The way you do, it matters

A case study: *farming economically* in Galician dairy agroecosystems in the context of a Cooperative

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Writing a thesis is a challenging exercise of reading, thinking, research, reviewing, reflection, and writing, which can take longer than expected, but it always leads to new experiences and a deeper level of knowledge. As far as I know and have experienced, PhD students are confronted with different frames of mind during the process, where ups and downs alternate. But in the end, it is a worthy process of academic and personal learning.

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1 GENERAL INTRODUCTION

In 1975, I visited the village of my parents for the first time. Galicia was then deeply rural. The *aldea* (tiny village) where my grandparents lived still had the taste of oldness, of the primitive, of the hidden, of the unspoken. There were many old people, their faces covered with wrinkles, tanned by the work in the fields, by the reaping in July, by doing the *mallas* in August (see Glossary). It was the land of the *rubias,* and the *ratinas,* with no Frisian cows at all. It was the time of the old wooden carts, of the women with heads covered by shawls, of the mourning clothes. The village was green in spring and brown in autumn because of the hundreds of chestnut trees and oaks, yellow in August because of the straw and the drought, and rather grey in winter because of the lack of sunlight.

My first memories are of people helping each other, working together, mowing the grass with *gadañas* (scythes) and gathering it with the *angazos* (rakes), using *espalladoiras* (barley forks), ploughing with old wooden and iron ploughs, and using communal rented machines to thresh. It was the time of the *palleiros,* of the children jumping on the grass to make it fit into the old wooden carts. In spring and summer, the cows went to graze in the early morning and in the evening and children had the task of taking care of them in the fields. In winter, people got up early to gather the *estrume* in the *monte,* in order to make the beds for the animals and to obtain manure for the crops.

In the last three decades, many things have changed in my village as in many other Galician villages. The process of transformation imposed from the end of the 60s onwards by the last and most recent process of farming modernisation[1] required a radical change in the way of doing agriculture, strongly framed by the assumptions of the Green Revolution.

When I reached university age, I decided to study economics. For five years many things were explained to me, always within a rational *Homo economicus* perspective, which gave the impression that by following certain assumptions it was possible to predict and or find the 'one' solution for the posed problem. The functioning of the economic process was, moreover, explained under the *mechanistic approach*[2] as

> *an isolated system or circular flow where everything that is produced is consumed and vice versa: a pendulum-like motion that does not alter the grounds of its environment, a self-sufficient and totally reversible in time and space 'perpetum mobile'* (Georgescu-Roegen, cited by Carpintero 2006:117; translated from the original in Spanish).

When I started to be involved in studying and researching the agricultural sector (one of the main but least profitable activities in Galicia), I experienced the very often useless nature of many of the assumptions of micro- and macro-economic models to explain agricultural reality. For instance, rationality in agriculture is not only led by

maximisation of net income; cooperation and community very often drive the individual's decision; at the same time, policy and market also frequently constrain or limit farmers' decisions and oblige or convince them to act in a specific way that not always brings the expected and promised outcomes; it also happens that against conventional assumptions, despite output prices decrease, production increases; particularly in the case of Galicia, land remains abandoned and does not enter a market, even where demand of land exists. Moreover, despite the low income, many farms keep on existing, etc.

After some years of conducting research on Galician agriculture and with farmers, this thesis aims to show how and why Galician agriculture has changed in the last century and especially in the last four decades; and what have been the main consequences of those changes as well as the multiple origins of those consequences. I intend to reject (neo)classical assumptions about the smallholding structure as the main reason to explain the current recessive situation of the Galician farming sector. Moreover, I want to show that modernisation failed to an unexpected extent in its aim of creating economic development, because of its narrow vision, approach and understanding based on precisely only economic (and monetary) variables. When people and nature are out of the equation, or when they are only reflected in terms of monetary or exchange value and treated as commodities, we might be surprised about output stagnation, depopulation, pollution, etc. When they are considered and their behaviour or state is studied as the result of a particular context but also of global processes of evolution, where history, geography, culture, knowledge, etc. are interwoven, we might not easily change the current state of things but we will start to understand why and how and look for better solutions. In general, I think, as Naredo (2003) stated, that:

> *Economy is the most mathematically developed social science, and the most humanly delayed social science, since it avoids social, historical, psychological and ecological conditions that are inseparable from economic activities* (…) *The economic reality was consolidated by doing physical and social abstraction of human being's life…The notion of the economic system was moved to the isolated universe of the monetary or exchange values, it equalled the function of production to simple added value and reduced wealth to a unified category:* capital (translated from the original in Spanish).

The approach that justifies such definition, understanding and analysis of reality has been for centuries:

> *… an analytical-parcelled (analítico-parcelario) approach regarding the method, and individual-competitive regarding its philosophy, that confuses individualism with egoism, in order to achieve by means of a non-solidary individual behaviour (thanks to technology and market) a general enrichment and welfare* (Naredo 2003; translated from the original in Spanish).

As I will explain later, this thesis proposes a different approach to studying agricultural reality, one that aims at taking into account as much as possible different interests and visions at stake, rather than the strictly economic one.

In this thesis, I aim to show something else: that although the study of the farming dynamics at the regional level (Colino *et al.* 1999, IDEGA s.y.) suggests the existence

of a sort of homogeneous picture by means of specialization, intensification and scale enlargement, the practice is still heterogeneous. In this research, heterogeneity in the practice or the way of doing things, as I mentioned in the title of this thesis, will be shown by applying the Farming Styles approach and methodology (van der Ploeg 2003).

Styles of farming will be analysed at a micro-level, at the level of the farmer and his/her farm, and for that I chose a group of farmers that belong to a cooperative of services, Os Irmandiños, in Ribadeo County[3]. These farms are situated in different small villages where agriculture and life in general have been subjected to the same process of modernisation and economic development that has affected the region as a whole in the last three decades. They share several common features: all of them belong to the cooperative, benefiting from the services that include fodder production and a wide range of other products (fertilisers, seeds, biocides, etc.) with lower prices than in the general market; they can, moreover, rent machinery, get technical advice on feeding and thereby diets to increase milk yield per cow, and on how to improve their own forage production. Belonging to the Cooperative distinguishes them from other farmers that operate individually and have to confront higher costs in general and a lack of advice. Furthermore, all of them produce conventional milk and with few exceptions this is the only activity they carry out.

As I will show in the study case, despite sharing the above-mentioned features, there are quite significant differences within the group, not only because their initial factor endowment or the access to land is different, but because of the different goals they pursue and their different views on how to conduct their farming. They combine different strategies (intensifying land or animal production, scale enlargement, cost reduction). One of the strategies encountered, based on cost reduction, is currently highlighted in debates associated with the newly emerging multifunctional rural development approach[4] (van der Ploeg *et al.* 2002). Cost reduction strategies are referred to by van der Ploeg (2000) as the main feature of the farming style, farming economically, by which farming is based on low-external-input-use (Francis and King 1988; Buttel *et al.* 1987). In this respect, farming economically serves to realise development in a way that it is not only socio-economically sustainable, but ecologically sustainable as well (van der Ploeg and Renting 2001).

In farming economically, cost reduction strategies re-emerge within the framework of a new rural development trajectory, one that understands the 'art of farming' as the mutual coordination of three different but interconnected domains within the farm: production, the rural environment as well as the relations with local and regional economy and culture, and the mobilisation and use of resources. *Through rural development, the agricultural side* (production) *is deepened* (organic farming, high quality production, short supply chains); *the rural side might be reorganised and amplified as well* through *a process of broadening* (agri-tourism, new on-farm activities, diversification, nature and landscape management); finally, *farm enterprise is grounded on a new or different set of resources and/or involved in new patterns of resource use*; this is the process of *regrounding* (van der Ploeg *et al.* 2002). Farming

economically reproduces the *regrounding* process by reducing the purchase of external inputs (and loans) and increasing the efficiency in the use of available internal inputs.

Furthermore, I want to show that cost reduction strategies, which are firmly rooted in the traditional peasant agriculture in Galicia, may be considered as a further development and revitalisation of the traditional modes of production that could very well be a viable alternative to the modernised farming systems that have been promoted so far. This is all the more true, as will be shown in Chapter 2, 3 and 4, as the adoption of modernisation has been quite unsustainable in the Galician context with regard to the environment but also in socio-economic terms.

1.1 THE RESEARCH QUESTIONS

Although the different aims of my research have been expounded above, I will summarise them by posing four research questions. The *overall goal* is *to analyse Galician agriculture from a methodological approach that by considering as much as possible the multiple interests and visions at stake, will serve to show that, as the title of this thesis suggests 'the way you do, it matters***'**. The way refers specifically to the style of farming and therefore to the way that farmers[5] carry out their activity; this way is the result of combining practice and knowledge of different nature (technical and/or scientific but also traditional, learned over centuries and transmitted from one generation to another). The way farmers do it matters, as the assessment of the different social, economic and ecological impact of the different styles of farming in the context of the Cooperative will show.

In short, I have formulated the following research questions:

1 What is the past and present of the Galician farming sector? That is, how and why has the Galician farming sector been showing a recessive dynamic in the last three decades regarding its economic, social and ecological components, and which's role have specific policies and modernisation played in determining such dynamics?
2 What have the responses of farmers been to the recent recessive dynamics of the Galician farming sector? And particularly: What are the different styles of farming present in a small but representative sample of dairy farmers?
3 How sustainable are the different styles of farming, taking into account the social, economic and ecological impact of the activity?
4 What are the potentials of farming economically for generating a more sustainable rural development within Galician agriculture?

The styles of farming encountered in the Cooperative are to be understood as responses to a specific socio-economic and political context that has been mainly driven by the implementation at a regional level of modern agriculture, imposing specialisation, intensification and scale enlargement as a global and homogeneous goal. In order to implement modernisation, geographical, historical, demographic, environmental and even economic starting conditions have been ignored. Thus, answering the first research question will serve to contextualise the recessive dynamics of Galician farming sector by showing not only the main features of the sector in the

recent decades, but also by considering the previous situation, before the most recent process of modernisation was implemented in the end of the 60s.

Secondly, the answer to the second research question aims at showing the existence of heterogeneity in a rather specialised farming activity: dairy farming, which was supposed to reproduce to a larger extent the project of modernisation and thereby has been considered rather homogeneous as the type of farm, goals and management are concerned. Thirdly, when heterogeneity arises, I will show that 'the way of doing it matters', since the social, economic and ecological impact of the activity carried out on the basis of different farming styles entails different degrees of sustainability and potentials to promote a more or less sustainable rural development. Furthermore, the potentials of cost reduction strategies in general and of farming economically in particular will be highlighted as a farmers' response of the past, but also as a response of the present in the context of modernisation and of the future to achieve a more sustainable development.

The fourth question is posed to highlight the potentials of farming economically to achieve a more balanced development at a regional level, not only based on economic, or on social, or on ecological development, but also on the integration of those three realms of agricultural reality. This question has been thought to link practice in a specific context (the cooperative) with the regional context (Galicia), which had been previously characterised and explained by responding to the first question. In this respect I must clarify that in fact, the four research questions, although formulated and treated here separately, are strongly interrelated and 'feed' and/or complement each other in order to finally fulfil the general goal of the thesis.

1.2 THEORY AND METHODOLOGY

In order to approach the features and heterogeneity of Galician agriculture, I have to consider an approach that understands farming as something other than an economic sector, where, furthermore, different domains and actors play different but equally important roles. From an economically conventional approach, agriculture has been understood as an economic sector and as such, can be only explained within the market parameters (to function) and expressed in monetary units.

Although farming, undoubtedly, is also an economic activity, the question is that in order to obtain the final product that is going to be commercialised, the direct appropriation, use, and transformation of natural resources is needed. When pollution and depletion or exhaustion of those resources takes place, the future of the activity is at stake. Furthermore, social relations and labour are also present and decisions are not always taken by following strict (conventional) economic rationality. Moreover, institutions and policy play an important role, determining not only orientation but also volume, and prices.

Understanding agriculture as an activity that by making use of nature and being socially organised in different ways can be also a way of living requires a different approach than when it is considered, as only a means to generate economic value added. The same happens when we want to approach and estimate development

generated from agriculture. Also in this respect, we must consider the different domains (social, economic, ecological) in which agriculture is having an impact (by means of appropriation of their resources or by generating a product), especially because those domains and the impact of agriculture within every one of them are strongly interconnected in two opposite directions: enhancing each other by means of synergies or counteracting each other by means of trade-offs.

In the last decades, different approaches have appeared within different disciplines to approach agriculture from a perspective radically opposite to the conventional stream, highlighting not only its economic side but also social and ecological ones, as well as the interrelations among them.

Within Economic science, in order to consider agriculture not only as an economic sector but also as an activity whose economic outcomes depend strongly on the natural environment, the way natural resources are appropriated, transformed and used, as well as the existence of different rationalities than the one of simply economic maximisation, it is necessary to adopt the *ecological approach.* Therefore, Ecological economics establishes in this thesis the global theoretical framework, since it enables us to understand from a holistic perspective the relations between economic activities – as agriculture also is – and their natural environment.

The strength of this approach lies in its criticism of the homogenised way of understanding the world that characterises conventional economics, especially the Neoclassical and the environmental approaches, show (Ramos-Martín 2003). Very briefly, ecological economics frames the perspective to critically approach the study of agriculture starting from three main (epistemological) premises: the recognition of hierarchy among the different systems or domains (natural, social and economic) that form reality; the open character of the economy; the entropy as a driving principle of economic processes, especially as the matter is concerned.

Regarding the first premise, ecological economics requires recognising *hierarchy* in organising the different human and non-human domains, and Nature embodies the other two, society and economy (Georgescu-Roegen 1996). Thus, economy and society are *part of* and *ruled by* the natural environment, which enhance not only Earth ecosystems, but the whole biosphere. Consequently, not all what happens within the economic domain can be explained by economic variables.

Secondly, Ecological Economics considers that the Earth is a closed system according to the matter exchange – excluding meteorites – but economic systems are otherwise, open. They are open because they are embedded and operating in a bigger entity (the Earth or, even bigger, the biosphere) and in order to function they must continuously exchange matter and energy and information with the natural systems. Therefore, energy and matter flows are relevant to understand the functioning of agroecosystems.

Thirdly, the ecological problem derived from the mechanistic understanding of the economic system is entropic in virtue of the second thermodynamic law. As was said above, the Earth is a closed thermodynamic system in terms of matter – although open in terms of energy (solar). The economic process transforms[6] matter (and energy from

natural resources and sources) reducing entropy (creating more order) in a first stage. However, the act of consuming such transformed matter (and energy) implies the creation of non-reusable matter and energy (waste and residuals), which finally increases entropy – degradation of energy and matter. Moreover, that degradation is irrevocable, since total recycling is impossible (Georgescu-Roegen, cited by Carpintero 2006). This means that firstly, economic systems will only work to the extent that we are able 'to add' low entropy; and secondly, every economic process has as a result a 'lost' and not a benefit, as it is defended by conventional economics.

Those three premises are the basis of the global theoretical and epistemological approach of this thesis. However, in order not to fall into the same mistake as conventional economic approaches, and in order not to undermine the other two domains, it is necessary to consider other approaches and methodologies that from a similar epistemological world view highlight on the one hand the significance of social and economic domains; and on the other hand supply of good techniques to assess social, economic and ecological impact in the agricultural context, and *from within* that context. In this respect, agroecology and styles of farming will be the perfect complement.

Agro-ecology approaches the study of agricultural systems or agroecosystems directly, although, at its narrowest,

> *agroecology refers to the study of purely ecological phenomena within the crop field, such as predator/prey relations or crop/weed competition, loosely defined, agroecology often incorporates ideas about a more environmentally and socially sensitive approach to agriculture, one that focuses not only on production but also on the ecological sustainability of the production system* (Hecht 1987:4; in Altieri).

In fact, this approach started as an instrument to solve technical agronomic problems, but later also included social variables that stress the significance of locality, traditional knowledge and cultural roots (Guzmán *et al.* 2000*)*. In this respect, agroecology serves to consider the potential of traditional ways of farming (peasant mode of production), recognising the possibility of a different logic of production, which prioritises the reproduction and survival of the farm instead of maximising economic benefits (Chayanov 1966). As several works state (van der Ploeg 2003), such different rationality can explain the persistence and/or re-emerging of farm strategies, which from a strictly economic perspective are 'non-profitable'.

Agroecology is an alternative epistemological approach that, based on a systemic and holistic world view, looks for the dynamic multi-causality and the interrelations between the different eco-subsystems involved (González de Molina 1997). As for the economic system within the ecological approach,

> *agroecology considers the natural environment as an open system, composed of different inter-dependent subsystems that configure a dynamic reality of complex natural, ecological, social and cultural relations* (Labrador and Sarandon 2001:22)*, demanding knowledge of a different nature. It is an approach more linked to the environment and more socially sensitive, focused not only in the production (output), but also on the stability of the system of production.*

Agroecology is, moreover, a new approach for agricultural development, more sensitive to local farming complexities, since it expands the objectives and agricultural criteria to comprehend properties of sustainability, food security, biological stability, resource conservation and equity without reducing output (Simón 1995). Therefore, agroecology implies a number of characteristics about society and production that go further than the immediate limits of the farming structure. Agroecology studies *processes* and *relations* that take place in the agroecosystems to manage them with less negative impacts on environment and society, more sustainable as long as the maximisation of internal and/or local available inputs and the minimisation of (market) external-input use are promoted.

Moreover, from the agroecological perspective, there will not be development without considering local knowledge and participation as well as the interaction and the mutual influence between people and nature, or, in the same way, without considering *coevolution*:

> *Agroecologists perceive people as a part of evolving local systems. The nature of each biological system has evolved to reflect the nature of people – their social organisation, knowledge, technologies and values. People have helped maintain desirable biological relationships. What species and varieties are selected and which relationships are assisted depends on people's values, what they know, how they are socially organised to interact with their environment and biological system and the techniques available to them (…) And so human culture moulds biological systems while biological systems mould culture (…) People and their biological systems have coevolved* (Norgaard 1987:23-24; in Altieri).

The participation of local actors in the research is important, not only to understand better *what and how they do*, and what is probably most important, *how they have been doing it*; but it also serves to check the existence of different ways of doing, and to preserve traditional knowledge and culture that may be important driving forces to increase sustainability. From the methodological perspective, actors' participation has been carried out by the research technique '*Investigación Acción Participativa*' or IAP (Action-Participatory Research). The IAP assumes that any process of development will be biased when realities, needs, aspirations and beliefs of the beneficiaries are not included, even more when the beneficiary him/herself is not included (Guzmán and Alonso 2007).

So far, ecological economics in general, and agroecology in particular, make it possible to construct a more complete conceptual framework for analysing the contribution of different agricultural production systems to attain rural development and sustainability. Ecological economics contributes to a wider understanding of economic dimensions, by stressing that economic growth only contributes to development when it is based on equity and environmental sustainability and to assume the entropic nature of the economic process. Meanwhile, Agro-ecology stresses the need to analyse environment-friendly farming techniques within their specific ecological, social and cultural context as a basis for the definition of localised, endogenous rural development strategies.

In this thesis, ecological economics and the agroecological approach are going to be reinforced by another approach that from a similar theoretical perspective and with a

strong analytical potential serves to characterise and explain *the heterogeneity of the endogenous* (Guzman *et al.* 2000:144-147). I refer to the above-mentioned *Styles of Farming* approach. Although a more detailed description of the Styles of Farming approach will be given in the part destined to show the outcomes of the study case, I advance a brief definition now: 'A style of farming is the complex but integrated set of notions, norms, knowledge elements, experiences, etc., held by a group of farmers in a specific region, that describes the way farming practice should be carried out (Hofstee 1985; cited in van der Ploeg and Long eds 1994:17).

That definition introduces the local knowledge as the central key to finding responses to external changes in looking for the adaptation of agricultural practices and their societal (rural) environment. The responses entail more sustainability when they are 'born from within' and the assimilation of the external is performed by local actors, who moreover have to relate to external actors and institutions.

From the styles of farming approach, local cultural patterns have been understood as: actively constructed[7] responses to local eco-systems, local relationships between town and countryside, and the insertion of the locality into wider trading patterns, etc (van der Ploeg and Long eds 1994). Thus, this approach is needed because it shows the existence of different responses, different ways of doing, in the end also as a result of different co-production (or co-evolutionary) processes. Some of them (farming economically), as I already advance, are particularly promising to promote rural development to a larger extent than others since they entail higher economic, social and ecological sustainability.

Summing up, the analysis of agrarian systems requires overcoming conventional perspectives that insist on approaching problems one-dimensionally and from only one discipline. Economic, Ecological and Social determining factors interact within each other giving place to socio-economic structures, whose function is to respond to human needs: agrarian systems are one of these sorts of structures. However, the development of the agrarian structures causes the presence of different 'optimal' outcomes, at different scales (local, regional, sectorial, …) In order to consider this and to analyse Galician dairy systems, this PhD-thesis tries to combine epistemological and methodological elements from ecological economics, agroecology and styles of farming.

There are three questions to clarify at this point: firstly, how the different farming styles are to be encountered; secondly, how (economic, social and ecological) sustainability is going to be approached; and last but not least, the concept of sustainability itself.

I will now answer the second and third questions, and will advance only a short response for the first one, because it is more amply explained in Chapter 6. Just in a few words, in order to find the different styles of farming within a sample of 63 farms belonging to the same Cooperative and for a specific year (2004), I analysed first the main trajectories of change experienced by the same (and smaller) group of farms between 1993 and 2004. In order to do that, I have considered different technical and economic variables, as well as the answers of 17 farmers that were interviewed in the

period 2004/2005. The information obtained was used to choose the variables to run firstly a Principal Component Analysis (PCA), from which the main strategies of management of the year 2004 appeared; and secondly, a Cluster Analysis in order to group the farms (cluster) according to different combinations of the strategies and to finally obtain the different farming styles.

Once the main features of every farming style are explained, it is possible to go to the second step: to assess their social, economic and ecological impact. To obtain this impact, I use different physical, quantitative and qualitative indicators, which are transformed into a common range to show higher or lower impact. The value of the indicator moves within a scale from 1 to 5. It is necessary to clarify that it is not the value per se which has a meaning, but the higher or the lower value: e.g. if one style scores 3.3 and another scores 4.5, as the economic impact is regarded, it does not mean that its impact values 3.3 or 4.5, only that the second one has a higher economic impact than the first one.

Please note that I have not yet spoken of sustainability but of impact. This is because in the case study of this thesis, it is easier to assess impact first and to conclude about sustainability later, since, as I will explain below, the analysis refers mainly to a specific year. Thus, agriculture has an impact on the different domains in which it is involved. The different ways of doing agriculture (referred to as styles of farming in this thesis) will affect differently the components of the agroecosystem – human, animal, crops, soil, water, etc. Furthermore, it must be made clear that the components are strongly interlinked in such a way that, for instance, the way the animal is fed will affect finally the quality of the soil; or the decision to use concentrates (in the case of dairy production) may increase the productivity (milk yield per cow) but may increase the costs, reducing the profit; the use of chemical fertilisers and pesticides may increase or maintain soil fertility and yields for a certain period but probably will end in a sort of downward spiral: more and more fertilisers or pesticides to avoid decrease of soil fertility and yields, increasing at the same time soil pollution and depletion.

Thus, interrelations among the different components and domains are not exempt from trade-offs; some of them are possible to be overcome, others never totally. On the other hand, the interrelations among the different components and therefore the impact, are susceptible to enhanced taking profit of synergies: in the case of Galicia and cattle agroecosystems, there is a win-win relation between the transformation of *monte* (mainly brush and bushes) areas into pasture, since this entails both higher availability of farming area (usually small in Galician agroecosystems), and reducing the risk of fire. Moreover, since this kind of management is labour intensive, it can contribute to creating employment (Chapter 2).

Thus, according to the data that are available for the study case, it is possible to approximate impact, higher or lower depending on the style. In general, a high social and economic impact is desirable, which entails more employment, income, fixation of population, creates social cohesion, and so on; on the contrary, it is preferable to have as low as possible an ecological impact, since ‘high’ means pollution, exhaustion,

depletion. With high socio-economic impact and low ecological impact, higher sustainability is achieved. But what is sustainability?

1.2.1 SUSTAINABILITY

The concept of Sustainability has been under controversy and very often has remained an adjective (sustainable) to qualify different names such as development or agriculture. The experts on sustainability know how much the topic has been already touched and that summarising every contribution to the question is *mission impossible*. I want, however, to expound on how Sustainability is going to be understood in this thesis and for that I will collect some of the definitions managed from different authors and/or disciplines. Moreover, I want to highlight the need of using, once it has been clearly explained, the term of *sustainability* or *sustainable agriculture* against the one of *sustainable development*.

Robinson (2004) referred to the problem of finding a definition – in case this is possible, as Pretty (1995) questions – of sustainable development and to the fact that while government and private sector organisations have tended to adopt the term sustainable development, academic and NGO sources have been more prone to use the term sustainability in a similar context. This is generally true, although from the scientific perspective, conventional approaches have very often been shown to be closer to government and private sectors than to individuals or communities since they are assuming a specific concept of development.

The consideration of the limits to growth and the increasing externalities (environmental and socio-economic problems caused by the model but not internalised by it) were the starting point to see questions as environment and development from another perspective. In 1974, in the Cocoyoc Conference (Mexico), the term 'eco-development' was proposed, with the aim of showing the compromise to increase production (especially in the Third World) and respect to ecosystems at the same time. This term was, however, replaced by the afterwards widespread term of *sustainable development*. This new concept succeeded in the most conventional domains of economics and development studies, understood within the optic of self-sustained growth (Naredo 1996).

By rejecting the eco-development concept, developed countries looked for a definition of sustainable development that could please everybody, but understanding development as economic growth. Thus, *sustainable development* emerged in the early 1980s as: *the development that meets the need of the present without compromising the ability of future generations to meet their own needs* (WCED 1987).

Such a definition drove one of the widest sets of literature on sustainability and development, with detractors and supporters according to the ideology, approach, or institution involved; unleashing, in the case of detractors, different attempts at giving a more accurate definition and solutions depending on the context or the problematic. Support came from all those that considered the possibilities of such an open definition. Nobody could reject the fact that is positive to meet the needs of people today whilst preserving the needs of our, let's say, grandchildren. The critique came

from those who wonder how it would be possible to reach such an ambitious (although defendable) goal (Naredo 1996; Robinson 2004; Pretty 1995), or how it would be possible to keep on increasing the world industrial output, preserving the present and future needs, given the limited endowment of physical stocks and the existence of non-renewable resources. Implicit in that rhetorical question is the rejection of *weak sustainability* (Pearce *et al.* 1989) or the rejection of admitting that all forms of natural capital are commensurable (susceptible to being expressed in monetary terms, as well) and can be replaced by human-made capital; as well as the belief that it is necessary *to develop without growing* (Daly 1990). When development is understood only as economic growth, the efforts of alternative approaches from economy, politics, ecology, etc., to build up a bridge (in Naredo's words) between development theories based on economic growth (shown through economic macroaggregates) and the increasing environmental worries were put aside.

Agroecology, as ecological economics, has elaborated alternative concepts of development that are based on qualitative improvement rather than on quantitative increases of consumption and/or production levels, rejecting the modern vision of agriculture that emphasises the maximisation of crops and benefits in the short-run, without paying special attention to the capacity of the productive systems to maintain yields throughout time; and also without showing the interrelation among the process of production and the environment, where that process is taking place. Within this vision, development is growth (higher yields, higher output), which is moreover assessed only in monetary terms (through value added per farm, labour, region, etc). From a different perspective, departing from Daly's premise – there can be *development without growth*, development must be assessed by considering not only monetary flows, but also physical stocks, quality as the output is concerned, capacity to generate labour, capacity to maintain and/or improve the quality of the environment, etc.

Developing without growing entails accepting only *Strong Sustainability* or that the existing stock of natural capital must be maintained and enhanced because the functions it performs cannot be duplicated by manufactured capital (Norton 1992). Accepting this does not imply rejecting technology but *rejecting it at any price*. It implies, moreover, reviewing and rejecting firstly assumptions on commensurability; secondly, accepting and including trade-offs between economy, society and environment with the uncertainty this entails; thirdly, accepting reality in terms of flow and processes and not in terms of only matter or end-state.

Especially the first and the third points require a change in the scientific approach, orienting it towards a holistic perspective, systemic analysis and the use of different measures (not only prices), whereas the second one entails a big effort of restructuring the way of making decisions, which are probably not always politically or economically correct. But the three of them pose the very often uncomfortable question of the normative and political nature of some presupposed scientific concepts, paraphrasing Max-Neff (2005:7) of including in our research 'values' and the question *how should we do what we want to do?* In Max-Neff's words: *(…) this level* (of research where values are included) *goes beyond the present and the immediate. It*

aims at generations yet to come, at the planet as a whole, at an economy 'as if people matter'.

The general definition of Sustainability that is managed in this thesis in the context of the agroecosystems is the one given by Altieri (1987) *as the ability of an agroecosystem to maintain production through time, in the case of long-term ecological constraints and socio-economic pressures*. In the context of agroecology, highlighting the post-normal character of the concept, sustainability is, furthermore, a goal and a means and which; meaning that is an attribute or a property of the agroecosystem (a means) and it is achieved (as a goal) when other attributes/properties are fulfilled. Thus, the main attributes of the agroecosystem are equity, stability (regarding the management, the economic and cultural) productivity, and sustainability (Conway 1985). Other properties are considered as well by different authors: autonomy (Simon 1995), resilience, reliability and self-reliance (López-Ridaura *et al.* 2002).

Equity is a measure of how evenly the products of the agroecosystem are distributed among local consumers. Furthermore, equity is reached when an agroecosystem meets reasonable demands for food without increases in the social cost of production. For others, equity is reached when income opportunities or distribution within the community increase (Altieri 1987).

Stability is the constancy of production under a given set of environmental, economic and management conditions (Conway 1985). Regarding management, stability depends on the choice of best adapted technologies to farmers' needs and resources. Economic stability depends on farmers' knowledge and ability to predict market prices of inputs and products. Cultural stability depends on the maintenance of the sociocultural organisation and context that has nurtured the agroecosystem through generations (Altieri 1987).

Productivity is a quantitative measure of the rate and amount of production per unit of land or input. *Resilience* is the capacity of the agroecosystem to resist and/or recover after an external shock (Conway and Barbier 1990) or under a series of ecological or management conditions, and to return to its original state after a disturbance. *Self-reliance* refers to the capacity of organisation and participation (Lopez-Ridaura *et al.* 2002) or self-empowerment and it is connected to autonomy, which refers to low dependence on external inputs of a different nature (for production and for financing) and, I would like to add, with high co-operation within the locality.

Sustainability, by considering all, or as many of those attributes as possible, is relative; i.e., it is not possible to be fully sustainable, but more or less sustainable. It is multilevel, considering the agroecosystem, the style or the region; multi-scale, since it may be local or global; it is multi-dimensional because it considers different domains or reality (society, economy and nature). Sustainability must be low entropic, the style must contribute as little as possible to the depletion and/or exhaustion of natural resources (renewable and non-renewable), which as regards the case study of this thesis is assessed by maximising the local and available internal-input use and by

minimising the use of external inputs (those directly use and transformed to enhance the output and those derived from external financing).

Finally, sustainability must include the time dimension. It is a process and not an end-state. In this thesis, this is one of the main constraints of the case study, since the analysis is carried out for a particular year. I tried to overcome this limit by analysing, on the basis of a small sample of farms (18), their main trends of transformation in the period 1993-2004. I used those trends (from the analysis of different technical-economic variables) as well as the responses 17 interviewed farmers, who werer farming in 2004, as an input to choose the variables to run later the PCA and Cluster Analysis that enabled me to obtain the different styles of farming. This is, along with the limitation imposed by the lack of some significant data (e.g. the composition of diets), a reason not to speak first and only about sustainability, but about impact.

Most of those attributes are used within Farming System Research by applying the MESMIS framework (Spanish Acronym for the *Marco para la Evaluación de Sistemas de Manejo incorporando Indicadores de Sustentabilidad*) to inform about sustainability within an agroecosystem (Masera *et al.* 1999, cited by Guzmán and Alonso 2007). The idea of the MESMIS framework has been used to assess the social, economic and ecological impact of the different styles. Thus, the attributes explained above will be related to different indicators that have been previously used to calculate the social, economic and ecological impact of the different styles. In this respect, and although with limitations given the available data, it will be possible to approximate which styles are fulfilling to a larger extent than others some of the attributes (not all); and therefore, which of them are achieving higher sustainability or are more sustainable than others. Moreover, it will be possible to know which of the styles are potentially preferable in order to advance in the path of development, understanding development not as simply economic growth (e.g., gross margin in absolute terms, per farm) but as a balanced combination of the different attributes, enhancing synergies and minimising trade-offs among them.

1.3 OUTLINE OF THE THESIS

This thesis is composed by three interrelated parts: the process of de-structuring of the Galician farming sector, the analysis of heterogeneity by using a small group of dairy farms, and the general conclusions.

The first part, the de-structuring process of Galician agriculture, contains 3 chapters (2, 3 and 4) and will respond the first research question. It aims at contextualising the dynamics of Galician agriculture in the last four decades due to the most recent process of modernisation (1960-2005) but also to the previous dismantling of the traditional agroecosystem. Furthermore, the recessive dynamics of the Galician farming sector will be shown through the analysis of different structural, socio-economic and ecological elements of the sector.

The process of de-structuring refers to the recessive socio-economic and ecological dynamics of Galician agriculture as a consequence of a longer process of change in which factors of different nature have been involved. The process of de-structuring

implies, in general, a transformation of the peasant-like or traditional agroecosystem into an industrial one, and as such includes the dismantling of the traditional agroecosystem in force until the midst of the 20th century; and the negative consequences derived form the most recent process of modernisation throughout the period 1960-2005.

I prefer to use here the concept of de-structuring[8] instead of re-structuring because during the last four decades the socio-economic and ecological dynamics has been recessive. The following chapter as a whole aims at showing that the change of model after the sixties brought, by not considering the previous structural, productive, social, and environmental conditions and by avoiding the potential benefits of the previous model, a less sustainable agriculture.

The de-structuring process will start with a characterisation of what I call here the traditional agroecosystem (Chapter 2). Since the term 'traditional' may cause misunderstandings, I would like to clarify that it is not referring to something static or backwards. In this thesis the traditional agroecosystem is that one based on an *articulated and joint* management of cattle, crops and *monte* (mainly bushes and scrub, but also destined to pasture and forest), with high degree of integration and interaction among each other. Furthermore, some political and socio-demographic factors that have jeopardised the continuation of that model will be explained. The dismantling of the traditional agroecosystem is effective during the last process of modernisation after 1960, and it is visible through the changes in the use of land.

Chapter 3 will show, therefore, the changes in the use of land and the process of land demobilisation, or abandonment. These changes are analysed through the evolution of the Useful Agricultural Area and the Total Area, as well as by the reduction in the number of farms between 1962 and 2005. It must be clear that the changes in land uses have been driven by the same factors that initiated the dismantling of the traditional agroecosystem, as well as by its impossibility to be maintained later with the implementation of the recent process of modernisation.

Chapter 4 will mainly focus on the last process of modernisation, which has been framed as in other countries by the Green Revolution. This process gave place to the replacement of land and/or labour by biological but especially by mechanical technology in order to increase output, and specially yields. The first section of the chapter presents an analysis of the farming sector by using different structural ratios, in order to highlight the presence of small sized farms (in terms of acreage) and to question whether the evolution of labour productivity is strictly related with acreage or there are other factors that are determining to a larger extent such evolution. The second section of this chapter will analyse the dynamics of Galician agriculture after the 60s, by using regional accountancy, therefore by using macroaggregates, aiming at showing the process of specialisation and intensification and at finding the major causes for the recessive dynamics in the last four decades.

As the main goal of the process of modernisation was to impose a unique model of development, based on homogeneous premises as regards what and how to produce, the second part aims at showing that whether the Galician farming sector has become

more and more specialised, there is still heterogeneity as regards the way of doing. Moreover, using the information of the first part, the second part also will highlight the need of heterogeneity.

The second part presents the case study, the field work based on the analysis of small sample of dairy farmers and it is contained in three chapters (5, 6 and 7). There I will look for the different ways of doing, by using the farming style approach.

The general goal of the second part of the thesis is to check, at farm level, whether after the process of transformation realised by Galician agriculture, in the last three decades (reviewed in Part I), such a process of transformation has homogenised the Galician farming reality, concerning its way of organising, taking decisions and carrying out the farming activity; or on the contrary, farmers have adapted to modernisation in different ways, developing different styles, i.e., different ways of co-production based on different factor endowments, on different ideals, and/or on different visions, revealing a sort of heterogeneity in managing and practising agriculture.

In order to show heterogeneity, I use the Styles of Farming Approach as developed by van der Ploeg (2003). Styles of farming arise as multi-dimensional, social constructions, internally coherent, responding to different strategic reasoning processes about how to organise the activity. The coherence is structured according to different cultural repertoires. In this respect, styles of farming are not only determined by market relations, neither by available technology only, but also by 'external relationships'; therefore, the style is a socio-technical network, a particular interweaving of divergent projects. Farmers and stockbreeders define and operate their objectives and agrarian practices on the basis of different criteria, interests, experiences and perspectives, developing projects and particular practices over time about how to organise the activity: *practices need to be organised and reorganised in order to be in harmony with the strategic repertoire and vice versa* (Long and van der Ploeg 1994; van der Ploeg 2003). In this respect, the approach is an argument to justify the abandonment of considering only the structure as '*explanans*', although without denying the effects of the social, technical, economic and political factors over the agrarian practice (Wiskerke 2004).

Heterogeneity (and subsequently styles of farming) will be analysed in this section within a group of Galician dairy farmers, who belong to a cooperative of services. This Cooperative was created in 1976, with the goal of producing fodder for its partners. The Cooperative has had a technical-economic management programme since 1992. The aim of this programme is to assist the decision making process that affects the farm in the medium- and long-run. The programme includes three complementary areas: firstly, farm management through the analysis of inputs, output, size, labour, etc., both in economic (turn over, gross and net margin) and physical units (number of hectares, cows, output, etc.); secondly, a program of cattle feeding including diet, production, preservation and management of forage; and thirdly, a programme to control reproduction (Os Irmandiños 1999). Furthermore, the Cooperative has developed a new programme since 1992 with the aim of renting machinery and labour

to its members in order to reduce farmers' capital investments: the cost per litre of milk was reduced by 18% on average in 2000 compared to 1992 (AGACA 2000).

The decision to consider the dairy farmers that form this Cooperative as a case study responds to different reasons. Firstly, dairy farming is an important activity within the Galician farming sector, regarding production, income, labour and natural resource use[9]. Secondly, this group of farms belongs to the same Cooperative, benefiting of all the services and advantages mentioned above. As I said in the beginning of the chapter belonging to the Cooperative distinguishes them from other farmers that operate individually and have to confront higher costs in general and a lack of advice. Furthermore, all farms in this study produce conventional milk and with few exceptions this is the only one activity they carry out. Thirdly, the Cooperative management board has been conducting a very complete monitoring of the structure and economic outcomes of the farms as well as gathering all kinds of technical and labour data during the last decade, which they kindly put at our disposal. Moreover, the cooperative facilitated the contact for us with 17 farmers to interview them, which provided us with an excellent source of opinions and visions from the actor perspective which complements the information given by economic and technical data.

In Chapter 5, in order to analyse the presence or the lack of heterogeneity regarding the management of the farms within the cooperative, I carry out firstly a brief characterisation of the Galician dairy sector. In this way, I show the dimension of the farms belonging to the cooperative (Co-farms from now onwards) within the regional dairy context they are involved in. This dimension will be checked in two different years 1993 and 2004 (2003 in the case of Galicia[10]). By doing so, the main changes that dairy farms have realised in both contexts, the Galician dairy sector and the cooperative, will be approached.

Next, I examine a smaller sample of 18 farms, which includes only those involved in the monitoring programme of the cooperative in the years 1993 and 2004. The use of this constant sample will allow us to observe and compare the initial (in 1993) and final (in 2004) position of every farm regarding size, output, and economic outcomes. By checking every individual position and trend, it will be possible to conclude whether every farm has reproduced the same process of transformation or not, and which are the main strategies of change they have realised.

To complement that information based on quantitative data, 17 farmers were interviewed as well, and their answers have been taken into account to choose the variables that will help to profile the main strategies of management in the year 2004. This will be done in Chapter 5 by means of running a Principal Component Analysis (PCA). Those strategies will be the input to run a Cluster Analysis in order to group the farms according to the previous strategies into more homogeneous clusters. The clusters will be understood as Farming Styles. Once the farming styles are found the goals and way of doing of style will be explained.

Finally, Chapter 7 will show the assessment of the socio-economic and ecological impact of every style, which will be used to show which are the most and least sustainable styles; as well as the potentials of those styles that are more sustainable.

The third part of the thesis (discussion and conclusions) aims at linking the outcomes at regional level with the outcomes at farm level, stating the potentials of farming economically and the possibilities of a *different way of doing* to promote a more sustainable rural development.

NOTES

1 Galician agriculture had suffered other transformations before. For instance, Soto (2006) gives an accurate review of the 'change before the change', referring to the changes between 1750 and 1900, or the ones in the first third of the 20th century. Although those changes did not alter the nature of the agroecosystem as regards its reproduction and functioning on the basis of internal resources and organic energetic sources.

2 The student of economics receives as one of his/her first lessons the explanation of the functioning of the economic process. That process takes place by means of the market where the exchange of goods and services and labour takes place and is determined by supply and demand, whose confrontation determines at the same time price and salary. Thus, market economy is a sort of circuit that connects families and enterprises in virtue of a monetary flow: families consume goods and services produced by enterprises and supply labour to them, and vice versa, enterprises supply goods and services and pay for the factors of production (land, labour and capital) they use. As the market is not always perfect, the State will intervene in the process in order to avoid market failures. The central point of that scheme is that it seems to be possible to go from consumption to production and from production to consumption, as if the resource basis was not affected or altered, as if there is no waste, or other externalities (Georgescu-Roegen 1977, cited by Carpintero 2006).

3 Ribadeo County is a coastal area situated in the north of the province of Lugo (Spain). The Ribadeo County borders in the North of the Cantabrian Sea, and in the East on the Autonomous community of Asturias.

4 In this approach rural development is recognised as a multilevel process rooted in historical traditions. The first level is that of global interrelations between agriculture and society. The second is the one of the agricultural activity: rural development can be seen as the search for (…) a new development model where, along with the consideration of elements such as quality production, new short chains linking producers and consumers, organic farming, etc 'win-win situations' represented by synergies are of central significance. Thirdly, rural development can be operationalised at the level of the individual farm household. At this level, rural development emerges as a redefinition of identities, strategies, practices, interrelations and networks. Fourthly, rural development should be defined at the level of the countryside and its (economic) actors, meaning that the 'rural' is no longer the monopoly of farmers. The fifth level is that one of policies and institutions (van der Ploeg *et al.* 2002:10-11). The recognition of this multi-level, multi-actor and multi-facetted nature enhances the possibility of developing the multifunctional approach proposed by the Common Agricultural Policy (CAP).

5 Although it is not something that will be widely developed in this thesis, I must clarify, that 'you', in the end, refers also to all of us, individuals that form society. Farmers have a certain degree of responsibility, but we all, as consumers, as policy makers, as scientists or technicians have also the responsibility to choose 'the way' we want.

6 That transformation obeys to a human purpose that is socially constructed, and the benefit or the lost will affect the human being.

7 However, as Tacconi (1998:103) explains, constructivism and Post-normal (which is the epistemological approach for ecological economics and agroecology) are more than opposing poles, complementary to one another and can enrich each other. The constructivist approach provides rather detailed guidelines about the conduct of participatory research that are lacking in the Funtowicz and

Ravetz Post-normal proposal (…). Thus, Funtowicz and Ravetz (1993, 1994, 2000) stress explicitly the need of addressing the question of quality (…) that has not been considered within the constructivist paradigm that, instead, refers to research rigour (…). However, some of the suggestions made by those authors regarding high quality assurance closely parallel elements of constructivist research methodology; for instance: (i) values should be made explicit; (ii) scientific arguments should be based on interactive dialogue; and (iii) scientist should not advance their arguments on the basis of the prestige of 'objective research' (…)

8 All the process of transformation require the de-structuring of what existed before with the aim of overcoming or improving the existing, being the next step, the re-structuring. In Galician, the re-structuring has been however partial and the final result recession, as if the de-structuring did not advance to the next step.

9 As it will be shown in the fourth chapter of the thesis, the Galician agricultural sector has been mainly oriented to dairy farming. Between 1987 and 2005, dairy farming has gathered most of the farms (from 16 to around 18%), area (from 32 to 34%) and income (from 36 to 48%) of the whole farming sector (INE 1987 and 2005).

10 In this case, we used data from year 2004, in stead of 2003 to not use many different years, since the data used in the case study are from 2004.

PART I

THE DE-STRUCTURING PROCESS OF THE GALICIAN FARMING SECTOR

The dismantling of the traditional agroecosystem and the process of modernisation in recent decades (1960-2005)

2 THE DISMANTLING OF THE TRADITIONAL AGROECOSYSTEM

2.1 INTRODUCTION

As was explained in the General Introduction, the process of de-structuring of the Galician agriculture implies a transformation of the peasant-like or traditional agroecosystem into an industrial one. The factors that impelled such process of destructuring, being of diverse nature, can be summarised (or at least in this thesis) in two phrases: *the dismantling of the traditional agroecosystem* and *the process of modernisation in recent decades*.

This chapter is devoted to showing the dismantling of the traditional agroecosystem, which implies the abandonment of a productive agricultural system, *or of a way of 'doing'*, based on the use of locally available resources, highly integrated and adapted to the features of its natural and socio-economic environment. The disappearance of this traditional agroecosystem is related mainly to the changes in the uses of soil, mostly driven by the implementation of specific policies of afforestation, as well as by the socio-demographic dynamics over the last century. The last stroke towards the dismantling takes place, however, with the implementation of the most recent process of modernisation, after 1960. That will be analysed in Chapter 4. This process entailed a radical change in the way of doing agriculture by imposing the change from a system based on locally available and renewable resources to another based on external inputs, non renewable energy sources and being highly market dependent.

This chapter will be structured as follows: firstly, I explain the main features of the traditional agroecosystem. Secondly, I refer to the factors, as they concern the implementation of afforestation policies and socio-demographic dynamics that contribute to its dismantling.

2.2 THE TRADITIONAL AGROECOSYSTEM

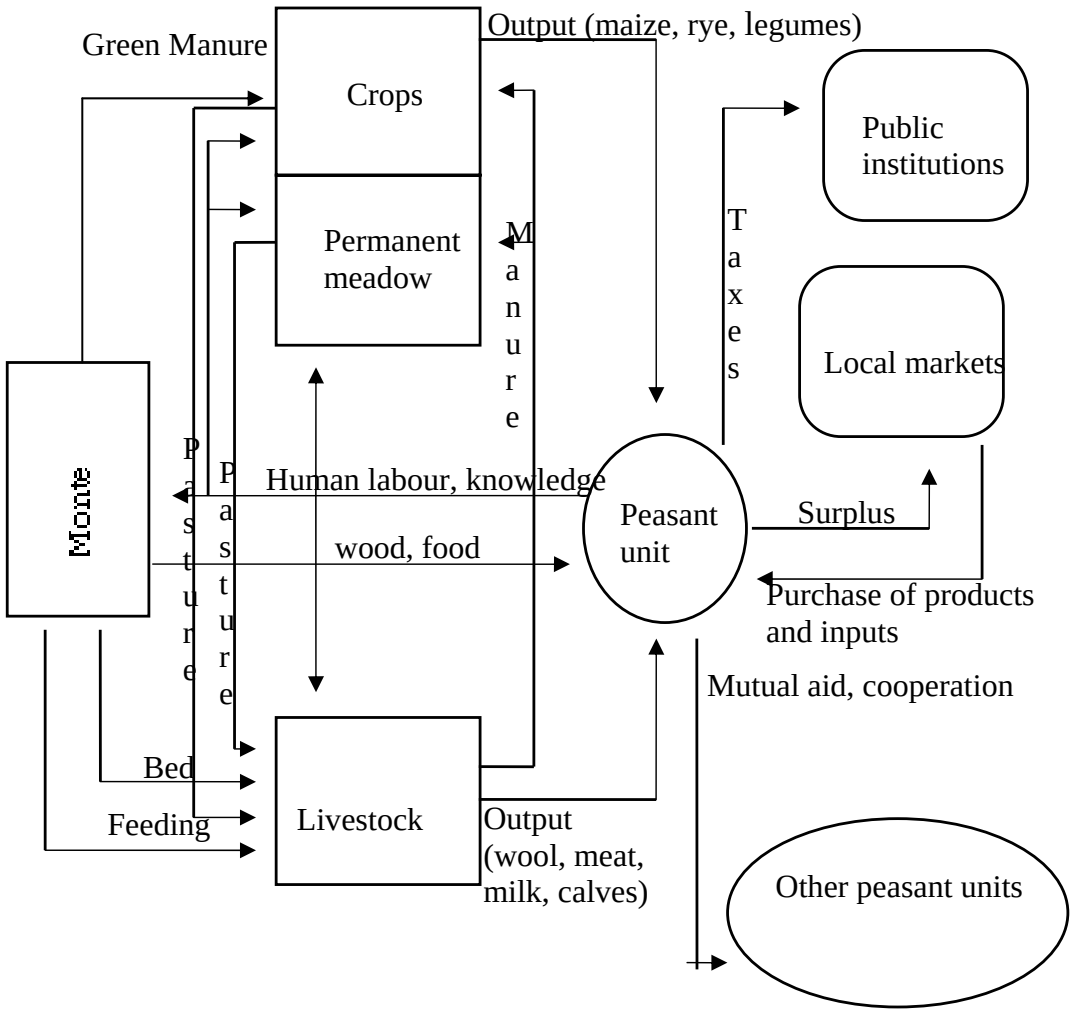
In this thesis the *Traditional Agroecosystem* refers to the Galician peasant-like agrarian system, characterised by an *articulated and joint* management of different subsystems: crops, cattle and *monte*, and with strong significance of community and local relations. The next graphic shows the main elements of that agroecosystem, as well as the numerous relations and interactions among those elements (Simón 1995).

