	σ		2	2.7	2.2	3.3	3.1	2.6
	r							
Nursing period								
[011] 1997 Duration of the nursing period (in days) 1997	μ	68	25.9	26.4	26.7	26.8	28.0	26.8
	σ		1.4	1.6	1.9	1.5	1.7	1.8
	r		-.288*				.391**	
[011] Duration of the nursing period (in days) 1995 - 1997	μ	62	26.1	26.6	27.0	26.9	28.3	27.0
	σ		1.6	2.0	1.9	1.6	1.8	1.9
	r		-.257*				.378**	
[t011] Trend in duration of nursing period 1995 - 1997	μ	65	-0	-.5	-.9	-.4	-.6	-.5
	σ		1	1.7	1.7	1.0	1.5	1.4
	r							
[sq011] Fluctuation in duration of nursing period 1995 - 1997	μ	62	-0	-.7	-.7	-.4	-.3	-.5
	σ		1	1.2	1.5	1.7	1.7	1.4
	r							
[021] Age at recruitment of maiden sows (in days)	μ	65	200	202	205	200	215	205
	σ		44	49	24	47	5	37
	r							

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
[020] Age at first insemination of maiden sows (in days)	μ	67	235	242	235	234	239	237
	σ		8	16	9	13	10	11
	r			203^{+}				
Maiden sow recruitment 1997								
[017] % Sow in the first farrow cycle	μ	68	18	15	20	18	14	17
	σ		3	3	5	5	3	4
	r				.302*		-.329**	
[016] % Newly introduced sows per year	μ	70	46	38	44	39	35	41
	σ		13	8	14	12	7	12
	r		.277*				-.284*	
Maiden sow recruitment 1995 – 1997								
[021] Age at recruitment of maiden sows (in days)	μ	60	197	178	197	235	214	204
	σ		49	66	37	98	5	57
	r					.244^{+}		
[020] Age at first insemination of maiden sows (in days)	μ	61	235	237	235	234	236	235
	σ		5	11	7	7	9	8
	r							
[017] % Young sows after first farrow	μ	62	18	18	18	18	17	18
	σ		3	2	4	2	3	3
	r						-.213^{+}	
[016] % Newly introduced sows per year	μ	65	46	44	46	43	39	44
	σ		10	7	8	6	6	8
	r						-.295*	
Trend in maiden sow recruitment 1995 – 1997								
[t021] Trend in age at recruitment of maiden sows	μ	63	-2	9	16	-54	0	-5
	σ		15	51	35	131	6	60
	r					-.357*		
[t020] Trend in age at first insemination of maiden sows	μ	64	2	8	0	-3	5	2
	σ		9	13	10	7	8	10
	r			.252*		-.253*		
[t017] Trend in % young sows after first farrow	μ	65	1	-4	2	-2	-5	-1
	σ		3	7	7	5	6	6
	r		.218^{+}		.307*		-.295*	
[t016] Trend in % newly introduced sows [per year]	μ	67	-2	-12	-2	-8	-7	-5
	σ		27	18	19	13	16	20
	r							
Fluctuation in maiden sow recruitment 1995 – 1997								
[sq021] Fluctuation in age at recruitment of maiden sows	μ	60	-7	-8	-9	-88	-4	-21
	σ		15	24	21	276	10	112
	r					-.269*		
[sq020] Fluctuation in age at first insemination of maiden sows	μ	61	1	-5	-3	-7	-4	-3
	σ		21	17	11	11	8	14
	r							
[sq017] Fluctuation in % young sows after first farrow	μ	62	4	3	0	-1	-2	1
	σ		13	6	12	10	5	10
	r							
[sq016] Fluctuation in % newly introduced sows [per year]	μ	65	-2	1	5	4	3	2
	σ		18	13	22	25	15	18
	r							
Sow cull 1997								
[050] Average farrow cycle number completed by the sows	μ	37	4.2	4.2	4.3	n.a.	n.a.	4.2
	σ		.4	.4	.5			.4
	r							

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
[015] % Of sows culled per year	μ	70	40	33	37	42	32	36
	σ		10	10	9	11	5	9
	r					.245*	-.289*	
[014] Days lost ('open days') per culled sow	μ	68	31	26	34	44	46	37
	σ		9	7	16	15	13	14
	r		-.228^{+}	-.300*		.234^{+}	.362**	
Sow cull 1995 – 1997								
[050] Average farrow cycle number completed by the sows	μ	34	4.2	4.0	4.4	n.a.	n.a.	4.2
	σ		.4	.3	.5			.4
	r							
[015] % of sows culled [per year]	μ	59	38	36	40	42	30	37
	σ		11	8	6	6	10	10
	r						-.397**	
[014] Days lost ('open days') per culled sow	μ	51	30	29	35	47	42	37
	σ		6	7	11	15	12	13
	r		-.273^{+}	-.290*		.386**	.236^{+}	
Trend in sow cull 1995 - 1997								
[t050] Trend in average farrow number completed by the sows	μ	34	-.0	.2	-.3	n.a.	n.a	.0
	σ		.4	.4	.5			.5
	r				-.331^{+}			
[t015] Trend in % of sows culled per year	μ	61	2	5	-2	0	6	2
	σ		13	22	9	13	16	15
	r							
[t014] Trend in 'open days' per culled sow	μ	54	-1	-3	-4	-3	4	-1
	σ		8	8	12	23	17	14
	r							
Fluctuation in sow cull 1995 – 1997								
[sq050] Fluctuation average farrow number completed by the sows	μ	34	-.3	-.3	-.1	n.a.	n.a.	-.2
	σ		.9	.8	.7			.8
	r							
[sq015] Fluctuation in % of sows culled per year	μ	59	0	14	7	4	7	6
	σ		8	18	13	18	19	15
	r							
[sq014] Fluctuation in 'open days' per culled sow	μ	51	-2	7	5	-3	-6	0
	σ		12	19	22	20	23	20
	r							
Pig production per year 1997								
[005] No. of weaners per sow [per year]	μ	70	23.3	24.2	22.5	21.4	22.7	22.8
	σ		1.1	1.1	1.3	1.6	.8	1.4
	r		.214^{+}	.403**		-.444**		
[010] % Piglet mortality after weaning	μ	68	1.8	1.7	2.2	1.9	1.6	1.8
	σ		.7	1.1	1.1	1.5	.9	1.1
	r							
[004] Intensity in feeder pigs (25 kg) per sow [per year]	μ	70	22.7	23.4	21.4	20.6	21.8	22.0
	σ		1.1	1.1	2.1	1.7	1.3	1.7
	r		.267*	.332**		-.371**		
[004l] log10 (Intensity) in: feeder pigs per sow [per year]	μ	70	1.356	1.368	1.329	1.313	1.337	1.341
	σ		.021	.021	.042	.038	.026	.035
	r		.269*	.321**		-.372**		
Pig production per year 1995 – 1997								
[005] No. of weaners per sow [per year]	μ	63	23.1	23.4	22.1	21.4	22.1	22.5
	σ		.7	1.2	1.5	.8	1.0	1.2
	r		.311*	.334**		-.373**		