From the management perspective, in the traditional agroecosystem, animals, crops and meadows and *monte* had a high degree of integration and interaction among each other. Those subsystems existed in an accurate proportion exchanging energy (labour and animal force, fertilisation), matter (cattle feeding, wood, etc) and information flows (applied technology or acquired by managing). The agroecosystem was characterised by spatial heterogeneity, genetic and biological biodiversity, as well as

by poor economic conditions that created endosomatic needs to be satisfied only to a mid-low level (Simon 1998).

In the traditional agroecosystem, the peasant unit was not isolated. It was not only in constant interaction with the transformed and natural environment, but also with the social environment (Toledo 1991 and 1992). It was also not a simple unit of subsistence, but immersed in local and non local markets: since the middle of the 19th century, cattle was one of the main commercialised agrarian outputs, exported to England and later, in the first half of the 20th century, to the rest of Spain (Soto 2006). This lack of isolation or subsistence did not deprive the farm of its peasant character: smallholdings, family labour, looking for reproduction over profit maximisation, strong community engagement, strong involvement in local cooperation networks, and especially of carrying out agriculture with a strategy that is mainly based on the use of locally available resources, both natural and human (Chayanov 1966).

Figure 2.1 The Traditional Agroecosystem



Source: Simón (1995)

Not only did the most usual energetic sources and resources come from the local environment of the agroecosystem, but the productive process was also based mainly on renewable resources. Furthermore, soil was a determining factor for the well-functioning of the agroecosystem and the peasant followed a multi-use land/soil strategy by managing crops, meadows and the vegetation from the *monte*; more important, land was totally mobilised in productive terms[1].

The *monte* can be considered as the angular stone of that system, because of its productive functions. The term *monte* in Galicia entails particular characteristica that differentiate it from its conceptualisation in other places (Bouhier 1979; Lage 2003). The general definition[2] of *Monte* as *the area formed by non arable land covered by trees, scrub and bushes* implies the combination of two English terms: forest (bosque in Galician) and *monte baixo* (bushes and scrub). In Galicia, within the traditional agroecosystem, the *monte* was, however, formed by bushes to a larger extent than by forest. In fact, the *monte* has been traditionally subjected to an intense process of domestication, or, in other words has been intensively farmed, and therefore does not strictly fulfil the definition of being *non arable land.*

In the traditional agroecosystem, the *monte* had three main functions: supplying cereals by means of the *rozas* or *estivadas culture*[3], supplying pasture and forage for the cattle and the most important supplying natural fertilisation (Bohuier 1979). Soil fertilisation was carried out by using organic manure (*esterco* or dung), which was made of vegetable matter[4] (*estrume*) obtained in the *monte,* and subsequently transformed with animal extrement into *esterco*.

As input supplier, the *monte* played a crucial role in the possibilities of reproduction of the family units, especially of those that had less land for cropping and pasture[5]. In fact, since the *monte* was domesticated to be agriculturally productive, the small dimension of the farms[6] was corrected by the communal and/or individual access to the *monte*. Moreover, it supplied wood and other complementary products for family consumption, such as fruits, mushrooms and medicinal herbs (Marey *et al.* 2003).

Furthermore, crops were characterised by high diversification. In fact, a most appropriate term might be polyculture, where intercropping and rotation were usually applied. The peasant had also deep knowledge about the properties of the soil, using carefully the crops that adapted better to those properties. Agricultural production had a very intensive character and needed a high quantity of fertilisers, which came as was explained above, from organic manure. Moreover, cattle supplied food to family and played also an essential economic role, through its commercialisation. In this respect, in the course of 19th century, cattle also drove the intensification of the rotations[7] and the reduction of fallow lands by replacing them with forage plants (among which was included maize), in order to increase the number of cattle but also to increase the *estrume* for soil fertilisation (Soto 2006). Thus, despite the multiple and significant functions of the *monte*, it should be clear that the traditional agroecosystem functioned on the basis of three above-mentioned elements – crops, cattle and *monte*, in a sort of feed-back process.

According to Bouhier (1979), the traditional agroecosystem was in force until the middle of the 20th century. As Soto (2006) very clearly explains, as agriculture is not static but dynamic, the traditional agroecosystem has been subjected to changes from the middle of 19th to the middle of the 20th century by means of increasing the intensification of land – by changing the rotation system – improving the autochthonous cattle breeds (Soto 2006:353); by the selection of crops (wine, potatoes, beans) which adapted better to the soil characteristics; by the introduction of chemical fertilisation in the first third of 20th century, etc. However, the traditional agroecosystem was in force, *without changing substantially*, for about two hundred years. *Without changing substantially* means that Galician agriculture, despite transforming during that period, did not suffer, as the traditional agroecosystem management is concerned, *any structural fracture that altered substantially the interrelation among the three main elements of the agroecosystem* (Soto 2006).

2.3 THE PROGRESSIVE DISMANTLING OF THE TRADITIONAL AGROECOSYSTEM

There are factors of different nature – political, demographic, socio-economic – that contributed to the progressive dismantling of the traditional agroecosystem in the second half of the 20th century. There are two factors of vital importance for the causing the rupture of the traditional agroecosystem: on the one hand, the changes in the uses of the soil; on the other hand, the recent process of modernisation that takes place after 1960. The second one will be widely explained in Chapter 4. This section focused briefly on the first factor, which, as regards the period 1850-1950, was the result of different afforestation processes of the monte that took place by means of different State political interventions. The first processes of afforestation before 1940 did not transform essentially the use of the *monte*, but prepared the way for the State intervention in 1941. From that date onwards it can be said that the traditional agroecosystem started its dismantling that would culminate after 1960 with the process of farming modernisation.

Moreover, the dismantling of the traditional agroecosystem was also impelled by a specific socio-demographic dynamics, where migrations, and the changes in the demographic trends, played an essential role in determining labour availability, and population settlements. All these factors (state intervention, afforestation of monte areas, socio-demographic changes and the latest process of modernisation) are, however, closely related with each other, and did occur interwovenly over a rather large period.

2.3.1 THE AFFORESTATION OF THE MONTE AREAS AS THE RESULT OF STATE INTERVENTION

The first important fracture within the traditional agroecosystem has to do with the afforestation of the monte areas, or which is the same as the enlargement of the forest area against those of monte baixo (scrub and bushes) destined to provide different inputs and functions within the traditional agroecosystem.

(i) Afforestation over the period 1850-1940

Afforestation processes started at the end of the 19th century and achieved major significance during the period 1920-1940 (Bouhier 1979), and were related to different

State interventions and the development of the wood industry from the end of the 19th century onwards.

The first State intervention took place in the second half of the 19th century. Especially significant is the one promoted by the Madoz law (1855) via the disentailment of the land belonged to the so-called *manos muertas*, e.g. different institutions, church, and nobility. The Madoz law imposed the auction of those lands that were low productive, from the State perspective, but were in fact to a large extent used by the peasants under the *Foral System*[8]. The *Leitmotiv* of that disentailment was to improve the forest management. After disentailment, those lands went mainly to bourgeois hands and to a small extent to the peasants – who had low economic resources to buy them. In fact, the *Foral System* was in force until 1926, when Galician peasants had finally the legal access to the property of the land (Marey *et al.* 2003; Balboa 1990).

At this point, a brief *intermezzo* is required in order to explain the character of the property of the Galician *monte*. In the 19th century, most of the *montes* were under two main regimes of property: *montes veciñais (or communal montes)* and the *montes de varas*. *The Communal monte* entailed collective property linked to specific neighbourhood associations. It was the belonging to that neighbourhood that gave the right to use them, it was not possible to inherit or sell that right (Lage 2003). The nature of the property was doubled: private, since those areas were used by private individuals, and not by public institutions; but also collective, since there was not a fixed assignation of the land for every individual user (*comunero*) (Grupo… 2002). The *montes de varas* were under co-property of a peasant community but entailed different shares of the right to access to the use: depending on the family or lineage. It was not possible to divide them as regards the *estivadas* or the pasture for cattle and *estrume* collecting. The *montes of varas* were those that belonged clearly to a specific owner. The share was not equal and the individual character of the right to use it entailed scarce communitarian cohesion. The rights of use were inherited and only rarely sold (Lage 2001). The process of privatisation of the *montes de varas* took place faster and earlier (in the 19th century) than in the case of the *communal montes* (Soto 2006).

In any case, and as first reaction against the disentailment, from 1880 onwards, an individual share of the *communal montes* took place, giving way to the beginning of private afforestation that reached its highest point between 1920 and 1940. Thus, the process of disentailment accelerated; on the one hand, the individualisation and subsequent intensification in the use of the *monte:* the extension of the *toxo* (*Ulex Europeus*) areas in order to increase the availability of fertilisation and later the conversion of part of those areas into meadows (Balboa 1990). On the other hand, the access and individualisation of property entailed also the development of a new use: forestry in order to produce wood for an incipient wood industry that started to be important in the last three decades of the 19th century (Lage 2003).

The action of the State during that period was mainly causing private afforestation, since public afforestation was hardly noticeable and although there was not yet a real change to the forestry use but more a diversification of uses (Soto 2006), it was the

starting point of a later process. In fact, the change from diversification to clearly wood production orientation took place progressively during the first three decades of the 20th century and culminated with another State intervention: the State expropriation of the Communal *montes* under the National Forest Plan (NFP) approved in 1941, under the Franco dictatorship (1939-1975).

(ii) Afforestation from 1940 onwards

This expropriation within the NFP (1941) was carried out with the goal of afforestation, which corresponded to the need of the Autarquy period (1939-1959) of being self-sufficient. The development of the national wood industry during this period also reinforced private afforestation, moved not only by the aim of diversifying their activity but also of speculating[9] (Lage 2001). Although there is no clear agreement on the significance of the private and public afforestation – although it seems proved that the private[10] was larger than the public – in any case, as Bouhier (1979) stated, the *monte* started to run away from the agricultural system, or which is the same, the agricultural uses of the *monte* started to be abandoned.

When the *communal monte* came back to the former owners after consecutive legal reforms between 1950 and 1970 (Grupo…2002), the agrarian units did not need it as before. Also in those areas where the *monte* had not been expropriated, it was not integrated any longer within the farm. The socio-demographic and economic conditions[11] were then already totally different, and agriculture had started its transformation on the basis of the agro-industrial model (Chapter 4).

2.3.2 OTHER FACTORS THAT CONTRIBUTED TO THE DISMANTLING OF THE TRADITIONAL AGRO-ECOSYSTEM

The dismantling of the traditional agroecosystem is also related to the changes in population dynamics driven by the demographic transition in the second half of the 19th century, and especially by the different migratory waves at the end of the 19th century and the first three quarters of the 20th century.

A summarised sequence of those factors can be the following one: in the second half of the 19th century, Galicia performed its demographic transition, increasing the pressure of population over natural resources. This pressure was reduced by means of different migratory waves that took place to a larger extent in the end of the 19th century and the first three quarters of the 20th century. Emigration determined population dynamics to a larger extent than the demographic trends over that period, and along with the decreasing fertility rates over the whole past century, they both determined the ageing of population as well as its unbalanced settlement, which favoured urban areas over rural areas.

The reduction of population pressure affected therefore mostly rural areas and peasant families and, as regards agriculture, had at least two effects: it reduced the availability of human labour in general, and young labour in particular. This contributed, on the one hand, to improving labour productivity and to injecting money into the peasant family, increasing its financing possibilities. On the other hand, by reducing labour availability, it contributed to dismantling of the traditional agroecosystem, whose

management was highly demanding in this respect. In more recent decades, the process of ageing, also fed by those former migratory processes and the demographic trends, is causing a progressive depopulation within rural areas, enhancing the unbalance between rural and urban areas. In general, emigration and the demographic transition contributed to dismantle the traditional agroecosystem, while the ageing of population and the unbalance population settlement are consequences of the emigration and demographic trends, and have jeopardised the survival of the traditional agroecosystem. Thus, in a strict sense, ageing and unbalance population settlement are not causes of the disappearance of the traditional agroecosystem, neither direct consequences, but have run parallel to the process of dismantling, hindering its maintenance.

(i) On demographic transition and migratory waves

Galicia performed its *demographic transition*[12] in the second half of the 19th century and the first three quarters of the 20th century[13] (Eiras 1996), which implied, as in other Western countries, population growth in absolute terms, and increased the pressure on natural resources (land, in agriculture): e.g. in the period 1860-2001, the Galician population increased by around 50%, from 1,799,198 to 2,695,880 inhabitants (INE 2001a and Eiras 1996).This absolute growth was, however, rather low in relative terms, when it is compared to Spanish or European population dynamics, which grew in the same period around 160% and 176%, respectively (Livi Bacci 1999). The reason for that was the strong process of migration[14].

In fact, as Fernández and Lopez (2000) concluded, and a rapid overview of the graphic permits us to check, over the last century the different migratory waves determined Galician population dynamics to a larger extent than the strictly demographic trends (showed by vegetative growth); at least in the first three quarters of the 20th century[15]

Figure 2.2 Impact of the migratory balance on real population growth

Source: Leiceaga and López (2000), and INE (2007) movimiento natural de la poblacion and saldos migratorios.

Between 1900 and 1996, the net migratory balance was negative, by around 835,000 people; a high percentage in a population of hardly 2,500,000 inhabitants. The migratory process shows, moreover, changes of rhythm and direction over the whole century. During the first three decades of the 20th century, more than 300,000 people emigrated (Fernandez and Lopez 2000). During the Civil War and until 1940, 115,359 people emigrated. The strong exodus continued until 1970 (around 466,500 people) and slightly down between 1971 and 1981 (5,660). In the following decades and until nowadays, Galicia started to receive people as a consequence of the return of the emigrants but also as place of destination of foreign people. The positive net migratory balances hide, however, an increasing internal migration from rural to urban areas: although the trend of emigration abroad changes (becoming positive), internal migratory movements continued so far to other Spanish regions or to Galician cities, although to a smaller extent, the migratory balance within Spain is negative by -30,775 people. However, what is now taking place and determining an imbalanced population settlement, between rural and urban areas, is internal migration, i.e., among the four Galician provinces. Internal migration affects especially the rural entities from Ourense and Lugo: over 50% of the 'immigrants' come from municipalities of below 20,000 inhabitants. In the case, of A Coruña and Pontevedra, the percentage is lower (around 40%) (INE 2007 for the period 1995-2005)

Emigration had a strong impact on peasant farms in economic terms, since it entailed liquidity injection, which brought additional resources to manage the farm. Different works have stated the importance of this liquidity since the beginning of the 20th century and how it enabled Galician farmers to reduce the role of moneylenders and loan sharks. The emigration wave of the 60s played again the same role, allowing peasant families to have a bigger saving capacity to carry out part of the strong farming capitalisation and innovation of the farming sector in the end of the 60s and the beginning of 70s (Nuñez 2001).

Furthermore, emigration affected mostly young people (16-55 year-olds) and especially peasant families (Marey *et al.* 2003), and had therefore a significant important impact over the traditional agroecosystem, contributing to its dismantling: although reducing the number of people within the family unit could contribute to an improvement of labour productivity, at the same time, it withdrew human labour availability from a management that was highly demanding in this respect. In short, the reduction of population required a change in the way of doing. It was not possible to carry out to the same extent the same rotation systems, to harvest bushes to create manure, or diversifying cropping, etc., to the same extent, since they were tasks within the traditional agroecosystem that used labour intensively. Furthermore, since the emigrant maintained or inherited the property of the land, he/she contributed to the land de-mobilisation, a fact that has become visible in recent decades (Lopez 1996) (Chapter 3).

The pressure of population over (agricultural) resources is no longer a problem as regards its quantity – as regards how farming activities are carried out this is another question that will be approached in Chapter 3 and in Part II.

(ii) The ageing of the population

Helped by demographic trends, another problem that migratory waves brought was the ageing of population, which although it has become rather problematic in recent times, makes also difficult the survival of the traditional agroecosystem.

The Galician population became older during the last century since emigration affected mostly young people and left behind children and old people. Because of the same reason, it contributed to diminishing the fertility rates – also linked to the control of natality. Thus, in the period, 1860-2001[16], the percentage of people older than 50 increased from 14.9-37.6%. After 1960, when the dismantling of the traditional agroecosystem took place, and until 2001, the percentage of people over 65 year-old is continuously increasing (from 8-21%), while the percentage of people younger than 15 year-old is continuously decreasing (from 27-11.8%) (Fernandez and Lopez 2000; and INE 2001a, for the period 1955-2001).

Table 2.1 Galician age structure (%) 1860-2001

Galicia	<15	15-64	> 65
1860*	31.5*	53.6*	14.9*
1950	27.0	65.0	8.0
1960	26.7	64.4	8.9
1970	24.5	64.4	11.1
1981	23.4	63.1	13.4
1991	18.2	65.7	16.1
2001	11.8	67.1	21.0

Source: Data from 1860 in Eiras (1996); data from 1950 to 1991 in Fernandez and Lopez (2000), data from 2001 in INE (2001a). Data for Spain in INE (2001a).

* Data for 1860 correspond to the intervals of age of '0-15', '16-50' and '>51'.

Although, not durectly causing the dismantling of the traditional agroecosystem, the process of ageing is increasing the difficulties of recovering such management, which is higher labour demanding than the current one.

In general, the process of ageing is accelerating since 1980. There are two factors that contributed to this: on the one hand the increasing return of Galician emigrants during the former decades: most of people who return are retired[17] (mostly over 55 years old). On the other hand, because fertility rates accelerated their decreasing trend, being currently among the lowest ones in the world (Guisan and Cancelo 2002). In the last two decades, Galician birth rates have drastically reduced. The death rate has decreased more rapidly than the birth rate: death rate has been below 10%, since 1960, whereas the birth rate has been lower than 10% since 1990, and from 1988 onwards, Galician birth rate is lower than death rate, which implies a negative vegetative growth. (INE 2005a and 2005b and IGE 2005).

By considering the different economic and productive sectors, we observe that the ageing process is especially affecting the primary sector (including fishing, agricultural activities and forestry), which employed 15% of Galician working population in 2001 (IGE 2001) and where around 75% are working in agricultural activities (INE 2001b). According to the data published by IGE (2001), in the primary sector, 30% of the workers are older than 55 years, whereas in the other sectors this percentage varies from 9 to 12%; moreover, younger workers (between 16 and 24) are only around 4%, while in other sectors, they are between 9 and 14%. More recent data, published by the EEEA Survey (INE 2005), showed that in 2005, only 2.5% of the people working in agriculture were younger than 25 year-old, while 55% was older than 55. Within the group of workers younger than 25, around 91% are relatives or other family members different from the owner or her/his partner, while within the group of older than 65.52% are owners and 35.5% are owners' partners.

(iii) Unbalanced population settlement: rural depopulation and urban overpopulation
Along with the ageing of population, depopulation of rural areas has become a problem over the last decades. Historically, Galicia has been a quite densely populated territory with a disperse configuration of human settlements,[18] classified by :Lage (2001) as: *casas* (houses), *lugares*, *aldeas* (small villages), *parroquias rurales* (rural parishes, *villas*, and cities. The high dispersion of the habitat is shown by the high number of entities of population, which are in around 6% of the Spanish territory, 50% of the total Spanish entities (29,179, in 2001). Such dispersion has been higher in the rural areas (Fernadez and Lopez 2000), which occupy most of the Galician territory and has been determined by a specific agricultural organisation developed during centuries (Lage 2003:118). Dispersion is related to the implementation of the *Foral System*, while population settlements are also conditioned by topography (Santa Cruz 1995).

Over the last century, density of population has been decreasing in rural areas – mainly in the provinces in Lugo and Ourense; and increasing in urban areas – mainly in the provinces of Pontevedra and A Coruña. In 2001, Lugo and Ourense located 6.5 and 18.8% of their population respectively in municipalities below 2,000 inhabitants that were 23% and 52% of the total municipalities in each province, respectively. Moreover, they counted as well the smallest percentage of big municipalities (over 20,000), 1% and 1.5%, respectively. On the contrary, the Atlantic coastal provinces, Pontevedra and A Coruña, located most of their population, 56.6% and 51.4%, in urban areas (higher than 20,000 inhabitants[19]) (INE 2001-2004).

Table 2.2 Dynamics of the density of population in every Galician province (1900-2005)

	1900	1950	1970	1981	1991	2001	2001(P)	2005(P)
Coruña (A)	82.2	120.2	129.6	137.5	138.0	137.8	139.4	141.7
Lugo	47.2	51.6	42.9	41.1	39.0	36.3	36.9	36.3
Ourense	55.6	64.3	60.7	59.1	48.6	46.5	47.4	46.7
Pontevedra	101.7	149.4	173.8	196.5	199.5	201.1	203.8	208.7
Galiza	67.0	88.1	90.5	95.1	92.4	91.2	92.4	93.4

Source: Own Elaboration from INE sources (www.ine.es) 1900-2001 data of population come from the Census of Population, while 2001 (P) and 2005 (P) come from Padron of inhabitants (INEc 2005).

This imbalance between population settlement and territory has nowadays important implications on social and economic domains: concentrated population means lower costs in terms of infrastructure, industrial development, urbanisation, etc., while depopulation and habitat dispersion entail higher costs or the disappearance of many social services and reduction of economic activity, plus community relations, culture, etc. In fact, the difference among provinces regarding population density is strongly linked to the economic process of development[20]. In short, the provinces with higher population density are those with stronger development of industry and services, therefore attracting and depriving people from rural areas and agricultural activity[21].

The reduction of population in rural areas, along with the process of ageing, have reinforced the process of labour reduction in agriculture, affecting along with other conditions (political and economic) also the *way of doing*. Labour reduction contributed to facilitating the dismantling of the traditional agrarian system that was finally struck down by the more recent process of farming modernisation that took place after 1960 (Chapter 4).

NOTES

1 This is especially interesting given the problems of land de-mobilisation and/or abandonment, in the last decades (Chapter 3).

2 According to the dictionary published by the Spanish Royal Academy of language (RAE, www.rae.es).

3 The *rozas* culture or *estivadas* was usual until the 1970s. It consisted in burning in summer of previously uprooted brush and scrub (matogueira) in spring. Once it had been burned the ashes were spread over the area in order to be seeded in autumn. Usually, only one (or two depending on the quality of the soil) harvests of cereal or toxo 'Gorse' (*Ulex Europeus*) was obtained. After harvesting, the area rested without being cropped for several years (from 8 to 30), depending on the soil (Bouhier 1979; Balboa 1990; Soto 2006).

4 This vegetal matter was mainly formed by *toxo* (*Ulex Europeus*) (Soto 2006).

5 This share of the *monte* was not totally equal. In fact within the Communal system of property, bigger peasant units had access to bigger plots of *monte* (Soto 2006).

6 This access has historically determined the configuration and low value of the ratio Utilised Agricultural Area (UAA)/Total Area (where the UAA includes crops and pasture and the total area includes scrub, forest and other non farming areas); and paradoxically it is higher in recent decades because along with a small increase of the UAA, the total area has on the contrary decreased, showing the current problem of abandonment especially regarding the monte areas, due to the lost of their productive use (Chapter 3).

7 In Galicia, the system of rotation varies not only geographically – in the different provinces – but also depending on the soil quality. The system has not been static, changing since half of 18th century until nowadays (Soto 2006:147).

8 Galician farms have been characterised by a small and dispersed territorial structure during the last century. This structure is to a greater extent, the legacy of the particular dynamics of land property in Galicia. It is not our aim to review all the historical events that conformed the actual land structure, but at least we must mention the *foral* system settled in the Middle Ages. The *foro* or *foral* contract was in Galicia a sort *emphyteusis*. The Law of *emphyteusis* is a right, susceptible of assignment and of descent, charged on productive real estate, the right being coupled with the use of the property with the condition of taking care of the estate and paying taxes, and sometimes a small rent. Thus, the *emphyteusis* gave the right of use but not the property of the land for a long period, while in the *foral* contract the time for land cession was reduced to the duration of three generations or king lives.

9 In the 1950s, Galicia was chosen as the place to install some of the first industries to transform wood: the cellulose located in Lourizan, for instance, responding to the need of the Spanish market for paper pulp (Lage 2001:244).

10 For instance, Soto (2006) argues that there is an overestimation of the private reforestation of around 200,000 hectares in 1964. Anyway, according to his estimations, in that year around 60% of the re-forested area was private and 40% belonged to the communal *montes*.

11 At this moment, the effects of the Plan of Stabilisation (1959) started to be noticeable: new markets and new technologies entered in the scene and thereby the process of farming modernisation that had started already in other Western countries.

12 Such demographic transition consists of overcoming the traditional demographic model that was characterised by high fertility and mortality rates, entailing, on the contrary, low fertility and mortality rates (Livi Bacci 1990).

13 In Galicia, the process of demographic modernisation started along with the Catalonia and Balearic Islands before the rest of the Spanish communities (López 1996).

14 There are different stages in the Galician migratory process with three different destinations: transoceanic, Europe and other regions of Spain. From the end of the 19th century until 1960, people emigrated mainly to America (Cuba, Puerto Rico, Argentina, Uruguay, Brazil, Mexico and United States of America). After 1950, this transoceanic migratory movement slowed down, and it is hardly significant nowadays. From 1960 onwards, Galician population goes mainly to industrialised European countries as well as to other Spanish regions, mainly cities. According to Fernadez and Lopez (2000), between 1960 and 1975, 17.6% was transoceanic, while 65% had as destination other European countries and 17.4%, Spain.

15 The graph has constructed by updating the one constructed by Fernandez and Lopez (2000). Between 1981 and 2005, the vegetative growth is calculated (for the different periods) from the difference of the annual growth rates of birth and death rates. The data on population in the two periods 1981-1991 and 1991-2001 come from the Censos de poblacion (INE 2001a), while for the former period come from Leiceaga and Lopez, and for the last period (2001-2005) are obtained from the Padron (INE 2005c). The difference between the Padron and the Census for years 1981 and 1991 and 2001 exist but are minimal.

16 The data for 1860 are collected in different age intervals (‘0-15’, ‘16-50’ and ‘>51’). Considering the same intervals in year 2001, in Galicia, between 1860 and 2001 the percentage of people older

than 50 increased from 14.9% to 37.6%, while in Spain the same trend has taken place to a lower extent, from 12.9-31.8%.

17 Between 1990 and 2005, 226,897 people emigrated, against 335,200 who came to Galicia, which gives a positive migratory balance of 108,303 people in year 2005 (IGE 2005 and 2007). Most of the immigrants came from the main destinations of emigration in the 60s – Argentina, Venezuela, Switzerland over the last decade (IGE 2004).

18 The dispersion of population settlements and the lack of a dynamic economic sector explain the low and late urbanisation process of Galicia. 'Low' because it affected a small part of the territory and 'late' because it took place in the last 50 years, whereas in other countries it needed more than one century (Domínguez and Simon 2005).

19 The criterion to define 'rural' is the one that considers entities below 20,000 inhabitants as rural according to the the criterion of López taboada (1996), which considers as urban the four capitals of province (A Coruña, Lugo, Ourense and Pontevedra) and the three biggest cities of Galicia: Ferrol, Santiago de Compostela and Vigo. By doing so, in 2001, 94% of the municipalities and around 54% of the population are rural. In 2001, those data revealed that a big portion of population (46%) is living in a small part of the territory (8%) (data elaborated from INE 2001a). Knowing Galician reality, this assumption is much closer to reality than the one that considers rural entities as those with fewer than 2000 inhabitants.

20 The concentration of Galician population shows the same tendency to polycentrism as other Spanish areas. This polycentrism has been reinforced and obeys the implementation of an economic policy articulated through plans of development and growth hubs. Such policy promoted the re-emerging of the four Atlantic cities of Vigo, Santiago, A Coruña and Ferrol (Lage 2001:114).

21 Rural depopulation, along with , contributed to de-stabilising the old agrarian order, converting it in a referent of backwardness against modernity and progress that is represented by urban areas, industrial growth and service sector (Lage 2003).

3 CHANGES IN THE LAND USE PATTERNS DURING THE LAST PROCESS OF MODERNISATION (1962-2005). THE ROLE OF LAND (DE)MOBILISATION

3.1 INTRODUCTION

This chapter has the aim of showing the changes in the use of land after 1960, when the dismantling of the traditional agroecosystem became a reality in virtue of a global process, the one of farming modernisation that will be explained in the following chapter.

The dismantling of the traditional agroecosystem entailed the change in the use of land. During the last three decades, this has been widely analysed since land – its size and structure – has often been considered, one of the main constraints of the process of modernisation, which does not mean that in this thesis this is going to be considered as such. The real cause, as I aim at showing in this first part, is the lack of adaptation to the initial socio-economic and environmental conditions of Galician agricultural reality that prevailed. In order to show that, it is necessary to give a general overview of the recent dynamics of the territorial structure of Galician farms and through the changes in the land uses, of the abandonment of productive soil.

Therefore, the goal of this chapter is to show the changes in the uses of soil in order to check the loss of productive soil suitable for agricultural purposes, and which is closely related to the dismantling of the traditional agroecosystem. Furthermore, in order to show these changes, a general overview of the recent dynamics of the territorial farm structure will be given as well. Furthermore, the abandonment has had important negative environmental consequences, such as the increase of fires in *monte baixo* and forest areas.

3.2 TERRITORIAL/SPATIAL STRUCTURE OF GALICIAN FARMS AND ITS DYNAMICS DURING THE RECENT PROCESS OF MODERNISATION (1962-2005)

In order to observe the main features of the territorial structure of farms and its dynamics during the last and most recent process of modernisation (1962-2005), it is necessary to use two different statistical sources. Thus, for the period 1962-1999, Table 3.1 and 3.2 are constructed with data from the Agrarian Census (INEc, several years or s.y.). To refer to a most recent period (1987-2005), Table 3.3 and 3.4 show data collected by the *Encuesta sobre la Estructura de las Explotaciones Agrarias* (Structure of the Agrarian Farms Survey or the acronym EEEA) (INEd s.y.). Despite both sources re (or) do not use the same sample and methodology[1] and therefore the absolute figures they show are not comparable; they show for similar intermediate periods the same dynamics, being comparable in this respect; as well as enabling an analysis of a larger period.

Table 3.1 and 3.3 show absolute figures concerning the number of farms, and the total area and number of plots as well as per farm, while Table 3.2 and 3.4 show the Average Growth rate[2] (%AGR) and the Annual Accumulated Growth Rate[3] (%AAGR) for different intermediate periods and for the total period.

Table 3.1 Dynamics of different indicators in absolute values of the structural basis of Galician agrarian sector. Period 1962-1999

	1962	1972	1982	1989	1999	Net Variation 1962-1999
Number of farms	421,294	385,832	360,436	358,886	268,995	-152,259
Total Area (TA)	2,424,352	2,456,592	2,241,968	2,217,145	2,041,799	-382,554
UAA	629,718	687,815	655,043	675,039	696,690	66,972
TA/farma	5.75	6.37	6.22	6.18	7.56	1.8
UAA/farm	1.49	1.78	1.82	1.88	2.58	1.1
Number of plots	9,544,981	7,289,176	5,454,555	5,445,081	4,717,093	-4,827,888
Plots/farms	22.66	18.89	15.13	15.17	17.5	-5.2
TA/Plot	0.25	0.34	0.41	0.41	0.43	0.2
UAA/Plot	0.07	0.09	0.12	0.12	0.15	0.1
UAA/TA%	26	28	29.2	30.4	34.1	8.1

Source: INEc (s.y.)

UAA: Useful Agricultural Area (including land for crops and pasture); TA: Total Area including UAA, bushes and scrub, forest area and other areas).

Table 3.2 Dynamics of different indicators of the structural basis of Galician agrarian sector through average and annual growth rates according to the Agrarian Census

	1962-1972		1972-1982		1982-1989		1989-1999		1962-1999	
	% AGR	%AAGR	%AGR	%AAGR	%AGR	%AAGR	%AGR	%AAGR	%AGR	%AAGR
N. of farms	-8.4	-0.9	-6.6	-0.7	-0.4	0.0	-25.4	-2.8	-36.1	-1.2
TA	1.3	0.1	-8.7	-0.9	-1.1	-0.1	-7.9	-0.8	-15.8	-0.5
UAA	9.2	0.9	-4.8	-0.5	3.1	0.3	3.2	0.3	10.6	0.3
TA/farm	10.8	1.0	-2.4	-0.2	-0.6	-0.1	22.3	2.0	31.5	0.7
UAA/farm	19.5	1.8	2.2	0.2	3.3	0.3	37.2	3.2	73.2	1.5
N. of plots	-23.6	-2.7	-25.2	-2.9	-0.2	0.0	-13.4	-1.4	-50.6	-1.9
Plots/farms	-16.6	-1.8	-19.9	-2.2	0.3	0.0	15.2	1.4	-22.9	-0.7
TA/Plot	36	3.1	20.6	1.9	0	0.0	4.9	0.5	72	1.5
UAA/Plot	43	3.6	27.3	2.4	3.2	0.3	19.1	1.8	123.9	2.2
UAA/TA	7.7	0.7	3.6	0.4	3.4	0.3	13.3	1.3	30.8	0.7

Source: INEc (s.y.).

Table 3.3 Dynamics of different indicators of the structural basis of the Galician agrarian sector according to the EEEA. Period 1987-2005

	1987	1997	2003	2005	Net Variation 1987-2005
N. of farms*	227,359	114,781	101,537	91,452	-135,907
TA	1,329,935	1,070,598	1,130,386	1,112,643	-217,292
UAA	710,514	621,552	724,624	732,759	22,245
UAA/Farm	3.1	5.4	7.1	8.0	4.9
TA/Farm	5.8	9.3	11.1	12.2	6.3
UAA/TA	53.4	58.1	64.1	65.9	12.4

Source: INEd (s.y); *Farms with UAA.

Table 3.4 Dynamics of different indicators of the structural basis of the Galician agrarian sector through Average and Annual Growth Rates, according to the EEEA.

	1987-1997		1997-2005		1987-2005	
	% AGR	% AAGR	% AGR	% AAGR	%AGR	%AAGR
N. of farms	-49.5	-6.6	-20.3	-2.8	-59.8	-8.7
TA	-19.5	-2.1	3.9	0.5	-16.3	-1.8
UAA	-12.5	-1.3	17.9	2.1	3.1	0.3
UAA/Farm	73.3	5.6	48.1	5.0	156.4	9.9
TA/Farm	59.4	4.8	31.2	3.5	108.0	7.6
UAA/TA	8.7	0.8	13.4	1.6	23.3	2.1

Source: INEd (s.y.).

The former data highlight firstly the strong and continuous reduction of the number of farms. According to the Census, between 1962 and 1999, the number of farms reduces by 151,241 farms (around 35%). Although these data are, however, not strictly comparable because the definition of farm[4] has changed since 1962, the reduction of the number of farms is a certain fact; it has been continuous and became stronger (by 25%), when the definition was the same, over the period 1989-1999. According to the EEEA (Table 3.3), over the period 1987-2005, 135.907 farms disappeared (around 55%). The strongest reduction took place between 1987 and 1997 (49.5%). These data show, moreover, that the strongest reduction – as far as both sources are concerned – coincided with the immediate years after Spain joined the Economic European Community (EEC) in 1986, highlighting the need of transformation of the farms because of the new market possibilities and competition within the Communitarian European context.

Along with the strong reduction in the number of farms, and despite the changes, two classical structural features of the Galician agrarian sector remain: the persistence of

small sized farms and of a high number of small plots per farm. According to the Census, in 1999, the average Galician farm had 7.6 hectares of Total Area (TA) and 2.5 hectares of UAA (Utilised Agricultural Area) and 17.5 plots per farm; while according to the EAAA, the average Galician farm was a bit bigger, in 2005: around 8 and 12 hectares of UAA and TA per farm, respectively. However, in both cases, the average Galician farm is rather smaller than the average Spanish farm (around seven and three times smaller, in 1999 and 2005, depending on which source is chosen). Galician farms have been, furthermore, divided into a high number of plots: according to Agrarian Census, almost doubly scattered than the average Spanish farms and with an average area per plot five times smaller.

The scattered nature and especially the small size of the plots have been often seen as a constraining factor to achieve a dynamic farming sector from the productive and economic perspective. However, some questions must be pointed out in this respect. Firstly, despite being smaller than in other contexts, the size per farm has increased in the last three decades; secondly, that dispersion is rather more constraining than size; thirdly, that small size does not imply directly low efficiency, although it is evident that this limits the global output. Fourthly, small farms are perfectly suitable within a different agricultural paradigm, that one that not only aims at scale enlargement and specialisation, but at diversification, and enhancing of the ecological and social sustainability.

The consideration of small structure as a constraining factor depends mostly on the specific goals the farming system pursues. That is, if the goal is to obtain a high output, or to specialise, small size and small scattered plots may be a restriction. If the goal is to produce quality, instead of quantity or to keep a big number of farms involved in the activity, the restriction may be minor. Moreover, small property, when it is linked to equitable system of property, becomes a key factor for dynamising the local potentialities and rural development: a big number of (small) farmers involved in the activity reduces depopulation and enhances social cohesion in rural areas**.** Nevertheless, what is certain is that the territorial structure of Galician farms – which, moreover, responds to historical questions related to property[5], makes it difficult to adapt to the farming modernisation requirements.

There is, on the contrary, another significant issue regarding the territorial structure dynamics. Farms are small despite having enlarged their average size. Without defending as absolutely necessary big sized farm as the only one alternative for socio-economic development, what is evident is that farms in Galicia could be bigger than they are. Statistically, this is to be seen by the changes in the uses of land. They are visible by reviewing, firstly the global dynamics of the UAA and the Total Area, and secondly by reviewing the land dynamics of different sorts of land according to their specific use. In order to avoid the use of different statistical sources and to focus on the most recent years, such a review will be done by considering the data from the EEEA in the period 1987-2005.

3.2.1 GLOBAL DYNAMICS OF THE UTILISED AGRICULTURAL AREA AND OF THE TOTAL AREA

Between 1987 and 2005, a first clue of the changes in the uses of land is given by the strong reduction (16%) of the Total farming Area (TA) and the small augmentation (3.1%) of the Utilised Agricultural Area (UAA). Note, moreover, that such dynamics explains the positive evolution of the ratio UAA/TA from 53.4% to 65.9%. That ratio has been usually low in Galicia – and lower than in Spain – and has been often used to highlight the constraining of productive land in Galicia (López 2000).

There are two clarifications to make, as far as the ratio UAA/TA is concerned. Firstly, this ratio has been traditionally low because, as was explained in Chapter 2, the articulation of the traditional agroecosystem on the basis of the use of *monte* areas, supplied of productive lands that have not been statistically considered as agricultural land (thereby, not included within the UAA). Secondly, that the augmentation of that ratio in recent decades responds to a slight increase of UAA, and to a strong diminution of the Total Area, in which those lands that before were used within the farming system for agricultural purposes without being part of the UAA, are, as will be shown, not appearing in the statistics; i.e., land that had been productive and used with productive purposes is out of use or de-mobilised.

At first sight, the strong reduction in the number of farms was expected to generate some *movement* or *transference* of farming land. Land mobilisation can take place in different ways: land goes from one farm (that is not active anymore) to another by using different mechanisms: renting, selling, inheriting, etc. Land can also *move* to a different category of use[6], for instance from cropping or forest to pasture. There is also a part of land that can disappear from the surveys because of methodological reasons. It may happen that some land is de-mobilised for farming purposes, i.e. *abandoned*, or goes out of the farming purpose (it becomes urban) and can go out of the farming surveys (López 1996). In Galicia, the last sort of (de)mobilisation has been so important that it has reduced the availability of productive land and the possibility of a major re-dimension.

3.2.2 UAA AND THE TOTAL AREA DYNAMICS: ON LAND MOBILISATION AMONG FARMS

Land mobilisation among farms is analysed by considering different acreage per farm intervals and by regrouping them into two bigger intervals: smaller and bigger than 10 hectares.

The reduction of area, concerning both UAA and TA, occurred within the smaller interval (less than 10 hectares) since it is there, where the disappearance of farms took place as well (144,568 farms), which entailed a reduction of 285,614 hectares of UAA and 557,393 hectares of total area. On the contrary, the number of farms with 10 or more hectares increased (8,661 farms) as their UAA and Total Area did[7] (307,859 and 340,101 hectares, respectively). This shows there has been an exchange of UAA or land redistribution between these two groups of (small and big) farms.

Table 3.5 UAA and TA dynamics by considering different ranges of area. Galicia 1987-2005

	UAA			TA			UAA/TA%	
	1987	2005	Net Var %	1987	2005	Net Var%	1987	2005
< 1	31,647	4,623	-27,024	78,382	15,489	-62,893	40.4	29.8
1 a < 2	87,918	31,085	-56,833	178,806	77,454	-101,352	49.2	40.1
2 a < 5	198,037	77,346	-120,691	393,231	165,338	-227,893	50.4	46.8
5 a < 10	189,348	108,282	-81,066	339,800	174,545	-165,255	55.7	62.0
10 a < 20	141,125	188,628	47,503	211,087	267,666	56,579	66.9	70.5
20 a < 30	34,008	111,853	77,845	49,965	143,817	93,852	68.1	77.8
30 a < 50	12,142	94,268	82,126	21,749	112,121	90,372	55.8	84.1
50 a < 100	8,901	57,621	48,720	35,022	72,027	37,005	25.4	80.0
>=100	7,388	59,053	51,665	21,893	84,186	62,293	33.7	70.1
Total	710514	732,759	22,245	1,329,935	1,112,643	-217,292	53.4	65.9

Source: INE 1987 (López 2000) and INE (2005).

Table 3.6 Evolution of the number of farms, the UAA and the TA between 1987 and 2003 by considering two UAA groups, bigger than 10 hectares and smaller than 10 hectares

1987							
Has of UAA	*N. of farms*	*% farms*	*UAA*	*%UAA*	*TA*	*% TA*	*UAA/TA%*
<10 has	214,654	94.4	506,950	71.3	990,219	74.5	51.2
>10 has	12,705	5.6	203,564	28.6	339,716	25.5	59.9
Total	227,359	100	710,514	100	1,329,935	100	17.0
2005							
	N. of farms	*% farms*	*UAA*	*%UAA*	*TA*	*% TA*	*UAA/TA%*
<10 has	70,086	76.6	221,336	30.2	432,826	38.9	51.1
>10 has	21,366	23.4	511,423	69.8	679,817	61.1	75.2
Total	91,452	100	732,759	100	1,112,643	100	65.9
Net Variation 1987-2005							
	N. of farms	*% farms**	*UAA*	*%UAA**	*TA*	*% TA**	*UAA/TA%*
<10 has	-144,568	-18	-285,614	-41.1	-557,393	-35.6	-0.1
>10 has	8,661	18	307,859	41.2	340,101	35.6	15.3
Total	-135,907	63.3	22,245	3.1	-217,292	-16.3	

Source: From INE (1987) and INE (2005).

* Percentage of farms that disappear, percentage of UAA increase and TA decrease.

Given that the augmentation of the UAA, as far as the bigger farms is concerned, overcomes in 22,245 hectares the reduction of the area within the smaller farms, it is to be assumed that some lands that were out of the UAA in 1987 have been incorporated now into this category. This proves that there is another sort of mobilisation, the one related to changes in the use.

3.2.3 UTILISED AGRICULTURAL AREA AND THE TOTAL AREA DYNAMICS: ON LAND MOBILISATION BY CONSIDERING DIFFERENT USES OF THE LAND

Land dynamics can be analysed as well by considering the different land uses. Following the land typology of the EEEA, the total area is formed by the UAA and the category 'other lands'. The UAA is divided into two sub-categories: lands destined to crops and lands destined to pasture. The category of 'other lands' includes: 'Wasteland, Esparto grass, and Bushes/or scrub' (WEB from now onwards), forest area (trade and no-trade[8]) and 'other areas'[9].

Table 3.7. Land use dynamics in Galicia agrarian sector.1987-2005

	1987	2005	NetVar87-05	AGR87-05	Net variation Farms <10ha	Net variation Farms<10ha
Cropping lands	334,621	166,268	-168,353	-50.3	-189,787	21,433
permanent pasture	375,891	566,491	190,600	50.7	-95,827	286,427
meadows	324,067	445,021	120,954	37.3	-285,614	307,860
Others	51,834	121,469	69,635	134.3	-271,777	32,242
UAA	710,514	732,759	22,245	3.1	-215,223	-15,078
Other lands	619,421	379,884	-239,537	-38.7	-64,723	40,848
WEB*	355,136	124,835	-230,301	-64.8	-18,793	6,739
Forest area	253,360	229,486	-23,874	-9.4	-45,929	34,111
Non-commercial	103,235	91,181	-12,054	-11.7	8,168	6,472
Commercial	150,125	138,305	-11,820	-7.9	-557,391	340,099
Other areas	10,925	25,563	14,638	134.0	-189,787	21,433
Total area	1,329,935	1,112,643	-217,292	-16.3	-95,827	286,427

Source[10]: Own elaboration from EEEA 1987 and 2005 (only farms with UAA, total farms: 1,130,922).

* Wastelands, Esparto grass land and Bushes.

The part of the augmentation of UAA (22,245 ha) that is not coming from the UAA of small farms that disappear must come from a change in the use of some lands within the category WEB or forest, that reduce globally 230,301 ha and 23,874 ha, respectively. Most probable, considering what happened in previous decades, is that they come from the 'forest' category, more fertile soils in general than the WEB and with better access, and/or close to the farm (López 1996).

On the contrary, at the same time the global evolution of the UAA has to do with the dynamics of the forest areas and certain political measures. In fact, the slight recovery of the UAA over the whole period (1987-2005) has to do with its negative dynamics between 1987 and 1997, when it reduced by 14.3% (Table 3.4). And this reduction had to do with the policy of afforestation of agricultural lands carried out over the period 1993-1998 under the programme of accompanying measures[11] (R. CEE 2080/92) (Garcia and Perez 2001).

In Galicia this measure withdrew land within the UAA and converted it into forest, causing a counteracting effect, given the scarce quantity of farming lands. Between 1993 and 1997, considering the farmers' 'approved' and 'paid' applications, around 3% of the UAA hectares was transformed into forest: around 4% came from areas occupied by herbaceous crops and around 88% came from *monte baixo* (within the WEB to the concept of scrub) and *erial*. Moreover, the negative effect on the UAA was not really compensated by economic benefits: despite being the community with the highest number of approved applications, it was the fourth one regarding the area forested and the fifth regarding the subsidies. This was due to the small average size of the plots and ended up, because of the lack of a zoning plan, in dispersed afforestation, often mixed with arable and pasture lands, which makes for difficult farming activity (*Ibidem* 2001).

However, it is evident that between 1987 and 2005, the category of WEB lands reduced the most (both in small and big farms) and therefore they contributed the most to the reduction of the total area, which is 217,292 hectares smaller[12]. Considering that some methodological changes could affect the statistics and that a small part of those lands could be given a forest use (therefore, they are automatically out of the agricultural survey), the situation in 2005 is that around 200,000 hectares disappeared from the survey because they do not fulfil any farming function: they are abandoned because their traditional uses also are abandoned, since the *monte* has lost its function.

The recent dynamics of the territorial structure of Galician farms highlights the excesses of the process of mechanisation (described in Chapter 4) that has accompanied the process of modernisation, and which has been justified to respond to one of the requirements of farming modernisation: scale enlargement. Moreover, it is useful to make relative the interpretation of the structural ratios (Section 4.1).

3.3 WHY ABANDON INSTEAD OF SELLING? SOME HYPOTHESES

After having observed the global dynamics of land with agrarian purposes in Galicia, the question that immediately arises is, why abandon and not sell or rent to other farmers/farms? In this respect, there are some studies that analyse the causes of the scarce land mobilisation (or no mobilisation at all in the first decades of strong modernisation); in particular I will comment here on some hypotheses – which seem to be confirmed, some of them, over the last decade – from the ones carried out by López (1996 and 2000). According to this author, there are two basic brakes related to the functioning of the two basic mechanisms to transfer land: the sales market and the market for renting.

The market for renting has been of low significance in the Galician farming sector, which as the author explains does not imply the existence of other ways of transfer, based on trust, word, and without any written contract. Although probably, given its non-written nature, the magnitude of that sort of renting is not fully collected by the agrarian statistical sources, what is, however, certain is that they have existed during the last century, especially promoted during or by the emigration waves (López 1996). According to the published data (INE 1987 and 2005), non-written contracts to transfer land have increased their significance (from 3.8% to 9.3%) within the different regimes of property (ownership and renting).

The advance of regimes of transfer/surrendering that include very often only verbal-agreement without economic consideration/payment (grass selling without farming, just harvesting; free grass donation; free permission to pasture for neighbours' herd; land surrendering within the family, from those who do not farm to those that keep on farming) have been usually seen as one of the causes of abandonment. In this respect, it is considered that when the conditions to transfer the land are not clear (there is no time continuity, or duration is not fixed…), no incentives are given to carry out an appropriate use of that land and/or investments to farm (e.g. it is difficult to increase the herd without being certain of how long the land would be available). Nevertheless, these types of transfers should be reconsidered, since they imply the existence of a channel of exchange (of land, in this case) that does not respond to strict market criteria on the one hand, and moreover, they might entail some dynamism that the market itself has not been able to create. Indeed, it is ironic that modernisation causes the de-activation of productive resources instead of re-orienting them to the market.

The second reason to justify the scarce land mobilisation (in the case of UAA) and de-mobilisation (in the case of total area) is the lack of a mechanism that promotes the market (sale and purchase) of land: in the middle of the 1990s, only 0.5% were the object of selling and purchasing (*compra-venta*). The reason given by López (1996) to explain this lack of market is that the real demand of land is bigger than the real supply of land.

The gap between supply and demand makes the land price too high. Thus, despite the fact that, in the last decades prices, although with oscillations, have diminished (by 11% between 1983 and 2004, for instance), a hectare of land in Galicia has always been between two and three times more expensive than in the Spanish market: e.g. in 1983 the average price per hectare of land in Galicia was 5,656 Euros, while in Spain it was 2,564 (real price by Gross Domestic Product price index, year 1983); in 2005 the prices were of 5,055 and 2,976, respectively (MAPA s.y: 2002, 2004, and 2005). Considering that the economic dimension of the farming sector, and the fact that labour productivity has always been smaller in Galicia than in Spain[13], it is obvious that land is 'overestimated' (at least given the average economic conditions). This overestimation has to do with the fact that land has not only a value related with its productive capacity, but also with other factors as regards both the demand and the supply side.

On the demand side (López 1996), the small territorial size per farm (Table 3.1 and 3.3) leads us to believe that the potential land demand must be big and/or bigger than the potential land supply. However, the scarcity of young farmers – due both to general ageing population and to emigration to urban areas – the difficulty of farming new lands given the available factors of production (to a larger extent human labour, but also machinery, since even when there has been a process of overmechanisation, the available machinery is not always appropriate given the territorial features) and the small purchasing power of farmers (given the in general small economic dimension) limit the real demand of lands.

The former reasons that were valid for the period 1972-1989 (López 1996) are also valid for the period 1987-2005; especially when the lack of young farmers is concerned, since ageing and internal migration to urban areas have increased over the recent period (Chapter 2). Furthermore, most of the farms have still a small economic dimension and labour productivity has hardly improved (Chapter 4).

On the supply side, retired farmers, farmers that stop the activity, as well as heirs of farms who are not dedicated any more to agriculture, are included. The factors that explain the 'passivity' or resistance to sell land are of four types, according to López (1996, 2000): firstly, the concurrence exerted by the possibility of an urban use gives hope of getting a higher price in a near future, thus the owner prefers to wait until soil (land) becomes urban. Secondly, the concurrence of forest uses: many owners prefer converting farming land into forest to selling it; in many cases not because the expected profitability will be higher but because land is considered as an 'active' or 'an item of wealth'. The augmentation of forest pressure initiated by the consecutive afforestation since the beginning of the 20th, and especially in the fifties, persists as well with the implementation of recent policies, such as the afforestation of agricultural lands within the CAP Regulation 2078/92.

Both factors (concurrence of urban and of forest uses) have been reinforced by the non-existence of effective town and country planning. In this respect, all agricultural area is potential urban area and it is preferable to abandon it or to crop trees rather than selling it (the price per hectare of urban soil is higher than the one of agricultural soil). Only very recently, (February 2007) the Galician government approved the *Law for the conservation of the utilised agricultural area and the bank of lands (BANTEGAL)*. This policy measure has been designed by the *Conselleria do medio rural (regional ministry of the rural realm*) with the aim of maintaining the productive capacity of the land as well as of dynamising the land market in Galicia, in order to avoid the underutilisation and abandonment of agricultural land. This measure is, therefore, an opportunity to fight the abandonment of land and will play an important role in the near future, whose success must and will be assessed.

Thirdly, land is considered as a secure fixed asset/investment given the small range of alternative investments and the low taxes that land owners must pay. Fourthly, there are extra-economic reasons, such as affection for the land. However, in general, this reason is conferred low significance by arguing that younger generations that inherit

the land do not live in the same area and/or do not dedicate themselves any longer to farming activity.

Finally, López refers to some infrastructural obstacles, such as the deficiencies of land due to the high plot fragmentation that makes difficult the access, and thereby, limits the productive use as well as generating high costs (on machinery, labour) that reduce the economic profit. As in the case of the demand, the reasons given to explain the small land supply for the first decades of strong modernisation are still in force in the most recent decades (1987-2005).

Without denying the importance of the above commented factors, or the need of promoting some mechanism to dynamise the exchange of land that is not in use, and considering that land is not only given a productive use, there are other questions to be taken into account. They will remain hypothetical to a certain extent within this thesis, since to check them would require far more research. However, I will point them out through the case study and advance them as possible future research lines.

Thus, it is true that in many areas there are quite rational expectations to consider land as a profitable investment in a near future. This is happening mostly in rural areas close to cities and to the coast, where the urban soil pressure is high. But it is not taking place in all of the inner rural areas located, where depopulation is advancing to a larger extent.

Along with this, peasant-like rationality should be also studied along the time-dimension: to which extent some farmers, or their heirs who do not farm any longer, do not want to sell their land because although they do not plan to use it now, they could use it in the future for farming purposes. In this respect, it could be interesting, to research to which extent Galician farmers act so; or even, whether there is still a strong link to the land because their predecessors had to wait so many centuries to gain access to the property.

As regards the present and near future, it is also possible, as López points out, that that younger generations – with low attachment to land and farming activity, will activate this market in the near future. However, whether this happens or not – as it has been so far, it should be considered whether it would be better to have small number of bigger farms (as regards their acreage and other aspects, such herd, output, etc.), which does not ensure high economic profit, since that depends on many other variables besides territorial dimension; or on the contrary, whether it is preferable to have a sector formed by a big number of smaller farms, that by solving some structural deficiencies – e.g. the distancing among or the difficult access to their different plots, helps to fix rural population and dynamise socially the rural area. Opting for the second way, this would require another way of doing agriculture to make it economically profitable, the one lower based on the use of external inputs or more based on locally available (natural and social) resource, as well as to make it better for the environment.

Nevertheless, all this must not make us forget that the main question that remains still unsolved is the abandonment of productive land. Before the next chapter, I would like to briefly allude to another problem that is directly related to this abandonment. In fact,

the abandonment is problematic, not only because it is not helping to get a major re-dimension of the remaining farms – which could help but is not strictly necessary to make a farm efficient in economic terms – but also because it is the origin of another major ecological problem: fire.

3.4 FOREST FIRES: ECOLOGICAL PROBLEM AS CONSEQUENCE OF THE ABANDONMENT

As was explained in Chapter 2, the traditional agroecosystem used fire (*rozas or estivadas*) as an agricultural method. Their knowledge about how to do it became perfect over the centuries and limited the possibilities of catastrophic fires. The dismantling of the agroecosystem and the subsequent abandonment of the areas, especially those covered by scrub, altered also the culture of fire. As Lage (2003) highlights, forest fires have become the symptom of a traumatic and conflictive change in the organisation of the land use. The data are eloquent: e.g. between 1961 and 1997, 132,233 fires burned 1,411,384 hectares, which is about the half (47.9%) of the geographical Galician area. Between 1970 and 2006 around 1,700,000 hectares have burned: around 60% belonged to non-tree area, therefore, mostly brush and bushes[14] – therefore, mostly affecting areas the category WEB (*Conselleria do medio rural* 2006; MMA 2006).

The problem is far more than local; it is global, since its effects spread beyond the areas where fires take place as well as doing damage not only to the soil and vegetation, but also to the water, atmosphere and animal habitats. Specifically, fire is one of the main causes of soil erosion[15] in Galicia. Furthermore, fires destroy vegetation – when they are frequent, the only vegetation that remains is brush – and fauna – most affected species are insects and invertebrates, small mammals, reptiles, etc, but also big vertebrates that cannot escape due to livestock and hunting fences. It destroys as well habitats and therefore loss of feeding resources that cause many species to emigrate to other areas. Aquatic species are also affected because of the sediment coming from soil erosion and river vegetation destruction. Moreover, fires are an important source of atmospheric pollution due to the emission of oxides (nitrate, sulphur…) as well as contributing to climate change because of CO^2 emissions (Verdegaia 2006).

In the last decades, fire affects the *monte* area for at least two reasons, directly related to agricultural activities. One is that public and private afforestation has been carried mainly with trees varieties, e.g. eucalyptus and pines[16], which are highly flammable[17]. Secondly, and more importantly, the *monte* burns because it is abandoned and therefore, also the brush and scrub remains there, contributing to extending the fire (Carballas 2003). The *monte* is abandoned because of structural problems, e.g. excessive number of plots, and because there is not a good forest culture (silvicultura). The question is important for agriculture, since as I have shown, farms are in general still rather small, the use of the *monte lands* suitable for pasture could enlarge the territorial basis of those farms and correct the gap between the UAA and the Total Area. In this way, it would be possible to reduce fire risk and to improve at the same time the economic and productive behaviour of the farms by managing locally

available and natural resources. Farming management might be in this way highly based on natural resources.

NOTES

1 The Agrarian Census offers a longer series about the structural features and productive orientations of the agrarian systems, since it started in 1962. On the contrary, the EEEA offers more recent and more frequent information. They are not comparable in absolute terms since the samples and time they use are different, but the dynamics they show are in general comparable. For example, the Census defines farm (or unit of exploitation) as those technical-economic units, where agrarian products are obtained under the responsibility of a titular owner. The definition is similar in the EEEA but the difference refers to the category 'farms with land'. In the case of the Census, all those with at least 0.1 hectares of Total Area or more than 0.0 hectares of Useful Agricultural Area are considered ; whereas the EEEA, in 1997 and 2005, includes farms that fulfill one or more of the following requirements: to have more than 1 hectare; to have 0.2 hectares destined to vegetables, flowers (outside or green houses), fruit trees (including citrus trees); or those that in the Agrarian Census had one or more cattle units and 0.75 Economic Unit Size (ESU) of Gross Margin. Consequently the criteria are more restrictive in the EEEA and the sample is smaller.

2 AGR or Average Growth Rate is the variation in percentage of a specific variable within a whole period. In our case, the difference between, for example, the number of farms in 1999 and 1989: (Farms99 – Farms89) / Farms 99 * 100.

3 AAGR or Annual Accumulated Growth Rate is the annual variation in percentage of a specific variable. Following the same example as in the endnote 6: ((farms99/farms89)^(1/number of years: 10)-1)*100.

4 A 'Farm' in the Census of 1962 is any agrarian exploitation land, or those, which even not having land, had two or more cattle heads (bovine, horse, mule, ass, pig, sheep, goat); 20 or more chicken, ducks, or rabbits; two or more beehives. In 1972 only farms with at least 0.1 hectares were included within the category farms with lands, while the others were included in the category farms without lands. Every Census from 1982 to 1999 has kept this definition, although with changes in the number of cattle heads regarding the definition of 'farm without lands'.

5 This structure is to a greater extent, the legacy of the particular dynamics of land property in Galicia, the *foral system* running from the Middle Ages until the beginning of 20th century. Only in 1926, when the Decree/law of Foro Redeeming (*lei de Redención de foros*) was approved, did Galician peasants have total access to the land property, which they had been cultivating during the last centuries. At this point, however, those who had access to property received land that was highly disaggregated, and properties were dispersed and divided into a high number of small plots (Villares 1982).

6 Land/Soil categories are, according to the EEEA, 'permanent crops' and 'pasture' (UAA), and 'other lands' (wasteland, esparto grass and brushes or scrubland, and forest) and other areas (with not farming purposes). The sum of the categories 'other lands' and UAA gives the 'total area' (see 3.3.2).

7 UAA mobilisation has in fact inverted its trend after 2003. According to the data provided by the EEEA, between 1987 and 1997, the UAA reduced by 88,962 hectares since the area liberated (201,617 hectares) by farms smaller than 10 hectares that disappeared was not totally absorbed by the augmentation within the group of farms bigger than 10 hectares (112,655 hectares) (Data obtained from EEEA 1987 and 1997).

8 Non-commercial: forest areas whose production is destined to self-consumption, environmental preservation, protection of the area of the soil or as a boundary between farms. Commercial forest areas whose production is destined to sell (wood, firewood and other forest output with lucrative goals)

9 The category of 'other areas' includes those lands that, being part of the TA of the farm are neither UAA, nor wasteland, esparto grass, brush, nor forest arboreal species.

10 There are always slight differences in the number of hectares or farms when carrying out the different calculations to construct the tables. The differences come from the original statistical sources. For instance, when calculating the sum UAA in Table 3.7, there was a difference of 1-3 hectares regarding Table 3.6, which we have corrected to avoid misunderstandings.

11 In Galicia the R.CEE2080/92 and the Royal Decree 378/93 (translation of the European regulation into Spanish regulation) were developed by the Decree 250/1993 of 24th September and modified by consecutive reforms in 1994 (to prevent fires), 1996 (to update premiums) and 1998 (new budget for 1999 and 2000).

12 The area is probably bigger when considering the forest surveys which are more specific of these type of land (the *monte* including both categories: *monte baixo* and forest). In this respect, Simón (1998) calculated for the period 1975-1997, which he calls the augmentation of the unproductive fallow lands (*Barbeito Improductivo*) that are those lands that could be incorporated to the process of production since they have a productive capacity, but are not in use due the abandonment of monte areas, mainly as the category of brushes and brushes is concerned. Specifically the *Barbeito Improductivo* is formed by fallow lands (arable lands that are given a rest, wooden areas (bushes in more than 20% of the area and trees covering less than 5% of the area) and erial lands (areas without trees or bushes with accidental pasture). An estimation for the period 1975-2000 shows that the *Barbeito improductivo* has increased from 810,900 to 944,789 hectares (27.5% to 32.8% of the total Galician productive area (MAPA s.y. and Simon 1998).

13 The ratio of the price of land/Farming Gross Value Added per hectare was between 1.7 and 2.5 times higher than in most of the Communitarian countries in the end of the 1980s.

14 The number of fires has constantly increased between 1970 and 2006, while the burned forest area decreased until 1999, and increased again between 2000 and 2006. The total area burned per year reached its highest value in the ten year period 1980 to 1989, and becomes rather serious again in the most recent period[14] (2000-2006). The reduction in the burned area is the consequence of the creation in 1990 of the General Subdirection of Defence against Forest Fires (*Subdireccion General de Defensa contra Incendios Forestales*) by the Regional Government (Xunta de Galicia) and the application of the INFOGA Plans. However, the percentage of burned forest over the total forest area was between 1995 and 2000, at 17.5%, the highest of all the Autonomous Communities. In the most recent period, around 50% of the Spanish fires took place in Galicia, where 34% of tree area and 27% of the non-tree area within Spain, burned (Verdegaia 2006).

15 The erosion can be chemical by means of fertilising elements and physical, i.e. causing soil losses. The physical erosion after the fire varies depending on the atmospheric and geological conditions: in case of strong rainfalls and slopes superior to 20%, it can cause soil losses of 100 tons per hectare.

16 68% of the species were conifers, 22% Eucalyptus and only 10% were lush autochthonous trees (Consellería do mundo rural 2006).

17 The study of M.P. Aramburu and R. Escribano shows that the index of flammability of the *Pinus pinaster* is of 13.8, the one of the *Pinus radiata* is of 13, the *Eucalyptus globules* is of 13.5, while the *Castanea sativa* is of 1.58 and the *Agnus glutinosa* is of 1.95 (Verdegaia 2006). The third National Forest Inventory (INF 1997-2006) describes the degree of combustion of the Galician forest as extreme or high in 85% of the cases. The classification of the forest systems in 2006 shows that around 70% of the forest area is occupied by highly flammable species (*Pinus pinaster*, *P. radiata* and *P. silvestris*, and *Eucalyptus globulus*), 24% is occupied lower and autochthonous lush-trees (*Castanea sativa*, *Quercus robur* and *Q. pyrenaica*) and the rest is occupied by different combinations of those tree-varieties (*Consellereia do medio rural* 2006).

4 THE WHY AND HOW OF THE RECENT RECESSION OF THE GALICIAN FARMING SECTOR: THE LIMITS OF MODERNISATION

4.1 INTRODUCTION

In this chapter I enter now into an explanation of what has been, in recent decades, the main cause of the recessive socio-economic and ecological dynamics of the Galician farming sector: the process of modernisation that took place in the last four decades without having considered former natural, social, economic and historical conditions.

It is well known that the process of farming modernisation within the context of the Green Revolution started in Galicia later than in other Western regions[1]. Moreover, this process was carried out on the basis of the dismantling of a former model:

> *Galician agriculture that confronts since the beginning of the 60s the challenge of the Green Revolution is not an agriculture of subsistence with recent features of commercial integration. It is rather an agriculture in productive crisis due to the annihilation of its model of endogenous development (…) during the first three decades of the 20th century.* (Soto 2006:400)

Farming modernisation entailed the substantial change from an agriculture (and an agroecosystem) based on renewable energy (basically solar) and locally available inputs to another one based on the massive use of fossil energy sources and/or external inputs. Moreover, farming production became completely linked to the agri-food industry[2] (Abad and Naredo 1997).

This last chapter will focus on the consequences (the recessive dynamics) of the process of farming modernisation. It starts with a rather static analysis based on structural ratios that has very often been used to show the recessive socio-economic dynamics, highlighting the deficient transformation of the territorial structure. However, after making some pertinent clarifications about those ratios, the recessive dynamics will be analysed in order to show the agrarian squeeze of the Galician farming sector, as the result of specialisation and the excessive dependency on external inputs and on the negative evolution of agrarian prices. Moreover, along with the socio-economic recession or the income crisis, there is a socio-environmental crisis as well.

4.2 SIZE AND EFFICIENCY: STRUCTURAL RATIOS BETWEEN 1987 AND 2005

The studies about the evolution of the Galician agrarian sector usually emphasise its recessive socio-economic trend, given that the (gross) margin per farm, per labour unit (labour productivity), and/or the (net) income per farmer, although they have increased in the last decades, are still low and do not converge with the Spanish or European ones. Thus, for instance, in 1993, the Galician Gross Margin per farm and per labour

unit were 33% and 24% of the average European one, and 57% and 34% of the Spanish one, respectively (López 2000). As the main cause of that negative evolution, the most orthodox approaches have pointed out the scarce territorial re-dimension of the farms, which does not enable farming modernisation to be efficient: *the essential factor that limits here* (i.e., in Galicia) *nowadays labour productivity and farm profitability is the small area per unit of production* (farm) *and per farmer* (Colino y Rodriguez 1996). López (2000) points out that *also the excessive number of plots per farm and deficient access to them is a limiting factor* but again *that the fundamental problem lies in the insufficient acreage per farm*.

In order to justify that statement, structural ratios are often used and compared in different years and between different contexts (Ruttan and Hayami 1989). Those ratios expressed farm and labour profitability in function of the acreage – or structural component (2)–, the Gross Margin per hectare – or intensification component (1) – in the case of the farm; and the Gross Margin per hectare and the acreage per labour unit – or component of mechanisation (3) – in the case of labour (Abad and Naredo 1997).

$$\frac{TGM}{Farm} = \frac{TGM(1)}{UAA} * \frac{UAA(2)}{Farm} \quad \text{for farm profitability}$$

$$\frac{TGM}{LU} = \frac{TGM(1)}{UAA} * \frac{UAA(2)}{LU} \quad \text{for labour productivity}$$

Thus the ratios give information about the processes of the intensification and mechanisation: the first by considering the evolution of the total Gross Margin per hectare, and the second by considering the area managed by one labour unit. Intensification is usually carried out on the basis of the most abundant factor: thus as far as traditional and peasant agriculture is concerned, this factor is labour – although it would be probably more adequately termed the time of labour, and in the case of Galicia related to the use of the *monte*.

When modern agriculture is regarded, the most abundant factor is capital/technology, mechanical or biological, and in general external to the unit of production and its environment. Concerning the process of farming modernisation within the context of Green Revolution and increasing commercialisation of the output in world-wide markets, intensification is linked to the augmentation of the use of biological and/or chemical inputs, or by the orientation of the farming sector towards activities with higher margin per unit of acreage, and towards activities disconnected to a larger extent from land. Furthermore, it is supposed that by intensifying the use of biological and mechanical technology, the farm profitability as well as labour productivity will automatically be increased. The augmentation of the structural component, acreage per farm, when is possible thanks to the disappearance of farms, entails a process of mechanisation that enables one labour unit to manage a bigger area, i.e. the augmentation of the farm acreage per labour unit (Abad and Naredo 1997).

4.2.1 THE AGRARIAN STRUCTURAL RATIOS IN THE PERIOD 1987-2005, CONSIDERING THEIR AVERAGE FOR THE WHOLE GALICIAN SECTOR

By observing the dynamics of the structural ratios in the last two decades of modernisation, it is possible to generally conclude that an augmentation of the acreage enables the Gross Margin per farm and/or per labour unit to increase.

Thus, in the period 1987-2005, when the process of modernisation is supposed to be settled and as regards the average of the structural ratios for the whole Galician agrarian sector, the territorial re-dimension of the average Galician farm – from 3.1 to 8 hectares per farm, as well as an augmentation of the average acreage managed by one labour unit (from 2.2 to 6.1 hectares), enabled labour productivity and farm profitability to increase by 252% and 231%, respectively. The evolution is, however, less positive than it seems, since there is no convergence: compared to Spanish farms, Galician farms became less profitable in 2005 than in 1987 (from 54.7% to 51.8% of the average Spanish profit per farm), while in terms of labour productivity, the recovery was very low (from 36.3 to 36.8%).

Table 4.1 Structural and economic ratios of the Galician and Spanish agrarian sector, years 1987 and 2005

	1987				
	TGM/farm	*TGM/UAA*	*UAA/farm*	*TGM/TLU*	*UAA/LU*
Galicia	2.9	0.9	3.1	2.1	2.2
Spain	5.3	0.4	13.9	5.8	15.2
Galicia as % of Spain	54.7	225	22.3	36.3	14.7
			2005		
	TGM/farm	*TGM/UAA*	*UAA/farm*	*TGM/TLU*	*UAA/LU*
Galicia	9.6	1.2	8	7.4	6.1
Spain	18.6	0.8	23.1	20.2	25
Galicia as % of Spain	51.8	150	34.5	36.8	24.5
			1987-2005		
AGR% Galicia	231.0	33.3	158.1	252.4	177.3
AGR% Spain	250.9	100.0	66.2	248.3	64.5

Source: calculated from INE (1987) and INE (2005, in www.ine.es).
GM: Gross Margin; LU: Labour Unit; UAA: Utilised Agricultural Area.

From an orthodox economic perspective, the evolution of the ratios shows that the re-dimension of the farm increases labour productivity and farming profitability and the lack of convergence is explained on the basis of the fact that Galician farms are still rather small, or smaller in comparison to a different context (the Spanish one in this case); or even on the fact that there is still a too high number of farmers.

But is the lack of re-dimensioning the only problem? In fact, there is another component within the structural ratios that shows at least in relative terms and unexpected dynamics given the inelastic supply of land explained in Chapter 3. Thus, the component of intensification that has been always relatively higher in Galicia than in Spain is now converging to the Spanish values.

As Soto (2006) explains, the Gross Margin per hectare is one of the few types of information about land productivity in Galicia. Agriculture of small farms (territorially speaking) maintains the possibility of increasing a favourable dynamics of the labour productivity or increasing the acreage per farm, which did not happen, or by increasing land productivity that will depend on the natural conditions as well as on the application of new techniques. Galician agriculture has not taken profit from its comparative advantage and its land profitability is currently more similar to the Spanish one. In order to check where this recession has taken place, the structural ratios will be analysed by considering different economic dimensions.

Table 4.2 Distribution and dynamics of farms, and UAA according to different economic dimension intervals (ESU) over the period 1987-2005.

1987									
	<8ESU			*8 to 16ESU*			*>16ESU*		
	Galicia	Spain	G/SP%	Galicia	Spain	G/SP%	Galicia	Spain	G/SP%
%Farms	93.5	84.6	14.2	5.5	9.2	7.5	1,1	6,2	2,3
%UAA	73.6	36.4	5.8	19.9	19.1	3.0	6,5	44,5	3,2
2005									
	<8ESU			*8 to 16ESU*			*>16ESU*		
	Galicia	Spain	G/SP%	Galicia	Spain	G/SP%	Galicia	Spain	G/SP%
%Farms	76.2	59.2	11	9.2	15.7	5	14,6	25,1	5,0
%UAA	46.3	19.8	6.9	15.5	10.4	4.4	38,2	69,8	2,0
AGR (%) 1987-2005									
	Galicia	Spain		Galicia	Spain		Galicia	Spain	
Farms	-67.1	-57.6		-30.9	3.1		439.6	145.4	
UAA	-35.2	-45.4		-19.4	-45.2		505.0	57.4	

Source: Calculated from INE 1987 and 2005.

4.2.2 STRUCTURAL RATIOS CONSIDERING DIFFERENT ECONOMIC DIMENSIONS

In the next two tables, the Galician farming sector is structured by considering three different economic sizes per farm: below 8ESU, between 8 and 16ESU and more than 16ESU. The economic dimension is assessed by considering the Gross Margin per farm and it is expressed by Economic Standard Units (ESU) (1ESU equalled € 1200 in 2005, and € 1073 in 1987).

Before going directly to the structural ratios, Table 4.2 shows first the evolution of the number of farms and acreage within the three economic dimensions, highlighting the differences within the farming sector, with a high percentage of small farms.

Table 4.3. Structural ratios by considering different economic dimensions. Galician and Spanish farming sector, years 1987 and 2005, and comparison

	TGM/farm		*TGM/UAA*		*UAA/farm*		*TGM/TLU*		*UAA/TLU*	
					Galicia					
	1987	2005	1987	2005	1987	2005	1987	2005	1987	2005
<8ESU	2.2	2.3	0.9	0.5	2.5	4.8	1.6	2.0	1.8	4.3
8-16ESU	10.7	11.2	0.9	0.8	11.6	13.5	4.9	6.9	5.3	8.3
>16ESU	27.4	46.9	1.4	2.2	19.7	20.9	10.8	23.6	7.8	10.5
					Spain					
	1987	2005	1987	2005	1987	2005	1987	2005	1987	2005
<8ESU	2.2	3.1	0.36	0.4	6	7.7	3.1	6.3	8.7	15.8
8-16ESU	11.1	11.4	0.38	0.7	28.9	15.4	7.1	13.8	18.5	18.6
>16ESU	39.6	59.8	0.4	0.9	100.2	64.3	13.0	29.7	32.8	32.0
					Galicia as % of Spain					
	1987	2005	1987	2005	1987	2005	1987	2005	1987	2005
<8ESU	102	74.2	248.9	125	41	62.3	51.9	32.4	20.9	27.1
8-16ESU	96.3	98.2	240.3	114.3	40.1	87.7	68.5	49.9	28.5	44.7
>16ESU	69.2	78.4	351.1	244.4	19.7	32.5	83.4	79.6	23.7	32.9

Source: Calculated from INE 1987 and 2005.

When considering both tables, it is to be observed that:

- small farms in Galicia resist in number but marginalise in terms of acreage (UAA)
- Galician farms show a specific structure characterised by, and differentiated from the Spanish ones:
  - They have a smaller economic profit by farm and labour unit, or a smaller economic dimension.
  - The economic yield of the land is high, and higher than in Spain but it is decreasing in small farms.
  - The territorial size of Galician farms is small despite the strong increase, and stronger than in Spain, over the period.
  - Galician farms use labour to a larger extent than Spanish farms in every economic dimension, which suggests a smaller presence of mechanical technology, but there still is mechanisation which is determining to a larger extent the augmentation of labour productivity, even within small farms.

Table 4.4 Percentage Variations (AGR%) of the different Structural Ratios in Galicia and Spain. 1987-2005

Galicia AGR(%)1987-2005					
	TGM/farm	*TGM/UAA*	*UAA/farm*	*TGM/TLU*	*UAA/TLU*
<8ESU	4.5	-44.4	92.0	25.0	138.9
8-16ESU	4.7	-11.1	16.4	40.8	56.6
>16ESU	71.2	57.1	6.1	118.5	34.6
Spain AGR(%)1987-2005					
<8ESU	40.9	11.1	28.3	103.2	81.6
8-16ESU	2.7	84.2	-46.7	94.4	0.5
>16ESU	51.0	125.0	-35.8	128.5	-2.4

Source: elaborated from Table 4.3.

Small economic sized farms (<8ESU), despite having realised the strongest re-dimension (they are around two times bigger in 2005 than 1987), have hardly increased their economic profit per farm and to the smallest extent, labour profitability, over the whole period. In the case of medium economic sized farms, farm profit increases – almost in the same proportion as for small farms- despite their area hardly changing and their Gross Margin per area slightly reducing. On the contrary, within the biggest economic dimension, farms increased the most their Gross Margin with a small augmentation of their area accompanied by the augmentation of the component of intensification (Gross Margin per hectare).

Thus, the problem in Galicia is not only related to the lack of transformation in territorial terms, which has taken place, although it could have occurred to a larger extent if the evolution of the UAA and the Total Area had been more dynamic. As I pointed out above, the reduction of the Gross Margin per hectare of UAA, takes place in the case of small and medium farms (which increase their area to a larger extent), and only increases in the case of the biggest one.

In fact, the farm profitability increases when by increasing the area per farm, intensification also increases. Parallel, in the case of labour productivity, the same occurs: despite the fact that small farms increased to a larger extent the ratio area per labour unit, in comparative terms with the other two bigger economic dimensions, their labour productivity increased to a smaller extent than in the other two cases, despite having the greatest reduction of units of labour.

Thus, small area has been considered the main cause of the low economic profitability of Galician farms, and served consequently as an argument to predict the disappearance of those farms. However, in 2005, we observe two dynamics that contradict this hypothesis. Firstly that, small farms, both in economic and territorial terms, keep on existing. Secondly, the increase of the area does not always automatically increase the profit of the farm to the same or larger extent, but has to do

with the evolution of the component of intensification. Thirdly, big farmers are also not improving their economic dynamics regarding other contexts (as, for instance, the Spanish one).

4.2.3 SOME REMARKS ON SIZE, ECONOMIC EFFICIENCY AND INTENSIFICATION

The main conclusion, still considering exclusively the ratios, is that economic profit dynamics are not dictated by the changes in area, but also by the changes in the intensification component. This component was decisive in improving the productive and economic dynamics of Galician agriculture and it is decisive when there is an inelastic supply of land. Furthermore, the high value of this variable was linked to a more diverse sector, with areas highly appropriated for cropping (e.g. potatoes, forage, wine), and others more suitable for cattle. Thus as Soto (2006) very well summarises, the link between the low labour productivity and small territorial size needs to be clarified: the negative productive consequences, as regards part-time farming, the presence of farms led by farmers older than 65, and the scarce re-dimensioning explained partly the lost of convergence of labour productivity[3]. However, there are other two factors that explain that loss of convergence: one is the evolution of the uses of land, which has been shown in Chapter 2. The other is the evolution of the component of intensification, mentioned above.

The slight recovery of the UAA and the reduction of the Total Area based on the abandonment of areas that before had a productive use limited the re-dimension. This question is strongly linked to the evolution of the component of intensification through specialisation of the Galician farming sector towards cattle activities. Such specialisation was carried out impelled by market needs and expectations (of demand) but did not take into account whether it was suitable for every area within the region. Cattle activities require more land than crops (vegetables, potatoes) and will not be as profitable for small farms as for big farms (Section 4.2 starts showing this evolution from crops to cattle specialisation). In general, Cattle specialisation withdrew land from crops and the effect has been different depending on the availability or not of communal areas (suitable for extensive pastures) and on the farm size and the access to those communal lands.

Moreover, in Galicia a strong process of mechanisation took place as will be shown in Section 4.2. In the beginning, that process affected mostly large sized farms as expected, but later it was carried out by small farms. When the land is a limiting factor, improvements in fertilisation, breeds, and crop varieties are normally decisive factors, but especially in the case of small farms, as the evolution of the intensification component suggests, the process has been the opposite. Moreover, only when intensification is carried out without excessive dependency on external inputs or fossil energies, is there the possibility of improving the socio-economic dynamics of farms – but particularly in the case of small farms – as well as environmental ones. As the analysis of the macro-aggregates shows in Section 4.2, intensification has been carried out mainly on external inputs, and mostly on those ones related to cattle, and not to fertilisers.

Given the current economic results of small farms and that evidently small farms have not disappeared, the question that arises is, why (or how) do small farms keep on existing? Probably, family rationality explains this maintenance to a larger extent, although this is difficult to prove by using statistics. In Galicia, as for instance the case study of this thesis shows, decisions are taken in the bosom of the family, by considering all sorts of income (part-time farming, retirement, off-family income of different family…). The family unit takes decisions on quota, land, investments, on the basis of a family income and not strictly derived from farming activity. When considering the data of part-time farms, which are indeed published by agrarian statistics, the presence of part-time farming within the small farms helps to understand that they survive, under which are considered irrational economic conditions within the perspective of the orthodox economic approach: in 2005, farmers below € 9,200 of Gross Margin per farm show a higher percentage of own (family) but also off-family labour working less than 100% of the time in the farm, than bigger economic dimensioned farms (INE 2005). In this respect, farmers with small sized farms are not "irrational", neither "hungry"; they have looked for an alternative to compete under imposed homogenised market conditions, showing, as always, resistance to disappear.

Small size is not *a priori* indicative of low efficiency (neither in economic nor productive terms). Small territorial dimension is a problem when small farmers want to compete in the same markets and with the same conditions and goals as big farmers. That question sounds nowadays more rational, since new rural development approaches emphasise the need of overcoming output growth as the only and/or most important target for a farm, stressing the importance of other questions as quality, landscape and environmental management, fixation of rural population, etc. This is why small farms are not expected to disappear nowadays, or indeed even less than before.

However, it is evident that the different economic and territorial structure of the Galician or any other farming sector should entail the existence and/or the need of different goals, management and systems of commercialisation. It is impossible that small farms compete in the same productive and market conditions as big farms – it is obvious, for example, that small farms that do not fit in a market system strongly oriented to quantity.

Finally, considering that well structured land (not excessively dispersed and with good access) could improve labour productivity, low farm profit and low labour productivity are mainly the consequence of the implementation of an inappropriate agricultural model, especially in the case of small farms. That model, as shown in Section 4.2, has tried to impose homogenisation as regards the output and the way to obtain it, without taking into account the initial structural conditions of Galician farming sector; imposing the same premises from totally different contexts, with better conditions regarding commercialisation and with different territorial features. The consequences have not been negative only in socio-economic but also in ecological terms.

4.3 THE RECENT PROCESS OF MODERNISATION AND THE RECESSIVE DYNAMIC OF THE GALICIAN FARMING SECTOR (1960-2005): SPECIALISATION AND AGRARIAN SQUEEZE

The aim is to show that the recessive dynamic of the Galician Farming sector is mainly a consequence of the most recent process of modernisation. The process fails due to its own requirements of homogenisation of the output and the way of farming. Along with other factors of a different nature already explained (demographic, political), modern farming *was not aware* of the impact of the abandonment of productive soil and the dismantling of the traditional agroecosystem; or in other words, its failure is due to its own homogenising nature and its lack of adaptation to the former and current specific conditions of a particular context.

The recent process of modernisation – framed by the Green Revolution that started after the Second World War in other countries – arrived in Galicia in the 60s, responding to a particular political and economic context[4]. The sector needed to be reformed in order to improve its economic return and to integrate in an increasingly global market[5] (Dijk 1995). This modernisation arrived late but was conclusive: strong investments in farm installations and improvement of the productive conditions, mechanisation, all of these helped by subsidies for early retirement, under improvement plans (*plans de mellora*), specific pricing policies, etc. After four decades of modernisation, the Galician farming sector has become more specialised, has renewed buildings, machinery parks, uses highly productive breeds, has increased the use of fertilisers, biocides and all type of technological inputs available in the market. However, the economic dynamics shown by the evolution of the macroaggregates of the sector, as it was shown by the structural ratios, has not improved; neither has the socio-ecological dynamics.

In order to show to what such recessive dynamics is due, the chapter is structured as follows: firstly, the global tendency to specialisation and product homogenisation as well as the main productive orientation of the sector nowadays will be shown and the remarks given in Section 4.1 confirmed. Next, the dynamics of the gross value added and net income in real terms will be shown, as well as the main factors that have contributed to such dynamics.

4.3.1 SPECIALISATION (1960-2005)

Farming modernisation in the last decades implies in global terms, considering the whole sector, specialisation of the activity and output homogenisation. This entails a significant change as regards the previous way of farming. Thus, traditional and peasant-like agriculture was not a specialised activity, since it combined different activities that enabled farmers to obtain different products (hand-crafted activities besides the agricultural ones, for instance) (Simón 1995). Also agricultural production was diverse, based on polyculture, and/or the combination of crops and cattle, as efficient as possible given the physical limits (land, orography, where slopes predominated over flat areas).

From an aggregate perspective, observing the composition of the Final Agrarian Output[6] (FAO) (Table 4.5), in the decade 1960-1970, one can observe how cattle specialisation that increases its participation within the FAO from 44.4 to 62%, and continuously increases until 1985 (around 70% of the FAO). From that year onwards cattle orientation reduces its weight within the final output of the sector but keeps on being the main orientation (always over 55% of the FAO). Thus, in general, between 1977 and 1985, the cattle sub-sector gained economic significance over the others (crops and forest), but after 1985 its trend becomes irregular, affected by multiple factors, among others, European market regulations, conditions, policies, diseases, etc.

The evolution within every sub-sector regarding the different productions is not uniform. Thus, intensive and more specialised crops such as vegetables, fruits, wine and flowers increase their output (although wine and vegetables suffer oscillations depending on weather conditions). The reduction of traditional crops such as cereals and potatoes has to do with the some CAP regulations that reduce their price of intervention (López 2000).

Table 4.5 Final Agrarian Output (FAO) structure (%) Galicia 1976-1999

Structure of FAO (%)	*1960*	*1976*	*1985*	*1995*	*1999*	*2000*
Cereals	8.8	0.89	1.40	1.00	0.6	0.9
Leguminous	3.3	0.71	0.89	1.10	0.4	0.4
Fruit	4.3	1.21	1.59	1.90	2.1	2.4
Vegetables	6.9	3.77	5.63	5.90	6.2	5.3
Potatoes	13.8*	14.89	5.94	8.60	4.1	3.9
Wine and subproducts	3.5*	5.39	3.47	6.00	9.3	7.6
Flowers and plants		0.04	0.91	1.70	1.9	2.1
Crop Subsector	*44.3*	*27.07*	*19.96*	*26.30*	*24.8*	*22.7*
Milk	12.3	22.01	25.90	28.40	29.1	29.8
Meat and bovine cattle	26.4*	20.29	16.33	10.60	10.3	8.9
Meat and porcine cattle		7.34	11.51	7.10	6.0	6.7
Meat and poultry cattle		5.47	6.59	5.80	6.0	6.3
Meat and sheep cattle		0.20	0.40	0.50	0.2	0.3
Meat and goat cattle		0.07	0.22	0.20	0.1	0.1
Meat and rabbit cattle		0.19	1.47	0.60	0.8	1.1
Eggs	5.2	6.00	7.00	3.60	2.8	3.0
Cattle subsector	*44.4*	*61.8*	*69.90*	*57.10*	*55.8*	*56.6*
Forest subsector	*11.3*	*5.54*	*6.15*	*13.20*	*15.1*	*16.8*
Other productions		5.55	3.96	3.40	4.3	3.9
Total FAO	*100*	*100*	*100*	*100*	*100*	*100*

Sources: IDEGA (s.y: 1985 to 2000, and 2002) ;Year 1960 in (Soto 2006)
*: all cattle specialisations included; and López (2000).

When the Cattle subsector is regarded, milk, porcine, and poultry have increased their significance within the FAO – in the last two cases with oscillations. The recession after 1985 in porcine and eggs has to do with the increase of competition once Spain joins the European Economic Community (1986). In the case of poultry, the recession

between 1985 and 1995 had to with the negative evolution of the prices (*ibidem* 2000). Bovine was also affected after 2000 by BSE (Bovine Spongiform Encephalitis).

Moreover, the changes in the composition of the FAO have also to do with the changes in consumption habits. In general, there is a reduction in the consumption per capita of fresh products such as fresh vegetables and of meat from goat and sheep higher than for the case of bovine meat or milk[7](Abad and Naredo 1997).

In order to observe the dynamics of the output in more recent decades (1987-2005), it is necessary to turn to the data published by the EEEA. In this case, the productive orientation of the sector is expressed by different productive typologies or Technical Technical-Economic Orientation (OTE) (INE 2005). Table 4.6 shows the percentage of farms, and area within every OTE, as well as their participation within the total Gross Margin of the sector. In that table, the OTE are re-ordered by considering their main orientation to crops or to cattle.

In 1987, the farming sector was shown to be clearly specialised on stockbreeding orientations (34% of the farms, 58% of the UAA and 58% of the Gross Income); particularly significant in that year are OTE41 (dairy bovine) and OTE71 (combining different sorts of cattle but with predominance of the herbivore ones). On the other hand, those orientations reproducing to a larger extent the farming activities of the traditional Galician agroecosystem, OTE8 (combining crops and stockbreeding), and OTE6 (polyculture), were still very significant, involving 14.2% and 17.5% of the farms, 18.8% and 10.9% of the area, and 18% and 9.2% of the gross income of the sector, respectively.

In 2005, Galician farming sector maintains its specialisation on Cattle, especially in "dairy production" (17.7% of the farms, 34% of the area and 48% of the Gross Margin of the sector). Regarding the most diversified orientations, although they are still quite important in terms of farm and area, all of them reduced their significance within the whole sector and lost importance regarding their participation within the total Gross Margin. At the same time, other more intensive and specialised orientations are gaining significance. It is the case, as also the classification of the composition of the final agrarian output of the sector shows, of cereals (and others, OTE13), horticulture (OTE2), diverse wood crops (OTE3), bovine to produce meat (OTE42) and grain eaters (OTE5). Especially impressive is the path followed by OTE5, which shared the second highest part (19%) after dairy bovine of the Gross Margin of the sector, and obtained the highest Gross Margin per farm (78.8ESU per farm, calculated from the data provided by INE 2005). This orientation suits a farming sector that is lacking land, since it is a low land demanding activity[8].

Thus, the Galician farming sector is becoming more specialised, by keeping dairy farming significance (OTE41), and by advancing in new specialisations, mainly wood crops and grain eaters. Furthermore, the sector becomes less diversified by means of the decreasing representation of traditional orientations such as Polyculture (OTE6) and those combining crops and cattle (OTE8) – those that have been closer to the diversification of the traditional agrarian system. Finally, the farming sector becomes more intensive by means of the advance of orientation such as horticulture, which

increases its significance because of the advance of greenhouse crops (INE 1987 and 2005); and the advance of Grain eaters (OTE5).

Table 4.6 Configuration of the Agrarian Galician sector in basis of its Technical Economic Orientation (OTE)

	Farms (%)			*UAA(%)*			*GM_{OTE}/GM (%)*	
	1987	2005	AGR%*	1987	2005	AGR%*	1987	2005
OTE13	0.2	1.1	182.0	0.1	1.4	1326.7	0.02	0.5
OTE14	2.6	5.7	-9.9	2.2	3.5	65.4	1.7	2.3
OTE20	0.9	2.2	4.5	0.2	0.7	190.4	0.5	2.7
OTE31	1.2	3.1	5.0	0.6	1.2	108.7	0.4	3.0
OTE32	0.1	0.7	274.6	0.1	0.2	213.5	0.0	0.3
OTE34	0.1	0.5	80.6	0.1	0.2	199.5	0.0	0.4
OTE6	14.2	13.8	-60.8	7.7	5.0	-33.0	5.9	3.6
OTE81	9.8	7.3	-69.8	7.9	5.4	-29.5	6.5	2.6
OTE82	7.7	4.8	-74.9	3.0	1.9	-35.5	2.7	1.1
OTE41	16.0	17.7	-55.4	32.4	34.0	8.2	36.2	48.1
OTE42	6.4	11.8	-24.8	8.0	21.5	176.4	7.1	6.2
OTE43	5.6	1.2	-91.1	10.1	1.8	-81.4	10.8	1.0
OTE44	6.0	11.4	-23.0	7.5	12.8	76.7	3.5	2.8
OTE5	1.1	2.4	-7.7	0.6	1.4	133.6	5.2	19.7
OTE71	27.1	12.5	-81.4	18.8	7.4	-59.4	18.0	3.5
OTE72	1.2	3.8	27.5	0.8	1.7	127.7	1.5	2.2
Total	100	100	-59.8	100	100	3.1	100	100

Source: INE 1987 and 2005;
(*) The %AGR has been calculated considering the variation of the absolute value of the variables. OTE13: Grain, pulse and oleaginous; OTE14: Diverse Agricultural crops; OTE20: Horticulture; OTE31: Viticulture; OTE32: Fruit trees and citrus fruit; OTE34: Diverse Wooden crops; OTE6: Polyculture; OTE81: General Agriculture and herbivore; OTE82: Other Crops and cattle; OTE41: Bovine oriented milk; OTE42: Bovine breeding and meat; OTE43B: breeding, milk and meat; OTE44: Ovine, goat and others; OTE5: Grain Eaters; OTE71: Mixed cattle mainly herbivore; OTE72: Mixed cattle mainly poultry.

Specialisation comes from the implementation of the Green Revolution premises, entailing monoculture, fewer different breeds, in short less biodiversity. Specialisation has the risk of concentrating too many resources, effort, and capital in a small number of orientations. In this respect, the global sector can be affected to a larger extent by shocks or perturbations to a larger extent (Conway and Barbier 1990). Moreover, specialisation provokes output homogenisation within the same sector or orientation, depriving the farmers, who *are doing* agriculture in a different and more sustainable

way, of benefits (higher prices, other markets) that should be possible within a more diverse sector.

On the other hand, specialisation has the advantage of being more competitive and increasing economically the national value added or labour income. However, as will be shown next, the macro-aggregate dynamics of the Galician farming sector does not show much of such advantage.

4.3.2 MACRO DYNAMICS OF THE FARMING SECTOR

The implementation of productive systems increasingly specialised and intensive, designed for a social, economic and ecological situation and environment different from the Galician one, is shown at a macro level by a rather negative dynamics in economic and social terms.

The macro-economic and social dynamics of Galician farming sector is studied by observing the evolution of different macroeconomic magnitudes, corrected by inflation. The data I present here are calculated on the basis of the FAO-methodology (FAO: Food and Agriculture Organisation of the United Nations) and defined Agrarian Income as follows:

		TAO	**-**	**Reuses**	**=**	**FAO**		
		FAO	**-**	**OSC**	**=**	**GVAmp**		
GVAmp	**-**	**Depreciations**	**+**	**Subsidies**	**-**	**Taxes**	**=**	**NVAfc**
		NVAfc	**=**	**AI**				

www.xunta.es/conselle/ag/public/macro_00/Introduccion.htm Macromagnitudes agrarias 2000

TAO: Total Agricultural Output; FAO: Final Agricultural Output; OSC: Outside Sector Costs; GVApm: Gross Value Added at market prices; NVAcf: Net Value Added at factor costs or Agrarian Income (AI).