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
[010] % Piglet mortality after weaning	*μ* *σ* *r*	64	2.0 2.1	1.4 .9	2.2 .8	1.5 1.0	1.4 .7	1.7 1.3
[004] Intensity in feeder pigs (25 kg) per sow [per year]	*μ* *σ* *r*	44	23.0 .8 .377*	23.1 1.4	21.7 1.5	21.0 1.0 -.334*	21.8 1.6	22.2 1.4
Trend in pig production 1995 – 1997								
[t005] Trend in weaners per sow [per year]	*μ* *σ* *r*	66	-.2 1.2	1.3 2.0 .213^{+}	.4 1.5	.1 2.7	.6 1.7	.4 1.8
[t010] Trend in % piglet mortality after weaning	*μ* *σ* *r*	66	-.8 5.6	.5 .9	.3 1.5	.5 .9	.6 1.3	.1 3.0
[t004] Trend in Intensity: feeder pigs per sow [per year]	*μ* *σ* *r*	45	-.6 1.1 -.273^{+}	1.2 2.6	-.2 2.2	.2 1.7	1.6 2.3 .300*	.2 2.0
Fluctuation in pig production 1995 – 1997								
[sq005] Fluctuation in weaners per sow [per year]	*μ* *σ* *r*	64	-.5 1.4	-.9 1.6	-.6 2.0	.7 2.6 .253*	-.9 2.4	-.5 2.1
[sq010] Fluctuation in % piglet mortality after weaning	*μ* *σ* *r*	64	-1 6	.1 1.2	.7 2.4	-1.0 1.6	.3 1.4	-.3 3.1
[sq004] Fluctuation in Intensity: feeder pigs per sow [per year]	*μ* *σ* *r*	44	.5 2.6	.3 1.0	.1 1.8	1.9 2.8 .261^{+}	.1 2.1	.5 2.2
Piglet growth 1997								
[025] Body weight of produced feeder pigs	*μ* *σ* *r*	61	25.5 1.5	25.9 1.5	25.4 1.8	25.4 1.5	27.0 1.9	25.8 1.7
[024] Age of produced feeder pigs (25 kg)	*μ* *σ* *r*	61	73 4	74 5	72 5	76 8	75 5	74 5
[026] Growth per day (in grams) of produced feeder pigs	*μ* *σ* *r*	61	331 21	331 23	333 25	322 32	345 30 .229^{+}	334 26
Piglet growth 1995 – 1997								
[025] Body weight of produced feeder pigs	*μ* *σ* *r*	57	25.1 1.0	25.2 .8	25.1 1.1	25.4 .4	26.6 1.2 .509*	25.5 1.1
[024] Age of produced feeder pigs (25 kg) [in days]	*μ* *σ* *r*	56	73 4	73 6	72 4	72 5	74 5	73 4
[026] Growth per day (in grams) of produced feeder pigs	*μ* *σ* *r*	56	329 19	330 28	332 15	336 25	344 27 .239^{+}	334 23
Trend in piglet growth 1995 – 1997								
[t025] Trend in body weight of feeder pigs	*μ* *σ* *r*	59	.6 1.4	1.2 2.8	.4 1.7	.8 1.2	.4 2.0	.6 1.8
[t024] Trend in age of feeder pigs	*μ* *σ* *r*	59	1 3	0 7	-0 4	8 6 419**	2 6	2 5