The macro dynamics of the sector can be observed in Table 4.7, along with the evolution of labour within the farming sector (that will be commented on in Section 4.3.5). Table 4.8 shows the estimation of the annual growth rate of the agrarian income in a most recent period for Galicia, Spain and EU-15.

In general, between 1977 and 2000, the general socio-economic dynamics of Galician farming sector is characterised by: a strong reduction of the agrarian income, from € 923.1 million in 1977 to € 439.4 million (minus 52% in 23 years); and a stronger reduction of labour – from 509 to 141 thousand workers (minus 72%). The dynamic is even more negative when considering the different methodology that is now in used, the SEC95[9]: Between 1990 and 2000, according to SEC-95 methodology, the agrarian income reduced by 47%, a stronger decline than the one shown by using FAO-methodology, which for that period was of 24%. Between 2000 and 2005,[10] the Galician sector maintains a recessive economic trend. Despite having increased (regarding the former year) in years 2003 and 2004, such growth as well as the diminution, with the exception of year 2005, has been more negative than in the context of Spain and the European Union (EU-15). Nevertheless, despite the estimated recovery that data show in the last year, in general, the dynamics of the sector continues being recessive.

Table 4.7. Evolution of the main Galician agrarian macroeconomic indicators and workers throughout the period 1977-2000. € Constant of 1985 (€ million) 2001

	FAO	*OSC*	*GVAmp*	*AI*	*Workers*
1977	1,088.1	337.3	750.8	923.1	509.2
1980	1,268.8	429.9	839.0	792.0	421.8
1985	1,251.9	481.2	770.7	666.1	415.1
1986	1,259.6	507.7	751.9	693.2	373.1
1990	1,224.3	589.2	635.1	584.2	292.2
1995	1,091.5	539.4	552.1	483.6	223.9
1999	1,196.9	546.7	650.2	465.6	139.3
2000	1,153.3	556.3	597	439.4	141.1
$\%AAGR^*_{77\text{-}85}$	1.8	4.5	0.3	-4.0	-2.5
$\%AAGR_{86\text{-}00}$	-0.6	0.7	-1.6	-3.2	-6.7
$\%AAGR_{77\text{-}00}$	0.3	2.2	-1.0	-3.2	-5.4
$\%AGR_{77\text{-}00}$	6.0	64.9	-20.5	-52.4	-72.3
$AGR_{90\text{-}00}$-SEC-95 Method	-8.7	20.3	-23.0	-47.1	-51.7

Source: Own elaboration from Fundación Caixa Galicia (several years) FAO methodology.
AAGR*: Average Annual Growth Rate (Accumulative approach); For the macroaggregates data are divided by 1,000,000 and in the case of workers by 1000; Source SEC-95: MAPA and IDEGA (2004 and 2005), Report 2004 and 2005; * Data published by the Galician Ministry of Agri-food policy and Rural Development in Macromagnitudes agrarias 2002.

Table 4.8 Annual Annual variation of the Agrarian Income in Galicia, Spain and EU-15. Period 2000-2005 (current currency)

	2000	2001	2002	2003	2004	2005
Galicia	-20.2	5.6	-7.4	2.2*	0.5*	-2.5*
Spain**	4.8	8.5	-6.7	8.2	4.2	-8.2
EU-15	0.5	4.8	-9.2	0	2.7	-8.3

Source: IDEGA (2005);* Estimation from IDEGA (2005);** MAPA Evolucion de las macromagnitudes agrarias 1990-1995 and EUROSTAT for EU-15.

The economic recession is explained by the evolution of turnover (ingresos) and costs. The turnover sources are commercialised output and subsidies; while the cost sources are of two different types: variable costs or outside sector costs, i.e., coming from inputs which are directly linked to and influencing the output, and depreciations or costs derived from fixed capital investments (machinery, installations). Both turnover and costs are influenced by the evolution of the prices.

The combination of the evolution of prices, costs, and output has determined negatively the sector income, reflecting as in other countries (van der Ploeg *et al.* 2000a; van der Ploeg *et al.* 2002), what is known as the *price squeeze* or the *agrarian income squeeze*.

4.3.3 THE PRICE DYNAMICS

In accountancy terms, it is possible to distinguish three sorts of prices: received prices, paid prices and General Consumer Prices, inflation, or its Spanish acronym: IPC. Those prices are used to convert the current agrarian income into constant currency. *Received prices* are those that farmers received according to the output they produce and *paid prices*, those that farmers pay for the inputs they use in the activity. Paid and perceived prices affect the real constant evolution of the gross value added of the sector, by deflating the outside sector costs and the final agrarian output, respectively; while the evolution of the general consumer prices determines the real agrarian income. Moreover, the combination of those prices permits one to obtain the *exchange relation* (received prices/ paid prices) and the *purchasing power* (received prices/IPC).

Although the macro-aggregates are estimated in real terms only for the period 1977-2000, the series of the prices are made for a longer period, until 2004. In this respect, we may observe that the negative dynamics of the prices continues until recent years. Moreover, Figure 4.1 shows the evolution of the price ratios that combine the different prices that are used to deflate the macro-aggregates and they show the evolution of exchange relation and the purchasing power of the farmers in the last decades.

Table 4.9 Annual Variation of price indexes by means of the Annual Accumulated Growth Rate (AAGR%) in different periods of time between 1977 and 2004 (basis, year 1985)

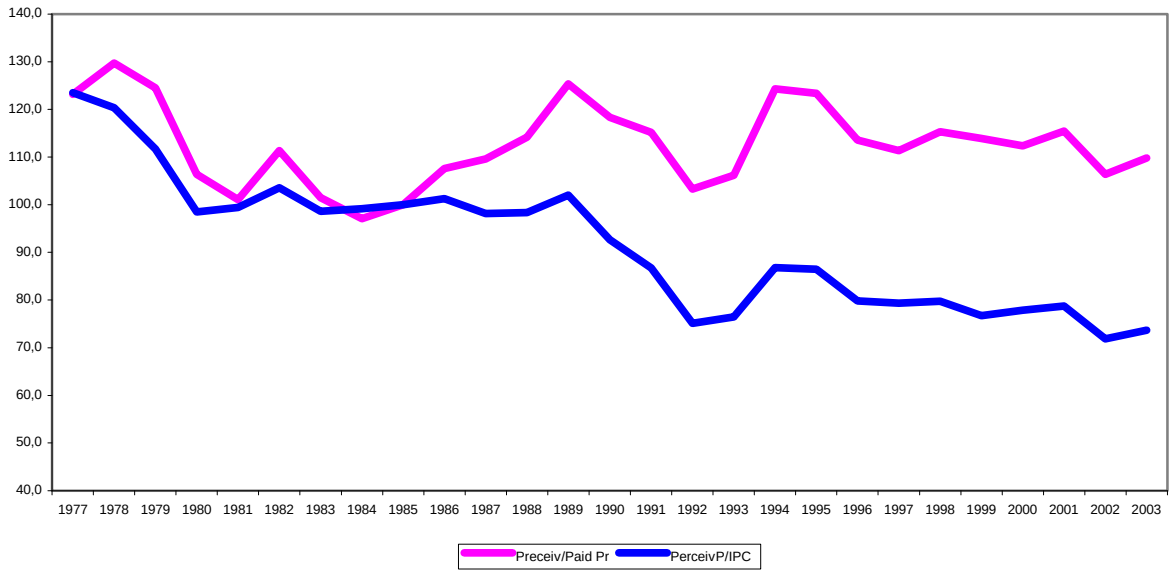
	Received Pr.	*Paid Pr.*	*IPC*	*Receiv/Paid Pr.*	*Receiv/IPC*
%AAGR $_{77\text{-}85}$	10.8	13.8	13.8	-2.6	-2.6
%AAGR $_{86\text{-}00}$	2.6	2.3	4.5	0.3	-1.9
%AAGR $_{77\text{-}00}$	5.7	6.1	7.9	-0.4	-2.2
%AAGR $_{77\text{-}04}$	5.1	5.7	7.2	-0.6	-1.9
%AAGR $_{03\text{-}04}$	1.5	5.5	3.0	-3.8	-1.5

Source: Own elaboration from IDEGA (s.y.).

Although over the whole period, received prices are higher than paid prices, the latter have increased to a larger extent (6.7% every year) than the former (5.7% every year). The evolution of the price ratios has been negative for the farmers' interests: between 1997 and 2000 the *exchange relation* – the perceived prices over paid prices – reduced continuously (at a rate of 0.4% every year), while the *purchasing power* decreased even more (at an annual rate of 2.2%). The negative dynamics of the prices persists in the most recent years: paid prices and general prices increased 5.5% and 3%, respectively, while perceived prices were only 1.5% higher in year 2003/2004; which will influence negatively the real evolution of the farming sector in real terms over that

period if there are not other mechanisms (output increase, subsidies, cost reduction) to avoid it.

Figure 4.1 Price ratios dynamics within the Galician farming sector



Source: Own Elaboration from IDEGA (s.y.).

The generally negative evolution of the different prices at least for farmers' economic interests partially explains the decreasing tendency of the farming sector gross value added and agrarian income (in constant currency). The other aspect that explains such a negative tendency is the increasing use, and therefore the quantity of external market inputs, shown by the (deflated) evolution of the different farming costs, both variable (OSC) and fixed (Depreciations), as well as the steadiness of the real farming agrarian output (FAO).

4.3.4 OUTPUT STAGNATION AND INCREASING COSTS

The reduction of agrarian income (52% throughout the whole period) is the difference between the total agrarian revenues (final agrarian output and subsidies) and the costs (fixed and variable), and becomes smaller and smaller between 1977 and 2000. The reduction was mainly a consequence of the increasing costs, by considering both the variable (OSC) and fixed (depreciations), since revenues formed by final agrarian output (FAO) and subsidies, although they have suffered oscillations, show in the end of the period similar values to the ones in the beginning.

(i) Reuses

In accountancy terms, the final agrarian output is the result of subtracting the *re-uses* from the total agrarian output[11], multiplied by the received prices. Over the whole period, the final agrarian output increases 6% as a consequence of a slight increase in the total output and a reduction of the re-use.

The evolution of the re-uses is interesting as a reflection of the internal basis of the system to sustain the augmentation of the commercialised output (FAO). The evolution of the ratio that relates the estimation of "re-use" to the estimation of the

total agrarian output shows a decreasing trend, both in current and constant currency. Between 1977 and 1999, in current terms, re-uses lost significance within the total agrarian output (TAO) (from 36.7% to 30.4%), which by considering price evolution and therefore the estimation in real terms, shows a diminution of their quantity over the whole period. On the other hand, the tendency of the ratio slightly improved after 1986, indicating a probable reaction of farmers to the price squeeze. In order to check that, I review the dynamics of another ratio, the one that relates the Outside Sector Costs with the Final Agricultural Output (Table 4.12). Moreover, as the main component of the re-uses is the cattle feeding (own forage) (Soto 2006), the evolution of this ratio, as well as the increasing significance of cattle fodder within the outside costs (see Table 4.11) show as well that the Galician sector is, as regards its main production, becoming increasingly dependant on external inputs. The abandonment of land is constraining the own forage production.

Table 4.10 Dynamics of re-uses (R) and Total Agrarian Output (TAO). Series 1977-1999

	% Re-uses/TAO current	*% Re-uses/TAO constant*
1977	36,7	45,2
1980	30,5	32,4
1985	26,8	26,8
1986	27,9	30,1
1990	26,9	31,8
1995	27,2	33,6
1999	30,4	34,7
AAGR%77-99	-0,8	-1,2
AGR%77-99	-17,1	-23,4

Source: Own elaboration from IDEGA (s.y.)

Table 4.11 Structure (%) of the OSC of the Galician farming sector over the period 1977-2000

	1977	1985	1990	1995	1999	2000
Selected Seeds and nursery plants	4.8	4.0	5.1	5.7	3.8	2.9
Cattle fodder	59.4	49.3	43.6	39.2	33.6	32.4
Fertilizers	6.1	5.0	4.4	4.2	5.5	5.4
Energy	3.5	10.6	12.2	8.1	9.5	11.9
Phito-sanitary Products	1.3	1.4	1.3	1.0	1.5	1.4
Zoo-sanitary Treatments	4.3	3.0	2.7	4.3	6.0	6.0
Machinery Maintenance	9.9	20.1	20.1	30.1	33.4	33.9
Other expenses	10.6	6.8	6.7	7.2	6.7	6.2
Total	100	100	100	100	100	100

Source: IDEGA (s.y)

(ii) Outside Sector Costs

The Outside Sector Costs are those derived from buying inputs that are related and are determined by the output. Thus, they include selected seeds and nursery plants, fertilisers, fodder, energy, pesticides, zoo-sanitary treatments, machinery conservation, oil and other expenses[12].

Within the OSC, *cattle fodder* and *machinery maintenance* are the most important expenses, although their trends have been different: whereas fodder significance diminished from 59% to 32%, the machinery cost significance increased from 10% to 34%. These opposite tendencies are explained by the better price evolution, i.e., lower and decreasing, of the fodder against the higher and increasing prices of the machinery.

The high significance of both expenses confirms the two main features of the Galician farming sector as well as two of the main constraints of income: its high orientation to cattle, especially to dairy farming, and the high dependency on external feeding; and secondly, the fact that farming modernisation has been mainly based on introducing mechanical technology, as the dynamics of the depreciation will re-confirm: the strong increase of the costs on machinery maintenance runs parallel to the increase of fixed capital.

Within the outside costs, the use of biological technology related to soil can be approximated by the evolution of fertilisers and phyto-sanitary treatments. The lower significance of these sorts of costs – as regards the former commented above, shows again the process of cattle specialisation and mechanisation, and the lost of significance of cropping and/or the trend of the component of intensification to lower values. However, this does not imply that the use of chemical fertilisation diminished, neither that the ecological of the use of these sorts of inputs had been low. Thus, between 1977 and 2000 the consumption of the kg of fertilisers per hectare has increased 3.6%, 1.4% and 3.8% annually as concerns nitrogen, phosphorous, and potassium, respectively. In 2004, the consumption of nitrogen fertilisers was of 46.7 kg per hectare, that of phosphates was of 36.8kg per hectare and of potassium 58.8 kg per hectare. The total consumption of biocides has increased 1.2% every year between 1996 and 2004 (data supplied by ANFFE and AEPLA[13]).

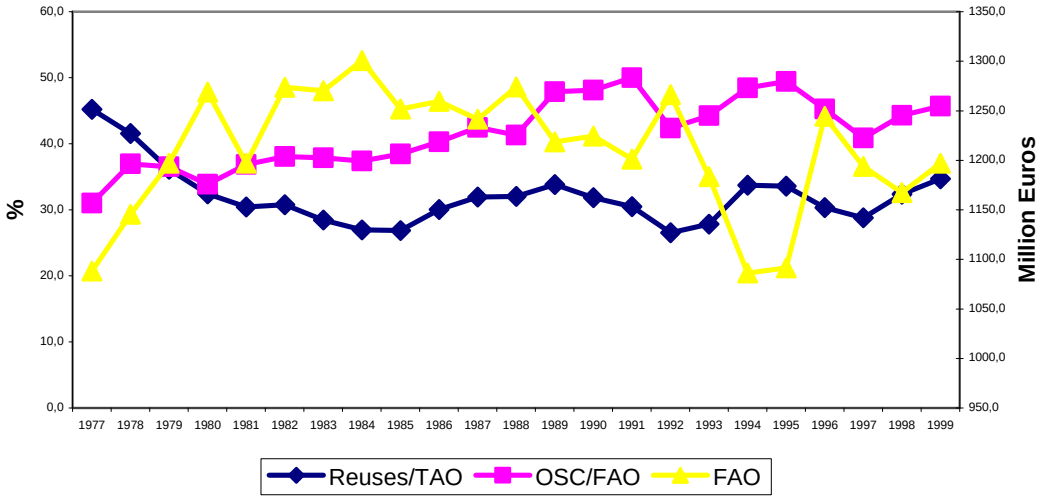
Table 4.12 shows the increasing incorporation of off-farm and market inputs as regards the commercialised output by using the ratio outside sector costs/FAO. In real terms, deflated, the ratio indicates the requirements of inputs per unit of final output. In current terms, the ratio indicates the part of the FAO the farms destined to pay for the inputs and it is related to the evolution of the ratio perceived/paid prices. The evolution of the ratio in real terms shows the increasing incorporation of external inputs in the sector. In current terms, the ratio shows oscillations depending on the variation of the exchange price relation.

Table 4.12 Evolution of the Outside Sector Costs over Final Agrarian Output, in constant and current currency (year basis of 1985). Some years within the period 1977-2000[14]

	% OSC/FAO Real	*% OSC/FAO Current*
1977	31,0	25,2
1980	33,9	31,8
1985	38,4	38,4
1986	40,3	37,5
1998	44.3	38.4
1999	45.7	40.1
2000	48,2	42,9
$\%AAGR_{77\text{-}85}$	2,7	5,4
$\%AAGR_{86\text{-}00}$	1,3	1,0
$\%AAGR_{77\text{-}00}$	1,9	2,3
$\%AGR_{77\text{-}00}$	55,6	70,5

Source: Own elaboration (IDEGA, s.y)

Figure 4.2 Dynamics of Reuses/Total Agrarian Output and OSC/Final Agrarian Output (%) and dynamics of the Final Agrarian Output (€ million)



By comparing the evolution of this ratio with the one that relates re-uses and total output, until 1986 the tendency is consistent with the general replacement of local available resources by external market inputs. After 1986, the dynamics of both ratios show changes of trend, increasing and decreasing in different sub-periods. However, such oscillations – increasing the use of re-uses and/or decreasing outside costs- follow the same direction and do not improve the dynamics of the output, which has remained more or less constant.

The evolution of the OSC has been interpreted in different ways. It can be considered that their growth is positive since they state technical improvements, which at the same time will contribute to increase productivity and efficiency. In the case of Galicia, nevertheless, this is not happening.

From a different perspective, the higher consumption of seeds and pesticides, as well as in chemical fertilisers, does not always guarantee progress in productive or economic terms, since Gross Margin per hectare or land productivity is diminishing over the last decades, as we showed in Section 4.1 in current terms, and as we can deduce from the negative evolution in real terms, also a reduction of the output per hectare has taken place. Moreover, the use of external bio-technological inputs is increasing pollution and risk of fertility losses, and the economic outcomes by reducing yields. In the case of Galicia, for instance, Soto (2006) shows that the impact of new technologies over the yield was rather scarce between 1964 and 1985.

(iii) Dynamics of the Depreciations

Fixed costs are also constraining the agrarian income and show the impact of other sorts of technology in agriculture, the one that aims at reducing the volume of labour. In accountancy terms, fixed costs are represented by depreciations. The Galician farming sector has realised a strong investment effort, as the strong reduction of the agrarian income suggested.

As Table 4.13 shows, depreciations have been absorbing the small increase of the final agrarian output as well as a big part of the gross value added (the difference between the output and outside costs). Thus, in 1977, depreciations withdrew around 5% and 7% of the FAO and GVA respectively, against 15% and 28%, in 2000.

Table 4.13 Ratios of Depreciation over Final Agrarian Output and Gross Value Added at market prices and at factor costs. Constant currency. 1977-2000

	%Depreciations/FAO	*%Depreciations/GVAmp*	*%Depreciations/GVAfc*
1977	4,9	7,1	5,8
1980	4,8	7,3	7,8
1985	9,3	15,2	17,9
1986	10,1	16,9	18,8
1995	15,7	31,0	38,4
2000	14,7	28,3	44,3

Source: Own elaboration from IDEGA (s.y.).

The former data reveal, moreover, an acceleration of the depreciations after 1986, which entails the continuous and increasing deterioration in the last decades of the fixed capital productivity, which can be approximated by inverting the former ratios (FAO/Depreciations and GVAcf/Depreciations) that was in 2000 around half of the Spanish average[15].

The economic significance of the investments is also reflected by the evolution of park of machinery. Between 1964 and 1985 the units of tractors increased at an annual rhythm of 18.6%, while between 1985 and 2000 increased 11.1% and between 2000 and 2005, augmented 1.6%. Despite the slowing down, in Galicia, in 2005 there were around 11.5 tractors per 100 hectares, while in Spain 2.8 tractors per hectare[16] (INE 2005).

Table 4.14 Number of tractors in the period 1964-2005

	1964	1975	1985	1995	2000	2004	2005*
Tractors	2140	26530	77168	111,557	130,737	138,846	141,457

Sources: IGE (s.y); *DOGA 19th April 2006, no. 78, pp. 64-57.

The impact of mechanisation was realised first by big farms, but later also by small farms. In 1989 around 43% of the farms that had a tractor had less than five hectares of UAA, while in 1999 they were only 24%, but that interval is one of the most affected by the disappearance of farms. Moreover, 95% and 84% of the farms that rented a tractor in 1989 and 1999, respectively, had also less than five hectares. More important, however, is to check the impact of mechanisation by considering the power (horse power) per hectare (Naredo 1997), which in Galicia has been since the beginning of the last process of modernisation rather higher, for instance around twice than in Spain (Soto 2006).

(iv) Subsidies

Subsidies are a component that might have a positive effect on the agrarian sector. They have increased during the last two decades – four times bigger in 1985 than in 1977, and 11 times bigger in 2000 than in 1986, with European aid. However, this positive effect on the agrarian income has been very low. In 1977, subsidies were only 0.63% of the FAO, 0.2% of the GVA and 0.9% of the Agrarian Income, whereas in 2000, they were 6%, 12% and 15% of the FAO, GVA and Agrarian Income[17], respectively.

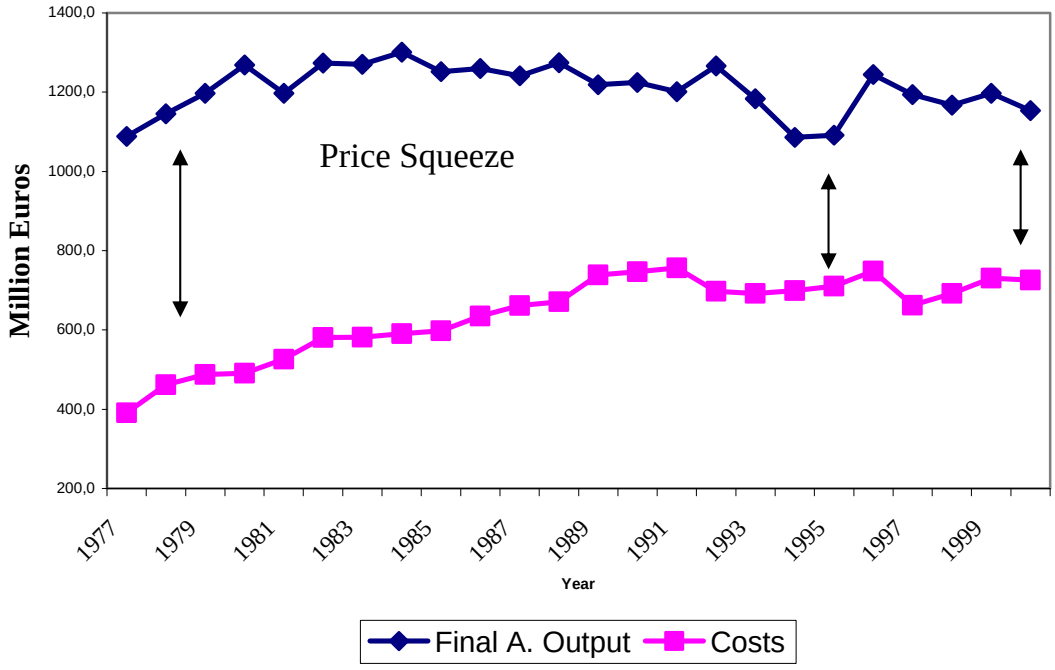
The low significance of subsidies is due to the fact that premiums were proportional to the farm output and played a significant role, given the small productive size of Galician farms. Specific reasons as regards the Galician farming sector were the lower levels of the premium destined to the meat cattle, one of the main products of the final agrarian output or the limited development of the compensation in mountainous areas (López 2000).

4.3.5 GALICIAN AGRARIAN INCOME SQUEEZE AND LOW LABOUR PRODUCTIVITY

The change of agrarian model increasingly based on external inputs along with the negative price evolution entailed what some authors name the *squeeze on agriculture* (van der Ploeg *et al.* 2001). In macroeconomic terms, the squeeze makes reference to the stagnation and decline of the output, accompanied by increasing costs, derived from the increasing use of external inputs with new and more expensive technologies.

The squeeze in Galician agriculture, which is shown by the reduction of the gap between the two lines (final output and costs) is continuous since the end of the 1970s and accelerates in the middle of the 80s, becoming extreme in the first half of the 90s; finally, and with a slight recovery in the second half of the 90s, it is maintained until the end of the period under study. Thus, the room to compensate factors of production and labour has become smaller and smaller.

Figure 4.3: Squeeze on Galician Agriculture 1977-2000



Source: the same as in Table 4.7.

The prices squeeze is limiting labour productivity as well. Labour productivity is now expressed by considering the gross value added (apparent labour productivity) and the net income of the farming sector (labour productivity), per worker; both in real terms.

Table 4.15 Annual Average Growth Rates of labour productivity and agrarian income per worker in Galicia

	GVA/worker	*AI/Worker*
AAGR77-85	2,9	-1,5
AAGR86-00	5,4	3,8
AAGR77-00	4,7	2,4
AGR%77-00*	186,9	71,8

Source: IDEGA (Several years); *AGR: Average Growth Rate.

Between 1977 and 2000, both ratios increased their value in absolute and real terms, despite the reduction of the gross value added (20.5%) and agrarian income (52%) and therefore, only thanks to the stronger reduction of the number of workers (72%) (Table 4.7).

Table 4.16 Significance of Galician labour productivity (GVA/Worker) and income per person (AI/Worker) regarding Spanish values (Spain=100)

		AI/Worker
1985-FAO	36,6	32,7
1990	23,8	22,4
2000	21,7	14,2
2000-CPADR	28,6	23,1
2001-CPADR	33,3	27,4

Source: own estimation from IDEGA (2005) and MAPA (2003 and 2004).
CPDAR: estimations from the Galician Ministry of Agri-food policy and Rural Development.
Series 1990-2000 are based on SEC-95 methodology, while in 1985 the comparison is done on the basis of data from FAO-methodology.

As the structural ratios showed concerning labour productivity (in current terms), both the gross value added and the net income per worker do not improve their dynamics in relative terms over the whole period; i.e. when they are compared with the Spanish values – and where labour has reduced less, around 61%. By following the FAO-methodology, in 1985 the significance of both ratios (as % of the Spanish one) was around 32-36%. Between 1990 and 2000, and using the SEC-95 methodology, Galician labour productivity is around 22-24% of the Spanish one. The estimations of CPADR (Regional Ministry of Agriculture) for years 2000 and 2001 suggest similar values to those of 1985.

Thus, modernisation has not brought the expected results in which it was supposed to be highly efficient, that is, in economic terms. In this respect, the model has been suffocated – or has suffocated farmers' life expectations, by its own premises: high dependency on mechanical and biological technology accompanied by an unfair (for farmers) evolution of the prices of that technology and the prices of the output, excessive variable and fixed (investment) costs, finally, agrarian income squeeze.

NOTES

1 The delay of the implementation of the process of modernisation in Galicia, and in Spain, in general, is all part of the autarchy imposed by the Franco Regime. After 1959, a process of opening up was started through the Plan of Estabilización (Stabilisation), which enhanced the timid economic development that took place during the fifties. During the sixties, the demand for foodstuff increased and its composition varied, whereas the sector was in full transformation and could not respond adequately to the demand. The national agricultural policy reoriented towards a pricing policy, with tax deduction for the investment, farm subsidies, and loan facilities. Agriculture stopped being a way

of financing the industrial development and became a net importer of capital (Naredo, JM and C. Abad 1997:85-86).

2 Between 1962 and 1990, the significance of agrarian produce that reached the consumer without being transformed by the agri-food industry reduced 60%. Moreover, agrarian produce also reduced its significance within the Spanish family budget: from around 45% to around 15% (*ibidem*:89-90).

3 The analysis of the structural ratios has been made in current terms, that is without considering price dynamics and inflation. In Section 4.2, when the analysis is realised in real terms, by considering the dynamics of different prices, we observed that in fact labour productivity has increased only due to the reduction of labour, since Gross and Net Margins have decreased over the last decades.

4 See note 1.

5 As van Dijk (1995:71) explains 'With the development of specialisation and trade the feedback loops are recognised as "normal" economic development. As the agrarian economy becomes an integral part of the international market system and the industrialised world, it is influenced by agricultural trade and marketing conduct in regions where conditions and resource endowments are often different'.

6 In accountancy, and according to the FAO-methodology (developed by Food and Agriculture Organisation of the United Nations), Final Agrarian Output (FAO) is Total Agrarian Production (TAO) minus the reused internal inputs. The TAO is the totality of goods and services produced by the agrarian sector (agriculture, stockbreeding and forestry) during a natural year, as well as the variation in the herd size and the improvements by own risk. The annual output is the harvest either within the same natural year or the former one, depending on the crop (the wine harvest in the "x" year is actually the "x-1" harvest). The means of production are those employed within the year, although the costs of fund fertilisers, the winter cereal crops, etc, cannot be considered within this period but in the next one. The reused inputs are an estimation of those inputs used to obtain the total output and that are not bought in the market. This means they come from "re-using" available inputs from the farm or from former harvests (own seeds, for instance).

7 Moreover, the state campaign of health, as well as marketing, entailed changes not only in those habits, but also in the places, where these products are bought (mainly big supermarkets). This last question is significant also to understand the lost of value added as regards the farmers, that runs along with the increasing power of agri-food industries, where most of the raw material is transformed and that goes to big shopping areas to be distributed (Simon and Dominguez 2004).

8 The process of specialisation and intensification has increased to a larger extent during the sub-period 1997-2005 (from calculations from, EEEA191997 and 2005).

9 There are different series of data responding to different methodologies. Here, FAO-Methodology is used because it gives the opportunity of analysing a longer period: between 1977 and 2000. However, the most recent methodology is the SEC-95 (European System of Integrated Economic Accounts, ESA or the Spanish acronym SEC), which covers a shorter period, between 1990 and 2000 and advances an estimation of the annual evolution of the agrarian income for the period 2000-2005. Moreover, in Galicia, over the last decades, we face four different statistical sources to analyse the macro-dynamics of the farming sector: the regional ministry of agri-food policy and rural development (CPADR), which elaborated a series that followed the FAO-methodology until 2000; the MAPA elaborated first the series based on the Eurostat-CEA-89 (following the SEC-79 rules) between 1986 and 2000, and later on applying the CEA-97 methodology for the period 1996-2000. In 2004, such diversity ended up with the decision of the MAPA and the CPADER of applying the CEA-97 that it is based on the SEC-95 methodology; as a consequence of that the MAPA elaborated the series between 1990 and 2000 following the SEC-95 methodology. Moreover, there is a time gap of more than two years for the publication of the data. (IDEGA 2004/05).

10 Although as estimations these data must be taken with caution (IDEGA 2005), given to the big delay of the publication of updated series, it is interesting to show them here. The estimations are moreover slightly different, despite using the same methodology (SEC-95) by considering the different institutions that have carried them out (EUROSTAT and MAPA for example). Here MAPA estimations are shown.

11 See note 6 for Total Agrarian Output definition. The re-uses are the part of the total production that is not abandoning the provincial agrarian sector, and it is not the same as self-consumption, which is indeed included in the Final Agrarian Output (Soto 2006).

12 These 'other expenses' include linen, sisal and raffia, plastics in forced crops, small tools, crop and fixed capital insurances, and renting machinery (*Macromagnitudes agrarias* 2000, *Consellería de Política Agroalimentaria e Desenvolvemento Rural*, en red).

13 Data on fertilisers elaborated from the data on fertilisers directly provided by ANFFE (National Association of Manufacturer of Fertilisers) ; the fertilised area is published by the MAPA in the Yearbook of Agri-food Statistics Data on biocides directly provided by AEPLA (Spanish Association for Plant Protection).

14 This tendency contrasts with the Spanish one that maintains the same value from half of the 80s onwards, a value that is moreover around half of the Galician one.

15 This tendency is corroborated by the most recent evolution of the same ratios according to SEC-95 methodology: in 1990 in terms of agrarian output, labour productivity was 8.1ESU in Galicia, while in Spain it was of 12.4; in 2000, Spain had slightly increased the ratio to 13.1, while the Galician one had reduced to 6.2. In the case of the ratio Gross value added over depreciations, the tendencies have been very similar: in Spain, the values were 7.9 and 8.3, while in Galicia they were 5.3 and 3.3, in 1990 and 2000 respectively (IDEGA 1999-2000:105).

16 Calculated from EEEA 2005: number of tractors that belong to the farm, farms with UAA (only tractors, without considering other machinery). According to the Agrarian Census, the number of tractors per hectare is very high, particularly in farms with less UAA: in 1999, around 68000 farms (81% of the total farms) that declared to have a tractor had less than 10 hectares; showing the over-mechanisation of the sector. On the other hand, big farms (more than 10 hectares) opt to a larger extent than small farms for renting machinery, especially in the size between 10 and 50 hectares.

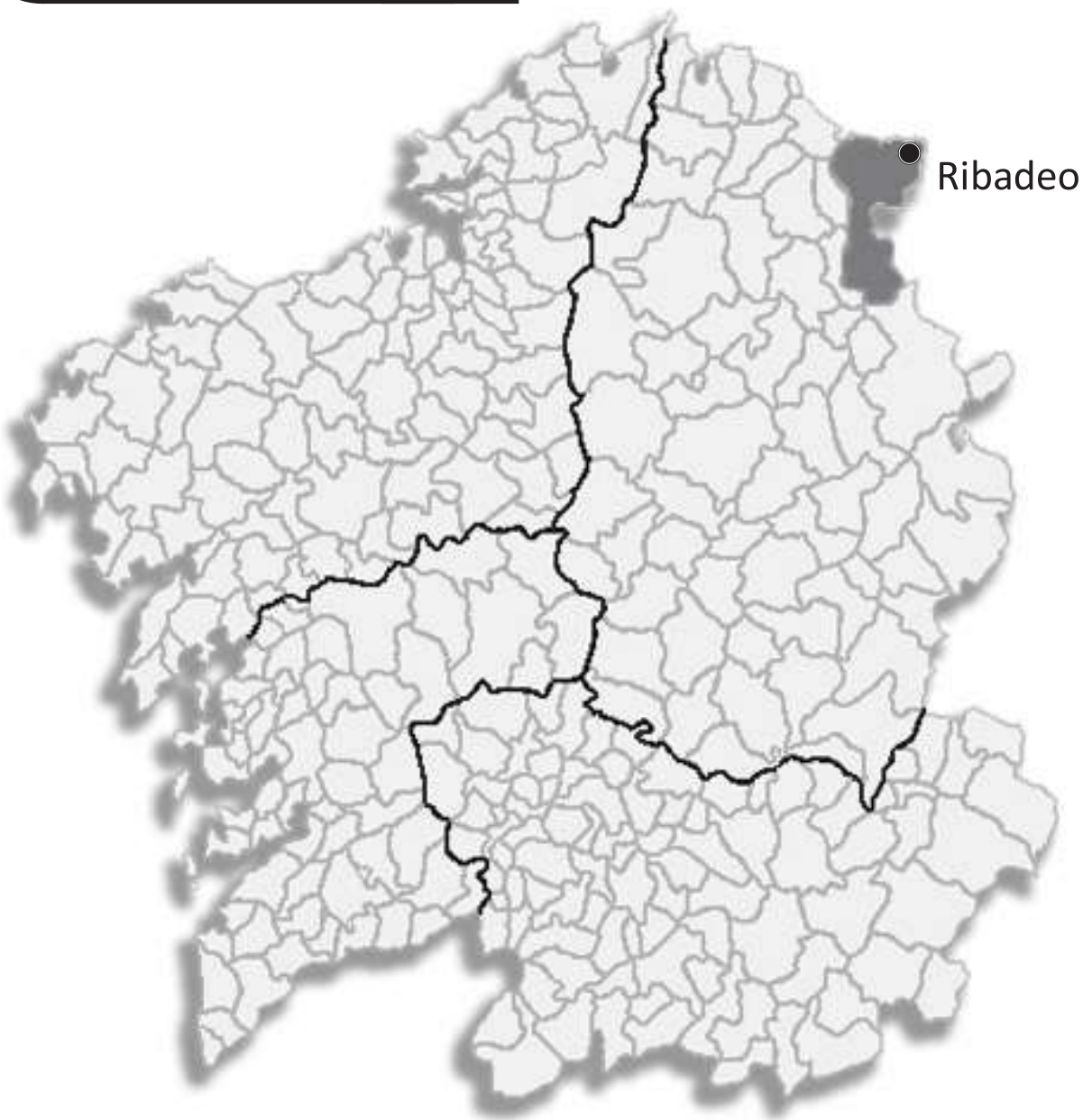
17 In fact, their impact on the agrarian income is much smaller than in the Spanish case, where they were around 25% of the agrarian income in (MAPA 2000).

PART II

LOOKING FOR HETEROGENEITY IN DAIRY FARMING WITHIN THE CONTEXT OF THE COOPERATIVE OS IRMANDIÑOS (LUGO, SPAIN)

The day in which we emit bank notes,
we will not print on them the portrait of politicians,
or wise persons or artists:
we would only print the figure of a cow,
as the symbol of our economy humanly distributed.
(Daniel Rodriguez Castelao, Sempre en Galiza.)

Map of Galicia



5 OS IRMANDIÑOS: DAIRY PRODUCTION IN THE CONTEXT OF A COOPERATIVE. STRATEGIES OF MANAGEMENT THROUGHOUT THE PERIOD 1993-2004

5.1 OS IRMANDIÑOS WITHIN THE GALICIAN DAIRY CONTEXT

Dairy production has played a strategic role in the transformation of the Galician farming sector. As I advanced in the first part of the thesis, it is the main production of the final agrarian output and involves most of the farms and area, as well as generating the biggest part of the gross income of the sector. The production of milk is around 52% of the total output of the cattle sub-sector and around 30% of the final agrarian output (IDEGA 2000).

The production of milk has constantly increased in the last three decades: from 880 tons in 1965 to 2181 tons in 2000. The rhythm of growth was stronger between 1975 and 1985 and slowed down after 1993, after the quota system was implemented[1] (specifically in the campaign 1993/94). However, the production has been systematically beyond the quota limits[2]: between 10 and 20% in the period 1993-2000 (IDEGA, reports nr 15 and 16). I will later re-examine this topic, which is important since the control is becoming stricter.

In the case of Galicia, the limits to production create a paradoxical situation: on the one hand, the Galician farming sector in general and the dairy sub-sector in particular has been immersed in a strong process of modernisation in order to respond to the goals of growth and in order to become competitive in an increasingly wider market. This process of modernisation has taken place with delay regarding other European contexts, which generates a certain tension and urgency to accelerate such transformation, mainly based on output growth.

On the other hand, the implementation of the quota system in order to slow down the European expansion of production arrived also in a moment of expansion of the Galician dairy farms. Therefore, important 'gaps' between the potential output and the quota were generated.

Moreover, the dairy sub-sector, like the farming sector in general, is quite heterogeneous. Although, as will be shown later, heterogeneity is related to much more than the differences in the size, statistically it is easier to advance the differences in this respect; thus, for instance in 2003 around 48% of the farms had fewer than 10 dairy cows; 24% between 20 and 50 dairy cows, and only 3.3% had more than 50 cows (IGE 2003). In this respect, it is expectable that such heterogeneity must entail different behaviours as well as goals and ways of operating. Furthermore, it is important to contextualise our object of study, the dairy farms that belonged to the

Cooperative within the whole farming sector, as well as to observe the differences among those farms.

The Cooperative Os Irmandiños was founded in 1976 and started to produce fodder in 1978. It started with partners of five councils around Ribadeo (Lugo) and nowadays is present in more than 40, spread along the province of Lugo and the west of the autonomous community of Asturias.

In the year 2004, the Cooperative had 986 partners from which 88% were autonomous farmers and 12% were under different juridical association (mainly SAT[3]). The average profile of the member was a man in his fifties, who works full time in agriculture, has secondary education and has attended agro-stockbreeding courses to specialise[4] (data provided by the Cooperative).

As was advanced in the introduction, the Cooperative was created with the goal of producing fodder for its partners. However, over the last two decades, it has developed different services for its members. Nowadays, besides the technical-economic management programme created in 1992, to assist in the decision making process that affects the farm in the medium- and long-run, another programme, the one oriented to rent and share machinery, has been a major success. Moreover, other services such as advising on feeding, reproduction, milk quality, genetics, animal health, etc are also provided. However, the biggest activity of the Cooperative is still fodder production: around 60% of its business volume.

The average farm of the Cooperative (from now onwards referred to as Co-farm) is bigger than the average Galician dairy farm. Table 5.1 shows a brief characterisation of the two contexts: the Galician dairy sector and the Cooperative, including in this case only those that participated in the 'socio-technical and economic program'. The characterisation is done, regarding the number of dairy farms involved in milk production, the number of total milking cows, the average number of milking cows per farm, the total and average milk output (per farm), the average milk yield per cow, the average area per farm and the number of dairy cows per hectare. The data are offered for two years, 1993 and 2003 in the case of Galician farms, and 1993 and 2004 in the case of the Co-farms. The last column of the table shows data for Galician farms with more than 30 dairy cows, since this group of farms is similar to Co-farms as regards the area, a factor very often under restriction within Galician farming (see first section of this thesis).

The dynamics of the whole Galician dairy sub-sector is characterised by:

- a reduction in the number of dairy farms: from 75,405 to 20,620, reproducing the general trend of the whole farming sector.
- the existence of two processes of transformation: one oriented to increase the size of the farm by means of the enlargement of the herd (from 7 to 18 cows), the output (from 25,201 to 107,737 kg of milk), and the acreage (from 7.7 to 11 hectares); and a process of intensification that regards both, the milk yield per cow (from 3,788 to 5,994 kg of milk), and the livestock density (from 0.9 to 1.64 cows per hectare).

Table 5.1 Cooperative dairy Farms and Galician milk farms, years 1993 and 1999

	1993 Coop	1993 Galicia	2004 Coop	2003 Galicia	2003 Galicia+30
Dairy farms	52	75,405	63	20,620	3,633
Dairy cows	1,659	501,621	3,508	370,600	161,065
Dairy cows per farm	32	7	56	18	44.3
Milk Output (kg)*	10,496,026	1,900,348,479	32,013,532	2,221,551,000	1,075,570,657
Milk Output per farm (kg)	201,847	25,201	508,151	107,737	296,056
Milk per dairy cow and year/kg	6,330	3,788	8.895	5,994	6,678
Average Area per farm (ha)** Average UAA per farm (ha) in the Cooperative	15.2	7.7	26	11	28
Dairy cows per UAA	2.11	0.91	2.15	1.64	1.58

Source: IGE (1999) and IGE (2001) *Enquisa de bovino*, in www.ige.xunta.es.
* The data on milk production for Galicia gathered by the Bovine Survey offers only the output for three months (September-October November). Thus, in year 2003, I have estimated the total Galician production for the 12 months and increased in a 10% since the total output then is around 90% of the total output given by the *Anuario* 2003 (MAPA s.y: 2003). I have applied the same estimation for year 1993.
** Total production from *Anuario de estadistica Agroalimentaria* (MAPA s.y:2003)

Table 5.2 Dairy farms under the programme of management within the Cooperative

	1993	2004	%AGR	%AAGR
Dairy farms under monitoring Progr.	52	63	21.2	1.8
Total number cows	1,658	3,508	111.6	7.1
Dairy Cows per farm (average)	31,8	55,7	75.2	5.2
Total Milk Output (kg)	10,496,026	32,013,532	205.0	10.7
Milk Output per farm	201,847	508,151	151.8	8.8
Milk per cow and year (kg) Average	6,126	8,895	45.2	3.4
Total Useful Agricultural Area (UAA, in has)	792	1,636	106.6	6.8
UAA per farm (hectares)	15.4	26	68.8	4.9
Cows per hectare	2.1	2.3	9.5	0.8
Total Family Labour Units (FLU)	n.d	125	n.d.	n.d
FLU per farm	n.d	2	-n.d	n.d
% of farms without paid labour	59.6	57.8	-3.1	-0.27
Paid Labour dependency* (%)	2.5	6.2	84.4	18.4

* Paid labour costs over Gross Margin, only considering the sub-sample of farms with paid labour (real terms); AGR: Average Growth Rate; AAGR: Annual Average Growth Rate; Data on labour units as regards the Cooperative are only available since 2002.

Co-farms have reproduced the same process of transformation to a larger extent: the average Co-farm is bigger and more intensive. They are bigger regarding the acreage (26 hectares, against 11 in Galicia in 2003), the output (508,151 against 107,737 milk kilograms per farm, in 2003/04) and more intensive (8,895 against 5,994 and 2.15 against 1.64 dairy cows per hectare, in 2003/04). On the contrary, opposite to what happens for the global dairy sector, more farms join the Cooperative every year, which shows that farmers are aware of the advantages of cooperativism and the good work of this Cooperative, in particular.

The magnitude of the transformation[5] realised by the Co-farms is bigger by comparing them with similar Galician farms in terms of acreage, that is, by observing the dynamics of Galician farms that have a herd with more than 30 dairy cows. In this case, the Galician farms have an average area of 28 hectares, while the Co-farms have 26 hectares, but Co-farms are larger in terms of output, and more intensive as regards livestock density and milk yield per cow.

5.2 OS IRMANDIÑOS: THE AVERAGE DEVELOPMENT TREND THROUGHOUT TIME, 1993-2004

Above I showed that within the Galician agrarian sector, along with the reduction of the number of farms, at least two processes of transformation have taken place: one oriented to enlarge the farm size in structural and productive terms and another oriented to intensify the use of the resources (labour) and labour object (dairy cow). Within the context of the Cooperative and for the period 1993-2004, on average, the strongest changes have taken place within the enlargement process, especially concerning output and herd, while land size has increased at a lower rhythm (Table 5.2): milk output increase and herd per farm increase 151.8% and 111.6% respectively, while area per farm increases 68%; the process of intensification is realised more by means of increasing the milk yield per cow (45.2%) than by the cattle density (9%).

Farmers and experts of the Cooperative agreed in the constraining role of low land availability, which according to some farmers' opinions would facilitate a bigger increase of herd and output, and/or a reduction of the livestock density. According to these data, the limited growth of the area is accompanied by stronger intensification by means of milk yield per cow than by means of livestock density.

Scale enlargement and intensification are characteristic of the process of farming modernisation. However, despite this process, labour dynamics is showing interesting and, to a certain extent, unexpected results from the modernisation perspective. Although within the Cooperative, family-labour units per farm reduce slightly, from 2.1 to 2.0, in the period 2002-2004, as for the whole Galician agricultural sector[6] these farms remain mainly family labour based: 58% did not have any paid labour unit in 2004. Moreover, although the costs derived from the paid labour have increased from € 2.5 from every € 100 of Gross Margin to € 6.2, they are of minor significance within the total costs.

5.2.1 A CONSTANT SAMPLE 1993-2004: BRIEF CHARACTERISATION

The conclusions extracted above could be influenced by the fact that the two samples (of 1993 and 2004) are not homogeneous: some farms have left the program of the Cooperative or the activity since 1993, while others have been incorporated. In order to obtain a more precise picture of both processes within the Co-farms, I have selected a constant sub-sample of 18 farms that includes only those farms that were present in both the 1993 and 2004 registration.

By analysing the same variables for the 18-farm constant sub-sample (18-farm sample from now onwards), I observe that the same two strategies of change emerge, as well the family character of labour persists (Table 5.3).

Table 5.3 Features of the 18-farm sample in two years, 1993 and 2004

	1993	2004	%AGR	%AAGR
Dairy farms under monitoring Progr.	18	18		
Cows per farm (average)	33.5	57.7	72.2	5.1
Milk Output per farm	225,390	541,393	140.2	8.3
Milk per cow and year (kg) Average	6,504	9,067	39.4	3.1
Total UAA (hectares)	278	463	66.5	4.7
UAA per farm (hectares)	15.5	25.7	65.8	4.7
Cows per hectare	2.34	2.36	0.1	0.01
Total Family Labour Units (TFLU)	n.d	37	-	-
FLU per farm	n.d	2	-	-
% of farms without paid labour	44.4	61	9.7	0.8
Paid Labour dependency* (%)	2.3	6.7	193.9	10.3

*in real terms

The trends realised by the big and the 18-farm sample, although they are the same, they show different rhythms. Thus, the process of scale enlargement is done by means of increasing the milk output per farm, the dairy cattle size and the area but the rhythm of growth is lower in the 18-farm sample than for the bigger and no-homogeneous sample: 140%, 72% and 65%, against 151%, 111% and 68%, concerning milk output, herd and area respectively. The process of intensification is, however, stronger in the 18-farm sample regarding milk yield per cow (66% against 45%), while livestock density remains constant (against the growth of 9% within the big sample). Now, by having realised a stronger increase in area, the intensification is again realised by means of the milk yield per cow, while livestock density remains constant.

As for the bigger sample, labour in the constant sample comes mainly from family[7]. In 2004, they have on average two units of family labour per farm and off-family labour is only present in seven of them. Paid labour dependency is also increasing in real

terms: from € 2.3 to € 6.7 per 100 of Gross Margin between 1993 and 2004, but remains minor.

As Table 5.4 shows, the farms that disappeared (D-farms) were slightly smaller and less intensive than the 18 that remained, which is to be expected given the changes of the farming sector during that period (strong reduction of small farms and orientation to specialisation and intensification).

Table 5.4 Farms that disappeared (D) and new (N) farms in the sample 2004

	1993 (D*)	2004 (N*)	D/18F (1993)	N/18F (2004)
Dairy farms under monitoring Progr.	34	45	1.89	2.50
Cows per farm (average)	31	54.9	0.93	0.95
Milk Output per farm	189,382	494,855	0.84	0.91
Milk per cow and year (kg) Average	5,926	8,827	0.91	0.97
UAA per farm (hectares)	15.2	25.98	0.98	1.01
Cows per hectare	2.1	2.2	0.90	0.93
FLU per farm	n.d.	2	n.d.	1.00
Paid LU per farm	n.d.	0.28	n.d.	5.60
Total LU per farm	n.d.	2.28	n.d.	1.11

D*: Farms that Disappear
N*: New farms, present in 2004 sample but not in 1993 sample

On the other hand, by comparing the 18 farms that remained with those present in 2004 but not in 1993, the 'new' farm (N-farms) are slightly smaller regarding the output and similarly intensive than the ones that remained. This is logical as well since the ones that remained have been involved longer in the process of specialisation and intensification already referred to. What is not possible to know exactly is why N-farms have had access to more land than those that remained.

5.2.2 HETEROGENEITY CONCERNING THE PROCESSES OF TRANSFORMATION

The question that arises at this point is, whether these 18 Co-farms are involved in a homogeneous process of enlargement and intensification, reproducing all of them, and to the same extent those processes. Or, on the contrary, and more probably, whether such processes have been followed by every farmer (or group of farmers) in a different way and/or with different intensity.

In order to check if there has been heterogeneity throughout the period, the different positions adopted by the same farm in 1993 and 2004 will be observed as regards both processes of transformation: scale enlargement and intensification. Furthermore, I include in the analysis of heterogeneity another feature that is typical within the process of farming modernisation: the tendency to increase dependency on external market inputs (Chapter 4, Part I). By doing so, it will be possible to check whether for this small sample the price and income squeeze explained in the first section is also a

reality. Moreover, in order to complement the outcomes based on the statistical data base, some farmers' answers, those from the 17 interviews that have been carried out, and who are within this smaller sample[8], will be advanced.

The study of heterogeneity will be structured by checking the main processes followed within the average trend (intensification and scale enlargement), as well as the study of resource mobilisation by analysing market dependency trends. The conclusions will be accompanied by three graphs. To construct these graphs I chose, firstly, some variables that can show the main processes of transformation. Secondly, I represent a particular farm in year 1993 by a number, while in the year 2004, a '4' is added to that number in order to be able to see the different position of the farm regarding a particular variable in both years. In this respect, for a particular farm, an arrow has been drawn linking its position in both years. The arrows linking both positions in the two different years show the individual 'jumps' for a specific farm – regarding the variables under consideration. The real dimension of the 'jumps' will be shown by the average growth rates of those variables.

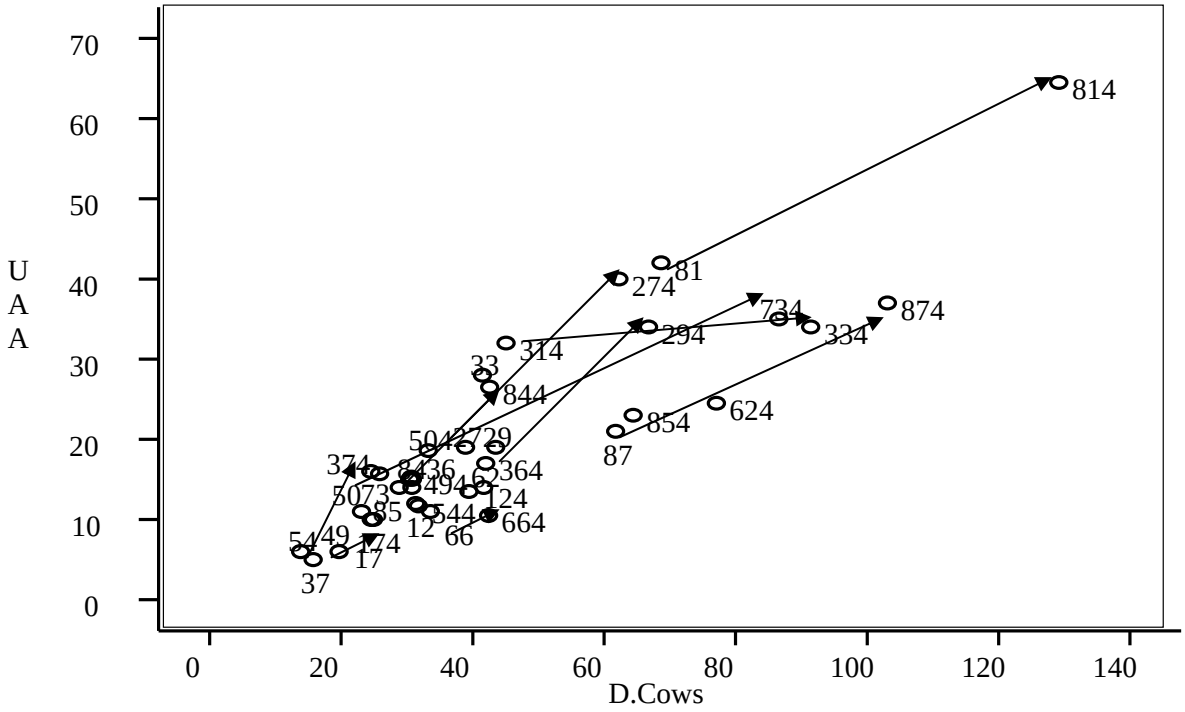
(i) Heterogeneity concerning Scale Enlargement through Size: synchronic and diachronic perspective

Scale enlargement is going to be analysed through variables that indicate size since there are not available labour data in the year 1993. However, labour data between 2002 and 2004 and the interviews suggested that labour has remained constant or diminished over the period, realising the same trends as for the whole region and Europe in general. Thus, assuming this, any increase on size (output, herd, land) entails scale enlargement.

On average, this group of 18 farms increased their size from 1993 to 2004, by increasing on average the output per farm (140%), their area (66.5%), and cattle number (72.2%), but as we will see, with significant differences among them. The increase of the output is highly correlated with the area and herd dynamics, so these two variables will be used to frame the scale enlargement process. Graph 1 shows the combination of these two variables. The graph has a synchronic (showing the position of a farm in two particular moments of the time, in our case 1993 and 2004) and a diachronic reading (shown by the changes in the position of farm from 1993 to 2004).

Concerning the synchronic analysis, in 1993 the farms had an area within a range from 5 to 42 hectares and a dairy herd within a range from 13.8 to 68.7 cows; while in 2004 the minimum size regarding area and herd is of 10 hectares and 18.6 cows and the maximum is of 64.5 hectares 129.4 dairy cows. Thus, in general the farms are bigger but still within a wide range, and therefore appearing to be rather different. In order to show this difference, Table 5.5 has been constructed; here farms are ordered from minor to major herd and area in 1993 (the sample is divided by using the median). By doing so, four different groups of farms arose in 1993: small farms in terms of area and herd (below the median in both cases), big farms regarding area and herd (both above the median), and two other small groups of farms combining small area and big herd, and vice versa.

Figure 5.1 Size dynamics by UAA (hectares) and Number of Dairy cows over the period 1993-2004



Moreover, when the time dimension is included, that is the value of the same variables for every farm in 2004, and the average growth rate or average increase/decrease over the period 1993-2004, rephrasing van der Ploeg (2002) 'the dancing of farmers through time' is to be observed. Observing the graphic, in general, as most of the arrows follow a direction to 'up' along the 'y' axis (number of dairy cows) and to the right along the 'x' axis (area of the farm), there is a trend to increase both area and cattle number. However, the magnitude of such change is different from one farm to another, as the average growth rate in Table 5.5 shows. Some farmers have operated by changing more the area than the cattle, while others have done the opposite.

Therefore, although both area and herd have increased, Table 5.5 shows a more heterogeneous picture of these two changes:

1 Small farms – below the median in 1993 regarding herd and/or acreage – grew, in relative terms, more than big farmers – above the median in year 1993.
2 Big farms increase the area but only by half the amount that the smaller group does; while they increase herd size more than area, in relative terms, they do it in both cases to a lower extent than the small group.
3 The third group is formed by only two farms. In 1993 they were classified as big concerning the area and small concerning the cattle (above and below the median respectively). They have both increased their area to a similar extent, although they behave differently regarding the herd: for instance farm 50 increases the number of dairy cattle to a smaller extent than farm 84, in order to maintain a low cattle density since its area was smaller in 1993.

4 The fourth group, small in terms of area and big in terms of herd, in 1993, has changed by increasing mainly the herd, opting for a strategy of intensification in 2004.

Table 5.5 Area and Herd size dynamics Average Growth rates (%) within every group regarding the area (UAA) and the herd (number of dairy cows). Ordered by values of 1993

Farms	*UAA*			*Herd*		
Small Area and Herd 1993	*1993*	*2004*	*AGR%*	*1993*	*2004*	*AGR%*
37	5	15.7	214.0	15.75	25.83	64.0
17	6	10	66.7	19.67	24.92	26.7
54	6	11.7	95.0	13.83	31.75	129.6
31	10	32	220.0	24.58	45.08	83.4
49	11	15.3	39.1	23.08	30.67	32.9
85	14	23	64.3	30.75	64.42	109.5
73	14	35	150.0	28.83	86.58	200.3
Average	9.4	20.4	121.3	22.4	44.2	92.3
Big Area and Herd 1993	*1993*	*2004*	*AGR%*	*1993*	*2004*	*AGR%*
36	15	17	13.3	30.83	42	36.2
29	19	34	78.9	43.5	66.75	53.4
27	19	40	110.5	38.92	62.25	59.9
87	21	37	76.2	61.75	103.08	66.9
33	28	34	21.4	41.5	91.42	120.3
81	42	64.5	53.6	68.67	129.17	88.1
Average	24.0	37.8	59.0	47.5	82.4	70.8
Big Area-Small Herd	*1993*	*2004*	*AGR%*	*1993*	*2004*	*AGR%*
50	24.5	33.25	35.7	16	18.6	16.3
84	30.42	42.58	40.0	15	26.5	76.7
Average	27.5	37.9	37.8	15.5	22.6	46.5
Small Area-Big Herd	*1993*	*2004*	*AGR%*	*1993*	*2004*	*AGR%*
12	12	13.5	12.5	31.33	39.42	25.8
66	11	10.5	-4.5	33.58	42.42	26.3
62	14	24.5	75.0	41.67	77.08	85.0
Average	12.3	16.2	27.7	35.5	53.0	45.7
Average of the last 2 groups	*19.9*	*27.0*	*32.7*	*25.5*	*37.8*	*46.1*

Generally speaking, all farms extend both area and herd but they do so with different rhythms and by choosing different factors to enlarge. Moreover, smaller farms, far from disappearing, have realised big changes and continue to exist.

The difference within the scale enlargement process by choosing different rhythms of growth and a factor of production (land) and/or an object of labour (cow) to realise that growth responds to questions of a different nature: the access to new resources (land, financing to buy land and cattle) and the goals they pursue. For instance, being both big sized farms in 1993, farm 81 carried out a stronger process of transformation than farm 84. Their goal is nevertheless different, since farm 81 aims at growing, and not at reducing costs as farm 84 does. In order to realise their goal, farm 81 had to intensify (higher livestock density) because it had no access to new land and/or it was cheaper to increase the number of cows.

> *The farm belonged to my father. He started to produce milk in 1969 and to commercialise it from 1970 onwards. In the 80s my two brothers and I inherited the farm. He* (the father) *had a small farm, we started with less than 40 cows and now we have 130 and have doubled our production. In fact, we are producing over our quotum, that is around 880,000 kg (...). We rent 50% of our land, it is difficult and expensive to buy land* (Farm 81).
>
> *This farm belonged to my wife's parents, but I have been in charge since they retired in the end of the 60s. In 1966 we had only meat cows. In 1970 we started with dairy cattle and in 1973 we had the first milking equipment and the tank. That year I started together with another neighbour from Ribadeo to buy Dutch cows. The farm has grown a lot since those years. I have more cows (42) (…) I have always tried to reduce my costs (…)* (Farm 84).

Thus, farmer 81's answer confirms the aim of increasing the production every year (overcoming systematically its milk quota) and how in order to increase the output it increases the number of dairy cows to the maximum, given the land the farmer could access. Farm 84, on the contrary, is not aiming at growing but at reducing costs. The farmer has enough land for the output he expects to obtain and to maintain low costs. Therefore, although this farm has changed as well, the process of scale enlargement has been softer than for farm 81.

Farm 27 also realised a big transformation, ever bigger than farm 81. The aim is also increasing the output, but now this is done differently, by increasing the area.

> *My main goal is to increase production. This farm has increased the number of cows and area, but especially the area, even when this is difficult. Prices are too high because of the speculation of the land with tourist aims – because of the coastal location. One hectare can cost between two and three million pesetas (€ 12,000-18,000). So I rent it and around 70% we manage today is rented* (Farm 27).

From the data and the farmers' answers, it is concluded that in the context of the Cooperative, scale enlargement is a differentiated process, which combines different elements in different ways; or in other words, scale enlargement is related to and is at least partially an expression of different strategies used by farmers. Furthermore, it is remarkable to notice how smaller units have been able to reproduce as well as even realise a growth that is often superior to the one of the larger farms.

(ii) Heterogeneity concerning Intensification: synchronic and diachronic perspective
The process of intensification has been assessed regarding milk yield per cow and livestock density. I used both variables to construct Figure 5.2, which shows a trend to intensify mainly based on increasing the milk yield per cow; while the livestock density has hardly changed on average, although it differs depending on the farm.

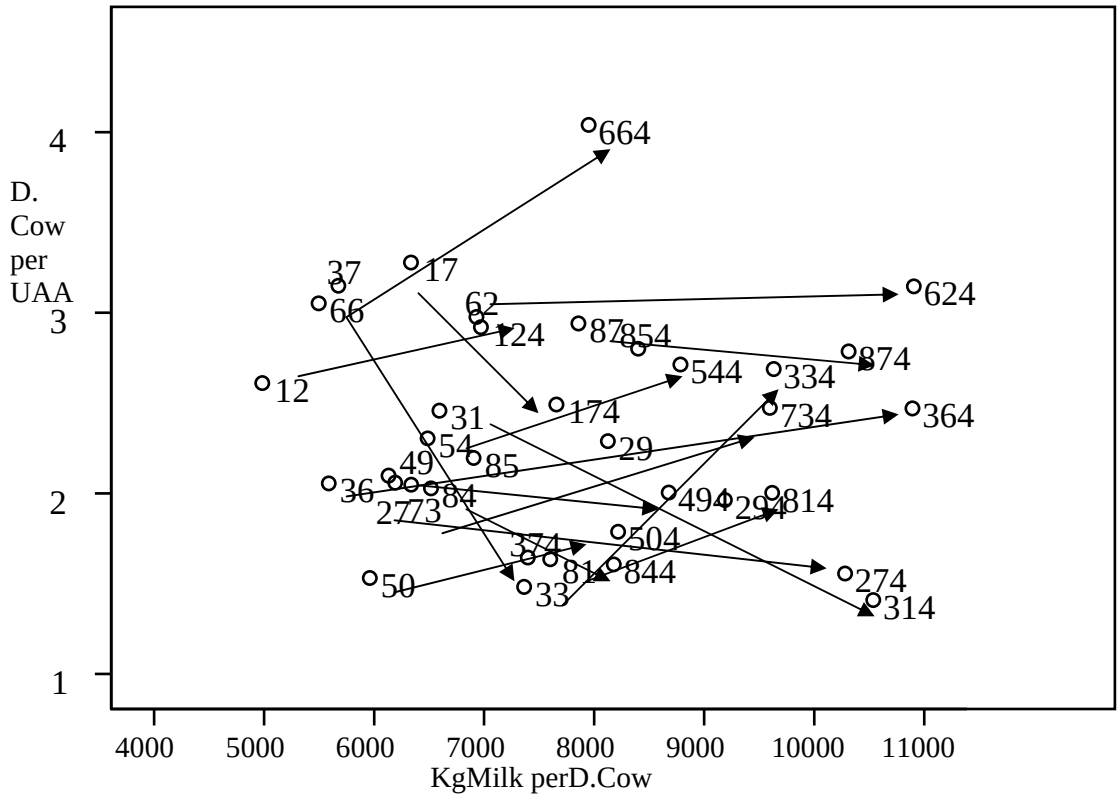
In 1993, most of the farmers produced between 5,600 and 7,100 kilograms of milk per cow, within a range from 1.5 to 3.2 dairy cows per hectare. In 2004, the range of milk yield per cow is higher and wider, between around 7,500 kilograms per cow to around 11,000. Concerning livestock density, the range is maintained over the period between 1.5 and 3.2 dairy cows per farm, with only one exception (Farm 66, which is also the only one that reduces area) which reaches 4 dairy cows per hectare in 2004.

Table 5.6 shows the process of intensification combining both variables: livestock density and milk yield per cow. The data are ordered by considering the livestock density changes (AGR).

Table 5.6 Process of intensification regarding milk yield per cow

	D.Cow per UAA			*Milk yield per Cow*		
	1993	2004	AGR%	1993	2004	AGR%
37	2.95	1.65	-44.1	5,676	7,398	30.3
31	2.46	1.41	-42.7	6,594	10,536	59.8
17	3.58	2.49	-30.4	6,336	7,657	20.8
27	2.07	1.56	-24.6	6,337	10,281	62.2
84	1.97	1.61	-18.3	6,517	8,179	25.5
29	2.35	1.96	-16.6	8,125	9,189	13.1
49	2.17	2.00	-7.8	6,131	8,678	41.5
87	2.94	2.79	-5.1	7,857	10,313	31.3
62	3.00	3.15	5.0	6,931	10,906	57.4
12	2.61	2.92	11.9	4,983	6,971	39.9
50	1.57	1.79	14.0	5,961	8,218	37.9
73	2.14	2.47	15.4	6,192	9,598	55.0
54	2.29	2.71	18.3	6,487	8,784	35.4
36	2.06	2.47	19.9	5,588	10,893	94.9
81	1.62	2.00	23.5	7,601	9,618	26.5
85	2.26	2.81	23.9	6,904	8,400	21.7
66	3.20	4.04	26.3	5,496	7,950	44.7
33	1.47	2.69	83.0	7,364	9,632	30.8
Median	*2.31*	*2.52*	*8.51*	*6,412*	*8,987*	*36.7*

Figure 5.2 Process of Intensification throughout 1993-2004



In the former table, we observed that while the process of intensification regarding the milk yield per cow is general for every farm – although with differences among each other, the process of intensification by means of livestock density has followed two different paths: 10 farms have intensified in this respect while 8 have extensified. This strategy is mainly followed by farmers that had access to more land, and/or were not mainly oriented towards increasing the output (an exception is farm 27) as well as being mainly oriented to cost reduction (exception are farms 37 and 29). Within this group, except for farm 49 and 87 (both of them were small concerning the herd in 1993), the reduction of livestock density has been realised by increasing the area to a larger extent than the herd.

> *(…) in the beginning the farm was producing meat and the cows were for that (producing meat) but also to work… Nowadays I produce only milk and my main goal is to increase production (…) I have not many cows per hectare but I produce quite a lot per cow (…) I increased the area because I rent around 70%. We have big problems to buy land her* (Farm 27).

The other strategy is based on increasing the livestock density over the period. Within this strategy there is a group of farms which are highly intensive concerning the milk yield per cow (farms 62, 33, 36, 73 and 81; while others although having intensified in this respect are still below the median (farms 85, 12, 66, 50, and 54). They are small farms in terms of area (except for farm 85) and output

(…) I took over the farm 25 years ago. For 15 years I had 'pinta' cows. Nowadays I have only Frisian cows. Everybody changed to those because they are more productive. I only have 10.5 hectares. Here, in this area, it is very difficult to buy new land (…) I have not enough quota, because I have too much production (340,000 kg (Farm 66).

We have 17 hectares, only two are rented and for the moment I am not thinking of getting more land, it is too expensive and difficult to get (…) my main strategy is to intensify given what I have (…) the cows do not graze, they are in the shed, before they were tied up (travadas) but we changed in 1989 because there was not enough space and it was more comfortable to change and better for increasing the milk yield per cow (Farm 36).

The process of intensification is realised, as in the case of scale enlargement, through different strategies and influenced by the different goals farmers pursued. The land intensification is constrained by the lack of land availability but also depends on the farmers' goals or criteria: some like to have a big herd, with the subsequent increase of the livestock density, while others do not. When there is land availability and they aim at increasing output, also the milk yield per cow is high or higher than for others that mainly aim at cost reduction.

(iii) Heterogeneity concerning cost reduction strategies: synchronic and diachronic perspective

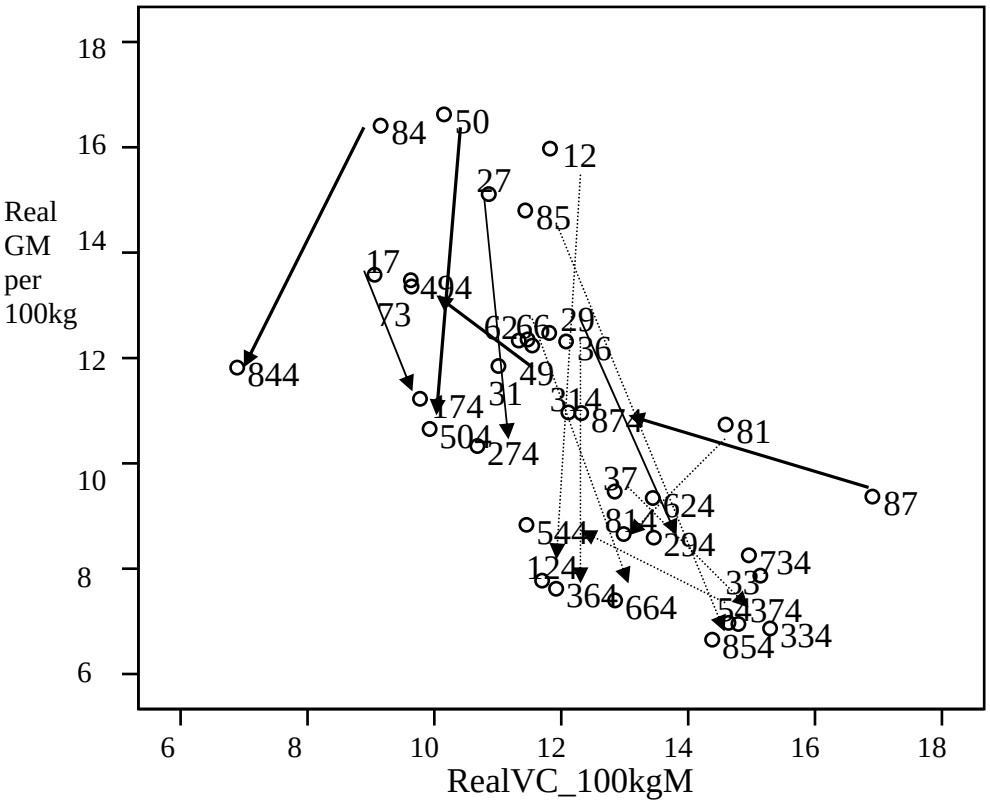
Nowadays, farmers' activity is strongly linked to the market. Through the market they commercialise their production and there they can buy inputs to obtain their output as well as to finance (through loans) the transformation of their farms. The danger of depending excessively on such external (re)sources is to be affected by a negative evolution of the market price of those external inputs. For instance, a strong reduction in the price perceived by milk can reduce dramatically the final income, when it is combined with a high dependency on external inputs, such as concentrates and fodder, and/or machinery, just to cite some. When the prices of concentrates and fodder or the interest of loan to buy a tractor or to renovate the stable rise, income reduces as well; or if the prices of the external inputs reduce, but less than the reduction of the price farmers received for the milk, the purchasing power of the farms diminishes as well.

Figure 5.3 shows the degree of market dependency by considering the evolution of two ratios: the variable costs per 100 kilograms of milk and the Gross Margin per 100 kilograms of milk. The variable costs are linked to the purchase of market inputs. Thus, when for the same output (100 kg of milk) there are different variable costs (in €), it expected to have different cost strategies. Variable costs are directly and negatively influencing the Gross Margin or income (difference between the gross output and variable costs). For the same amount of milk (100 kg), some farmers are having a higher Gross Margin and lower variable costs than others, thus they are following cost reduction strategies in comparative terms (with other farms within the sample).

Again, we observe a quite heterogeneous picture concerning the different positions of every farm in every one of the years under analysis. For example, farm 84 has in 1993 the highest Gross Margin and the lowest variable costs per 100 kg; while farm 87 experiences the opposite. In between, there is a wide range of combinations.

In the figure, most of the arrows are moving down along the 'y' axis. This means there is a reduction of the Gross Margin per output in 2004 compared to 1993. On the other hand, some of these arrows are oriented to the 'right' regarding the 'x' axis (showing the variable costs per output), which means the variable costs per output are increasing during the period under analysis; few others are oriented to the left, which indicates that those farmers are reducing their variable costs in terms of output. Only three farms, 87, 54, and 49, show a positive tendency in both ratios[9].

Figure 5.3 Cost Reduction Strategies 1993-2004



Furthermore, clear differences are visible when comparing the farms among each other in one or another year. For instance, farms 84, 49, 50 and 27 have always had lower variable costs per output compared to the rest. Some of them follow such a cost reduction strategy, by reducing the use of all kind of external inputs, showing disagreement in this respect:

> *(…) I have always tried to reduce my costs, not buying forage, concentrates. I never had paid labour and have always been careful, minimizing the loans for buying things such as machinery, or land. I am not interested in having a big production, in increasing my output too much (…) we do not know too much about this, how they affect us (the pesticides), how they affect the cow. It is not good* (Farm 84).

Others affirmed that they were able to reduce costs, and focused on some of the Cooperative services such as the machinery and labour renting. They are convinced

very often about the positive evolution of their income. However, as for instance the case of farm 27, despite the answer of this farmer, the gross income per 100 kg has reduced from € 15 to 11 per 100 kilograms between 1993 and 2004:

> *As for cost reduction strategy, well, I rent machinery from the Cooperative, so I do not have to buy… but I cannot reduce my costs so much. Anyway in the last 12 years I manage the farm, I have increased the income* (Farm 27).

Some others are conscious of their real situation because they have realised big investments, as is the case of farm 66. In this case the Gross Margin reduced from € 13 to 7 per 100 kg of milk.

> *We cannot reduce the costs, we cannot aim at that (…) Now we have a lot of debts because we had to built up new installations (new stable, milking machinery, tractor), we had a bad period and only could overcome it with the neighbour's help, who lent us an old stable* (Farm 66).

In fact, the general trend shows a reduction of the real Gross Margin and an increase of variable costs per output: the graph shows that most of farmers in 1993 are on the upper-middle part of the graphic, while in 2004 most of the farms are in the lower right part of the graphic. Why is the Gross Margin per output decreasing? One reason is the one discussed so far: the increase of the variable costs. But there is another reason: the price of the milk. If as we know the output of these farmers is increasing throughout the period, a price decrease can very well explain the strong reduction of the Gross Margin, adding its effect to the increase of the variable costs. Indeed, the average price received by these 18 farms dropped, in real terms considering price index of 1985, from € 22.2 to 19.6 per 100 kilograms of milk. Moreover, this reduction is combined with, although positive, a very small reduction of the price of concentrates from € 15.8 to 15.1 per 100 kilograms. The low price farmers received for the milk they produce goes along with a high price for the consumer. This has become a burning question within the Galician dairy sector in general and among the Co-farmers in particular.

Furthermore, the augmentation of the costs shows the strong subordination of the farmer to the agro-food system. Farmers are caught between two strong oligopolies, the one providing inputs and the one transforming the output, as well as their lack of power regarding commercial distribution.

The next step is to retake the bigger sample of 2004 and study in depth heterogeneity in the management, but before that, some qualitative outcomes of the research will be introduced, in order to put down the myth of a sort of global farmer that the modernisation of agriculture tried to impose.

5.3 DE-MYSTIFYING THE 'GLOBAL FARMER'

The processes of transformation that affected the Co-farms have been shown so far through different socio-technical and economic data. However, such data are the reflection of only one side of reality, a vision that becomes more partial when the explanation is based on an average trend. In short, actions and knowledge are difficult to observe only by considering statistics.

In order to complement the research outcomes, especially those that will be introduced in the next section, 17 Co-farmers were interviewed. The interview was thought to give a picture of the historical evolution of every farm as well as to gather farmers' knowledge about management and thereby to discover different strategic patters in carrying out the activity, new rural development trends and their interests in them, as well as farmers' opinion about the dairy policy and policy-makers in the region.

Every interviewed farmer pointed at the enormous transformation of the farm in the last four decades. These farmers manage a farm that belonged at least to their parents and in most of the cases to their grandparents or grandparents' parents. They always started remarking how much their farms had changed regarding the herd and the capacity of producing more milk: *from 3-4 cows to more than 40, and from some few thousands of litres per year to hundreds of thousands*. In fact, from the interviewees' answers, it is easy to conclude that these Co-farms started being rather small and had an important room of manoeuvre to grow in different aspects but also limitations: on the one hand, these farms had a big margin to be transformed since they had small herd, little land, old infrastructure and machinery. On the other hand, transformation could not be realised only by the farmers themselves. They needed financing help that was possible in that particular socio-economic context within Spanish and European development. Furthermore, the transformation was driven to a specific direction: towards modernisation, based on specialisation and intensification with constraints that arose later such as the lack of available land or the price squeeze, as I explained in Part I, or some that affected specifically dairy farming activity, such as quota limits.

In this respect, I quote here just a few answers since in every one of 17 interviews the argument is very similar. The responses are furthermore remarkable since they are the testimony of peasant resistance and a proof against the argument that smaller farms were destined to disappear.

> *The farm belonged already to my grandparents. Afterwards my parents inherited the farm. The farm was small. They had three or four 'rubia' cows, for family consumption. They worked on the farm until 2000. Now I am the owner and have 46 cows and produce over 400,000 kg of milk. But I could produce around 600,000 so I am buying quota every year and land'* (Farm 34).
>
> *We started the activity two generations ago, so my grandparents first and then my parents. My father is 55 and I am going to keep up the activity* (the farmer is 26). *The farm started being very small, four or five cows and oriented to meat. Now it is exclusively oriented to milk and we have 133 cows. My volume of milk quota is 780,000 (…)* (Farm 26).
>
> *There have been three generations on this farm. My grandparents produced meat. In 1973 they started to produce milk and then my parents inherited the farm. Since 1990, the farm has been on my name. My parents retired 16 years ago. Now I only produce milk. I have increased a lot the number of cows and the area and have a SAT with 4 partners… we produce around 760,000 kg with 75 dairy cows and 95 MCU. I am the only one of my family working on the farm, although my father helps me'* (Farm 3).
>
> *My grandparents had rented the farm and the house. Later they constructed their own house and bought some land. They produced meat. My parents inherited the farm and kept on producing meat but also milk until in 1985 they started to produce only milk with a*

quota of 12,640 kg and three Frisian cows. When I inherited the farm, I kept on producing meat and the milk output (and the quota) is nowadays over 120,000 kg (Farm 89).

The activity started here years ago with my grandparents. They had three or four cows only. My parents took over the farm 30 years ago and built up a stable with 17 tied cows.. Then I inherited the farm and constructed a new stable with a new milking room. The cows are now in the stable, they never go out, nor do the 'dry cows'. I have 52 cows under production and around 75 animals, and produce more than 450,000 litres per year (Farm 72).

By emphasising the changes regarding the increase of the number of dairy cows, production and land, farmers can ride out the change from small farms producing mainly for subsistence to bigger and modern farms, producing mostly for the market.

(…) when my grandfather emigrated to Cuba, he did it to earn some money because this (agriculture) was not enough to live. Then he met my grandmother, whose parents were Galician as well (…) and they decided to come back. But everything has changed a lot since then. It is difficult now but this is not a subsistence farm anymore, although it is not a Dutch farm for example… anyway I have heard they also have some problems. But it is not the same of course. We grow but are still small (Farm 34).

The transformation realised by the farms was necessary since otherwise these farmers could not live according to the living standards of nowadays. The income was low and as they say, the activity was 'subsistence'. Moreover, with the initial farm structure (little land, few cows, old buildings, no machinery) it would be rather difficult to compete in the market. In the seventies, the agricultural services of extension started to carry out courses, which most of these farmers followed. There a 'new farming model' was presented. This new model required higher output, and a market to sell that output and to provide the inputs, which – in a never-ending circle – would allow farmers to reach that bigger output. In those courses, there was also an explicit argument to be learned: modern farmers should be strongly mechanised to carry out large-scale production, they should have a big and specific type of cattle and they should be specialised if they wanted to increase their output and income. They had to think in economic (profit, monetary) terms, be technically and economically efficient. Some of the farmers have been reflecting about these courses and indirectly about the message they got. As farmers are different regarding the way they understand the activity, also the opinions about the model proposed in those courses is different:

(…) yes, a whole life with cows (…) I have been involved in programmes to increase cow fertility and to improve the pasture quality. But I do not like to use herbicides and pesticides (…) I think there is not enough information about how to do these things. There are no courses. And the government and the unions only defend their own interest. We were told to change, to be big, to have more cows, but in the end, we do not know too much about a lot of this, how they affect us (the pesticides), how they affect the cow. It is not good (Farm 84).

I followed the courses of the Agrarian Extension and the goal was to become specialised and this is what I would like to do (Farm 72).

I did courses with the agrarian extension and the goal was to specialise. And this is what happened here, before we produced meat and milk and now only milk (Farm 78).

The change in the model entailed a change in the management. The traditional way of management based on extensive pasture became very difficult, for many reasons: there is not enough land for the bigger herd, the cow should not lose energy moving to the fields, the farm should specialise in one type of production to become as big as possible. Efficiency is generally linked to high milk yield per cow, a big production per farm, and a good machinery park. Within this framework, the traditional way of management, combining different productions as well as specially the management of the *monte* has been put aside. As a consequence of that, cows are not pasturing any longer, they remain in the shed; the vegetal biodiversity has been reduced to maize and ryegrass; the purchase of concentrates and forage has increased to replace own forage because the land is not enough to feed the bigger herd; animal biodiversity has been reduced to the Holstein Frisian breed. The use of scrub areas is abandoned and forest areas within the farms are destined to industrial wood production or they are ploughed when the 'oldest' pass away, or they give the property to the 'youngest'. In 2004, only two out of the 63 farms that formed the sample had a pasturing system. The rest keep their cattle in the shed. They agree this is easier given the big herd they have, the dispersion and the scarcity of land:

> *(…) It is difficult to have the cows outside, only some people have, only those with land around the farm. I could have them out if my land was close but in the end this also entails more work and you have to be aware that the production will be lower. Maybe not so much as one could expect. I would not mind doing it if could but I cannot. (…) Nobody is taking care like before (of the cows) and we have too many now. And of course we do not go to the forest, we do not take into account the forest anymore, except for selling wood* (Farm 34).

> *I bring my cows outside because I like I it and because I can, my land is surrounding my farm and I do not have big roads around. This is another problem nowadays: you cannot cross just a road when you want. If you cause any accident, you have to pay and you lose your cow…*(Farm 84).

> *(…) we have a problem now with land. We have seven hectares of forest, of pines. I want to cut them and plough them. But my grandmother did not agree. Neither my uncle agrees. When he retires (and she dies) and I inherit, I will do it* (Farm 25).

The transformation of the farms has not been exempt of problems. To obtain higher output levels there were some restrictions: land to produce forage and feed the cattle, labour, and machinery to work the land and to obtain the milk. The land has been indeed one of the most problematic questions for these farmers. The transformation of the farms required to buy and/or to rent new land. Buying was difficult since there was hardly any willingness to sell. Most of the times, they used land from relatives, who emigrated. In the last decade, some farms got the possibility of buying some land, mainly thanks to the disappearance of other farms in the area, although most of the times they can still only rent it.

> *We have 17 hectares of our own but we rent two more. We had the possibility and it has been welcome. It is not easy to get land and I need it because I have around 70 cows* (Farm 36).

The area increased because we have rented land. It is not possible to buy land. People in Galicia do not want to sell (land) (Farm 93).

Today I have around 20 hectares. We have ploughed 5 or 6 hectares of forest and rented 6-7 hectares. We need it because we have 130 head. Buying is difficult and expensive. (Farm 72*)*

I am waiting for a neighbour to retire. She is going to sell me her quota and her land, and I will rent it (Farm 34).

It is impossible to buy land. It is too expensive. In general it is easier to rent it. The contracts are for seven years. I have eight hectares rented. I can stop when I want with this because it is a 'word' agreement. People are afraid to sign papers, they are afraid of the rights the renters can acquire after some years. The prices for renting land are between 300 and € 500 per hectare (in Asturias). In Galicia, the prices are higher… the most expensive can reach € 720 per hectare. And you know, I could pay that if the land was around my house… (the woman interferes and says) Well, not at all, because indeed now we have a lot of land and it is not so far away, so I do not believe you would pay so much (Farm 28).

(…) I increased the area because I rent around 70%. We have big problems with buying land here. It is because of the speculation of the soil with tourist aims – because of the coast area. One hectare can cost between two and three million pesetas (€ 12,000-18,000) (Farm 27).

For transforming the farms, money was needed and it came not only directly from the activity. An important part came from the subsidies of different national, regional, and after 1986 European programmes. Concerning the Cooperative, every interviewed farm admitted that the farm had benefited from one or another type of economic aid. The most common has been the subsidy to improve farm structure. From this money they constructed new buildings, restored old ones, installed new milk production systems, as well as other machinery to crop and harvest.

I have got subsidies for being young (the farmer in his thirties), also for buying quota… well everybody has got subsidy for that. Also I got some subsidies to transform my farm: the milk tank, the milking machine… (Farm 34).

I got subsidies from a Plan of mellora (plan of improvement) for silage and for the quota as well (Farm 36).

Everybody has perceived some subsidies of one or another kind in the last years: to crop maize for example, they cannot get it for the silage, but in the end is for that, and for buying quota (Farm 28).

The Cooperative has also played an important role in the transformation of the farms. Created in 1976, the first goal was to produce concentrates and to sell them among the Co-farmers. Later on, other services were adopted: the technical-economic advice services, the shop for partners, and more recently (in 1992) the park of machinery with the aim of reducing the impact of mechanisation costs by supplying a service of renting machinery and labour to manage the silage and forage. Although they recognise some constraints[10], the perception of the farmers is very positive regarding the Cooperative.

> *'We have been foundational partners of the Cooperative since 1976. The Cooperative was born to supply fodder but it became soon a price regulator of the area. Nowadays it has an important driving role in this area'* (Farm 84).
>
> *'Now I rent a unifeed car from the Cooperative and it is going really well. I have much less work. The Cooperative is working really well. It had some difficult times, but now it is going well* (Farm 34).
>
> *I have now been in the Cooperative for 10 years more or less. I am saving machinery costs because of that and this is always good, to save money. The Cooperative has done good things for the farmers* (Farm 78).

Along with the already mentioned increasing costs, farmers have confronted more recently some political restrictions that affected what was the main imposed goal: to increase production by means of the quota limits implemented after 1993. In general, the quota policy had a lower impact in its beginning but started to be a problem when stricter control[11] on the overproduction (production beyond the quota) was implemented in 2004.

Within the context of the Cooperative, the quota limitation started to be a problem in the last four years, especially for those farmers who aimed at growing constantly, and moreover, in combination with the decreasing tendency of prices farmers received for the milk. In their answers, farmers constantly make reference to this problem, as well as to the high gains of middlemen, the lack of power to negotiate a better price, and the lack of awareness of consumers, who do not mind which price farmers' receive as long as they can buy cheap milk. A few of them – although 81% surpass their quota- made also reference to the quota system corruption.

> *(…) But this is complicated (to increase production) because the price farmers receive for the milk is rather low by comparing it to the one that consumers have to pay (in the supermarket)…And it is said it will drop by around 12-20%. Besides, the price of the litre quota is around 100-110 pesetas (€cts 60-66) while farmers get very often around 30-32 cents… Already a lot of banks are taking the quota as guarantee for the credits (loans). Buying quota is increasing your patrimony, around 35% in my case* (Farm 27).
>
> *(…) My volume of milk quota is 780,000 litres and it is not enough because we are producing a lot per cow. We bought last year 25.000 litres, but it is becoming more and more difficult to buy because of the quota policy and it is becoming more and more expensive* (Farm 26).
>
> *(...) I produce 1,100,000 litres of milk. I am buying quota from farms that closed. A neighbour of mine closed and I paid 15 millions (pesetas) with money I had and for the other 15 million (pesetas) I had to pay for the quota, I asked for a loan. This I am paying month by month. But there are problems selling the quota (and then buying it) because the administration forbids us to sell within the following five years after you have bought it, before for instance it was only three years (…) We should sell a better image of our farms, more information for the consumers, so they can know the true reality of the cattlemen and about the milk quality. It is not possible to buy milk for less than €cts 60* (Farm 78).
>
> *We have not enough quota. We buy a bit every year. We got a bit from the national reserve without paying but now we have to buy it. And this is very difficult within the region (Galicia) and very often we go to Cantabria* (Farm 10).

'So far the Galician farmers could buy quota in Asturias but from this year onwards (2005/06) it is not possible to sell Asturian quota unless you did not get any kind of subsidy in the last five years… which is impossible and it is not happening in any farm (…) the price of the quota in Asturias is cheaper than in Galicia. In Asturias you can buy around €cts 60) per litre while in Galicia you have to pay €cts 70 or 80 per litre' (Farm 28).

The quota is not enough. We are buying quota the last two years (2002 and 2003), 39,000 and 25,000 kg (respectively) but it is getting more and more expensive. In the beginning we were advised not to buy it by the Galician Peasant Union and this was wrong, because then it was much cheaper. Then, we also see a big difference between the prices we get and the prices consumers pay. Consumers have not money or do not want to pay for expensive milk (…) (Farm 36).

My quota is not enough. I could produce much more but I do not want to sell black milk. I do not buy more because the price I get for the milk is too low. This is the real problem. The 'quota' is a good system for controlling production and prices but it is not working because other farmers do not follow the rules (Farm 3).

The gains of the middlemen are too big. This is why the milk is so expensive when it arrives in the supermarket (Farm 72).

Considering now the answers about the low prices of the milk for farmers, the subsequent question is: why do these farmers keep on farming and moreover why do they try to buy more and more quota to increase their production? There are at least two reasons for that. One is that they know that with bigger outputs, the power to negotiate the price is bigger as well. Small productions get lower prices, even when the quality is good and especially when the farm is far away from the main routes of milk collecting:

(…) I belong to a Cooperative of producers that negotiate the price of the milk. It was created in 1996. First, we were 60, now we are 46 (…), not all from the Cooperative. We have to do so, because if you are small or too far away from the main routes of the trucks that take the milk, you get a very low price for your milk (Farm 89).

If you are far away of the processing plant they do not want even to take your milk... so you have to accept low prices for your milk, what else can you do? Here there are not enough farmers to sum up their forces and ask for higher prices (Farm 10).

The second reason led us to notice a feature all these farm share: namely their family character. Typical for family farms is the fact that they can be losing some economic efficiency, increasing production when prices are low (Archetti 1979), because they want above all to maintain the activity, just because they like to be farmers and sometimes because they do not have another way or possibility to work somewhere else.

I cannot negotiate the price, but this is what I want to do. I inherited this farm and I like it (Farm 27).

If I had known all the problems I had to confront (by being a farmer), I would never have left my work in the factory. But now I am here and I have to keep on doing this (Farm 93).

I hope my children will keep the farm. I do not want to force them but I like what I do and even with the problems (of the quota, prices) I have I keep on thinking it is a good way of earning your living, better than working in an office, sometimes even for less money (…)

> *yes, a lot of young people, friends of mine, they prefer to work for less money out of farming because they think this is of lower category* (Farmer 34).

Family labour is present even for those farms that have transformed in a society of partners; most of the time they become SAT (Society of Agrarian Transformation). The members, however, usually belong to the same family. Moreover, this sort of association responds more to fiscal criteria than to entrepreneurship conversion:

> *We are three brothers and have formed a SAT. The farm belonged to my father (Farm 81); (…) in fact the SAT is formed by my sister, my mother, but my mother does not work on the farm, neither does my sister* (Farm 78).

> *With my wife I formed now a civil association. We did it like that because it was better in financing terms, since we were only two and are married. But indeed, every SAT you know is formed by members of the same family most of the time* (Farm 34).

As in peasantry, families are made up of members of different generations: grandparents, parents and (grand)children. The farming activity must consider that the number of consumers is very often bigger than the number of workers[12]:

> *My father is retired but he keeps on helping me now and then, and my mother, well she does not work so much on the farm, but she does at home… we live all together (…) The mother intervened: this is a lot of work as well. It is nice to arrive home and have everything on the table, isn't it, and I also do a lot of small things… but men, they do not think about all this (…)* (Farm 27).

> *We are two persons working full time, but when I, or my husband, are out, my parents help us and work in the farm. The family is formed of six people: my parents, my grandmother, my husband, our daughter who is seven years old. So, there are between two and four people from the family working, but only two working full-time. Sometimes work is not only in the farm, you need help in the house, or with the child* (Farm 10).

The sources of income are diverse because there are different generations living together and because not everybody is dedicated to farming – and very often the number of workers is smaller than the number of consumers. Thus, in the case of the grandparents, they receive a retirement payment, some partners or the farmer himself may have an off-farm job, the children, when adults, can work as well off the farm but keep on living with their parents. Since the budget is sometimes not strictly linked to only farm income, it gives the possibility of making new investments, impossible in some cases if the only one income is coming from dairy farming. Indeed, the farm is in part patrimony of the family as a whole, thus the whole family assists in maintaining it. It is equally a place to live, that is, it is a unit for both production and consumption.

> *I have only worked in the farm and I live with my parents (…) my father who is retired receives his pension and my mother is going to retire soon… yes, everything is in the family budget and this has helped to improve the farm. We consume some of what we produce, of the milk, and also potatoes and vegetables; although not so much as before* (Farm 27).

> *Between 50 and 70% of our family budget comes from farming, and depends on the benefit of the SAT. I have it together with my mother and my sister. My wife works out of agriculture and we live together with my parents and our two children. My father is retired and has a pension. He helps a bit now and then*[13] (Farm 78).

> *Around 70% of the family income comes from the farm. The other 30% comes from the salary of my wife, who is a government employee* (Farm 62).
>
> *The part of the budget coming from the farm is around 75%. My husband and I, we live together with my parents and my grandmother. They are all retired and add their pensions to the family budget, because we live all together and they have helped us in the last investments we had to make (…) we still produce something for own consumption, mainly potatoes and vegetables* (Farm 10).

From the different farmers' answers spread through this text, it is confirmed that the existence of different goals entails different ways to overcome the same problems. For instance, by confronting low prices some of them decide to keep on growing (Farm 27), while others prefer to maintain a smaller production capacity but with a higher degree of autonomy (Farm 84). Some renounce any possibility to negotiate the prices (Farm 100) but others join a Cooperative for that (Farm 89). Some have the possibility and recognise the importance of having a diverse family budget to make investments (Farm 10) while others only have farm income sources and keep their financial costs low (Farm 84).

Very often, farmers choose for producing more than the 'rational and entrepreneurial' parameters would advise, considering the price reduction, or reducing the family expenses to keep on existing: within the constant sample, the Net Margin per family labour unit has reduced between 1993 and 2004 by 4.3% in real terms, while the output keeps on increasing. Every labour unit is obtaining € 580 less on average for the whole group, and half of the farmers reduced their income, while the other nine increased it. Among the nine farmers that increase income, there are, as it will be concluded from the later analysis carried out for year 2004, different styles of farming. What is happening is that farmers, by trying to keep the farm existing, are permanently looking for different strategies (enlargement, intensification, cost reduction). They play their game differently influenced by their structural context as well as by their knowledge (learned by themselves or through others) and particular vision of farming.