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
[t026] Trend in growth per day (in grams) of feeder pigs	*μ* *σ* *r*	59	3 22	10 50	5 20	-24 35 -.278*	-3 25	1 30
Fluctuation in piglet growth 1995 - 1997								
[sq025] Fluctuation in body weight of ready feeder pigs	*μ* *σ* *r*	57	-.5 1.9	-.3 3.3	-.3 1.6	-.6 1.8	-1.2 1.9	-.6 2.1
[sq024] Fluctuation in age of ready feeder pigs	*μ* *σ* *r*	56	-3 3	-7 7 -.307*	-2 5	-4 6	-2 7	-3 6
[sq026] Fluctuation in growth per day (in grams) of ready feeder pigs	*μ* *σ* *r*	56	5 20	22 41 .238^{+}	7 30	5 33	-8 37	5 32
Section 6.2.3 Balance of inputs and outputs and of prices and returns								
Animals present 1997								
[001] Farm size in no. of sows	*μ* *σ* *r*	70	273 110 .569**	227 57	130 70 -.239*	161 63	96 20 -.461**	191 121
[001l] log 10 (1997 Size) in: no. of sows	*μ* *σ* *r*	70	2.41 .16 .571**	2.34 .11 .264*	2.07 .21 -.274*	2.18 .16	1.97 .09 -.537**	2.21 .24
[---] Total no. of produced feeder pigs [per year] [11]	*μ* *σ* *r*	70	6243 2707 .563**	5331 1472 .221^{+}	2829 1599 -.240*	3339 1406	2103 504 -.439**	4034 2412
[---l] log 10 (1997 Total no. of produced feeder pigs [per year])	*μ* *σ* *r*	70	3.76 .17 .567**	3.71 .12 .291*	3.40 .23 -.279*	3.49 .17	3.31 .11 -.506**	3.54 .25
[103] Average no. of boars	*μ* *σ* *r*	38	1.7 1.0	1.7 .5	1.8 .6	n.a.[12]	n.a.	1.7 .7
Animals present 1995 – 1997								
[001] Farm size in no. of sows 1995 – 1997	*μ* *σ* *r*	61	266 128 .555**	215 52	130 63	132 35	94 18 -.412**	166 98
[t001] Trend in no. of sows 1995 – 1997	*μ* *σ* *r*	61	21 41	29 30 .220^{+}	11 16	12 21	8 11	15 27
[sq001] Fluctuation in no. of sows 1995 – 1997	*μ* *σ* *r*	59	4 29	18 32 .304*	-5 6 -.221^{+}	2 7	3 10	4 21
Pig prices 1997								
(in €)[13] *[202] 1997 Average purchase price per maiden sow (6-7 months)*	*μ* *σ* *r*	30	232.= 95.=	209.= 79.=	281.= 34.= .349^{+}	n.a.	n.a.	245.= 75.=
(in €) *[207] 1997 Average sales price per feeder pig*	*μ* *σ* *r*	34	53.61 1.87	53.16 2.05	51.51 1.85 -.288^{+}	n.a.	n.a.	52.83 3.01
Pig prices 1995 – 1997								
(in €) *[207] Average sales price per feeder pig 1995 - 1997*	*μ* *σ* *r*	31	50.82 1.36	49.46 1.36	49.01 1.36	n.a.	n.a.	49.92 2.27
(in €) *[t207] Trend in sales price per feeder pig 1995 – 1997*	*μ* *σ* *r*	31	9.72 2.12	11.84 3.63 .345^{+}	9.03 2.53	n.a.	n.a.	9.97 2.98

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
(in €) *[sq207] Fluctuation in sales price per feeder pig 1995 – 1997*	*μ* *σ* *r*	31	11.57 4.36	12.76 3.70	12.44 1.90	n.a.	n.a.	12.18 3.11
Inputs of feedstuff 1997								
[113] Feedstuff for sows (in kg) per sow [per year]	*μ* *σ* *r*	36	1082 78	1134 73	1094 124	n.a.	n.a.	1097 88
[114] Feedstuff for piglets (in kg) per produced feeder pig	*μ* *σ* *r*	37	31.0 4.1	31.4 4.6	29.3 2.4	n.a.	n.a.	30.7 3.9
Inputs of feedstuff 1995 – 1997								
[113] Feedstuff for sows (in kg) per sow [per year]	*μ* *σ* *r*	33	1073 48	1091 94	1092 68	n.a.	n.a.	1090 66
[114] Feedstuff for piglets (in kg) per produced feeder pig	*μ* *σ* *r*	34	29.9 2.2	29.2 2.4	29.1 2.8	n.a.	n.a.	29.8 2.5
Trend in inputs of feedstuff 1995 – 1997								
[t113] Trend in feedstuff for sows (in kg) per sow [per year]	*μ* *σ* *r*	33	6 59	124 168 .427*	8 103	n.a.	n.a.	23 112
[t114] Trend in feedstuff for piglets (in kg) per produced feeder pig	*μ* *σ* *r*	34	1.7 3.6	5.0 9.2 .306^{+}	.1 2.8	n.a.	n.a.	1.5 5.5
Fluctuation in inputs 1995 – 1997								
[sq113]Fluctuation in feedstuff for sows (in kg) per sow[per year]	*μ* *σ* *r*	33	-8 101	108 130	15 98	n.a.	n.a.	45 164
[sq114] Fluctuation in feedstuff for piglets (kg) per produced feeder pig	*μ* *σ* *r*	34	-2.9 5.5	-.7 4.7	-1.1 4.3	n.a.	n.a.	-2.4 5.2
Costs of feedstuff 1997								
(in €) *[216] Costs of feedstuff for sows per 100 kg feedstuff*	*μ* *σ* *r*	34	18.78 1.17	18.75 1.18	18.65 .54	n.a.	n.a.	18.66 1.04
(in €) *[217] Costs of feedstuff for sows per 100 Energy Value Equivalents (EV)*	*μ* *σ* *r*	30	18.80 1.05	18.60 1.03	18.41 .50	n.a.	n.a.	18.59 .77
(in €) *[218] Costs of feedstuff for piglets per 100 kg feedstuff*	*μ* *σ* *r*	33	29.81 3.89	29.70 2.51	29.05 1.91	n.a.	n.a.	29.33 2.76
(in €) ***[210] Costs of feedstuff for piglets per produced feeder pig***	*μ* *σ* *r*	33	9.17 1.65	8.91 1.18	9.05 2.13	n.a.	n.a.	9.01 1.65
Costs of feedstuff 1995 – 1997								
(in €) *[216] Costs of feedstuff for sows per 100 kg feedstuff*	*μ* *σ* *r*	31	18.11 .70	18.67 .73	18.29 .50	n.a.	n.a.	18.36 .61
(in €) *[217] Costs of feedstuff for sows per 100 Energy Value Equivalents (EV)*	*μ* *σ* *r*	29	18.12 .57	18.52 .70 .319^{+}	18.07 .47	n.a.	n.a.	18.23 .54
(in €) *[218] Costs of feedstuff for piglets per 100 kg feedstuff*	*μ* *σ* *r*	30	29.37 3.55	28.86 2.28	28.56 1.62	n.a.	n.a.	28.81 2.35

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
(in €) *[210] Costs of feedstuff for piglets per produced feeder pig*	*μ* *σ* *r*	30	8.62 1.51	8.79 1.44	8.75 1.94	n.a.	n.a.	8.76 1.49
Trend in costs of feedstuff 1995 - 1997								
(in €) *[t216] Trend in costs of feedstuff for sows per 100 kg feedstuff*	*μ* *σ* *r*	31	1.33 .88	-.40 4.46	.98 .74	n.a.	n.a.	.75 .84
(in €) *[t217] Trend in costs of feedstuff for sows per 100 Energy Value (EW)*	*μ* *σ* *r*	29	1.27 .93	-.46 4.42	.94 .64	n.a.	n.a.	.65 2.23
(in €) *[t218] Trend in costs of feedstuff for piglets per 100 kg feedstuff*	*μ* *σ* *r*	30	1.36 2.35	1.96 2.50	1.18 1.63	n.a.	n.a.	1.40 1.93
(in €) *[t210] Trend in costs of feedstuff for piglets per produced feeder pig*	*μ* *σ* *r*	30	-.00 2.69	-.37 2.07	.39 .85	n.a.	n.a.	.01 1.91
Fluctuation in costs of feedstuff 1995 – 1997								
(in €) *[sq216] Fluctuation in costs of feedstuff for sows per 100 kg feedstuff*	*μ* *σ* *r*	31	.98 .95	-1.69 7.37	.76 .71	n.a.	n.a.	.17 3.53
(in €) *[sq217] Fluctuation in costs of feedstuff for sows per 100 (EV)*	*μ* *σ* *r*	29	.96 .82	-1.85 7.29 $-.313^{+}$	.79 .62	n.a.	n.a.	.12 3.61
(in €) *[sq218] Fluctuation in costs of feedstuff for piglets per 100 kg feedstuff*	*μ* *σ* *r*	30	1.23 2.78	.83 2.65	.64 1.84	n.a.	n.a.	.64 2.32
(in €) *[sq210] Fluctuation in costs of feedstuff for piglets / produced feeder pig*	*μ* *σ* *r*	30	.17 1.67	.93 1.24	.63 .81	n.a.	n.a.	.77 1.46
Health care								
(in €) *[229] 1997 Costs of health care per sow [per year]*	*μ* *σ* *r*	30	40.24 14.37	49.38 21.71	42.86 16.61	n.a.	n.a.	42.63 15.98
(in €) *[229] 1995 – 1997 Costs of health care per sow [per year]*	*μ* *σ* *r*	28	41.64 11.27	50.25 8.36	41.19 13.28	n.a.	n.a.	42.14 12.12
(in €) *[t229] Trend in costs of health care per sow [per year] 1995 – 1997*	*μ* *σ* *r*	28	1.42 13.36	11.34 35.48	6.20 12.57	n.a.	n.a.	5.19 18.61
(in €) *[sq229] Fluctuation in costs of health care per sow / year 1995 – 1997*	*μ* *σ* *r*	28	8.86 15.56	15.43 34.97	8.62 21.26	n.a.	n.a.	9.49 21.70
Financial balance 1997								
Costs of feedstuff 1995 – 1997								
(in €) *[236] Balance (without interest) per sow [per year]*	*μ* *σ* *r*	31	560.= 54.=	647.= 87.= .552**	520.= 79.=	n.a.	n.a.	558.= 88.=
(in €) *[237] Balance (without interest) per feeder pig*	*μ* *σ* *r*	31	25.17 1.50	27.93 3.63 .451*	24.45 2.44	n.a.	n.a.	25.30 3.20
Balance 1995 – 1997								
(in €) *[236] Balance (without interest) per sow [per year]*	*μ* *σ* *r*	28	535.= 61.=	548.= 60.= $.372^{+}$	476.= 58.=	n.a.	n.a.	508.= 71.=

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<Q>*
N			19	10	13	12	16	12
(in €) *[237] Balance (without interest) per feeder pig*	*μ* *σ* *r*	27	16.06 8.14	24.16 2.25 .380$^+$	22.13 1.39	n.a.	n.a.	22.80 2.39
Trend in balance 1995 – 1997								
(in €) *[t236] Trend in balance (without interest) per sow [per year]*	*μ* *σ* *r*	28	128.= 93.=	270.= 113.= .447*	164.= 84.=	n.a.	n.a.	185.= 101.=
(in €) *[t237] Trend in balance (without interest) per feeder pig*	*μ* *σ* *r*	27	7.33 3.12	10.45 3.99	7.98 2.66	n.a.	n.a.	8.53 3.25
Fluctuation in balance 1995 – 1997								
(in €) *[sq236] Fluctuation in balance (without interest) per sow [per year]*	*μ* *σ* *r*	28	235.= 169.=	203.= 70.=	221.= 51.=	n.a.	n.a.	214.= 114.=
(in €) *[sq237] Fluctuation in balance (without interest) per feeder pig*	*μ* *σ* *r*	27	10.68 5.83	8.99 4.31	10.16 3.23	n.a.	n.a.	10.83 4.43