What is clear at this point is that despite the homogenous picture the 'modernised model' tries to implement, a more heterogeneous picture has arisen; in few words, there is no global farmer, even when farmers assume the farming modernisation. In the next section, I will show that reality is diverse and presents more than one optimal solution. The existence of such diversity gives, furthermore, the possibility of showing the inadequacy of a unique solution based on specialisation and intensification in a world where resource depletion, pollution, and socio-economic inequities are increasing. Diversity will show, in short, that another (dairy) agroecosystem and another dairy sector are possible.

NOTES

1 In the period 1965-1975 milk production increased by an annual rhythm of 2.7%; between 1975 and 1985, by 4.8%; between 1985 and 1995 by around 2.8% and finally between 1995 and 2000 milk production increased by 0.3% on average every year (calculated from data published by IDEGA s.y)

2 The quota system was introduced in the EEC in the campaign 1984/85 in order to control milk production – key output within the European agriculture: around 18% of the final output (*ibidem*)

3 *Sociedad Agraria de Transformación* (Agrarian Society of Transformation): born in 1941 as an entity that pursues agrarian or agri-food goals, where advantages of combining societies of capital and people are combined.

4 The number of members has increased in the following years. The profile of the average member maintains, although 'other juridical associations' are gaining significance every year.

5 Data from the agrarian farm structure Survey (EEEA) used in chapters 3 and 4 are sound with the stronger process of transformation realised by the Co-farms that we show here. According to the 2003 Survey, the average dairy farm manages 13.9 hectares, 20.6 dairy cows a livestock density of 1.5 dairy cows per hectare (INE 2003). The data of 2005 reproduce the same trend: 15.3 dairy hectares per faro, 22.4 dairy cows per faro and 1.5 dairy cows per hectare (INE 2005).

6 In 2005, 94.2% of the total labour units came from family (calculated from INE 2005).

7 As for the bigger sample, we have data of paid labour in both years, 1993 and 2004, but we only have data of family labour for year 2004.

8 As the constant sample is very much reduced, we count only with five farmers'interviews within it, since the other 13 were not under monitoring in year 1993.

9 Farm 49 is a typical 'Economical' farm, while farm 87 has opted for scale enlargement and intensification and has reduced costs as well but due to the fact that they were very high, indeed the highest within the sample in 1993.

10 The transformation of the Cooperative has been big as well and although with some delay, the system to provide machinery has improved nowadays. There are some farmers, however, who keep on mechanising: 'In the beginning the Cooperative was not able to provide all the services. Some farms had grown so much that there was not infrastructure for everybody. Some of them had to buy machines because of that, but a lot of them just liked to buy those machines. Even now in the last five years some farmers want to have their own tractor, even when they hardly use it. Some of them realise a bit too late when the investment is already done and they have to confront big costs (expert of the Cooperative).

11 Regulation (CE) No 595/2004.

12 In the past, as an old farmer explained children were capital (*os fillos son capital*), meaning that the more children, the more available labour. Nowadays, this is totally different: children are not supposed to work in the farm as main task, at least until they are not obligated to go school. After that, they will choose what they want to do.

13 When they say now and then it means pretty often, especially to milk the cows.

6 FROM STRATEGIES OF MANAGEMENT TO STYLES OF FARMING THROUGH PRINCIPAL COMPONENT AND CLUSTER ANALYSIS

6.1 INTRODUCTION

The diverse logic, goals and strategies involved in the transformation of the farm, shown by the data analysis of the 18-farm sample[1], as well as by the farmers' responses, was the first step to set up the existence of heterogeneity concerning the management. The aim of this new chapter is to show that this diversity entails, furthermore, the existence of different patterns of coherence – or farming styles, on the basis of a bigger sample of 63 farms and their data from year 2004.

Thus, the first goal of this chapter will be to check whether there are different styles of farming as a result of using different strategies of farm management. In order to do so, firstly, I will briefly introduce the style of farming approach. After that the existence of different styles of farming within the context of the Cooperative will be carried out by running a Principal Component Analysis (PCA) and a Cluster Analysis. The PCA will be run by using different technical and economic variables. Such variables will be grouped into different factors or components, which are understood as expression of different strategies of management and will be used as input to run a Cluster Analysis[2]. This second method enables us to group or *cluster* individuals (farmers) according to, in this case, the presence and/or prevailing of one, two, and/or more strategies of management – the components previously obtained by the PCA. Therefore, by constructing these clusters, the main styles of farming that might be distinguished within the group of farmers belonging to the Cooperative in 2004 will arise.

The styles of farming will be characterised by means of the variables used in the PCA as well as other available variables for every farm within every style. By calculating the average and the standard deviation of those variables, and considering the farmers' responses gathered by the interviews, the main goals and features of every style will come up. Once the styles have been characterised in Chapter 7, I will assess their impact on different domains – economic, social and ecological. By doing so, I aim at discovering the potentials and constraints of every farming style to promote higher sustainability or more sustainable agriculture.

6.2 THE STYLES OF FARMING APPROACH

Hofstee introduces the concept of farming style as a generally accepted opinion, shared by a more or less coherent group of people about how an agrarian activity should be carried out. Hofstee developed the concept to explain interregional diversity of Dutch farming. Later on, van der Ploeg reintroduced it to explain the intraregional diversity (Wiskerke 2004).

Furthermore, in his article *The Netherlands, past, present and future* expounds some reflections on the actor-oriented approach developed by Long (1997) – a bottom-up approach – according to which farmers and stockbreeders define and operate their objectives and agrarian practices on the basis of different criteria, interests, experiences and perspectives, developing over time, projects and particular practices about how to organise the activity (Long and van der Ploeg 1994:70; cited by Wiskerke). This approach was an argument to justify *the abandonment of the structure as 'explanans', although without denying the effects of the social, technical, economic and political factors over the agrarian practice*, stating thereby a new *focus*.

An important pillar to construct the actor-oriented approach was the introduction of the labour process approach into rural sociology (van der Ploeg 1995; cited by Wiskerke 2004). This labour process combines three elements considered indispensable for a total understanding of agriculture as highly diversified, social and heterogeneous practice (van der Ploeg 1991; cited by Wiskerke 2004):

1. the process of production and reproduction in agriculture
2. farmers as actors with knowledge and skills
3. the socio-technical relations that involved farmers, who maintain and transform them according to the daily life and labour.

Thus, according to van der Ploeg (1991, 1995), agriculture has a specific character because of the specification of its labour nature. Firstly, labour in agriculture is a combination of manual and mental skills. Secondly, it implies the transformation of live matter (animal, plants, ecosystems) into products to consume or to use as inputs within the process of production. Thirdly, traditionally, labour has been a family question.

Labour, locality and technology are strongly related concepts to analyse and reflect on the agrarian modernisation and are the basis of a new programme, the styles of farming. The Styles entailed by considering these three concepts a methodology and a new approach to research about heterogeneity, and coherent responses to this modernisation within a specific context and time.

Labour, its origin, processes, and links with technology and markets – also with a specific scientific perspective – is the central axis of the styles of farming theory. Production, reproduction, social economic and institutional relations, and the set of natural resources are actually performed by the changes in the labour origin, character and composition.

Van der Ploeg (1994) proposes that locality and heterogeneity are not only the result of the mere repetition of previous expressions but also a repertoire of new responses and strategies to the current modernisation trend within a scheme that entails the elimination of the specific[3]. Modernisation implies that labour processes perform more and more through standardised and regulated processes, thus resulting in a monotonous and homogeneous agriculture (with fewer and specialised breeds, low genetic biodiveristy and so on).

Styles of farming aim at exploring, defining and analysing the diversity of agrarian practices and development. At the same time, this model is a critique to the model of modernisation that imposed a homogeneous and unique agrarian reality, moreover disconnected from locality. This theory is, therefore, within the critical approaches that question the neoclassical approach in economics, which is based on the assumption that market and technology determine the way, contents, direction and rhythm of agrarian development. This model establishes, moreover, only one optimal solution, classifying the agrarian practice as good or bad regarding that optimum. In this respect, van der Ploeg (1990) argues that markets and technology are only the room for manoeuvre; where the different positions the farmers achieved are the result of a specific strategic action. The distancing or integration in markets and technology are the result of a strategic reasoning, influenced by the local history, ecology and economic-political relations in a particular time.

The basic unit of analysis is the agrarian practice that is based on a specific unit of manual and mental work developed by the farmer. How this work is implemented responds to a specific organisation of the labour process and depends on a broad set of interrelations between the production unit and its technical-institutional domain.

According to this theory, numerous studies were carried out within the Dutch agrarian system (on dairy, horticulture and cereals). These studies showed two facts[4]:

- The strong process of modernisaton that entailed the homogenisation and globalisation of the agrarian activity and which was based on the academic assumptions defended by the positivist approach as well as in the (neoliberal) economic guidelines (individualism, no state intervention, free market supremacy).
- The process of heteregoneity as a response to the former process of reconstructing the locality by revaluing the labour process, local culture and natural resources.

Locality is another key element within the farming style theory. Locality cannot be understood as the result of isolation but as something specific, locally constructed. The technical development affected not only the heterogeneity of agriculture but the locality as well. Locality embodies not only a specific geographical context but a particular culture and history that dictate the evolution of the practices (agricultural or not) carried out there (Wiskerke 2004, van der Ploeg 1994a). The reconstitution of locality is a result of a historical and scientific processes and of a local knowledge evolution and all these elements interact and influence each other.

The styles of farming established the local notion of ‘good agriculture’, accounting for all these processes and must create and look for adequate and specific responses to the local conditions and limitations. Styles of farming arise as multi-dimensional and social constructions, socially coherent. They are not pure deductions of the market relations, neither of the available technology. They are the result of a strategic reasoning process. They express coherent behaviours and are underlying *patterns of coherence*.

A style of farming reproduces a way of ordering that aims at creating coherence within the different domains where a farmer and her/his family have to operate with multiple

actors and institutions. From such interaction emerges a *socio-technical network* (as the style comprehends different social and material elements that relate with each other) which entails a particular constellation that gathers these different modes of ordering.

A farming style can be defined and researched at three interconnected levels (van der Ploeg 2003:111):

1. At the level of strategic notions, it is a cultural repertoire and a mode of ordering that guide practical actions and informs farmers' judgements (Roep and Roex 1992, cited by van der Ploeg 2003). In this respect it is a decision-making model and enables calculation. *The strategic notions are time and again shared by a larger number of farmers, it being possible to refer to the networks in which these notions circulate and are discussed.*
2. At the level of a particular practice, whose *structure and internal coherence* is informed (structured) by the cultural repertoire mentioned above. The practice is partly an expression of the strategic actions (of the mode of ordering) of the actors directly involved. And vice versa, necessary feedback emanates from this practice. It reconfirms and/or modifies the cultural repertoire. The particular ordering of the practice can also be regarded as a specific model for income generation (…). In dynamic terms, a farming style emerges, at this level, as a particular development pattern.
3. At the level of a socio-technical network, stressing the significance of the connection between *internal and external relationships*. This determines a set of particular relations between markets and technology supply, on the one hand, and farming on the other. And when marketing ordering and technology policy are explicit parts of governments' agricultural policies, FS can be conceptualised as strategic positions vis-à-vis government policy.

The relevance of showing the existence of different farming styles is the ascertainment of different development routes or potentials, overcoming the idea that the sector is exclusively oriented to and by the technological and market proposals. The styles show coherent patterns, but the possibility of discovering different degrees of sustainability among every style is a new task I propose in Chapter 7 and shows the possibility of developing in different ways.

6.3 THE PRINCIPAL COMPONENT ANALYSIS: LOOKING FOR DIFFERENT STRATEGIES OF MANAGEMENT

PCA is a method for re-expressing multivariate data. It starts by finding a linear combination of variables, which is called a component. Every component gathers a group of the initial variables and accounts for as much as possible variation in the original variables that compound it. The researcher can in this way find the first few dimensions, which account for most of the available information showing latent or underlying patterns that otherwise, would be difficult to find. The first component accounts for most, and much as the variation in the original variables as possible. The second component accounts for as much of the remaining variation as possible and it is uncorrelated with the previous component, and so on. Thus, PCA not only reduces the

dimensionality of the variables, but it also allows the researcher to gain insight into patterns of association (Lattin *et al.* 2003, p. 83-87).

The first question the researcher has to consider is which variables are to be introduced in the model. Here, I took into account the general characterisation, static (year 2004) and dynamic (period 1993-2004), carried out in the former chapter. In this respect, I introduced variables that relate land and labour – two basic factors that a farm has in order to carry on its activity, to the object of labour, the dairy cow. Moreover, I chose as well variables mainly related to the technical and the economic domain[5], which reflect the management of the farm. Finally, 13 variables, which are listed below (as they appeared in the final solution shown by the rotated matrix) have been chosen:

Dairy Cows density rate: ratio of the Dairy Cows per Useful Agricultural Area (which includes the area to produce forage and available for animals to stay outside) *Total livestock density rate*: ratio of the Major Cattle Units (dairy cows, calves and young cows) per hectare of UAA *Land productivity*: kilograms of milk (of a farm and one year) per hectare *Forage Costs per Forage Area (FA)*: Forage Costs include fuel and oil, machinery reparation, machinery renting, seeds, fertilisers, other cropping costs and cropping machinery depreciation. This ratio indicates the costs of producing own forage related to the forage area the farmers have to manage
Area (UAA): Useful Agricultural Area *Cow per TLU*: Dairy Cows per Total Labour Unit *Dairy Cattle*: number of dairy cows (producing) *Milk Output* per farm (Kilogram) *Milk yield per cow*: Kilograms of milk per dairy cow and year
GM per 100 k milk: Gross Margin per 100 kilograms of produced milk *VC per 100 k milk*: Variable Costs per 100 kilograms of produced milk *Maize Cost per FA*: Cost associated to maize production per forage area *Technical feeding efficiency*: Kilograms of concentrate per year per kilograms of milk-cow-year

In order to observe strategies of intensification, I opted for relating the land size[6] (Useful Agricultural Area and Forage Area) to the number of cattle this land had to support, considering dairy cows as well as Major Cattle units (that is, other animals such as calves and heifers destined to be sold or to become dairy cows). I considered as well a technical indicator, as it is the land productivity, through the ratio milk output per hectare and the intensification linked to animal production via the milk yield per cow. The variables to show the different scale of the farms are the total area they manage, the number of dairy cows they have per year, and the total milk output per farm and year.

Another important factor within the farm is labour. All the farms of the sample are family labour based; even those which are under the form of entrepreneurial association, the SAT, and are formed by members of a same family. By introducing some ratios relating the objects of labour, dairy cows, land, or output (milk output) to the labour, I expect to find which farms have opted for a more mechanised model. I

chose, given the restriction of the sample size for introducing variables[7], the number of dairy cows per total labour unit[8].

Furthermore, there are some economic variables related to productive outcomes. This is the case of the Gross Margin and variable costs per 100 kilograms of milk output. The Gross Margin, calculated as the difference between the Gross Product and the Variable costs, can be a good indicator of the significance of the internal decision-making process regarding the agrarian management in the short-run, as well as of autonomy to take decisions and of economic stability. Nowadays farming can be highly dependent on external inputs, which entails a strong dependency on the market conjuncture: an increase on the input price can strongly reduce the Gross Margin and make the activity less profitable[9]. However, the main reason to introduce these two variables is to show whether there are cost reduction strategies, that is, whether there is a group of farmers that maximises the Gross Margin by minimising the variable costs per 100 kilograms of milk. This factor is a good indicator to approximate the existence of low-external-input agriculture or farming economically, always when such cost reduction strategies are further from a too intensifying and scale enlarging oriented model of farming.

The costs derived from obtaining forage (per hectare of forage area) and the maize costs per forage area may help to discriminate in the first case (and when high) those farms with very dispersed and/or small sized plots, which entails higher costs of production. The second variable is used to indicate different strategies of management by opting for the production of maize or pasture. In general, it is easier and cheaper to produce maize, at least in the short-run. However, in the longer-run the soil becomes exhausted and the farmer starts applying an increasing quantity of agro-toxics. I added, moreover, one technical ratio showing how much dependant on external feeding farms can be, by using the kilograms of concentrate with the kilograms of milk obtained.

After choosing the variables, I proceeded to run the Principal Component Analysis by using the statistical packet SPSS 14 for Windows. By doing so, PCA helps to answer the first research question of this thesis: *is there any heterogeneity within this group of farms regarding their way of doing or producing milk?* The answer is, according to the outcomes, positive. Derived from the combination of the 13 variables, the rotated matrix shows three different underlying dimensions or strategies represented by three components or rotated factors, giving a first insight of a heterogeneous picture regarding the management. Every rotated factor will be given a name and explained next[10].

Table 6.1 Main strategies of Management from the Rotated Matrix

	Strategy of Land Intensification	*Dual Strategy*	*Cost Reduction Strategies*
Dairy Cow per UAA	.96		
Total Livestock per UAA	.96		
Milk Output (kg) per UAA	.95		
Forage costs per FA	.76		
Output per farm		.95	
Dairy Herd per farm		.90	
UAA per farm		.84	
Milk yield per dairy cow-year		.70	
Dairy cow per Total Labour Unit		.63	
Gross Margin per 100kg of milk			.88
Variable costs per 100kg of milk			-.87
Kg of concentrates per Kg of Milk			-.70
Maize Cost per FA			-.52

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 4 iterations.

FACTOR 1: LAND INTENSIFICATION STRATEGY

The first factor gathers variables that offer information about the intensification of the available agricultural area: the density of cattle, dairy cows and Major Cattle Units, per hectare, land productivity in terms of milk output, and the costs derived from the production of the own forage.

All of the variables relate positively to each other. High cattle rates per land are linked to high costs of managing the forage area as well as land productivity in terms of output. I name this component 'land intensification strategy'.

This factor shows the strategy of those farmers who have high land productivity, high livestock density and high costs to produce their own forage per forage area. There can be two types of farms within this component: one, where land is a scarce factor and can be highly divided into small plots, which are usually further from each other. This would explain the high cattle density, even with smaller herds than on other farms as well as the high costs of producing their own forage, because of the dispersed and highly divided land structure.

However, there are large-sized farms in terms of acreage but where herd density is high too, because in spite of land availability, the herd is very big as well, in order to obtain high production levels. Here the costs derived from producing own forage are

more linked to the scale (big area) than to the excessively fragmented land structure, although this can exist as well and contribute to cost increase. In the past this strategy was very common since land has always been scarce. However, the management and the farmer's goal, the reproduction of the farm, were carried out in such ways that enable the soil to maintain its fertility and recover. Nowadays, when there is an intensive use of land, it is in general realised beyond the ecological boundaries.

FACTOR 2: DUAL STRATEGY

The second factor is an ambiguous one, meaning that it combines variables that entail different strategies. Thus, there are three variables that are indicative of scale: total acreage, herd and output. The other two variables are representatives of other processes: milk yield per cow, when high, indicates intensification. Intensification may be the result of 'care', when avoiding excess, and therefore attention to the animal in order to keep a certain level of output[11], or the use of biological technology, by means of the use of specific breeds and feeding (specific diets in order to increase the production). The second variable, dairy cow per total labour unit indicates, when high, mechanisation.

Therefore, this factor includes variables showing scale, intensification and mechanisation, which are in fact, three of the goals of the modernisation project. With modernisation, it was expected that farms reduced labour and increased machinery, became larger in terms of area, output, herd and more efficient in productive terms, that is obtaining high yields per cow thanks to improvement of diet, and the breeding specialisation. Thus, the factor shows to a large extent a specific empirical pattern of modernisation in Galicia, a dual strategy that is carried out mainly by increasing milk yield production and scale enlargement, when in other studies both questions appear clearly separated. This strategy is important when considering another specific feature of the Galician dairy sector, namely the power to negotiate. In this respect, a dual strategy gives the opportunity of obtaining a good price for the milk even when quality is not the best.

FACTOR 3: COST REDUCTION STRATEGIES

The third factor gathers information about the annual management of the farm through two economic ratios: the variable costs per 100 kilograms of milk and the Gross Margin per 100 kilograms of milk. The first ratio gives information about the significance of the use of external-input through the costs of such inputs, and the second variable gives information about the gross income (free of the influence of fix costs, linked to depreciations, interest payment, external labour and social insurance). Moreover, this strategy is linked to costs linked to the maize production and to dependency on external feeding.

The different, positive and negative signs of the variables within this factor indicate the existence of a combination of low costs and high Gross Margin per 100 kg of milk, with a low dependency on external feeding and low maize costs. I name this component Cost Reduction Strategies, being aware that the other combination of high variable costs and low Gross Margin is also present and represents a high market dependency.

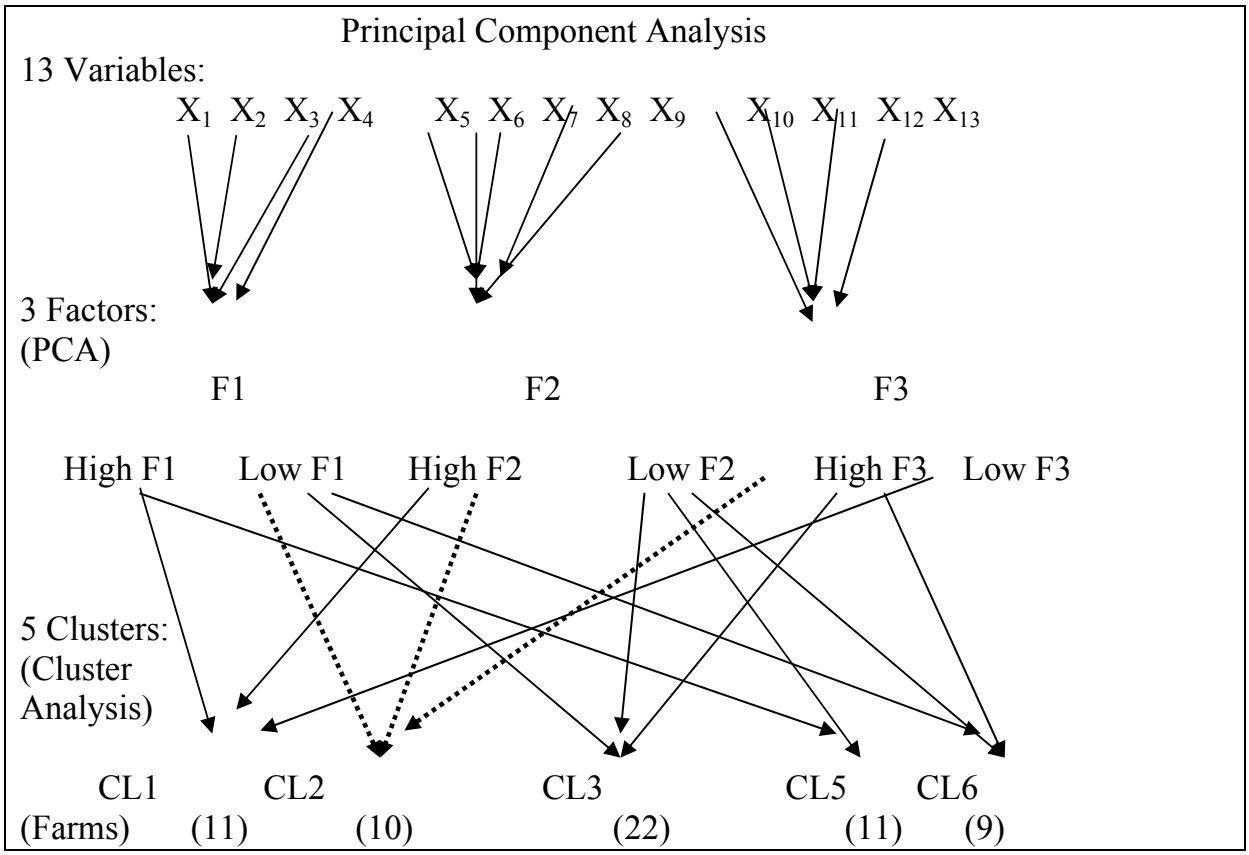
Summing up, the PCA has shown three different underlying strategies to manage and understand dairy farming activity within this 63-farm sample. The three components obtained by running the PCA are used to run a second model: a Cluster Analysis, which will help to identify more accurately which strategy or strategies every farm chooses. The combination of the different strategies within every cluster will profile the styles of farming within the Cooperative.

6.4 THE CLUSTER ANALYSIS: FROM STRATEGIES OF MANAGEMENT TO STYLES OF FARMING

Cluster Analysis is a multivariate method that enables one to classify all of the units of analysis (farms) based on the former three dimensions that were discovered with the PCA: the *intensification strategy*, the *dual strategy*, and the *strategy of cost reduction*. Thus, any farm is going to be involved in one, two and/or three of these processes or strategies.

The hierarchical clustering has been done by using the *Ward's method*[12]. In order to decide the final number of clusters, I observed the *dendrogram*[13] and discussed the classification with the technician of the Cooperative. Given the technical-economic data, the technician's advice and the farmers' answers from the 18 interviews, I finally chose five clusters. The next figure explains how the clusters have been formed by combining the factor loadings of every farm within every component.

Figure 6.1 From Strategies to Styles of Farming: Methods



High makes reference to a positive factor score
Low makes reference to a negative factor score

Thus, running the PCA with the 13 variables, three components were obtained. By running the Cluster Analysis with those three components, using the factor loading of every component in every farm, five clusters arose. The next table shows the average of the factor scores for every cluster within every component.

Table 6.2 Strategies (S.) of Management from the PCA and Farming Styles from the Cluster Analysis

	Intensification S.	*Dual S.*	*Cost Reduction S.*
CL.1 (Vanguard)	0.40	1.27	-0.81
CL. 2 (Cowmen)	-0.20	1.02	0.96
CL. 3 (Marginal Farmers)	-0.49	-0.48	-0.70
CL. 4 (Intensive)	1.25	-0.70	0.27
CL 5. (Economical Farmers)	-0.57	-0.67	1.25

In the first cluster, 11 farms are grouped. They scored positively on the first and second factor and negatively on the third factor. Thus, this cluster is discriminating farms very much involved in strategies related to scale enlargement and milk yield intensification (dual strategy), with very high positive loadings on the second factor; rather intensive, with a positive loading in the first factor; and highly dependant on the market or not opting for cost reduction strategies, as the high negative loading of the third component shows. I name this group 'Vanguard', since they combine strategies of scale enlargement and intensification regarding both milk yield and livestock density and are highly dependant on external (market) inputs, reproducing farming modernisation to a larger extent than the other groups.

The second cluster is grouping 10 farms with a high positive factor loading in the second component, so very much involved in the dual strategy, that is scale enlargement along with milk yield intensification, but rather extensive in terms of livestock density – low negative loading on the intensification strategy, and following cost reduction strategies – high positive loading on the third component. The farms included here have high positive loadings on variables related to size (output, area and herd) with a high negative loading in the first component (land intensification), but intensifying milk yield per cow. Furthermore, farms within this group are following cost reduction strategies (high positive loading in the third component). Thus, on average this group is formed by big farmers, extensive regarding the land, intensive regarding the yield per cow and low market dependant. I name this cluster 'Cowmen' since they operate *by 'keeping an eye' on the cow* (van der Ploeg 2003:125).

The third cluster is the biggest, including 22 farms. They all have negative loadings in the first and second component, not opting clearly for intensification or the dual strategy. The common feature is that, except for two of them (with low positive loadings), the rest has negative loadings in the third component, showing a strategy of dependency on external market inputs, as in the first cluster, but now in small and rather extensive farms. This cluster could be named as 'Marginal Farmers', 'Losers'',

since as I show later their Gross and Net Margin is rather low as they are *punished* by its excessive market dependency and not rewarded with good milk prices. However, in my opinion, these names sound at least pejorative. I think they represent the 'Average farmer', not because they represent strictly the average Galician farmer in terms of output, herd and/or area (although they are close in terms of area and herd[14]), but because they represent the average recessive dynamic of the farming sector in general.

The fourth cluster is formed by 11 farms with high positive loadings in the first component and high negative loadings in the second one (except for one with a low positive loading) They are on average lower market dependant (mainly high positive values in the third component) than cluster 3 and higher dependant than cluster 2 and cluster 5. I name this cluster 'Intensive farmers', since the land being their scarce factor (they are small in this respect), they have the highest cattle density (CMU and/or dairy cows per hectare).

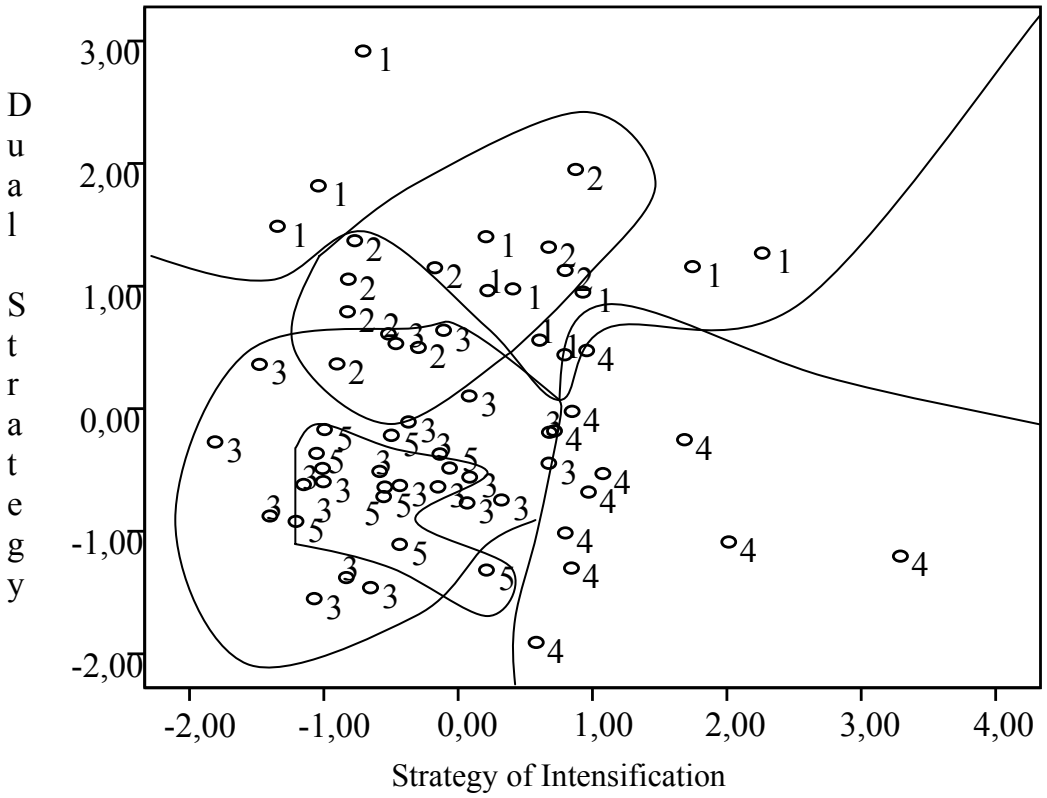
Finally, the fifth cluster is grouping nine farms. They have high negative loadings in the first and second component and high positive loadings in the third component. Thus, these farms are reproducing the dual and intensification at a lower extent than cost reduction strategies, to which they really aim at. I called them Economical Farmers and they reproduce Farming Economically (van der Ploeg 2000). From now onwards Economical Farmers and Farming Economically will be used indistinctively.

The five clusters, or styles of farming, are graphically represented below. Thus, the next two-dimensional figures show the map of the farming styles for the whole sample (63 farms) by combining the factor score of every farm within each of the three main strategies. The numbers refer to the cluster classification (1 for Vanguards, 2 for Cowmen, 3 for Av. Farmers, 4 for Intensive and 5 for Farming economically). In Figure 6.2, the first and second strategies are combined, while in Figure 6.3 the second and the third strategies are considered. Both figures show the overlaps among the different styles, since some of them share strategies and there is always one component out (the figure is 2-dimensional).

In Figure 6.2, cluster '3' and '5' appear together in the first (bottom-left) quadrant because they share the characteristic of being less intensive and smaller than the other four clusters. The difference among them is that cluster '3', representing Av.Farmers farmers, does not follow cost reduction strategies, but as this component is not in the graphic, it is not possible to separate those two groups. Cluster '1' and '2' appear clearly delineated from 3 and they share the characteristic of being involved in the dual strategy; thus, they share the upper part of the graph. Cluster 4 (Intensive farmers) is moreover clearly different from the other four styles since they are small and the most Intensive regarding land use.

Cowmen and Vanguard are involved in dual strategies to a more major extent than the other three styles. The difference between them is that Cowmen are lower Intensive regarding land use than Vanguard. Average Farmers and FE are not choosing for a dual strategy, neither for intensification, as the other three styles are. In order to complement the former figure, duality and cost reduction strategies are combined in the next one.

Figure 6.2 Styles of farming within the Cooperative Os Irmandiños by considering Dual and Intensification strategies (N=63 farms)

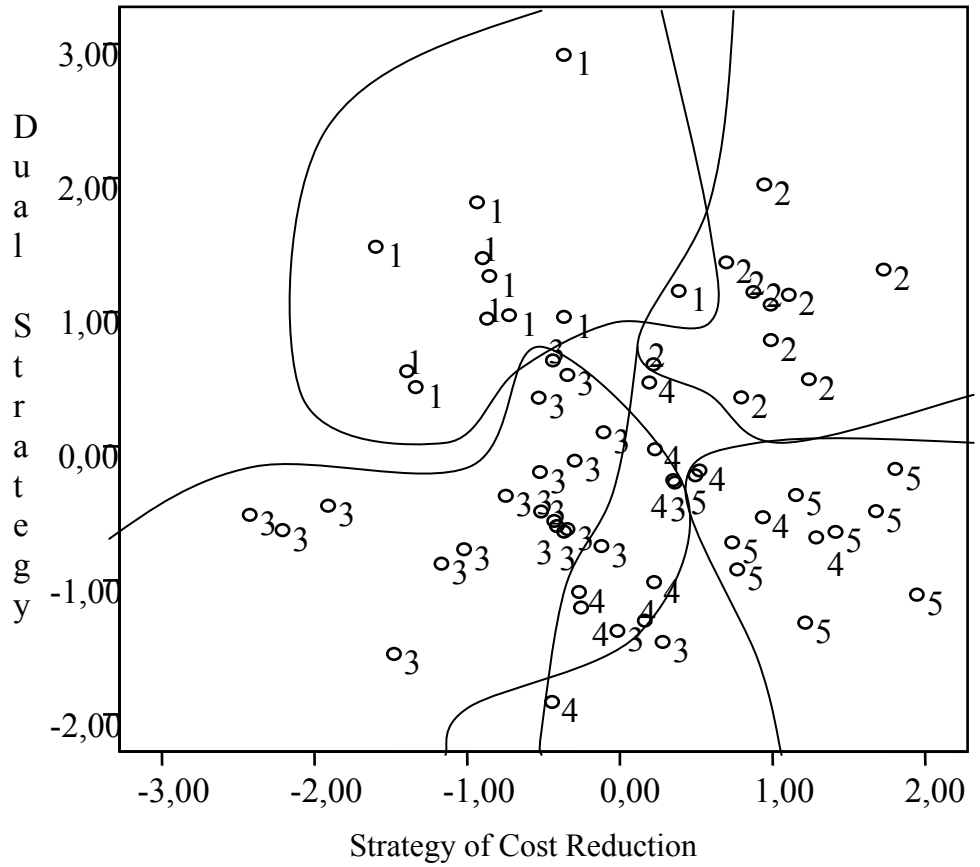


Now, clusters '1' and '2' are clearly separated, since Vanguard (cluster 1) is highly and higher market dependent than Cowmen (cluster 2). Farming economically (cluster 5) stands out as opposed especially to cluster 1 and 3; while cluster 4 shares with cluster 5 the feature of being small but shows not such a clear tendency to cost reduction.

By considering the main features of the different strategies: land intensification, output intensification, scale enlargement and cost reduction strategies, it is possible to define the different styles as opposite images of each other: thus, Average farmers are a mirror image of Vanguard farmers, since being smaller and not so intensive regarding land use, they are spending like Vanguards. Economical farmers are a mirror image of Cowmen, the main difference between them being the scale, which is bigger for Cowmen. Intensive farmers are a mirror image of Vanguard regarding size, since they have different (lower) absolute availability of land but share cattle density to a larger extent than with others.

So far, the factor analysis has underlined the main strategies in which farmers from this Cooperative are involved in year 2004, and the cluster analysis has profiled a diverse picture by constructing five groups where farms combine some of those different strategies. Nevertheless, every group or style maintains general patterns of coherence that enable to distinguish one group from another. To go deeper into those patterns, in the following section, the styles will be widely explained by using a wider range of variables, besides those used already to carry out the PCA.

Figure 6.3 Styles of farming within the Cooperative Os Irmandiños by considering Dual Strategy and Cost reduction Strategies (N= 63 farms)



Therefore, that wider set of variables is shown in the next two tables: in the first one, variables are devoted to show the main farm features of any style; in the second one, variables show the different optimisation criteria, which are, finally, highlighting the different goals that build up any style. In every table, the mean of every variable within every style as well as its standard deviations are shown. The deviation helps to see the heterogeneity within the same style and to observe higher or smaller overlaps among them. In general, it is shown what already could be observed in the former two graphics: e.g., that Vanguard farmers overlap the most with Cowmen and Intensive farmers since they share intensive and scale enlargement strategies. Farming economically differentiates the most from the other five styles regarding those strategies and is the maximum representative of cost reduction strategies, which are used to a smaller extent by Cowmen farmers than by Economical farmers. Intensive farmers are the maximum representatives of land intensification, sharing this characteristic with Vanguards, but being closer in size to Farming Economically farmers. Average farmers are in a sort of medium position regarding the other four groups: they show a high market dependency while being much smaller than Cowmen and Vanguard farmers, although bigger and more intensive than FE.

Table 6.3 Variables to characterise every style

Characterisation	*Vanguard (11 farms)*	*Cowmen (11 farms)*	*MFV (22 farms)*	*Intensive (11 farms)*	*Economical (9 Farms)*	*Average 3 Farms*
UAA (Useful Agricultural Area)	38.3 (15)	34.9 (4.3)	24.6 (7.2)	14.0 (4.4)	18.7 (5.4)	25.9 (11.7)
Forage Area (FA)	37.5 (14)	34.4 (4.3)	24.1 (6.9)	13.4 (4.2)	18.7 (5.4)	25.42 (11.4)
Dairy Cow per UAA	2.6 (0.6)	2.0 (0.5)	2.0 (0.5)	3.1 (0.7)	1.8 (0.3)	2.31 (0.7)
Cattle Major Units per UAA	3.5 (0.8)	2.6 (0.7)	2.6 (0.6)	3.9 (0.9)	2.2 (0.4)	2.99 (0.9)
Kg of concentrates per FA	11,110 (3,618)	7,492 (1,880)	7,203 (2,158)	11,267 (3,076)	4,714 (1,073)	7,981 (3,353)
Milk yield per cow (Milk Kg per cow)	9,488 (883)	10,144 (831)	8,340 (1,083)	8,787 (1,389)	8,277 (808)	8,896 (1224)
Kg of Concentrates per cow	4,071 (607)	3,762 (433)	3,355 (782)	3,471 (742)	2,623 (323)	3,460 (763)
Dairy Cows per Total Labour Unit	37.4 (8.1)	25.9 (6.2)	22.4 (5.6)	20.9 (5.0)	16.3 (4.0)	24.5 (8.7)
UAA_Total Labour Unit	14.8 (4.5)	13.4 (2.9)	11.6 (3.3)	7.0 (2.0)	9.6 (3.7)	11.36 (4.1)
Output (kg) per Total Labour Unit	352,377 (72,685)	260,990 (56,773)	186,112 (48,940)	187,458 (64,355)	135,057 (32,400)	219,969 (89,198)
Variable Costs per Gross Revenues (€)	0.6 (0.0)	0.5 (0.0)	0.6 (0.1)	0.6 (0.1)	0.4 (0.1)	0.6 (0.1)
Price of Concentrate (€) per 100 kg	24.4 (0.8)	24.3 (0.5)	24.0 (0.5)	23.8 (0.8)	23.3 (0.9)	24 (0.8)
Cost of concentrate (€) per dairy cow	992 (149)	915 (107)	808 (198)	827 (189)	611 (84)	832 (195)
Kg of Concentrate per 100 Kg of Milk	43.1 (6.0)	37.1 (2.7)	39.9 (6.5)	39.5 (5.7)	31.7 (2.4)	38.7 (6.2)
Cost of Concentrate (€) per 100 Kg of Milk	10.5 (1.5)	9.0 (0.7)	9.6 (1.7)	9.4 (1.3)	7.4 (0.6)	9.3 (1.6)
Machinery Depreciation (€) per 100 kg of Milk	1.3 (0.8)	1.4 (0.8)	1.6 (0.7)	1.3 (0.6)	1.2 (0.9)	1.4 (0.7)
Milk Output (Kg) per UAA	25,053 (6,617)	19,983 (5,089)	16,650 (4,591)	27,092 (6,137)	14,798 (2,626)	20,643 (7,109)
Forage costs (€) per Forage area	1,274 (322)	867 (216)	956 (259)	1,252 (245)	571 (217)	994 (341)
Maize cost per hectare of maize	906 (149)	436 (401)	751 (344)	429 (431)	316 (399)	610 (404)
% of Maiz Area % of Pasture area	50 50	30 70	30 70	30 70	10 90	30 70
Cost of forage (€) per 100 kg of milk	1.3 (0.8)	0.4 (0.5)	0.8 (1.0)	1.2 (0.5)	0.2 (0.2)	0.8 (0.8)
Cost of forage (€) per cow	124 (80)	36 (53)	64 (70)	104 (53)	18 (15)	70 (70)
Fertiliser costs (€) per hectare	210 (124)	145 (62)	147 (40)	206 (84)	117 (45)	163 (78)

Characterisation	*Vanguard (11 farms)*	*Cowmen (11 farms)*	*MFV (22 farms)*	*Intensive (11 farms)*	*Economical (9 Farms)*	*Average 3 Farms*
Feeding Costs (€) per hectare	3,073 (816)	1,911 (566)	1,804 (654)	3,059 (1,029)	1,131 (272)	2,166 (989)
KgN per Forage Area	139 (71)	111 (58)	93 (29)	130 (65)	51 (23)	105 (56)
Feeding Costs per 100 Kg of Milk	12.0 1.3	9.4 0.9	10.5 1.7	10.6 1.5	7.6 0.6	10.2 1.9
Agrotoxics (€) per forage area	45.6 (25)	21.3 (20)	29.0 (15)	28.3 (22)	18.1 (17)	29 (21)
Calves less than 1 year old per Dairy cow	2.5 (0.6)	2.5 (0.4)	2.0 (0.6)	2.0 (0.8)	1.8 (0.7)	2.2 0.7
Machinery renting (€) per UAA	521 (209)	301 (87)	319 (199)	386 (253)	159 (87)	348 (216)
Machinery Depreciation (€) per UAA	297 (158)	305 (221)	261 (112)	347 (143)	181 (142)	277 (153)
Land Machinery Depreciation (€) per UAA	93 (88)	124 (116)	135 (95)	198 (178)	106 (71)	133 (115)
Building, Machinery and Quota Depreciations (€) per UAA	687 (428)	796 (305)	524 (245)	900 (316)	354 (304)	637 (352)
Land Rent cost (€) per Forage area	74 (57)	110 (34)	94 (58)	80 (45)	53 (44)	52 (63)
Fixed costs (€) per UAA	1,249 (492)	1,171 (344)	912 (329)	1,336 (321)	683 (421)	1,053 427
Total Debt long-run (index)[15] (€)	0.64 (0.1)	0.61 (0.1)	0.59 (0.2)	0.55 (0.2)	0.44 (0.2)	0.58 (0.2)
Fixed Costs (€) per 100kg	5.1 (1.4)	6.0 (1.4)	5.5 (1.6)	5.0 (1.3)	4.5 (2.7)	5.3 (1.7)
Quota Depreciations (€) per 100kg	0.6 (0.8)	1.4 (1.6)	0.4 (0.7)	1.0 (0.9)	0.2 (0.5)	0.7 1.0
Rent of Machinery per variable costs (€)	8.8 (3.0)	8.7 (3.2)	8.5 (3.6)	6.6 (3.0)	7.1 (3.2)	8.1 (3.3)
Family Labour Units per Farm	1.7 (0.7)	2.4 (0.7)	2.0 (0.5)	1.9 (0.3)	2.0 (0.3)	1.99 (0.5)
Total Labour Units per Farm	2.6 (0.7)	2.7 (0.6)	2.2 (0.7)	2.0 (0.3)	2.0 (0.4)	2.3 (0.6)
Number of Dairy Cows	93.4 (17.0)	68.4 (16.9)	47.6 (14.2)	41.7 (8.9)	32.3 (6.3)	55.69 (24.3)
Cattle Major Units	124.5 (22.8)	90.0 (21.5)	62.1 (20.1)	53.1 (13.5)	40.6 (10.4)	72.77 (33.4)
Price received (€) by 100 kg of Milk	35.8 (0.9)	35.9 (1.2)	33.4 (1.7)	33.1 (3.2)	32.2 (2.6)	33 (2.3)
Fat (%)	3.823 (0.13)	3.857 (0.15)	3.871 (0.17)	3.755 (0.2)	3.854 (0.15)	3.838 (0.16)
Protein (%)	3.208 (0.05)	3.161 (0.06)	3.088 (0.11)	3.089 (0.19)	3.048 (0.07)	3.115 (0.09)
Cells (%)	287.6 (74.6)	156.6 (58.2)	222.28 (68.7)	196.80 (108.8)	189.48 (65.3)	209.61 (83.9)
Germs (%)	22.98 (13.9)	17.08 (6.4)	25.80 (15.8)	25.17 (17.6)	19.39 (12.2)	22.75 (14.1)

The information provided by the technical-economic and social data (i.e. the different variables) will be complemented by farmers' answers. Qualitative information enhances the quantitative outcomes, although in some cases the number of interviewed farmers is low regarding. The consistence of their responses regarding the style characterisation has been discussed with one of technicians of the Cooperative.

Table 6.4 Variables showing the criteria of optimisation within every style

Optimisation Criteria	*Vanguard 11 farms)*	*Cowmen (11 farms)*	*MFV (22 farms)*	*Intensive 11 farms)*	*Economical (9 Farms)*	*Average63 Farms*
Output (Kg of milk)	882,148 (160,306)	691,209 (172,867)	403,430 (146,606)	371,870 (117,181)	270,198 (70,337)	508,151 (253,462)
Milk Quota (kilograms)	764,727 (124,709)	652,510 (190,333)	341,051 (137,778)	328,966 97,010)	211,909 (51,193)	442,449 (232,739)
Gross margin (€) per 100kmilk	13.8 (2.1)	19.7 (1.8)	14.1 (2.6)	15.6 (3.5)	19.7 (3.0)	15.9 (3.6)
Variable Costs (€) per 100kg of milk	23.9 (1.7)	18.2 (1.4)	21.6 (2.4)	19.4 (2.0)	14.6 (1.9)	20.1 (3.5)
Gross Margin (€) per Dairy Cow	1,318 (278)	1,995 (220)	1,175 (265)	1,369 (357)	1,622 (256)	1,428 (394)
Gross Margin (€) per hectare	3,475 (1,239)	3,947 (1,124)	2,294 (611)	4,141 (906)	2,925 (731)	3,175,2 1,149,3
Output per UAA (€)	8,375 (2,289)	6,710 (1,851)	5,172 (1,534)	8,369 (2,217)	4,450 (1,002)	6,430 2,355
Gross Output (€) per Total Labour Unit	133,183 (28,997)	98,617 (20,636)	66,332 (16,716)	66,076 (24,069)	45,651 (8,489)	80,130 (34,992)
Gross Margin (€) per Total Labour Unit	49,110 (13,938)	51,265 (12,029)	25,540 (5,832)	28,967 (10,769)	26,061 (5,427)	34,411 (14,622)
Maize cost (€) per ha of maize	906 (149)	436 (401)	751 (344)	429 (431)	316 (399)	610 (404)
Feeding Costs (€) per hectare	3,073 (816)	1,911 (566)	1,804 (654)	3,059 (1,029)	1,131 (272)	2,166 (989)
Annual Quota Purchase (€)	82,035 (41,087)	64,888 (47,638)	40,523 (33,788)	42,099 (21,816)	22,271 (1,958)	53,673 (38,443)
Farms buying quota 2003 and 2004 % of the style	7/11 63.6	9/10 100.0	7/22 31.8	9/11 100.0	2/9 22.2	34 54.0
Farms depreciating quota 2004 % of the style	7/11 63.6	9/10 100.0	11/22 50.0	9/9 100.0	2/9 22.2	38 60.3

6.5 CHARACTERISING THE STYLES OF FARMING

Styles of farming will be next characterised more in depth by considering the wider range of variables gathered by Table 6.3 and 6.4, as well as by farmers' answers collected during the course of the interviews.