Supplement Table 6c: Attitudes towards the indicators

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
Section 6.3.1 Purpose of management support								
In the questionnaire one answer was requested:								
[55y1] Purpose of insight in data is: general overview	*n* *r*	20	4	0 -.222$^+$	3	5 .204$^+$	4	4
[55y2] Purpose of insight in data is: technical improvements	*n* *r*	41	10	6	5	7	9	4
[55y3] Purpose of insight in data is: economic improvements	*n* *r*	24	7	3	6	1 -.204$^+$	3	4
ΣN		85/ 82	21/19	9/10	14/13	13/12	16	12
The following was raised as an open question:								
[Note:] Management support does not include economic indicators ()[14]		(26)	(2)	(0)	(1)	(6)	(8)	(5)
[56c0] Why are economic data important? answer: unimportant	*n* *r*	16	3	1	2	3	4	3
[56c9] Why are economic data important? answer: (no specific answer)	*n* *r*	25	5	2	2 -.203$^+$	5	8 .223$^+$	3
[56c1] Why are economic data important? answer: feed costs	*n* *r*	17	5	2	5 .198$^+$	1	2	2
[56c2] Why are economic data important? answer: balance / animal	*n* *r*	12	3	4 .272*	2	1	1	1
[56c3] Why are economic data important? answer: farm balance	*n* *r*	12	3	1	2	2	1	3
ΣN		66	16	9	11	9	12	9
Respondents could choose multiple answers:								
[56a1] Data are compared to: general average	*n* *r*	17	7 .229$^+$	1	2	2	3	2
[56a2] Data are compared to: farms of comparable sizes	*n* *r*	45	12	8	7	6	9	3 -.249*
[56a3] Data are compared to: top 10%	*n* *r*	23	8	6 .236*	4	1 -.237*	4	0 -.259*

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[56a4] Data are compared to: in the study club	*n* *r*	50	18 .403**	7	9	4 -.278*	6 -.286*	6
[56a5] Data are compared to: previous years	*n* *r*	35	10	5	6	5	5	4
[56a6] Data are compared to: personal targets	*n* *r*	24	4	3	3	4	7	3
ΣN		194/ 492	59/114	30/60	31/78	22/72	34/96	18/72
In %		39%	52%	50%	40%	31%	35%	25%
Section 6.3.2 Validation of indicators								
In the questionnaire 3 answers per farm were requested:								
[51y3] Most important indicators are about production per sow	*n* *r*	63	14	10 .204^{+}	11	7 -.246*	14	7[15] -.247*
[51y1] Most important indicators are about sow fertility	*n* *r*	60	12	9	10	9	12	8
[51y7] Most important indicators are about profits and balance	*n* *r*	38	8	5	8	6	5	6
[51y6] Most important indicators are about feed costs	*n* *r*	28	8	2	3	5	5	5
[51y4] Most important indicators are about rearing piglets	*n* *r*	27	8[16]	4	5	2	5	3
[51y5] Most important indicators are about animal health care	*n* *r*	10	1	0	1	2	2	4 .267*
[51y2] Most important indicators are about sow replacement	*n* *r*	10	2	0	1	2	2	3
[51y8] Most important indicators are about mineral efficiency	*n* *r*	2	1	0	0	1	0	0
[51y9] Most important indicators are about heating and general costs	*n* *r*	1	0	0	0	1	0	0
ΣN		239/ 246	54/57	30	39	35/36	45/48	36
In the questionnaire 1 answer per farm was requested:								
[53y1] Key production indicator is: piglets born alive per litter	*n* *r*	21	5	3	2	6 .234^{+}	3	2
[53y2] Key production indicator is: weaners per litter	*n* *r*	10	3	2	0	2	2	1
[53y3] Key production indicator is: weaners per sow / year	*n* *r*	4	1	0	1	1	1	0
[53y4] Key production indicator is: feeder pigs per sow / year	*n* *r*	46	10	5	10	3 -.267*	10	8
ΣN		81/ 82	19	10	13	12	16	11/12
[52y1] Key fertility indicator is: % newly introduced sows per year	*n* *r*	5	1	2	1	0	1	0
[52y2] Key fertility indicator is: % of sows culled per year	*n* *r*	7	4 .225^{+}	1	1	0	1	0
[[52y3] Key fertility indicator is: days lost per culled sow	*n* *r*	14	3	3	3	3	2	0
In the questionnaire 1 answer per farm was requested:								
[52y4] Key fertility indicator is: % re-inseminations	*n* *r*	43	8	3	5	8	9	10 .256*
[52y5] Key fertility indicator is: farrow index	*n* *r*	13	3	1	3	1	3	2
ΣN		82	19	10	13	12	16	12

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
Which specific indicator might cause serious concern? Which specific indicators would give cause for celebration. A maximum of 3 answers for each question was requested and the responses to both questions are combined here in the table.								
[] Answer: I cannot name specific indicators for either category	*n* *r*	9	2	2	2	0	2	1
[] Answer: I cannot name specific indicators for concern	*n* *r*	6	2	1	1	1	0	1
[] Answer: I cannot mention specific indicators for celebration	*n* *r*	19	3	2	4	2	6	2
ΣN		43/ 34	9/7	7/5	7/5	3	10/8	5/4
[58x004] Special attention: feeder pigs per sow [per year}	*n* *r*	49	12	7	8	7	11	4 -.223*
[58x018] Special attention: % re-inseminations	*n* *r*	25	6	1	3	4	4	7 .250*
[58x006] Special attention: piglets born alive per litter	*n* *r*	25	6	4	3	4	5	3
[58x008] Special attention: % piglet mortality before weaning	*n* *r*	23	6	2	6	2	6	1
[58x003] Special attention: farrow index	*n* *r*	10	3	3	1	0	3	0
[58x236] Special attention: financial balance per sow [per year]	*n* *r*	6	2	1	1	0	1	1
[58019] Special attention: % farrows of first insemination	*n* *r*	5	3	0	0	1	1	0
[58x010] Special attention: % piglet mortality after weaning	*n* *r*	4	2	1	0	1	0	0
[58x215] Special attention: total cost feed stuff per feeder pig	*n* *r*	4	3	0	0	0	1	0
[58x009] Special attention: weaners per litter	*n* *r*	3	1	1	1	0	0	0
58x012] Special attention: interval weaning – first insemination	*n* *r*	3	0	1	0	1	0	1
[58x229] Special attention: costs for health care	*n* *r*	2	1	0	0	0	1	0
[58x115] Special attention: kg piglet feed per reared feeder pig	*n* *r*	1	1	0	0	0	0	0
[58x208] Special attention: sales price per sold feeder pig	*n* *r*	1	1	0	0	0	0	0
[58x210] Special attention: costs of piglet feed per feeder pig	*n* *r*	1	1	0	0	0	0	0
[58x005] Special attention: weaners per sow [per year]	*n* *r*	1	0	0	1	0	0	0
[58x014] Special attention: days lost per culled sow	*n* *r*	1	0	0	0	1	0	0
[58x026] Special attention: growth / day of feeder pigs	*n* *r*	1	0	0	0	0	1	0
[58x002] Special attention: availability of maiden sows	*n* *r*	1	0	0	0	0	1	0
[58x050] Special attention: farrow number	*n* *r*	1	0	0	0	0	0	1
ΣN		167/ 363	48/87	21/39	24/57	21/63	35/66	18/57
In %		46%	62%	54%	42%	33%	53%	32%
Section 6.3.3 Participation in management support								
[15a3a] Management support programme: Comzog	*n* *r*	39	4 -285*	4	2 -.278*	7	14 .474**	8
[15a3b] Management support programme: CBK	*n* *r*	37	13 .242*	6	11 .344**	2 -.290^{+}	2 -.393**	3

Variable			*<E>*	*<C>*	*<W>*	*<K>*	*<F>*	*<U>*
N			19	10	13	12	16	12
[15a3c] Management support programme: ZAP	*n* *r*	6	2	0	0	3	0	1
ΣN		82	19	10	13	12	16	12
[15a1] Management support started before or after 1990 (1 = before)	*n* *r*	50	12	4	8	9	8	9
[15a2] Management support includes economic indicators	*n* *r*	56	17 .259*	10 .267*	12 .232^{+}	6 -.199^{+}	4 -.535**	7
[15b] Participation in farm data comparison programme	*n* *r*	69	14	9	13 .217^{+}	8	14	11
[19x10] Equipment: personal computer	*n* *r*	76	19	10	11	11	16	9 -281*
[19x11] Equipment: connection to the Internet	*n* *r*	12	3	2	2	2	1	2
Interviewees were asked to answer all the questions separately:								
[57x1] Farm data are discussed with: no one	*n* *r*	0	0	0	0	0	0	0
[57x2] Farm data are discussed with: partners (family)	*n* *r*	31	9	5	7	3	4	3
[57x3] Farm data are discussed with: other relatives	*n* *r*	31	8	3	5	7	6	2
[57x4] Farm data are discussed with: personnel	*n* *r*	14	6 .234^{+}	3	0 -.217^{+}	2	1	2
[57x5] Farm data are discussed with: study club members	*n* *r*	42	14 .238*	6	9	5	4 -.320**	4
[57x6] Farm data are discussed with: general extension officer (DLV)	*n* *r*	30	8	2	5	6	2 -.236*	7 .187^{+}
[57x7] Farm data are discussed with: the accountant	*n* *r*	19	6	3	0 -.260*	4	3	3
[57x8] Farm data are discussed with: feed supply extension officer	*n* *r*	70	17	9	12	10	14	8 -.219*
[57x9] Farm data are discussed with: chain contact (Dumeco)	*n* *r*	8	3	1	1	0	2	1
[57x10] Farm data are discussed with: the veterinarian	*n* *r*	41	11	8 .222^{+}	5	8	5 -.236*	4
[57x11] Farm data are discussed with: the breeding company	*n* *r*	7	0	1	1	1	3	1
ΣN		293/820	82/190	40/100	44/130	45/120	41/160	35/110
In %		36%	43%	40%	34%	38%	26%	27%

Supplement Table Appendix B

List of Standard Management Indicators[1]

Part 1: Production indicators	*Notation*
Animals present	
001 Average number of sows	xxx.x
002 Average number of maiden sows	xxx.x
Piglet production	
004 Average number of produced feeder pigs per sow [per year]	xx.x
005 Average number of weaners per sow [per year]	xx.x
006 Average number of piglets born alive per litter	xx.x
007 Average number of piglets born dead per litter	xx.x
008 % Pre-weaning piglet mortality per litter	xx.x
009 Average number of weaners per litter	xx.x
010 % Post-weaning piglet mortality per litter	xx.x
Fertility cycle of the sows	
003 Average farrow index: number of farrows per sow [per year]	x.xx
011 Duration of the nursing period	xx.x
012 Interval weaning to first new insemination of sows	xx.x
013 Interval between first and last insemination	xx.x
014 Number of days open per culled sow	xx x
018 % Re-inseminations	xx
Sow cull and replacement by maiden sows	
015 % Sows culled per year	xx
016 % Newly introduced maiden sows per year	xx
017 % First farrows of maiden sows	xx
019 % Farrows from first inseminations	xx
020 Age at first insemination in life	xxx
021 Age of maiden sows at introduction on the farm	xxx
022 % Cull of young sows (maiden, or in gestation before first farrow)	xx
023 Average age of young sows when culled[2]	xxx
050 Average farrow number[3]	xx.x
Piglet growth	
024 Age of produced feeder pigs ready for fattening	xx
025 Weight of produced feeder pigs ready for fattening	xx.x
026 Growth per day (g) of produced feeder pigs until ready	xxx