6.5.1 VANGUARD FARMERS

Vanguard farmers are large, intensive, and highly dependent on external market inputs. The transformation of their farms over the last decades is confirmed by the interviewed farmers who belong to this style:

Vanguard farmers are large, intensive, and highly dependent on external market inputs. The transformation of their farms over the last decades is confirmed by the interviewed farmers who belong to this style:

> *This farm started three generations ago. My grandparents produced meat. In 1973 they started to produce also milk. My parents inherited the farm and, since 1990 more or less, it has been on my name. My parents retired 16 years ago. So, the farm was first producing meat, afterwards both things (milk and meat) and finally, now, only milk. I have increased a lot the number of cows and the area and now I have a SAT with 4 partners. My quota is over 750,000 litres and it is not enough. I have capacity for producing more but I do not want to sell black milk. In think this (black milk) is the cause of the low milk prices (the farmers perceive). (…) I have around 26 hectares, more than half (57%) destined to maize (…)* (Farm 3).
>
> *My grandparents had four or five cows to produce milk for family self-consumption. The farm has always been oriented to milk, but before in the past it was only for family consumption. My father went to Santander to look for five dairy cows. Land consolidation took place 30 years ago and it was possible to increase the size of the farm. Since 1992-1994, the farm has been on my name and started with around 30 cows. I asked for a 'Plan de mellora' (improvement plan subsidy). Now I have around 60 dairy cows and around 24 hectares, five are rented* (Farm 62).
>
> *We have always been farmers… I remember my grandparents. They had eight cows that produced eight calves. Afterwards my father took it (the farm) and the number of cows increased, to around 15. Finally I inherited it. I was 24, now I am 40. I worked together with my father until he retired. (…) This was a … subsistence farm. It produced a bit of everything, milk, meat… Now it is a SAT and produces only milk. I am not for diversifying. I followed courses in the Extension services and the goal was too specialized and this is what I like and what I do. I have big cattle now and quite high yield per cow (9,840 kilograms per cow per year in 2004). I started with a quota of 33,000 litres, from that I increased to 150,000 and now I have around 900,000… I have to buy more…* (Farm 78).
>
> *My goal is to increase the total output per farm. In order to do so, I try to improve the fertility of the cows and the quality of the milk… for that also the quality of the pasture* (Farm 3).
>
> *(…) We produce only milk. We need much more quota because we have high production. Besides, we need more land because we have very high stocking rate, around 5CMU per hectare. We have rented eight hectares* (Farm 25).
>
> *I produce quite a lot and I keep on buying quota because I have a lot of production. The system to keep the cows has changed. In the beginning, when my parents managed the farm, cows were pasturing, then they were tied up and nowadays they are 'confined in open-sheds', but they do not pasture outside anymore. I tried to do it, but stopped. I produce quite a lot (around 840,000 kg) and I keep on buying quota because I have a lot of production (overproduction). I expect my farm will strongly grow* (Farm 62).
>
> *(…) I have to buy more (quota)… because I have produced around 1,100,000 litres and it is not enough. So I am buying quota from those who closed the farm, a neighbour of mine (…)* (Farm 78).

In order to realise their goal, they have the biggest farms in terms of herd and area: 93 dairy cows and 124 cattle major units, and 38 and 37.5 hectares of UAA and forage area. Having more area than Cowmen farmers, but many more cattle, they manage a

farm with high livestock density: 3.6 CMU and 2.6 dairy cows per hectare, only lower than intensive farmers. They are quite intensive as well regarding the milk yield per cow, obtaining around 9,500 kilograms of milk (per cow per year), but lower than for Cowmen, the most intensive in this respect. In this respect, Vanguard and Cowmen are quite similar. In fact, both of them aim at having big production. The way they do it is, however, different. Vanguards operate with bigger herd and higher livestock density than Cowmen, who obtain the second highest output specially by means of increasing the milk yield per cow.

Therefore, Vanguards are highly involved into the modernisation process and are their maximum representatives within the context of the Cooperative. Although the process of change over the last three decades has been realised by every style, Vanguards have reproduced the features of an intensive, large scale and external input model to a larger extent.

In fact, the high dependency on external (market) inputs is another difference between the two styles of farming, Vanguard and Cowmen. Vanguard, despite having the highest gross turnover per 100 kg (€ 37.7) – from selling milk and calves- get lowest Gross Margin per 100 kilograms (€ 13.8) because of the high (the highest of the five styles) variable costs (€ 24 per 100 kilograms of milk). The high variable costs are shown through different expenses related to output, and/or animal and land (objects of labour). Thus, Vanguards are the biggest buyers of concentrates regarding the output and cattle, spending the most concerning feeding, as regards the output (€ 10.5 per 100 kg of milk) and the object of labour (€ 992.5 per dairy cow). They are also the biggest buyers of forage: € 1.3 per 100kg and € 124 per cow; as well as spending the most in producing their own forage (€ 1.3 per hectare). In this respect they are close to Intensive, whose costs (€ 1.2 per hectare) are, however, related to a much smaller forage area: 13.4 hectares against 37.5 in the case of Vanguard. Intensive have high costs due to the small size and dispersion of their plots, while Vanguards spend more because of their higher production and size.

> *(…) I do not follow any cost reduction strategy. I cannot reduce my costs. The bigger the farm, the more difficult it is to reduce the costs. But I try to negotiate the price of the milk and to increase the volume of my production. In the past I diversified to meat but not anymore (…) I also aim at improving the fertility of the cows, the quality of the milk. For that you have to improve the quality of the pastures* (Farm 78).
>
> *I do not think of reducing costs. I think of having more land, so it would be not as exhausting as now* (Farm 25).
>
> *I tried to reduce some external inputs such as concentrate and forage but mainly the milk yield per cow; my income increased thanks to that. I am also involved in a group of 7 farms to negotiate the price of the milk.* (Farm 3).

In comparative terms with the other styles, along with the low economic efficiency, Vanguards show low technical efficiency as well. They use the most concentrates per output (43.1 kg of concentrate per 100 kilos of milk) and per cow (4,071 kg of concentrate per cow).

The dependency on external inputs is shown not only by the high expenses on inputs linked directly to the output but also to external financing and labour. External financing is roughly shown by the amount of depreciations from machinery and buildings. In this respect, I reviewed the investments realised in every farm as well as the period during the expenses on machinery and builds have taken place. The investment realised is shown by the variable 'debt in long-run', which is actually the part of the total investment that must be still paid. Vanguard farmers must pay 64 €cts per every Euro they have destined to machinery and buildings. The difference is rather small when it is compared to Cowmen (0.61), who moreover started the investment process two years before the Vanguards did (average starting year of the investments: 1985 in the case of Cowmen and 1987 in the case of Vanguard). Therefore in this respect, both of them are dependant on external financing, to a larger extent than the other three styles. However, by considering the variable 'machinery renting', which shows the costs paid to the Cooperative for using the service offering machinery and labour to manage silage and feed cows, Vanguards are paying more than Cowmen: € 521 per hectare against € 301 per hectare, respectively, that is Cowmen paid 40% less with 8% less of the area. This also confirms what was told by the Co-technician about the infra-use of own machinery as well as the fact that some farmers buy machinery because they like it and not because they really need it.

Another way of checking dependency on technology is the ratio that relates human labour units to the objects of labour. Vanguard farmers have an average of 2.6 persons working on their farms – the second highest after Cowmen farmers. The composition of the labour confirms, moreover, that family is still the main labour force, although this group shows as well the highest proportion of paid labour (0.9 units, the highest in absolute and relative terms) over family labour, which only reaches on average 1.7 of FLU, the lowest of the five groups. Nevertheless, despite having the highest quantity of labour per farm in absolute units, they are *labour intensive* as the ratio herd and area to the total available labour, suggests: one unit of labour manages 37 cows and around 15 hectares, while in the other four groups, these ratios are lower.

> *There are two persons working full time: one it is me and the other is either my wife or my uncle, who take turns. (…) We have some temporary labour as well, for example two months in 2003 and four months in 2004. We pay them to milk cows. We pay € 80 per day, but I only pay 40 (the other 40 is paid by the enterprise that collects the milk) and I think it is not a bad system* (Farm 25).
>
> *On the farm there are other people working, paid, (1.5 paid labour units) and I work full time (1 family labour unit). My wife is working outside. I have three sons, who are studying outside, they would keep the farm, I think, but I am still 44* (Farm 62).
>
> *This farm is a SAT. We have people working here (2-3). There is somebody to milk the cows and I am looking for somebody else. I had even people without papers and helped them to regulate their situation but they always leave. Now I am preparing a house for whoever wants to work here. I rather prefer to hire two men than a family* (Farm 3).

In short, Vanguards farmers are carrying out strategies based on scale enlargement by means of having the highest absolute output, acreage and herd size per farm. They are high intensive regarding the units of cattle per hectare and labour, complementing

family labour with off-family labour to the largest extent. They are highly (at most) involved in markets, as regards both variable and fixed inputs. This is why their gross per output is smaller than for the other five styles and the Net Margin per output is smaller than for Cowmen and Farming Economically. Thus, in comparative terms they are less economically efficient than other styles as well as less technically efficient – as they need a higher quantity of input to obtain the same output. The high involvement in markets increases considerably, regarding the other styles, their variable costs per output. They are the higher representatives of farming modernisation.

6.5.2 COWMEN FARMERS

The style of Cowmen has been widely characterised and explained by different Dutch studies (van der Ploeg 2003) thus, in the Cooperative they were given this name due to their resemblance to that Dutch style, although they showed some particularities, due to the different socio-economic context. In the Netherlands, Cowmen, as van der Ploeg (2003:125) explains *will especially keep an eye on the margin per dairy cow. They do this not only to critically guard their aim of the highest possible milk yield per cow ('you have to avoid excess'), but also especially because they are convinced that a good margin per dairy cow is the most important cornerstone of generating a good income (…) their farms are, above all, ordered (constructed) around this relation.*

In the context of the Cooperative, Cowmen are involved into a scale enlargement strategy by means of big output levels, big herd and area (the second biggest after Vanguard). Unlike Vanguards who are also involved in such a strategy, Cowmen farmers are lower intensive as regards livestock density per hectare, higher intensive regarding milk yield per cow and lower market dependant.

Reproducing the dynamics of transformation carried out by all the farms, they started to be small family farms and, although being still family farms, they have increased their herd, acreage and output to a large extent in the last two decades:

> *We started the activity two generations ago, so my grandparents first and then my parents. My father is 55 and I am going to keep the activity (he is 26). The farm started being very small, four to five cows and oriented to meat. Now, it is exclusively oriented to milk and we have around 75 D. cows. My volume of milk quota is around 780,000 (775,000) and it is not enough because we are producing a lot per cow. We bought last year 25,000 litres* (Farm 26).

> *The activity started 50 years ago. My grandparents, they started. They were guard keepers. Now we own the land. My parents inherited and started with Frisian cows, seven or eight. In 1975, I took over the farm and in 1986 I had 46 cows. It was in the beginning for meat and cows. I passed from 175,000 to 600,000 litres of production. I own 500,000 kg of quota but also have to rent some (…). I have around 32 hectares but I rent around 20. This year I bought two hectares. We dedicate as much as time as possible to the cows. (…) My aim is to produce more, and now I can because I rent quota. Our cattle are very good and in fact we participate in cattle contests and gain several prices. The calves are free in a yard. The dry cows are pasturing until 15 days before they give birth and the dairy cows are in cubicles; they get food at will* (Farm 31)

The activity was started by my wife's parents, who inherited the farm in 1997. (…) My family also had cows. I have two brothers who abandoned farming activity and my father closed his farm 12 years ago. He and my mother pre-retired. I kept the farm of my wife because she preferred to live here (…) I try to increase the milk I produce. For doing so I use the service of the Cooperative to rent machinery (to collect grass and do silage). This enables me to save time and this time I devote to my cattle, to take care of the animals and of the production (…) (Farm 28).

My idea is we have to diminish the production, in this way we could diminish the costs and with lower gross income, still maintain a final income that would be like what we have now. I am very interested in the environmental sustainability and worry about the productivistic orientation of the farm. It is polluting the environment; what will happen with our future? I worry for the welfare of the animals, of our cows. After three births the cows become exhausted and die or we have to kill them; we had already some cases. I cannot deal with this because you get attached to the animal and then you do not like them to suffer. But it is not me who takes decisions (he is the farmer's son), so this farm aims at increasing the output, producing around 10,000kg per cow. We have around 600,000 kg of quota…. Yes, it is enough because we bought 'a destajo (meaning a lot)' (Farm 100).

(…) in the beginning the farm was producing meat and the cows were for that (producing meat) and to work, drought animals… Nowadays I produce only milk and my main goal is to increase production (…) I have not many cows per hectare but I produce quite a lot per cow (…) I increased the area because I rent around 70%. We have big problems to buy land here (Farm 27).

Therefore, Cowmen are similar to Vanguard in size: the second highest output (691,208 kilograms of milk per farm and year), area (35 hectares, only three less than Vanguard), and herd (68.4 cows and 156 CMU) that is, managing 94% of the Vanguards area, and 73% of the Vanguard cattle, they obtain 78% of the output. Thus, they are lower Intensive. Intensification is realised by Cowmen farmers by means of high milk yield per cow (10,144 kg per cow and year). In this respect, they are more efficient than Vanguard, since using less in concentrates per dairy cow (3,762 against 4,071 kg) and per 100 kg of milk (37 against 43). Therefore, Cowmen farmers aim, like Vanguards, at increasing their output but they do it not by increasing the number of dairy cows but by increasing milk yield per cow. They also have more labour to take care of animals than Vanguard, which is translated not only into high milk yield but also into high Gross Margin per cow (the highest of the five groups, € 1,995 per cow).

Despite sharing some features with Vanguards regarding size (cattle, output and area) and intensification regarding milk yield per cow, Cowmen farmers show themselves to be lower market dependent than Vanguard farmers (€ 18.2 per 100 kg of milk against 23.9). According to the interviews, it is in general carried out by reducing concentrates, which is logical since they have more land to produce their own forage.

I try to reduce the use of bought fertilizers and forage. But I follow other strategies as well such as negotiating the milk price…I want to improve the quality of the pasture and the milk and the fertility. I have some problems with that (Farm 31).

> *The most I try to reduce is the concentrates I buy in the market of the Cooperative and this helps to increase my income as well as to improve the fertility of the cows… and, yes, also the quality of the milk and pastures* (Farm 28).
>
> *(…) I also 'fought' to convince them (his parents) to reduce costs, especially regarding concentrates* (Farm 100).

Along with the Farming Economically farmers, Cowmen farmers obtain the highest Gross Margin per 100 kg of milk (€ 19.7, the same as FE). The difference with FE farmers is that for these ones, the main strategy is to minimise the costs. Gross output is the combination of production and price, and in the case of Cowmen farmers, the output is the second biggest and the milk price they obtain, the highest of the five groups: € 35.9 per 100 kg of milk. Therefore, despite milk quality being very similar to, for instance economical farmers, Cowmen obtain around € 4 more per 100 kg. This confirms farmers' answers about the importance of having big outputs to obtain better prices and power to negotiate with the big enterprises that collect the milk:

> *I am negotiating the price of the milk and for that try to increase my production of milk. In order to do so, I try to improve the fertility of the cows (to increase production) as well as I to improve the quality of the milk and the pastures.* (Farm 26) (This farmer obtains one of the highest prices within the sample).
>
> *The strategies in this farm are more oriented to negotiate the price of the milk and to increase the output* (Farm 100).

Another significant difference between Vanguards and Cowmen is labour. Cowmen have on average 2.7 labour units per farm and year, practically the same as Vanguards (2.6). However, Labour composition is rather different. In the case of Cowmen, labour is mainly family oriented with 2.4 family labour units and 0.3 paid labour units: 89% of the labour units come from the family against 66% in case of Vanguard.

Regarding the ratios that relate herd and area to labour, Cowmen show some differences from Vanguard as well. While the ratio 'area managed by one labour unit' is rather similar: 14.8 hectares against 13.4 hectares for Vanguard and Cowmen, respectively, the ratio 'dairy cow managed by one labour unit' is rather different: 26 cows for Cowmen, instead of 35 for Vanguard. This difference explains the higher milk yield per cow as well as the higher Gross Margin per cow.

> *I have my cows with 'estabulado trabado' (tied-up), it is a Canadian system.* (According to the technician of the Cooperative who introduced us to the farmers, *there is a very specialized and care monitoring of the cattle in this farm. The dry cows are outside, free as well as those destined to rebreeding)* (Farm 28).
>
> *(…) We dedicate as much as time as possible to the cows. For example, we do not cut the grass, neither do we collect it, we only turn it over and so we can dedicate time to animal care and also we save depreciations (they rent the service of the Cooperative). The calves are free in a yard (…) The dry cows are pasturing until 15 days before they give birth and the dairy cows are in cubicles; they get food at will* (Farm 31).

Moreover, Cowmen farmers have a lower livestock density (regarding Vanguard and Intensive). This is corroborated by the effort in renting land, which is higher than for other styles (€ 109 per hectare (per year) they manage):

No, not all my area is mine. I have rented six hectares plus two, two years ago. I cannot buy land… it is too expensive. The contracts for renting the land last for seven years but I can stop working the land when I want. Most of the contracts are by 'word' because people are afraid of signing papers that can give rights over the land under renting. The price of the hectare varies between 50,000 and 80,000 Pesetas (€ 300 and 500). In Galiza the price is higher (Co-technician says 120,000 (€ 720) per hectare, then the farmer responds)… I would pay that for the hectare if the land was around to the house … His wife: I do not think we would pay that much. We do not really need it now because we have already a lot and not so far away (Farm 28).

This farm has increased the number of cows and area. Regarding the land, around 70% of what we manage today is rented. We have big problems to buy land here. It is because of the speculation of the soil with tourist aims – because of the coastal area. One hectare can cost between 2 and 3 million pesetas (€ 12,000-18,000) (Farm 27).

We have 30 hectares but only 20 ha and 3 ha of forest belong to us. The rest we rent. We manage pasture (grass) and maize and as manure we use 'purin and solid' from the cows (Farm 26).

Concerning fixed costs, Cowmen were shown to depreciate to a larger extent than the other styles, in terms of machinery and quota. However, it is difficult to confirm from these data whether they are more or less mechanised. Probably, given their features (both large scaled), both of them are. There is, however, a remarkable difference regarding the investment in quota, which is much higher for Cowmen (€ 1.4 per 100 kg of milk, while Vanguards spend only 0.6). Thus, Cowmen farmers, with 78% of the total output per farm of the Vanguards, invest double in quota (233%). There are two reasons to buy quota: to grow and to cover the overproduction. In the case of Cowmen, the overproduction is the lowest of the five groups (around 6%). Therefore, while Vanguards are investing in milk quota to cover their overproduction, which is around 15%, Cowmen would designate a small part of the investment to this reason (overproduction), while the biggest part is destined to increase their quota and therefore the final output.

In general, Cowmen maximised the Gross Margin per cow and in order to do so, they opted to extensify regarding livestock density and to reduce the use of external feeding. The care they dedicate to the animal turns into high milk yield per cow.

6.5.3 AVERAGE FARMERS (AV.F)

Average Farmers (Av.F) are, by comparison with the other four styles, medium sized, rather extensive and highly dependant on external market inputs. Thus, regarding production, land and cattle, they are smaller than Cowmen and Vanguards but bigger than Intensive and Farming Economically; regarding livestock density they have the same value as for Cowmen farmers and lower than Vanguard and Av.F; and milk yield per cow is only higher than for Farming Economically. They are only clearly attached to high variable costs per output as well as to fixed costs. Only two farmers within this group could be interviewed but they both are good representatives of the group regarding the area they manage (around 24 hectares), the output (around 400,000 kilograms) and dairy herd (around 50). Moreover, according to the technicians' knowledge, they are good representatives as well of the general feature of the group: high external dependency on market and a sort of 'messy' management, not following

often the advice given by the Cooperative technicians, immersed in a process of growing 'much and fast'.

As in the former styles, these farmers explained how much their farms have transformed. However, as is obvious, the changes have not yet reached the dimension of Vanguard and Cowmen.

> *The activity on this farm started 40 years ago. My parent started it. They had three or four cows. My grandparents inherited more than 30 years ago and built a stable with 'trabados' (tied-up) for 17 cows. Since 1989 we have a new stable with a milking room. Today I have around 20 hectares (22 ha in 2004; 36% is maize, the rest is pasture). We have ploughed five or six hectares of forest. And I have rented six to seven hectares. We have around 100 heads (53 D. cows and 73 CMU, in 2004)* (Farm 72).

> *This farm has been here for at least three generations. My grandparents started the activity. Afterwards my parents got the farm and eight years ago I inherited it. Before, I was working in a bottle industry in the dairy enterprise. I regret having left that job because I have hardly any free time now… but I did it because the enterprise started to do 'garbage' contracts… So when my parents retired I took the farm. We have always produced milk on this farm but it has changed a lot. My grandparents had 8 cows, now I have 80; the area increased because we have rented (land). It is not possible to buy land, people in Galiza do not want to sell (land)* (Farm 93).

According to the data, Average farmers manage 24.6 hectares, 48 milking cows and 62 cattle major units. The average production per farm per year is of 403,430 kilograms of milk. They obtain a low milk yield per cow (8,340), in comparison with the other styles, only higher than the one for Farming Economically. In this respect, they are being low efficient, since by using more concentrates per 100kg of milk (40) than Cowmen and Intensive, the milk yield per cow is lower.

Their main feature is the low economic efficiency shown by their high 'market dependency': spending around € 22 per 100 kg (only € 1 less than Vanguards) when their expenses on external inputs is regarded. They spend the most, after Vanguards, on producing grass (€ 284) and maize (€ 751) per cropped hectare and are high consumers of pesticides[16], spending € 29 per forage hectare (only behind the Vanguards (€ 45) and very close to Intensive farmers (€ 28). They cannot optimise in any other of the factors of production they have: the Gross Margin per dairy cow is the lowest (€ 1,175), as well as the Gross Margin per hectare (€ 2,293). Only two farmers within this group could be interviewed. One confirms that he is not following any cost reduction strategy:

> *No, I do not have any plan to reduce costs… for the moment I focused as I said on improving quality of milk and pastures* (Farm 93).

The answer of the other farmer was quite surprising as the analysis of the data confirmed later. He affirmed to follow cost reduction strategies and to not see any improvement:

> *Yes, I use cost reduction strategies such as reducing the use of concentrates, manure and forage, and try to minimise the loans. I only use my own forage. With these strategies I did not see any improvement of my farm* (Farm 72*)*

However, the ratio of variable costs per output was one of the highest (€ 21 per 100kg), although the relationship between external-internal forage was low, the costs of producing own forage, e.g. maize, were rather high (€ 36/100 hectares, around € 10 over the average) as well as the rather high quantity of concentrates per dairy cow (around 3,200 kg per dairy cow) and finally a rather low milk yield per cow (around 8,000 kg). This corroborates the statement of one of the technicians of the Cooperative: that the farms within this group were in general spending too much because they did not take care of optimising their resources. They were trying to grow fast in economic and physical terms, which required a big effort in investments and variable costs that is not rewarded on the turnover side.

The fact that this market dependency has no reward is clear by analysing the price of the milk. In this respect, they are 'market victims' since, with a very similar milk quality to Vanguard, the price they receive for 100 kg of milk is € 2.5 E lower. Again the lack of negotiating power rises related to the smaller production:

> *I try to negotiate the price of the milk but I cannot do too much because I do not have a big output to negotiate. I am also working to improve cow fertility, as well as the quality of the milk and of the pastures* (Farm 93).

Thus, Average farmers obtain a rather low Gross Margin (€ 14 per 100 kg of milk, only higher than Vanguards), as a result of the combination of low gross revenues and high variable costs.

Average farmers are neither economising regarding the fixed costs, spending € 5.5 per 100 kilograms of milk, the most after the Cowmen. The payments to depreciate machinery (per 100 kg of milk) are the highest (€ 1.6), while the milk quota payments represent only € 0.4 per 100 kg, only higher than for Farming Economically. Thus, they are not investing in quota, as much as others (the second lowest after FE), despite the overproduction (around 18% of their quota).

After Cowmen they are spending the most on renting land. This shows one of the main problems and concerns of some Galician farmers, who by trying to enlarge their farms, having big herds and output, confront land scarcity. In the case of the two interviewed farmers, they refer to the need of having more and better land (not scattered) but it seems rather difficult because of the cost they already confront:

> *I need more land. I have 14 hectares of forest but it is not together (consolidated). I have around 40 plots as well. They are not together either* (Farm 72).
>
> *It would be better to have more land. But I cannot. I already rent most of it* (Farm 93).

They have, moreover, the highest depreciations per hectare concerning the machinery to manage the land: € 135.4 per hectare. These high costs on land machinery combined with the payment they designate to rent machinery (€ 319 per hectare), show that these farmers are rather highly dependant on technological costs. This confirms not only their market dependency on variable inputs but also their tendency to depend on machinery; which would be difficult to state from the ratio object of labour over labour, since they have an intermediate position in this respect: one labour unit manages 22 dairy cows and 12 hectares (middle position of the five groups). They are family farms with low presence of paid labour (10% of the total labour).

From the technical-economic data – given that although representative, only two farmers were interviewed, Average farmers aim at becoming bigger, probably following the strategy of Cowmen, as the costs on renting land show but also and especially of Vanguard, as regards more dependency in general. For that they are spending and investing too fast and too much according to the benefits they are obtaining by selling their output. The technician defined them also as farmers without a fixed strategy, 'a bit messy' since they do not follow the advice from the Cooperative technicians in order to become more economically and technically efficient. Although, unluckily only two farmers within this group could be interviewed, they represent quite well the previous diagnosis.

6.5.4 INTENSIVE FARMERS

The main feature of Intensive farmers is the small acreage they manage: around 14 hectares per farm. They operate with the highest livestock density of the five styles: 3.9 cattle major units and 3.1 dairy cows per total area. They are small regarding the output: producing 371,870 kilograms of milk per farm and year, only bigger than Farming Economically.

> *This farm is three generations old. My grandparents started with it. My grandma was Cuban. She married my grandfather and they came together to Galicia. They inherited the farm. It was a small farm then, only 3-4 rubias and it was for family consumption. My parents worked here until three years ago. Now I am the owner, my parents retired early. In the time of my grandparents, the farm was strictly for family consumption, diversifying production, while now it is oriented to produce milk. The farm is of course much bigger. It increased the number of cows and production, first with my parents, from 4 cows to 20, and nowadays to 40-45. The growth already took place with my parents but because I was working with them. I wanted to be bigger. Now, I produce around 474,000 litres and have 340,000 kg of quota. Three years ago I got a subsidy for young farmers and bought 70,000 kg of quota. I want to buy more, between 100,000 and 150,000 kg more. I am waiting now for a neighbour to close his farm and I want to keep then his land and quota. The most difficult thing, however, is to get land and to get it close by* (Farm 34).
>
> *The farm was of my grandparents and afterwards went to my parents and now I am the owner. In the past there were drought and meat cows. For 15 years we had 'pinta' cows and nowadays we have only Frisian cows. I took over the farm 25 years ago. The quota is not enough; I have too much production. I have to by some more quota. But we have a problem with land. It is expensive to buy and more difficult to find it close to the farm* (Farm 66).
>
> *We have not enough quota and every year we buy more. We got in the beginning a percentage of the national reserve, without paying but nowadays it is difficult to get quota in the region. We went often to Cantabria to get more* (Farm 10).

The transformation of the farms has affected, according to the data, mainly the herd size and the output, and land is the factor under restriction. In general these farmers want to buy more quota and they have all done so in the period 2003-2004. In 2004, they are overproducing around 13% more than their legal limit. Buying land seems not be an option, since it is too expensive and there is not much available.

(…) I rent 6 of the 13 hectares I have. Buying land is very expensive and it is difficult to find somebody who wants to sell it to you. So I keep on having a high livestock density and try to increase the volume of milk and the cow per milk (Farm 34).

We rent two hectares, the rest is ours (17 hectares). We have around 3 heads per hectare which is a bit high, but it is difficult to get more land. (Farm 36).

Three of our nine hectares are rented. We have four hectares of maize and five of meadow. We rotate maize with grass every three years. We use ryegrass and clover and specific mixture. We use maize because it is easier to harvest and to feed the cows. Grass is complicated; if it rains and you do not harvest in time it goes wrong. We do not have so much land available in the area, and we have some that is far away, which also makes it difficult to harvest it. We used it to produce maize because it gives less problems when it rains… (Farm 10).

They use their scarcest resource very efficiently, both in economic and technical terms: they realise the highest land profitability, obtaining the highest Gross Margin per hectare (€ 4,335), and the highest quantity of milk per hectare (27,092 kilograms of milk). The restriction and the distribution of land translate into high costs to produce their own forage (€ 1,252, only a bit lower than for Vanguards with € 1,273 per hectare), despite the fact that they consciously try to follow cost reduction strategies and they managed to spend € 19.4 per 100 kg of milk, more than Farming Economically and Cowmen, but less than Vanguard and Av. Farmers. Confronting the small size of their output, they all tried to improve quality and improve their output, as this will make it easier to negotiate a higher price:

I try to reduce costs especially regarding the concentrates and the forage. I have increased the income of the farm. I try to negotiate the price of the milk as well but this is really difficult because of the production I have. Now, I am also trying to improve the fertility of my cows, the quality of the milk and the quality of the pastures. I start to use a unifeed vehicle from the Cooperative to feed the cows. It saves labour and I follow the advice of the technician with the diet. I hope I can increase in this way the volume of milk by increasing the cow per milk. I really want to make the litre per cow cheaper (Farm 34).

*I do cost reduction, reducing concentrates, fertilizers and forage from the market and this is increasing the income of the farm. I try to improve the fertility of the cows as well as the quality of the milk and pasture (*Farm 66).

I try to reduce my costs specially the concentrates, the fertilizers and forage. And with this I have increase my income. But my main strategy is to increase the quota, besides I do my best to improve the fertility of the cows, and the quality of pastures and milk (Farm 36).

Intensive farmers are small family farms. Paid labour is hardly present 0.1 labour units, against 1.9 from family. Compared to Farming Economically – since they share more similarities in farm structure terms – they are more intensively using this labour concerning the number of cows they manage (21 cows managed by one labour unit, against 16), but less intensively concerning the area (7 hectares managed by one labour unit, against 9.6). However, both styles show higher potential to generate employment in the area, since they are using more human labour than the other three. Some of them would like to have some more off-farm labour but it is difficult given the economic returns and labour availability.

(…) My wife works out now and then. My parents are pre-retired and have money but they do not give their money to me. However they help on the farm. I want to have some more paid labour. Now I have some but not enough. I need it to have a better life quality but it is very difficult to find somebody. I would like to have two people (…) I think the best idea would be to associate with some neighbours, so we could take some holidays but here people do not trust each other…it is thought nobody can do the work as well as oneself does… (Farm 34).

Our family has five members: my wife (49) and I (50), two daughters and one son. They are all independent (working out of the farm). Only my son helps us during the weekend. He is the only one who likes to help here. We can manage in this way. It is not easy to get labour from outside… it is expensive as well… (Farm 66).

We work only on the farm, my wife and I, and we have no paid labour. But the family is bigger: four adults, my parents who are retired and help now and then…(Farm 36).

We are two people working at full time but when I, or my husband, are out then my parents help us. Family is indeed formed of six people: my parents, grandma, husband and daughter (7). Thus, in the end, there are between two and four people from the family working, but not full time. We have no paid labour; it would be expensive (Farm 10).

Summing up, Intensive farmers are those who have less land and try to increase their output; they intensify regarding livestock density. They show themselves to be quite efficient regarding their scarce factor, trying to reduce their variable costs, and to increase milk quality. With no land restriction, probably they will be closer to Cowmen than to Vanguards.

6.5.5 FARMING ECONOMICALLY

Economical farmers are the smallest ones in terms of production with 270,198 kilograms of milk per farm and year, and cattle, with 32 cows and 40 cattle major units; and only bigger than Intensive in terms of area (19 hectares). Thus, they are extensive regarding cattle density with lowest value of the whole sample: 2.2 cattle major units and 1.8 cows per hectare. The only two farmers within the Cooperative that have extensive pasture systems belong to this style.

The transformation of the farm in the last decades has followed a similar path than in the other styles, although by a smaller proportion than their actual scale shows:

I remember my grandparents rented the farm and the house. Afterwards they constructed a house and bought land. They produced meat. My parents inherited the farm and produced mixed (milk and meat) until in year 1985 they started to produce milk, just 1,260 kg with three Frisian cows (Farm 89).

This farm was of my wife's parents, but I have been in charge since they retired in the end of the 60s. In 1966 we had only meat cows. In 1970 we started with dairy cattle and in 1973 we had the first milking equipment and the tank. That year I started together with another neighbour from Ribadeo to trade with Dutch cows. The farm has grown a lot since those years. I have more cows (42) (…) but my cows still go to graze outside some days (Farm 84).

The group FE is oriented to cost reduction strategies, since they spend the lowest per output: € 14.6 per 100 kilograms of milk. Moreover, they obtain the highest (the same as Cowmen farmers) Gross Margin per output as well: € 19.7 per 100 kg of milk. The

high Gross Margin they obtain is mainly due to the cost reduction, since with the smallest output per farm, the price they receive for the milk is also the lowest (€ 32.1 per 100 kg of milk). The difference once again is not in the quality but in the quantity. They minimise the costs, not only by comparing them with the output, but also with other factors of production (acreage) and objects of labour (dairy cow). Thus, they have the lowest cost on fertilisers (€ 117), purchased forage (€ 571), pesticides (€ 18), producing maize (€ 316), grass (€ 189), and purchased feeding (€ 1,131) per hectare; and the lowest costs of purchased concentrates per cow (€ 611).

> *Yes, I consciously follow cost reduction strategies. I reduce to the maximum the external inputs, the concentrates, fertilizers and forage from the market. The same (I do) with external labour and of course with loans. These strategies have helped to increase my income. As I said (before), I am in this Cooperative to negotiate milk prices, and some years I have received good prices. I try to diversify my income by selling meat, but this is not always working because of all the problems we had, you know. I am working now on improving the fertility of my cows. The quality of my milk is very high and the forage I produce is quite good. I belong as well to a Cooperative of milk producers, that we formed in 1996 in order to negotiate the price of the milk. We had several meetings with the neighbours: at the first meeting they were 60, finally only 46 remained. Nowadays we are around 70… but not the same, some had already finished with the activity. Recently we have just opened an 'economato' (a kind of supermarket only for associated members) where we commercialise products that we need to produce, but not milk. The main problem for me, however, is the structure of land… the smallholding. I have a small farm with 30 cows but my plots are so small and dispersed that my work increases a lot and actually it is not profitable in this way to have more cows* (Farm 89).

FE show also cost reduction strategies regarding the fixed costs, which are the lowest of the five styles (€ 4.5 per 100 kilograms of milk). Although some of them have realised investments in the last two years, especially in quota (they are the style who overcomes the most the production, around 21% of their quota), they are still spending less than the other four styles regarding depreciations, or off-family labour.

> *My buildings are old; actually I have renewed them, but slowly. I share machinery and in general my variable costs are very low* (Farm 89).

> *(…) and in 1973 we had the first milking equipment and the tank. (…) I have constructed a new house but we conserved the old one and old sheds as well. We are going to restore them and maybe we will dedicate ourselves to tourism when we retire… that will be soon. In 1986 I constructed a building (nave) to keep the cattle inside as well as a milking circuit to milk. But my cows still go to graze outside some days* (Farm 84).

This low dependency on external inputs of production and of financing (fixed costs) gives them a condition of high stability regarding external shocks or changes that could negatively influence prices, interest rates and output commercialisation.

> *You must be careful with the investments. When the rates rise, the loans become very expensive and milk prices are not having a good trend. In fact, the farmer receives less and less and has to give more and more* (Farm 89).

> *I try to keep my relations with the bank low…I manage my farm following that…* (Farm 84)

Moreover, their technical efficiency is high. They have the lowest ratios of concentrates per cow (2,623) and output (31.7 kg per 100 kg of milk); as well as per hectare (11,267 kg), showing the highest technical efficiency of the five styles.

Only one farm within this group has paid labour. The rest have only family members working, an average of two per farm. They are more human skill oriented than the other four styles, at least regarding the herd care (16 dairy cows per labour unit) and very close to Intensive regarding the land (nine hectares per labour unit).

> *My husband and I, we work each one in our farm, but my parents help us, so this means that there are 1.5 people more working… We have two sons of 19 and 20 years. They are both studying and do not help. Well, we have also, 4-5 days per year, one temporary worker; this is not from the Cooperative and it is for making silage. The silage I make only from dry grass and it is like 120 alpacas (pieces), although this year I only got 70…, it depends on the year. I do two cuts per year in the grass and with machine* (Farm 89).
>
> *Only my wife and I work on the farm, although in the time of the silage we get some help from some retired neighbours. I also rent the machinery for that activity, for the silage. My cattle are out the whole year, free, pasturing. We only have Frisian cows* (Farm 84).

In short, Economical farmers reproduce in this context the features of low-external-input use to a large extent. They minimise the use of external input, as is highlighted by the low variable costs per unit of output. The management is to a larger extent based on pasture and on grass. Maize is a complement to grass and concentrates but they use it to a smaller extent than other styles and this translates into lower costs on biocides. They use own labour and are lower intensive (labour per object of labour) in this respect than other styles, which potentially entails the possibility of generating more employment at regional level. Furthermore, they economise fixed costs, reducing their dependency on external financing. The result is that despite having a smaller output than other styles, their Gross and Net Margins per output are the highest (along with the Cowmen). They show in short high economic and technical efficiency.

NOTES

1 The 18 farms from the smaller sample are included in the bigger sample of 2004 I use now.

2 Both analyses have been run by the statistical packet programme SPSS 14.0 for windows and although I show some of their main results in this section in order to justify our discourse, the total outcome can be consulted in the methodological annexe of this thesis.

3 In this context, the technical development strongly based in the evolution of science causes, at least according to the author, six sorts of disconnections between agriculture and its traditionally structural elements. Within these six disconnections there are some specifically linked to the changes in the labour character and processes. Thus, an increase in labour division due to the technical advances affects the management and reproduction of economic factors such as capital formation and mobilisation, the socialisation of the labour force, mobilisation and redistribution of the soil, of the inputs, knowledge development and the reproduction of social relations. The relation between the labour process and the required labour force is broken regarding the fact that not only the quantity but also the quality of labour is getting more and more superfluous due to the mechanisation process. Another disconnection is related with the disappearance of the family (and gender and inter and intra-generation relations) as the central core of farm organisations. Finally agricultural production

processes and nature and ecology are also disconnected by means of the process of scientification (van der Ploeg 1993). The scientifism assumes that contemporary or conventional science constitutes the only valid knowledge to solve the problems of managing nature. It is the science converted into ideology and the distancing between the processes of agricultural production and the final products (Toledo 1991).

4 The two facts are showing what Chayanov (1966) predicted, a coexistence of a 'dictatorship' of trading and financing capitalism and small-scale family labour (peasant) farms, or a broader heterogeneity in terms of the styles of farming theory.

5 Variables linked to the ecological domain have not been included within the PCA because for most of them there were too many missing values.

6 It is known from the interviews and the declaration of the technicians of the Cooperative that the limited availability of land is a restrictive factor for some farmers, whose availability gives place, however, to different strategies. For example, a farmer who has a small farm in terms of area, can opt for a strategy of intensification, with a high cattle charge per hectare; or, on the contrary he can decide not do that and opt for a different strategy (as it will be shown).

7 One of the rules of thumb to run a PCA analysis is to keep a specific relation of at least 1/5 between the number of variables and the sample size. The sample size here is of 63 farms. In order to keep the relation, I could only choose for 13 variables, which will be exactly the number for a sample of 65 farms. The ratio is then slightly exceeded but after carrying out several analyses with different combinations of variables within a range of 11 to 13 variables, the combination that is used here proved to improve the clustering without disturbing the statistical significance of the PCA. Moreover, all the run models reproduced the same three components.

8 After carrying out different PCA, with different combination of variables for the same sample, all of them grouped together the variables related to labour, as well as gave always the three factors representing the same three processes.

9 The Net Margin (NM) is the difference between the Gross Margin and the Fixed Costs. In this respect, it is a better indicator of the long-term decisions as well as on the degree of financial autonomy and therefore also of dependency and lack of room to manoeuvre in difficult times, from the economic perspective. In this case study, it was considered that the Net Margin is going to remunerate family labour, after having paid all variable and fixed costs, and was not introduced as a variable within our model, although we will analyse later the different values of the NM within the different styles.

10 In order to carry out a Principal Component Analysis, different steps are followed: an analysis of the correlation, a factorial extraction, the extraction of components and the rotation of components. The first step aims at checking whether there is enough correlation between the variables. If these variables were not correlated between them, each of them could be a factor and it would be impossible to find a common factor. The determinant of the correlation matrix should be as close as possible to cero but without having this value (to avoid an identity matrix). In this case, the determinant of the matrix is very small (4.488E-10). The Bartlett's Sphericity test (BS test) enables to contrast the hypothesis that we are not facing an identity matrix. This statistical is obtained by transforming the determinant of the matrix of correlation in a $\chi 2$ distribution, so that the bigger it is, and therefore the lower degree of signification, more probable it is that it is an identity matrix. In this case, the BS test permits to reject that it is an identity matrix. Another text to justify the use of the PCA is the sample suitability of Kaiser-Meyer-Olkin (KMO). This index compares the Pearson coefficients of correlation that can be observed in the correlation matrix, with the partial correlation coefficients between the variables ($KMO = \Sigma\Sigma\ r^2_{ij}\ / \Sigma\Sigma\ r^2_{y}\ + \Sigma\Sigma\ a^2_{ij}$ for $i \neq j$; where, r_{ij} is the Pearson correlation coefficient between the variables i and j, and a_{ij} is the partial correlation coefficient between the variables i and j). A very small value in the partial correlation coefficient for two variables means that the relation

between them can be explained by the rest of variables and the factorial analysis can be a good solution. If the addition of the square partial correlation coefficients is very small, then the KMO will be close to 1 and the analysis is right. In this case, KMO is 0.729, thus the outcomes are acceptable. Furthermore, the anti-image matrix shows the co-variances and correlations between all the variables. The values in the diagonal of this matrix show the Measure of Sample Appropriation (MSA), which are the KMO of every variable. Excepting one, the rest of MSA show acceptable or good results. The first outcome obtained by the PCA is the determination of the communality. The communality is the proportion of explained variable by every component. When a communality is close to cero, the components hardly explain anything about the variability of a variable; whereas when they are close to one, the variability is totally explained by the component. In this case, every value is closer to one than to cero. Therefore we conclude that the variability of the variables is mostly explained by the components. With the aim of determining the number of necessary components to represent the data, it is necessary to examine the total percentage of variance that is explained by every one of them, given that the PCA looks for maximising the total explained variance.In order to decide how many factors must be extracted, I have opted for the Kaiser rule, i.e., those factors with Eigen value higher than '1' and we have checked the Scree plot as well. In this case, the 3 components explain 79.1% of the variance of the 13 variables. Once they have been rotated, the first factor explains most of the variance, 29%. The second factor explains the second highest part of the variance, 27.6%, while the third factor explains 22.1% of the variance. Next outcome is the matrix of components indicating the load of every typified variable (mean cero and standard deviation one) associated with every factor. High values of these loads in absolute terms show a close relation between the variable and the component. The ideal is to find variables that saturate in a component, this means, with a high factorial load in one of the components and low in the others. For a better interpretation of the matrix of components we can rotate the components. I chose for the VARIMAX *method* to rotate. This method minimizes the number of variables with higher loadings in one factor. A factorial rotated matrix has to fulfil three characteristics: every factor must have few high loadings and the rest close to cero, every variable must be saturated in only one factor, there must not be factors with the same distribution, as it happens in the rotated matrix obtained (Table 6.1).

11 In the case of Dutch Cowmen, this is what happens: these farmers work in the basis of maximising the gross margin per cow and through that look for high milk yield per cow, although avoiding excess that could bring an earlier exhaustion of the animal, for instance, which will finally reduce their margin (van der Ploeg 2001).

12 The Ward's method calculates the average of every variable in every cluster. Afterwards it calculates the squared Euclidean distance between every individual and the average of the cluster, adding up all the distances of all cases. In every step, the clusters are those with the lowest increase in the total sum of the squared intra-cluster distances (Bisquerra 1989:412).

13 This decision is taken by the researcher. This does not mean a fall in subjectivity. On the contrary, to decide how many clusters we should have, we did consider the dendrogram, a tree-shaped graphic, as well as our knowledge of the sample obtained from the technical economic data we could manage, the interviews we carried out previously, and the factor scores obtained by running the PCA.

14 The average farm in Galicia with a herd over 30 dairy cows had in 2003 44 dairy cows, 296056 kg of milk output, and 28 hectares of UAA, while these 'Average farmers' had in 2004 around 25 hectares of UAA and 48 dairy cows, and 403,430 kg of milk, in 2004.

15 Considering the difference between the quantity invested in capital (machinery, buildings…) and the value that has been paid, divided by the number of years of the investment. Example: Vanguard: 0.64 means, that for every Euro invested, still 0.64cts have to be paid.

16 The higher costs on pesticides can be linked as well to the degree of toxicity. It happens that expensive pesticides are less polluting than cheaper ones. This is not the case, as we will show in the assessment of the ecological impact of every style in Chapter 7.

7 QUANTITATIVE AND QUALITATIVE ASSESSMENT OF THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF STYLES OF FARMING WITHIN THE COOPERATIVE

7.1 INTRODUCTION

Five styles of farming were found within the Cooperative Os Irmandiños. Every style represents a coherent pattern, which responds to different endowment of resources of diverse nature (land, labour, cattle, financing), as well as different knowledge and goals. The combination of these resources, knowledge and goals is used to obtain a final output, in this case, milk. The production of milk is, in this way, the result of different processes of co-production or co-evolution (van der Ploeg *et al.* 2004; Toledo 1991), by which nature and individuals (society) interact in diverse ways.

If the different resource endowment and goals give place to heterogeneity in farming approached as different styles of farming, should the rationality of every style be questioned? As van der Ploeg (2003) explains within the Farming Style approach, there is no reason to question this rationality, since every style is a coherent pattern of behaviour, representing different logics based on different goals. However, could the impact of every style be questioned? And, is it possible that some styles are more sustainable than others? Therefore, the aim of this chapter is to show that the different styles, in the context of the Cooperative, will entail different impacts on different domains and are finally achieving higher or lower sustainability.

In order to respond to that question, this last chapter of the case study will be structured in four sections. In Section 7.2, I will explain the methodology to assess the impact of every style within every domain. In Section 7.3, the outcomes of the assessment will be shown and from them it will be concluded which styles have higher or lower impact in any of the domains. Section 7.4 will show the 'estimation' of sustainability as every style is concerned. Finally, Section 7.5 is devoted to concluding the potentials for regional development of that or those styles that show that they are more sustainable.

7.2 METHODOLOGY TO ASSESS IMPACT AND ESTIMATE SUSTAINABILITY

The first step to assess the impact is to select the indicators to show the influence of dairy activity on different domains as far as every style is concerned. Based on previous studies on the assessment of the impact of agroecosystems (Conway 1985; Altieri 1987; López-Ridaura *et al.* 2002), I have chosen different indicators (from technical-economic data, physical variables, human labour, etc.) which are usually used to approach the evaluation of sustainability by considering different properties of the agroecosystem (e.g. productivity, stability, equity, autonomy, etc.).

The idea of assessing impact instead of assessing directly sustainability has been explained in the general introduction of the thesis (Chapter 1). There it was explained that sustainability, in order to be more accurately approached, needs to include the changes – in the systems under analysis – *through time* in order to value whether they show more or less ability to maintain production in the long-term.

Although farmers' responses (from interviews) highlighted some of those changes, they are but a small sub-sample (17) within the whole sample of 2004. Moreover, the analysis of the process of transformation realised by the same 18 farmers (only 5 of them were interviewed) in the period 1993-2004 helps to include the temporary dimension only to a small extent. Both of them, interviews and the process of transformation have been inputs to choose the variables that help to define the farming styles in 2004. In this respect, speaking directly about sustainability – or to state which farming styles are more sustainable in 2004 would be rather pretentious. Facing this problem, it is more certain to assess first the impact of every style on the social, economic and ecological domain; and later 'to approach' or 'to approximate' their higher or lower sustainability, since the indicators for assessing the impact are susceptible, at least some of them, to expressing some of the attributes of the agroecosystems to approach sustainability. Please note that in this case study the agroecosystem will be replaced by farming styles, as they represent on average different types of agroecosystems.