[1] Source: 'Uniformeringsafspraken varkenshouderij, versie 96_1' by IKC, PV and ATC, Netherlands 1996; see for detailed information about the specification of the indicators.
[2] young sows: gilts, maiden sows and other young sows before the first farrow
[3] Average farrow number is not in the official standard list, but it appears often in commercial lists; the number 050 is fictive.

Part 2: Inputs and outputs	*Notation*
Animals present	
101 = 001 Average number of sows	xxx.x
102 = 002 Average number of maiden sows	xxx.x
103 Average number of boars	xxx.x
104 Average number of other pigs	xxx.x
Animal flow per year	
105 No. of introductions of maiden sows (gilts)[4] per a.n.s.[5]	x.xx
106 No. of introductions of maiden sows for first insemination per a.n.s.	x.xx
107 No. of culled maiden sows per a.n.s.	x.xx
108 No. of culled sows per a.n.s.	x.xx
109 No. of introductions of boars per a.n.s.	x.xx
110 No. of culled boars per a.n.s.	x.xx
111 No. of ready feeder pigs per a.n.s. (= 004)	xx.x
112 No. of feeder pigs sold per a.n.s.	xx.x
Feedstuff consumption	
113 Kg feedstuff for sows per sow [per year]	xxxx
114 Kg feedstuff for piglets per produced feeder pig [per year]	xx.x
115 Kg feedstuff for piglets per produced feeder pig of 25 kg	xx.x
116 Kg feedstuff for young sows per average no. of young sows [per year]	xxx
117 Kg feedstuff of boars per average no. of boars [per year]	xxxx
118 Kg feedstuff per sow feed group[6] per a.n.s. [per year]	xxxx
119 Total kgs of feedstuff used per produced feeder pig	xxxx
120 % By-products to the sow feed group	xx
121 % By-products to the piglet feed group	xx

[4] gilt: young sow that not yet has been inseminated; maiden sow: young sow that not yet has been in gestation
[5] a.n.s. average number of sows
[6] sow feed group: all feedstuff that is traded as sow feed

Part 3: Prices and balance[7]	*Notation*
Prices for animals bought and sold	
201 Average price (purchase) per introduced young maiden sow (gilt)	xxx
202 Average price (purchase) per introduced maiden sow	xxx
203 Average price (selling) per sold young sow (gilt)	xxx
204 Average price (selling) per sold sow	xxx
205 Average price (purchase) per introduced boar	xxxx
206 Average price (selling) per sold boar	xxxx
207 Average price (selling) per sold feeder pig	xxx.xx
208 Average price (selling) per sold piglet at 25 kgs	xxx.xx
Feed costs	
209 Feed costs sows per a.n.s. [per year]	xxx
210 Feed costs for piglets per sold feeder pig	xx.xx
211 Feed costs piglets per piglet of 25 kgs	xx.xx
212 Feed costs maiden sows per average no. of maiden sows	xxx
213 Feed costs boars per average no. of boars	xxx
214 Feed costs sow feed group per a.n.s. [per year]	xxx
215 Total feed costs per produced feeder pig	xx.xx
216 Feed price sow feed group per 100 kg feedstuff	xx.xx
217 Feed price sow feed group per 100 EW[8]	xx.xx
218 Feed price piglets feed group per 100 kg	xx.xx
Profits on feedstuff [per year]	
219 Profits on sales of sows and pigs per a.n.s.	xxxx
220 Profits on sales of maiden sows, boars and other pigs per a.n.s.	xxx
221 Costs for purchased maiden sows, boars and other pigs per a.n.s.	xxx
222 Difference in balance per a.n.s.	xxxx
223 Turnover and difference in balance of feedstuff per a.n.s.	xxxx
224 Feedstuff costs for sows and piglets per a.n.s.	xxx
225 Feedstuff costs for sows and piglets per produced feeder pig	xx
226 Feedstuff costs for maiden sows, boars and other pigs per a.n.s.	xxx
227 Profits on feedstuff per a.n.s.	xxxx
228 Profits on feedstuff per produced feeder pig	xxx
Various additional costs per sow [per year]	
229 Costs of health care	xx
230 Costs of artificial insemination (AI)	xx
231 Costs related to other breeding activities (not AI)	xx
232 Costs of fuel	xx
233 Costs of electricity	xx
234 Costs of straw	xx
235 Costs of drinking water	xx
238 Costs for manure removal[9]	xx
Balance of costs and profits	
236 Balance per a.n.s [per year]: [Ind. 227 -/- (Ind. 229 through Ind. 235)][10]	xxxx
237 Balance per produced feeder pig: [Ind. 236 -/- Ind. 004]	xxx.xx

[7] Some management support programmes have an extended list of prices and other economic data.
[8] EV: Energy Value standard
[9] Costs for manure removal [238] did not exist (yet) in the standard lists before 1997.
[10] Ind.: Indicator (no.)

Notes

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[1] <E>: Entrepreneur, <C>: Craftsman, <W>: Steward, <K>: Stockman, <F>: Shifter, <U>: Unclassified, <Q>: All (population average).

[2] n = number, μ = mean, σ = standard deviation, r = correlation; only (nearly) significant correlations are given; notation of correlation (r) and significance (Pearson, 2-tailed): r^+: $p < .1$; r^*: $p < .05$; r^{**}: $p < .01$.

[3] Variable descriptions:

Bold variable is used in the final principal component factor analysis

Regular variable is not used in the final factor analysis, for reasons explained in the text

Italic variable is not used in any analysis, for lack of odds: (N) among the 70 classified farmers is less than 7 or more than 63.

[4] n.a.: not available

[5] Unclassified farmers had no information available about the indicators. The population average of the farmers who had the information available is provided in Supplement Table 6b. The last column was used for the average of 'All' <Q>.

[6] Data on the following technical indicators were not available for lack of farmers (less than 28) who provided them (see also Supplement Table Appendix B):

[002] Average no. of maiden sows; [022] % Cull of maiden sows; [023] Average age of culled maiden sows.

[7] Mean: [(data 1997 + data 1996 + data 1995) / 3]

[8] Unclassified farmers had no information available about the indicators. The population average of the farmers who had the information available is provided in Supplement Table 6b. The last column was used for the average of 'All' <Q>.

[9] Trend: (3 * data 1997) – (2 * data 1996) – (1 * data 1995)

[10] Fluctuation: (2 * data 1996) – (data 1997) – (data 1995)

[11] The total production of feeder pigs was indirectly obtained from data overviews: calculated from the provided data.

[12] Data were considered 'not available' if they were available from less than 6 farmers in a group (*style*).

[13] 1€ = *fl* 2.20371; *fl.*: Dutch *florin* or 'guilder'.

[14] Information copied from Supplement Table 6b.

[15] One unclassified farmer made this choice both on the first and the third positions.

[16] One entrepreneur made this choice both on the first and third positions.

Curriculum Vitae

Monica Alida Maria Commandeur werd geboren op 19 februari 1955 in Alkmaar; als zesde in een gezin van tien kinderen. Haar voorliefde voor vee en de veehouderij is vooral gebaseerd op de veekeuringen, die in haar jeugd tegenover de ouderlijke woning in de stad werden gehouden. Zij heeft op verschillende middelbare scholen gezeten. Door de Mammoetwet veranderde er veel in hun onderwijsprogramma's. In januari 1971 kwam zij terecht op de toenmalige Rijksscholengemeenschap voor Noord-Kennemerland te Alkmaar (het huidige Willem Blaeu College) waar zij de HAVO (1973) en het Atheneum-B (1975) voltooide.

In 1975 kwam zij naar Wageningen voor een studie aan de toenmalige Landbouwhogeschool (de huidige Wageningen Universiteit). In het toen geldende lotingsysteem lukte het niet om een studieplaats bij Diergeneeskunde in Utrecht te bemachtigen. Met een studieonderbreking van een jaar voor het voorzitterschap van de Wageningse Studenten Organisatie (WSO: 1979/1980) en enkele malen voor lange reizen naar o.a. Noord-Amerika en Afrika voltooide zij in 1984 haar veeteeltstudie. De belangrijkste onderdelen van de afstudeerfase waren: acht maanden stage in het landbouwonderwijs in Colombia (Zuid-Amerika) en de afstudeervakken: Gezondheids- en Ziekteleer der Landbouwhuisdieren, Tropische Veehouderij, Veefokkerij en Vrouwenstudies.

Van 1984 tot 1989 was zij universitair docent bij de vakgroep Veehouderij, met als specialisaties Gezondheids- en Ziekteleer der Landbouwhuisdieren (in het bijzonder de uiergezondheid van melkvee), Rundveehouderij en Discipline Integratie. In 1989 was zij korte tijd zelfstandig adviseur waarin zij zich vooral in de biologische rundveehouderij profileerde. Naast het werk is zij blijven reizen met speciale aandacht voor de rurale gebieden elders in de wereld (Oost-Europa, China, en veel Afrika).

Van 1990 tot 1992 was zij beleidsmedewerker voor de institutionele vernieuwing van de landbouwvoorlichting en het ondersteunen van institutionele vernieuwing in midden- en oost Europa bij het Ministerie van Landbouw, Natuurbeheer en Visserij (LNV) in Den Haag. Van 1992 tot 1994 was zij sectorspecialist rundveehouderij, deskundige gebiedsontwikkeling en deskundige beleidsdoorwerking bij het Consulentschap Landbouw van het Ministerie van LNV in Tilburg. Van 1995 tot 2003 was zij beleidsmedewerker bij de Directie Zuid van het Ministerie van LNV in Eindhoven. Haar voornaamste taken betroffen de strategische beleidsontwikkeling van het Ministerie van LNV voor Brabant en Limburg, en de regionale gebiedsontwikkeling; met name in het waardevol cultuurlandschap (WCL) in midden-Limburg. Daarnaast had zij een veelheid van taken die minder van haar tijd in beslag namen, hoewel sommige van deze taken tijdelijk veel van haar aandacht vroegen. Dat gold met name voor de thema's milieucoöperaties ('De Peel' en 'Peel en Maas'), dierziektepreventie (in het bijzonder gedurende de eerste drie maanden na de uitbraak van de varkenspest in 1997) en de communicatie van de Directie Zuid.

Sinds 1996 is zij (deels informeel en deels formeel) als gast-onderzoeker betrokken bij Rurale Sociologie en bij Dierlijke Productie van de Wageningen Universiteit voor het doen van deze studie.