The next figure summarises the methodology used in this chapter. The figure stresses first the style as a particular agroecosystem, where different domains are interacting with each other. Within the style itself, as within the agroecosystem, there are also different components – animal, crops, soil, people, institutions – that although they are related to a specific domain, to a larger extent they are also strongly interrelated. The social, economic and ecological impact of every Style is assessed by using different indicators, which relate to those different domains as well as to different components. Those indicators have been selected on the basis of the available data to highlight different properties or attributes of sustainability. Note that classifying indicators, components, and domains all together is complicated, since one indicator can affect different components. Thus, in the matrix of impact, indicators appear classified only regarding domains and attributes.

Figure 7.1 Methodology to assess Impact and Approach Sustainability of the Styles

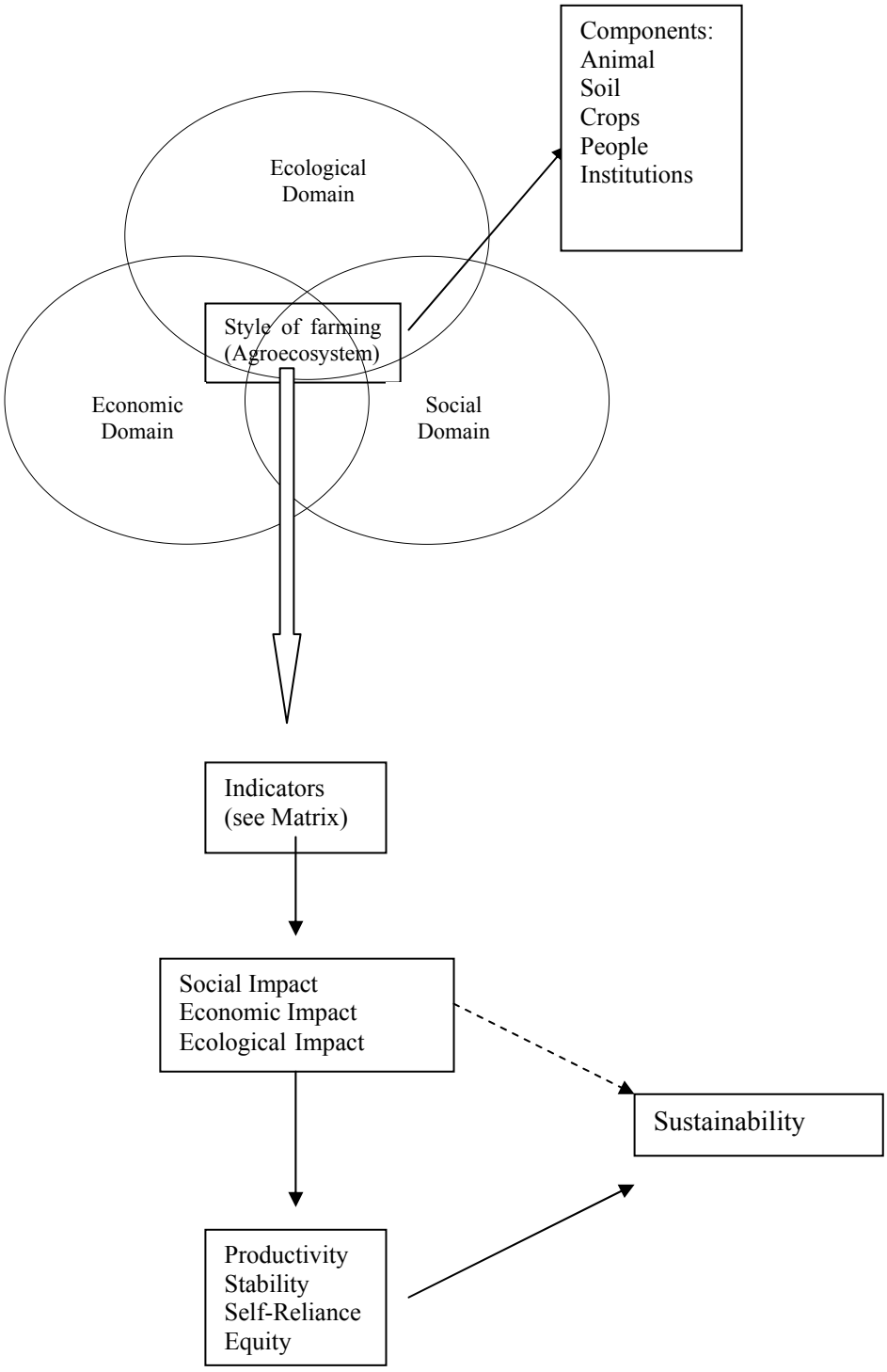


Table 7.1 Matrix of Impact: Basic Indicators to assess ecological, social and economic impact

	Productivity	Stability	Self-reliance or Autonomy Self-empowerment	Equity
Ecological Domain	CMU per UAA	Mandatory herd reform Death calves over born calves Number of abortions per 100 CMU No. of death cows over sold cows Kg of Nitrogen per FA (ha) Kg of Phosphates per FA (ha) Litres or kg of pesticides per FA (ha) Toxicity of pesticides	Kg of concentrate per D.cow and pasturing systems Fuel oil (l) per ha Kg of concentrates per ha (FA)	
Economic Domain	Gross Margin per 100 kg milk	Net Margin per FL Net Margin1 per FL ΔIncome: NM-NM1 (Net Margin stability) Paid labour cost per 100kg of milk	Variable costs per 100kg milk Land rent/ha Pesticides costs per Forage Area (FA) Fertilisers costs per FA Forage cost per ha (own forage costs) Purchased forage per ha (external forage cost) External/internal forage costs on concentrates per dairy cow	
Social Domain			Subsidies dependency Participation in co-programmes	Internal decision on quality Generation employment

* For these variables there are no available data. I mentioned them however in order to show that there are indeed more variables which could be used.
FA: forage area; D. cow: dairy cow; UAA: Utilised Agricultural Area; CMU: Cattle major Units or total herd; TLU: total Labour Units; FLU: Family Labour Units; smi: Spanish acronym for *salario mínimo interprofesional* or minimum professional salary (by law); NM1 is the Net Margin after subtracting the amount that still must be paid in concept of loans; L.S.: Living Standard

As the variables are assessed in different units, e.g. physical, monetary, labour, etc., in order to compare the final impact within every domain and for every style, it is necessary to transform the original value into a common a scale: thus, the original value of the indicator will be represented in the end by an impact score within the interval (1,5), in such a way that those socio-economic indicators close to 5 show 'high impact', whereas the ecological indicators close to 5 show 'low impact'. When the style shows high socio-economic impact and low ecological impact, it is entailing higher sustainability than the other way around. For instance, when an economic indicator, as it is the 'Gross Margin per 100 kilograms', is higher for one style than for other, the economic impact is higher for the first one than for the second one, and is therefore preferable. The same happens with the social indicator 'paid labour units per farm' – this obviously entails a trade-off between social and economic impact, since paid labour implies a cost for the farm, and therefore low economic impact, whereas the higher the units of paid labour, the higher the impact in social terms because of employment generation.

The ecological impact requires some more explanation. As an activity that directly uses natural resources, agriculture is always having an impact on the environment: the higher the impact, the lower the sustainability. Thus, there is always an inverse correlation between the indicator and impact. This is so, in virtue of the second thermodynamic law or the entropy law, meaning that it is not possible to eliminate the externalities or, in other words, it will always be irreversible: stocks and flows of matter and energy are transformed in such a way that they cannot always be reused (Georgescu-Roegen 1996).

Moreover, just to clarify, one of the main challenges to be faced in this last part was to introduce variables to show the ecological impact that were refused when I carried out the styles of farming classification because they are not available for every farm, which would have reduced the size of the initial sample. I use them now, since it is known to which style every farm belongs and, in order to be sound with the original groups of farms within every style, I checked if the new groups – with fewer farms – maintained the characteristics of the original ones; when this happened, I selected the variable, otherwise I rejected it.

In order to transform the original values of the indicators into the (1,5) scale, the following formula have been applied:

a. When a high value of indicator entails low impact:
   $(X_1 - X_i) / (X_1 - X_2) * (Y_1 - Y_2) + (Y_2)$
b. When a high value indicator entails high impact:
   $(X_i - X_2) / (X_1 - X_2) * (Y_1 - Y_2) + (Y_2)$

Where:
X_1 is the maximum value of the variable within the whole sample (63 farms)
X_i is the value of the variable within every style of farming
X_2 is the minimum value of the variable within the whole sample (63 farms)
Y_1 is '5' that is the highest impact score
Y_2 is 1 '1', that is the lowest impact score

Last but not least, a last explanation is needed to clarify that the idea to link indicators of impact to attributes of sustainability started from the review of MESMIS framework. Just briefly, the MESMIS follows the following methodological steps (Guzmán and Alonso 2007):

1 Selection and previous characterisation of the agroecosystem (in this case, style of farming), obtaining basic information (interviews, quantitative data…)
2 Determining the critical points that threaten the sustainability of the system and selection of indicators. Those indicators will be related to some or all the attributes of sustainability: productivity, stability, resilience, equity, autonomy, self-reliance.
3 Definition of the operative criteria to consider: maximum, minimum, etc.
4 Assessment and monitoring of the indicators (e.g. kilograms of pesticides per hectare, Gross Margin per 100 kilograms of milk, etc.)
5 Integration of the analysis through a multi-criteria analysis, presenting the outcomes by a spider graphic.
6 Discussion and recommendations

Step 1 has been carried out in the former chapter. Thus, in this chapter, steps 3 to 6 will be followed to assess impact. Firstly, I constructed the matrix of impact that gathers the main indicators of impact in every domain as well as the relation between the indicators and the attributes of sustainability. Secondly, I will explain every indicator and how it is scoring the impact. As the variables are expressed in different units – some in physical, some monetary units – they will be transformed into a common scale within a range from 1 to 5 (as it was explained above). Moreover, I will explain as well the criteria that link the score and diagnosis of high and low impact. Thirdly, the assessment of the impact of every style on every domain will be carried out and will enable to estimate which styles are having higher or lower impact as the different domains are concerned. At the same time, given the relation between indicators and attributes, sustainability will be approached in every style. By checking the potentials of the different styles regarding impact and sustainability, and linked to different scenarios, discussion and recommendations will close the chapter.

7.3 ECOLOGICAL, SOCIAL AND ECONOMIC IMPACT OF EVERY STYLE OF FARMING WITHIN THE COOPERATIVE OS IRMANDIÑOS

The ecological, social and economic impact of every style will be carried out on the basis of the indicators shown by the matrix of impact. This section will be structured in three sub-sections by considering the three domains. In every section, firstly, a brief justification of the chosen indicators will be given; secondly, the outcomes of the impact assessment will be shown.

Every one of the following three sections show two tables, one the original variables and their values and another with the indicators constructed from those variables expressed in the interval (1.5). Furthermore, there is a graphic that represents the values of the impact scores (second table) for every style by using an amoeba-shape: in every graphic the five styles are represented by a line that links every indicator. The most external line (and thereby a style) will inform about the lowest ecological impact and the highest socio-economic impact (all of them close to 5).

7.3.1. ECOLOGICAL IMPACT

(i) Ecological Indicators

The ecological impact is assessed by variables, which are linked to the animal and the soil component. Concerning the animal component, the assessment of the ecological impact starts by considering indicators that show the 'way of doing'.

Thus, a first indicator is the 'care of the herd'. This 'care' was measured by considering 'mandatory herd reform', that is the number of cows that a farmer has been obliged to send to be slaughtered because they were sick, old or not productive enough, related to the total herd. After discussing this variable with one of technician of the Cooperative who has a wide knowledge about the functioning of every farm, it was concluded that those farms with a higher number of slaughtered cows because of those reasons were shown to take less care of the animal. The indicators 'death of calves over calves born' and 'number of abortions per total herd' denote problems regarding the renewal of the herd and to a certain extent the level of care and health of the cattle. Finally, in some farms the ratio 'number of cows deaths per cows that have been sold' is positive, which implies deficiencies in foreseeing health problems as well as accidents – although the accidents cannot be foreseen, if their number is big, it can be a symptom of slovenliness. The higher the values of these indicators are, the higher the ecological impact (close to 1) and the lower the (ecological) stability.

Within the animal component, I considered as well the demand on external feeding inputs that is shown by the ratio 'kilograms of concentrate per cow': some styles are using a higher quantity of concentrates per cow than others. The use of concentrates entails negative effects on the environment since they suffered an industrial process of transformation and demand of transportation to be delivered, which enhances the use of energetic inputs often derived from non-renewable resources. Therefore, the higher this indicator is, the higher the ecological impact in ecological terms and the lower the self-reliance of the farm.

Concerning the soil, ecological impact is assessed by analysing the use of fertilisers and pesticides. I considered the quantity of chemical fertilisers and their composition, calculating the kilograms of nitrogen and phosphorous per hectare of forage area[1]. Regarding pesticides, besides their quantity (kilograms or litres) per hectare, the degree of toxicity has been considered as well.

In order to introduce the level of toxicity as an indicator, I elaborated a list with the different indications of toxicity (for human beings) and eco-toxicity[2] (for the environment) associated with every pesticide used by every farm. Once the list had been elaborated, I ordered the indications of toxicity and eco-toxicity from minor to major and gave them gave them an ordinal value. I have considered as well the frequency of the use of different sorts of products, which increases the potential level of toxicity. The value obtained in the end has no meaning 'per se' as the litres or kilograms per hectare can have; it is indicative of a lower or higher degree of toxicity. The higher the quantities of fertilisers and pesticides per hectare as well as the higher the degree of toxicity, entailing high ecological impact and low (ecological) stability.

Also concerning the soil component, I use the ratio relating kilograms of concentrates per hectare of forage area. This ratio indicates the change in the herd feeding system that was usually based on the production of own forage: hay, silage and pasture (from forage acreage). Because of the process of modernisation, new feeding systems appear. These new systems entail the combination of concentrates from cereals and the oleaginous, among others, to increase the milk yield. As in the context of the Cooperative farms combine both systems, the 'kilograms of concentrates per hectare' are a good indicator of different ways of management. When this ratio is very low -or lower in one style than in another – the style is closer to low-external input management, is less market dependant and less vulnerable to the evolution of the prices of concentrates. In other words, the farm is more agroecological and more sustainable, enhancing its self-reliance (autonomy).

Another indicator of ecological impact regarding the soil is the livestock density. In this case, I assume the higher the livestock density, the more negative the ecological impact is. A higher number of animals per hectare usually results in a more intensive cropping system to produce forage, with the consequent higher use of fertilisers and/or pesticides to maintain or enhance soil productivity. Furthermore, the cattle produce excrement that goes into a septic tank to be later spread on the fields as manure. The higher the livestock density is, the higher the quantity of liquid manure (*purin*) the soil has to support, therefore the higher the ecological impact and the lower the soil productivity (in the mid- or long-term).

Finally, the quantity of fuel per hectare has been considered to show the degree of use of fossil and non renewable resources. Moreover, it highlights, when high, the strong process of mechanisation and often *overmechanisation*, already explained. The high use of this input indicates high ecological impact and low self-reliance.

Last but not least, I have rejected other indicators that could be interesting to show ecological impact. Firstly, the indicator of productivity 'milk yield per cow' has not been used since it is difficult to deduce whether high milk yield per cow is causing high or low ecological impact with only the data of only one particular year (2004). Furthermore, it not possible to affirm that high yield per cow always entails high or low ecological impact. This will depend on other management criteria; e.g., when high productivity is achieved by using a high quantity of external inputs, the ecological impact is higher than when it based on own forage produced by minimising the use of other external inputs (fertilisers, biocides…) Moreover, productivity can be of higher importance in developing than in developed contexts, since while in the first ones, there can be a goal of solving food problems, whereas in the second ones, this goal has been already largely achieved and output surpluses may be more problematic since they cause, for instance, price reduction or stagnation.

Secondly, other variables such as breed and crop biodiversity regarding the animal and the soil components have not been used for two reasons: regarding the breed, the sample is homogeneous, since the cows are all Frisian Holstein. Regarding the crop varieties, first I do not have data for every farm, only for those farmers who were interviewed and cropping, as in the case of the breed, shows hardly any differences:

maize, rye-grass, clover, and different vegetables for home consumption were common to every farm, according to the farmers' answers. Nevertheless, some differences regarding the area destined to maize and grass have already explained and included in the principal component analysis.

Furthermore, emissions of ammonia and methane from the dairy cattle are also interesting to assess the ecological impact. For doing that, I could consider an average value of emission per animal and by considering the herd, I could roughly estimated the emissions per farm. However, those emissions depend as well on the composition of the feeding given to the animal, data which were not available. Thus, without considering the feeding, the total emission would be totally correlated with the size of the herd, undermining the influence of the diet.

Finally, it must be highlighted that 'pasturing systems', i.e., those in which the herd is grazing outside and entailed lower ecological impact[3] than those ones in which the herd is fed in the stable are only present in two farms; both of them Economical Farmers. Within our sample, only two farmers use this system, both of them are Economical Farmers. I decided not to include it since, although it could positively score economical farming, the fact is that the other seven Economical Farmers follow the conventional system. Thus these two farmers are an exception and cannot be considered as a feature of farming economically, at least regarding our context. However, pasturing systems are highly indirectly related to the consumption of concentrates per dairy cow, which has been considered.

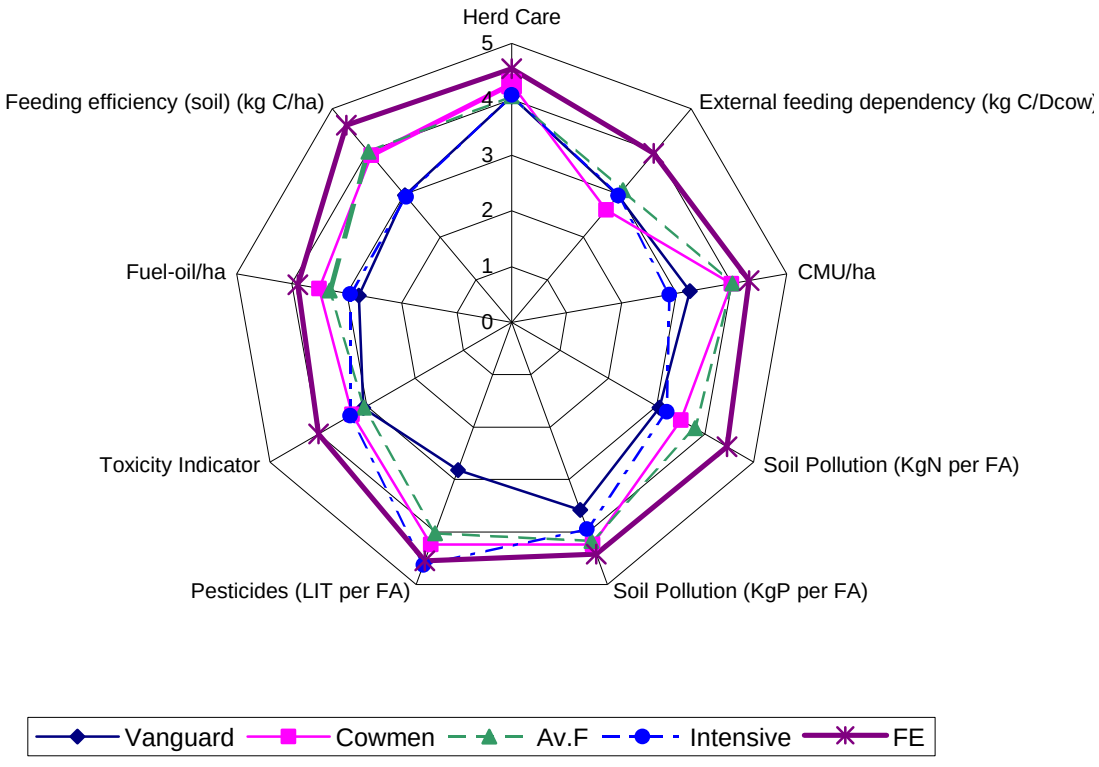
Table 7.2a Original variables and values for assessing ecological Impact

	Vanguard	*Cowmen*	*Av.F*	*Intensive*	*FE*
Mandatory Herd Reform	0.2	0.24	0.22	0.19	0.12
Death calves over Birth calves	0.18	0.07	0.11	0.05	0.04
Abortion (over 100 CMU)	1.6	1.2	2.3	2.3	1.2
Death (cows)	0.12	0.05	0.08	0.13	0.03
External Feeding dependency (Herd)	4,071	3,762	3,355	3,471	2,623
CMU per UAA	3.503	2.608	2.586	3.940	2.234
Kg N per FA	139.5	111.3	93.1	129.9	51.1
Kg P per FA	128.36	68.8	75.05	95.55	52.67
Pesticides (l) per FA	3.1	1.1	1.4	0.5	0.6
Pesticides (Kg) per FA	0.04	0.01	0.08	0.27	0.01
Toxicity Indicator	3.4	3	3.4	2.9	2.1
Fuel-oil/ha	29,717	20,504	22,941	27,639	15,554
Concentrates (kg) per forage area	11,110	7,492	7,203	11,267	4,714

Table 7.2b Scores of Ecological Impact

	Vanguard	*Cowmen*	*Av.F*	*Intensive*	*FE*
Herd Care	4.049	4.27	4.057	4.08	4.55
External feeding dependency (kg C/Dcow)	2.969	2.63	3.1	2.968	3.96
CMU per UAA	3.240	3.997	4.015	2.872	4.313
Soil Pollution (KgN per FA)	3.06	3.5	3.79	3.21	4.45
Soil Pollution (KgP per FA)	3.58	4.24	4.17	3.94	4.42
Pesticides (LIT per FA)	2.82	4.24	4.02	4.63	4.55
Toxicity Indicator	3.07	3.3	3.06	3.34	4
Fuel-oil/ha	2.78	3.5	3.31	2.94	3.89
Feeding efficiency (soil) (kg C/ha)	2.98	3.91	3.99	2.94	4.61

Figure 7.2 Ecological Impact



(ii) Assessment of the Ecological Impact

By considering the indicators explained above, and as the table of indicator scores or easily their graphic representation, Farming Economically shows the lowest (although represented by '5' to make an easier comparison with the socio-economic impact scores) ecological impact, while Vanguards are the ones with a high (negative) impact on the ecological domain.

The ecological impact of Farming Economically is lower than for the other styles regarding every indicator by means of using fewer inorganic fertilisers, pesticides, lower intensification and less fuel oil, therefore contributing less to soil pollution. In fact, the differences with the other styles are specially related to soil and to a smaller extent to herd care. Although showing a lower indicator score in external feeding (3.96) and fuel oil per ha (3.89) compared to the other indicators, Farming Economically is always showing lower ecological impact than the other styles.

After Farming Economically, the ones with the lowest ecological impact are Cowmen and very closed Average farmers. The difference between these two styles are that Cowmen are making higher use of concentrates while Av. Farmers are making higher use of inorganic fertilisation and pesticides, in this case also with a higher degree of toxicity. In the case of Intensive, the restriction of land makes them to be quite intensive in the use of external feeding and the high density of cattle, which is pressing the soil quality and it is accompanied also by higher use of inorganic fertilisation. Vanguards show the highest ecological impact by means of higher quantity of all kind of external inputs (fertilisers, pesticides with high degree of toxicity, concentrates, fossil energy), as well as more problems regarding herd care (higher ratio of deaths regarding calves and cows).

7.3.2. ECONOMIC IMPACT

(i) Economic Indicators

The variables used to assess the impact within the economic domain are those that relate gross income and variable costs to the output, to the objects of labour (land and dairy cow), as well as those that show labour remuneration, and external financing dependency.

Regarding the animal component, Gross Margin per output (100 kilograms of milk) indicates when the value is higher, with a higher economic impact; on the contrary, 'variable costs per output' indicate when low, with high economic impact[4]. Furthermore, high scores of the Gross Margin per output will be used to indicate high (economic) productivity, whereas high scores of variable costs per output indicate high autonomy, as they refer to high mobilisation of internal resources. Note that this indicator could also indicate (economic) stability, since lower external input use reduces the risks of being affected by negative economic conjunctures (e.g. price input increase).

Regarding the human component within the economic domain, 'income (Net Margin) per family labour unit' (NM/FLU) shows family labour remuneration. Moreover, by considering the payments of capital loans that are not included within the calculation of the Net Margin but are paid by the farmers annually, a new variable has been calculated: Net Margin1 (NM1). By calculating the difference between NM/FLU and NM1/FLU, labour remuneration stability in the short-run is obtained. In both cases, the higher the labour remuneration (before paying annual capital loans) and Net Margin stability, the higher the economic impact and the higher the stability.

'*Payments for fixed off-family labour per 100 kg of milk*' is an indicator of labour costs. Having off-family labour is considered an advantage from the social perspective, since it entails employment generation, and therefore off-family labour units, when they are high, will be considered to assess social impact, scoring positively on it. However, within the economic domain, they entail a cost for the farm. Thus, the higher this indicator, the lower the economic impact and (economic) stability of the style.

Concerning the soil component, I consider the economic impact of renting land, by using the ratio 'land rent costs per UAA', as this entails dependency of an external input, I assume that higher values of this ratio indicate lower economic impact and lower self-reliance. Furthermore, within this component, costs derived by the production of own forage related to the purchase of forage are used to obtain the indicator 'external/internal forage'. Finally, the costs derived from the use of fertilisers and pesticides per hectare, assuming that higher costs increase the negative impact as well as reduce the self-reliance because of the higher dependency on external inputs. In this respect, the higher the dependency on external forage and the use of fertilisers is, the lower the economic impact and self-reliance.

(ii) Assessment of the Economic Impact

The next two tables show the indicators – the original values in the first one and the impact scores in the second one, that have been explained above in order to approach the economic impact of the styles. A high score (close to 5) means high economic impact and it entails a positive feature.

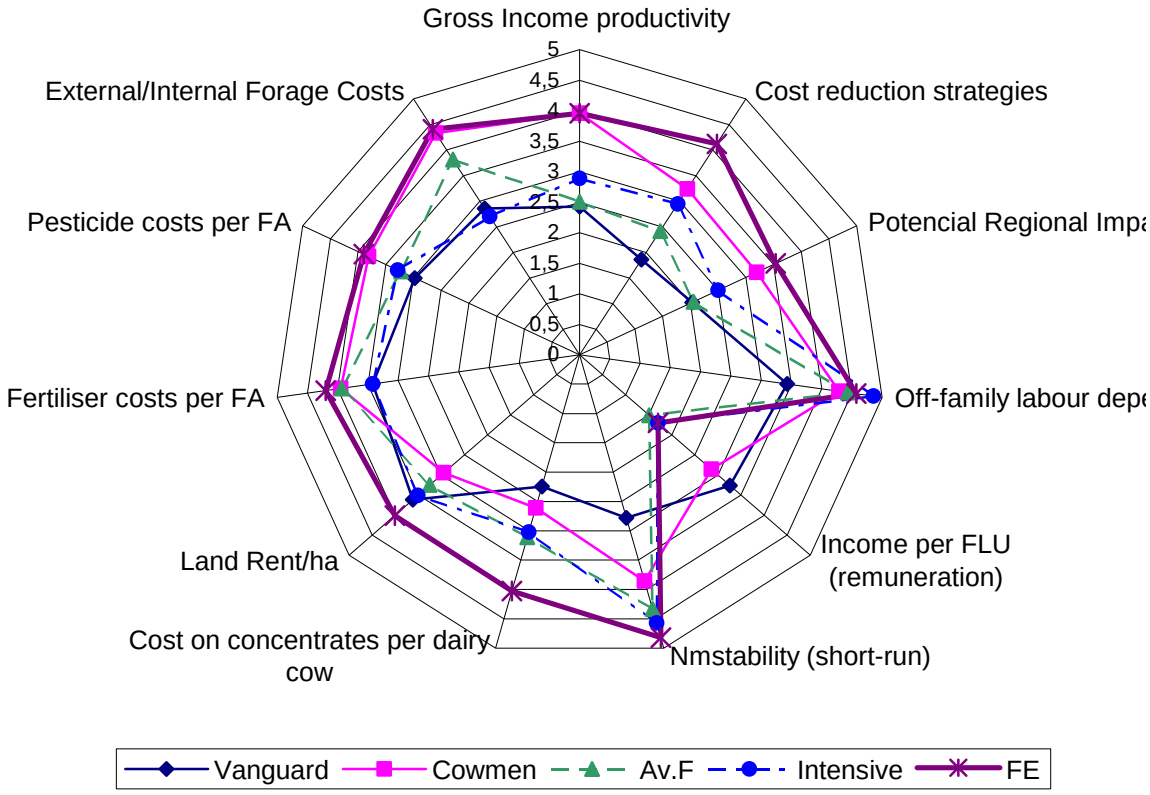
Table 7.3a Original variables and values for assessing economic Impact

	Vanguard	*Cowmen*	*Av.F*	*Intensive*	*FE*
Gross Margin per 100kgMilk	13.8	19.7	14.1	15.6	19.7
Variable Costs per 100kgMilk	23.9	18.2	21.6	19.4	14.6
Net Margin per 100kg (potential Regional Impact)	12.7	13.7	8.5	10.5	15.2
Paid Labour Cost/100kg Milk	1.1	0.5	0.4	0.1	0.3
Net Margin (NM) per Family labour unit (FL)	49,596	42,092	17,182	20,688	20,751
Net Margin 1 (NM1) per FL	29,101	31,617	10,967	16,714	19,097
Δ(NM-NM1) (%)	-41.32	-24.89	-36.17	-19.21	-7.97
Cost on concentrate per dairy cow	992	915	808	827	611
Land Rent cost /FA	74	110	94	80	53
Costs on biocides per Forage Area (FA)	45.6	21.3	29	28.3	18.1
Cost on Fertilisers per FA	210	145	147	206	117
Costs on Own forage per FA	1273.6	867.8	956.3	1252	571.1
Cost on External Forage per FA	312.3	84.5	141.3	355.7	32
Ext/Int forage	0.26	0.08	0.15	0.28	0.07

Table 7.3b Scores of Economic Impact

	Vanguard	*Cowmen*	*Av.F*	*Intensive*	*FE*
Gross Income productivity	2.43	3.96	2.51	2.89	3.96
Cost reduction strategies	1.86	3.24	2.42	2.95	4.12
Potencial Regional Impact	2.03	3.20	2.06	2.50	3.54
Off-family labour dependency	3.43	4.29	4.43	4.86	4.57
Income per FLU (remuneration)	3.26	2.86	1.51	1.701	1.704
Nmstability (short-run)	2.78	3.86	4.33	4.57	4.82
Cost on concentrates per dairy cow	2.25	2.61	3.11	3.02	4.03
Land Rent/ha	3.62	2.95	3.25	3.51	4.01
Fertiliser costs per FA	3.42	3.95	3.93	3.42	4.20
Pesticide costs per FA	2.98	3.81	3.23	3.29	3.90
External/Internal Forage Costs	2.86	4.33	3.81	2.70	4.41

Figure 7.3 Economic Impact



The styles with higher economic impact (thereby positive, and graphically represented by the most external line) are Farming Economically and Cowmen. Intensive occupied an intermediate position and Av. Farmers and Vanguards, by this order, are behaving less efficiently in this respect.

Farming Economically is performing the best in every indicator except for the one that shows income per family labour unit, and which is only higher than in the case of Intensive. It is, however, compensated in both cases by higher income stability. On the contrary, in terms of Net Margin per output, showing the potential of cost reduction strategies as regards variable and fixed inputs, Farming Economically shows the highest impact and Av.Farmers and Vanguard the lowest.

Vanguard shows the most negative impact in general because of their highest involvement in using external (market) inputs related to concentrates per dairy cow to larger extent than for soil management. On the contrary, Av. Farmers showed comparatively lower costs on concentrates than on soil management. Thus, their economic impact is more negative regarding the second one. This was observed already in the ecological impact when they showed lower consumption of concentrates per dairy cow than Vanguards, and even than Cowmen. As the milk yield per cow is lower than in any of those styles, they should probably reconsider not so much the quantity, but more the composition of those concentrates in order to improve their yields, as well as they should reconsider the way they manage their soil, aiming at reducing their dependency on external inputs linked to maintain fertility and/or biocides.

7.3.3. SOCIAL IMPACT

(i) Social Indicators

The impact of the activity within the *social domain* is assessed by indicators related to the human component.

The milk output per total labour unit is used as an indicator of potential employment generation in the area. In this respect, those styles that show a higher value (more output per labour unit) are showing a lower capacity to generate employment. If every style behaved in that way, the potential employment would be lower in the context under study, as it will lower the social stability and/or potentially the equity.

Another indicator of social stability is subsidies per 100kg of milk. In general, higher subsidies per 100 kilograms of milk contributed to increase the Gross Margin. In the Cooperative, subsidies are given mainly under the unique payment for output production and cereals, specifically maize – specifically the forage area destined to maize in 2000/2001 and 2002 was considered, and the quota was divided by this maize area. Another sort of subsidy is the one for breeding. In this case the regional government gives a subsidy when the farmers use the semen provided by the Xunta. There are subsidies to finalise the mother's milk feeding and other subsidies to improve the farm. They are not disaggregated. If they were, it would be possible to check their different significance and if it was mostly related to scale (output or area), it would be indicative of inequity. However, they may highlight, despite the economic benefit, a dependency on external aids; when these economic aids disappear or change, they will restrict the possibilities of the farm to keep on developing in the same way. The lower the subsidies are, the higher the social impact and the autonomy (or self-relience).

The decision-making process refers to the farmer's decision power regarding commercialisation. This indicator is based on checking the orientation to produce in the basis of quantity or in the basis of quality. As it was explained by the farmers during the interviews, in general, farmers are at a disadvantage as regards the milk suppliers, since it is the enterprise that collects the milk which in the end decides the prices, most of the times more based on the quantity than on quality. Furthermore, it is also known that the power to negotiate the price received by the milk increases when the total output (per farm) is higher.

In order to know which of these two criteria has a higher influence on the final prices of every style received for the milk, I assessed the correlation among milk price, quality of the milk (protein, fat, cell and germs) and milk output (regarding both the output and the quota). By doing so, it is possible to observe, within every farming style, whether the price is responding more to the production (higher correlation) than to the quality, or vice verse. The result was that for the smaller producers (Intensive and Farming Economically), the price was higher correlated with the quality than with the quantity; while for bigger farmers (Vanguard, and Av.F.), the price was higher related with quantity than with quality. An exception is the case of Cowmen, where the prices are only correlated with the quality despite having high output; but they have, moreover, the best milk quality of the five styles.

In terms of social impact and decision mechanisms, assuming that farmers are pressed to produce more in order to get higher prices, this reduces the equity of the system. Therefore, I considered that those farmers who are not producing big quantities but still have a good quality, as is the case of intensive and FE, are going to score higher regarding social equity than those who obtain higher prices due more to quantity than to quality.

Finally, the participation of farmers within the Cooperative has been considered by accounting the services they are making use of. The Cooperative offers mainly economic advice to those farms which supply their economic data, and in this respect all the 63 farms (and every style of farming) make use of that service. The same occurs with the supermarket to buy fertilisers and fodder. However, this does not happen with the pesticides. Some farmers buy these products outside the Cooperative and are out of the control of the co-technician. Another service monitors the fertility of the herd and it is also not followed by every farmer. Therefore, three main co-services have been considered: economic advice, pesticide supply and fertility. The higher the number of services they use, the higher the participation within the Cooperative and the more positive the social impact, increasing the self-reliance.

(ii) Assessment of the Social Impact

As for the economic impact, the indicators that score close to 5 show high social impact, which entails a preferable outcome.

Table 7.4a Original variables and values for assessing social Impact

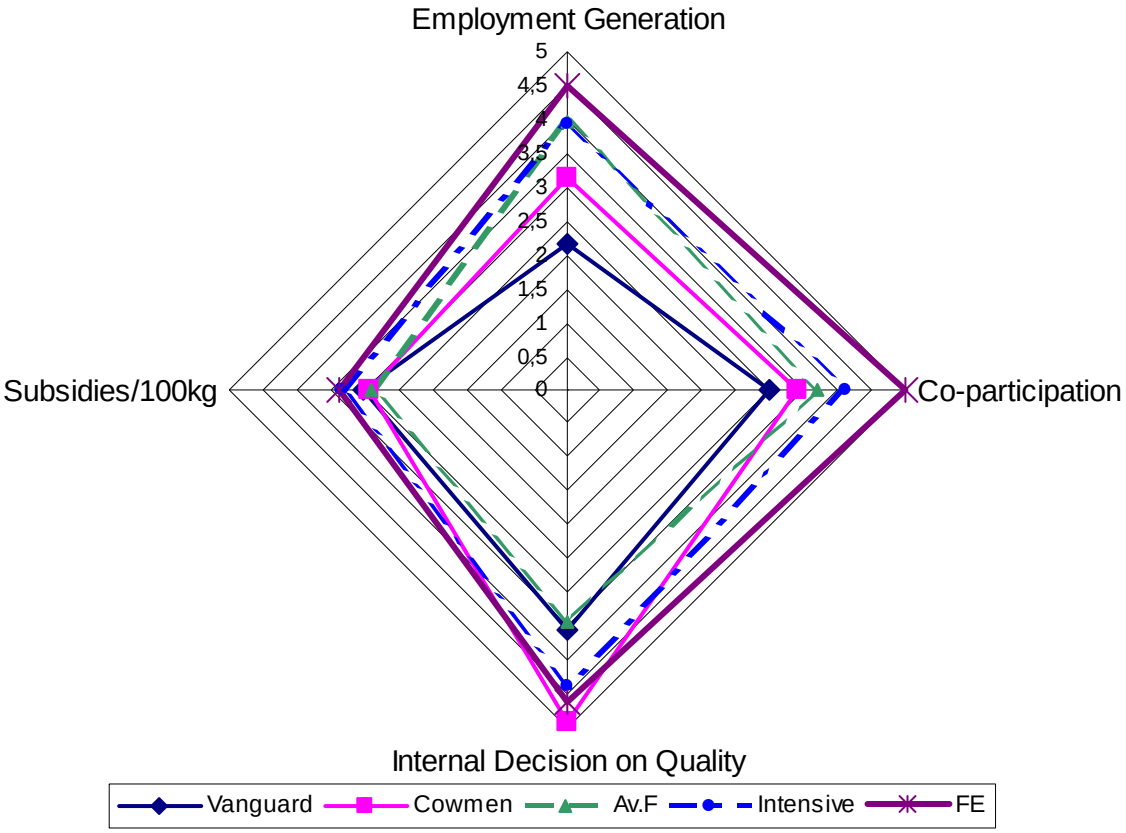
	Vanguard	*Cowmen*	*FVM*	*Intensive*	*FE*
Output per LU (empG)	352,377	260,990	186,113	187,458	135,057
Subsidies per 100kg	2.1	2.2	2.2	1.9	1.9
Co-Participation (number of activities)	2	2.2	2.4	2.5	3
Quality over quantity	No	Yes	No	Yes	Yes

Table 7.4b Scores of social Impact

	Vanguard	*Cowmen*	*Av.F*	*Intensive*	*FE*
Employment Generation	2.16	3.15	3.95	3.94	4.5
Co-participation	3	3.4	3.7	4.1	5
Internal Decision on Quality*	3.55	4.9	3.43	4.39	4.63
Subsidies/100kg	3.02	2.92	2.9	3.35	3.38

*Calculated in basis of milk quality and on the existence (scoring 1) or non existence (scoring 0) of correlation between quantity, quality and price per kilogram.

Figure 7.4 Social Impact of the different styles of farming



Farming Economically shows the highest social impact due to a higher capacity to generate employment, to the lower dependency on external turnover, to high participation within the services provided within the Cooperative and to the capacity to decide internally on quality over quantity. The differences with the other styles are regarding the decision on quality, specifically with Cowmen and Intensive, as well as on the dependency on subsidies regarding Intensive farmers. Vanguards show once again the lowest impact.

7.4 APPROACHING SUSTAINABILITY FROM SOCIAL, ECONOMIC AND ECOLOGICAL IMPACT

So far, Farming Economically has shown the lowest ecological and the highest socio-economic impact, performing potentially better to achieve higher sustainability.

Table 7.5 summarises the main attributes of sustainability of the different styles. The different indicators have been grouped now to show some of those attributes. By considering the available data, we can approach potential sustainability (note that data refer to only one year) through productivity, ecological stability, economic stability, equity and self-reliance[5].

Farming Economically shows in general higher productivity, more ecological and economic stability, equity and resilience.

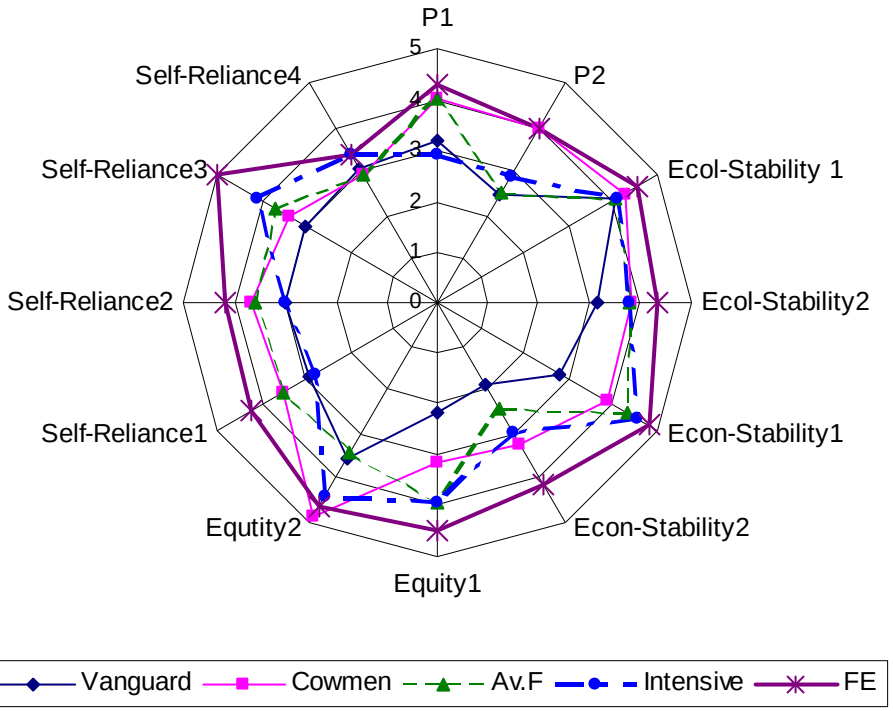
In order to show productivity, two variables have been chosen: intensification by considering dairy cattle density (per hectare) and Gross Margin per output. The higher the number of cows per hectare, the higher the ecological impact on the soil ecosystem is. Intensive farmers and Vanguards develop such a strategy because of different reasons. In the first case, it relates to a lack of land; whereas in the second case, it helps to achieve the goal of increasing the output as much as possible. In both cases, however, the pressure on the soil is high/higher than in other styles and therefore contributes to a larger extent to the pollution of aquifers (by nitrates). In the case of Vanguards, sustainability may be potentially lower than for intensive farmers since they manage a bigger herd, which entails higher emission of gasses to increase greenhouse effect. As I explained above, this possibility should be tested by considering the diet composition of the animal, and this is not at my disposal.

The second indicator (Gross Margin per 100 kg of milk) shows productivity in economic terms. Farming Economically and Cowmen show that they are the most efficient in this respect, since for the same quantity of output, they are obtaining the highest Gross Margin. The difference between them is that while Cowmen obtained it because they receive a higher price for the milk, Economical Farmers are following cost reduction strategies to a larger extent. Thus, although regarding productivity (specifically P2) they are the same, regarding economic stability (see Econ-Stability 2), Economical Farmers are more sustainable.

Tabel 7.5 Attributes of Sustainability within the context of the Cooperative and regarding every farming style

	Productivity	*Vanguard*	*Cowmen*	*Av.F*	*Intensive*	*FE*
P1	Intensification	3,2	4,0	4,0	2,9	4,3
P2	Gross Income productivity	2,43	3,96	2,51	2,89	3,96
	Ecological stability	*Vanguard*	*Cowmen*	*Av.F*	*Intensive*	*FE*
Ecol-Stability 1	Herd Care	4,049	4,27	4,057	4,08	4,55
	Soil Pollution (KgN per FA)	3,06	3,50	3,79	3,21	4,45
	Soil Pollution (KgP per FA)	3,58	4,24	4,17	3,94	4,42
	Pesticides (LIT per FA)	2,82	4,24	4,02	4,63	4,55
	Toxicity Indicator	3,07	3,30	3,06	3,34	4,00
Ecol-Stability 2		3,13	3,82	3,76	3,78	4,35
	Economic Stability	*Vanguard*	*Cowmen*	*Av.F*	*Intensive*	*FE*
Econ-Stability 1	Family Remuneration Stability	2,78	3,86	4,33	4,57	4,82
		3,05	3,25	2,95	3,10	3,20
Econ-Stability 2	Cost Reduction strategies	1,86	3,24	2,42	2,95	4,12
	Equity	*Vanguard*	*Cowmen*	*Av.F*	*Intensive*	*FE*
Equity 1	Employment Generation	2,16	3,15	3,95	3,94	4,50
Equity 2	Internal Decision on Quality	3,55	4,90	3,43	4,39	4,63
	Self-Reliance	*Vanguard*	*Cowmen*	*Av.F*	*Intensive*	*FE*
	External feeding dependency (Cow)	2,969	2,63	3,1	2,968	3,96
	Forage (ext/int-Soil)	2,86	4,33	3,81	2,70	4,41
Self-Reliance 1		2,9	3,5	3,5	2,8	4,2
	Fuel-oil/ha	2,78	3,5	3,31	2,94	3,89
	Feeding efficiency (soil) (kg C/ha)	2,98	3,9	4,12	2,94	4,61
	Fertiliser costs per FA	3,42	3,95	3,93	3,42	4,20
	Pesticide costs per FA	2,98	3,81	3,23	3,29	3,90
Self-Reliance 2		2,99	3,66	3,57	3,01	4,17
Self-Reliance 3	Co-participation	3,00	3,40	3,70	4,10	5,00
Self-Reliance 4	Subsidies/100kg	3,02	2,92	2,90	3,35	3,38

Figure 7.5 Main attributes of sustainability regarding every Style of Farming



Ecological stability is approached by herd and soil care, in order to reflect the potential good maintenance of those two basic resources of the agroecosystem. Regarding herd care, styles show slight (all of them are over score '4'), but still remarkable, differences. Farming Economically shows itself to be more sustainable in this respect, followed closely by Cowmen. The care of the animal allows Cowmen to obtain higher milk yield but also, as Table 7.2b. showed, goes along with a higher rate of mandatory reform and cow deaths. Thus, with more detailed data about the average age of the cow in every style and about welfare animal, sustainability would be potentially higher in the case of Economical Farmers. Vanguards and Av.Farmers obtain the worst outcomes in this respect, with the difference that in the case of Vanguards, they are accompanied by high milk yield per cow, thus something that translates into higher global output and better economic returns, as opposed to what happens in the case of Av.Farmers, most probably because many of them do not follow the program to improve the efficiency of the animal diet.

Regarding soil care, Economical Farmers are also more sustainable. Along with a lower quantity of inorganic fertilisers, they use fewer biocides than any style except for Intensive, but the toxicity degree of the biocides is lower. Very often, lower degrees of toxicity go along with higher prices and this might explain well why the costs of biocides per hectare are higher for Economical Farmers than for instance for Intensive Farmers, who are also using a lower quantity.

To approach economic stability, family remuneration stability and cost reduction strategies linked to variable costs have been considered. In this respect, Farming Economically, Intensive and Av.Farmers, and therefore the small sized farms in this

order, are more sustainable than Cowmen and Vanguard. The Net Margin per family unit is much higher in those two styles; however, when the effect of fixed payments to loans that are not considered in the calculation of the Net Margin are introduced, then that Net Margin per labour unit is reduced to a larger extent in the last big sized styles. Av. Farmers are shown to more sustainable than Vanguards and Cowmen in this respect, but by considering for instance their debt in the long run (see Table 6.3 in Chapter 6), they are shown to have still a bigger part of their fixed capital to depreciate than Intensive and Economical farmers. As this is the same case of Vanguards and Cowmen, by considering their debt in the long run, they will show a lower economic stability over time than the one obtained by considering only one year.

Equity is evaluated by considering the potential to create employment, which also contributes to increasing social stability, and the capacity to internally decide on quality over quantity. In the first case, Economical farmers are shown to be more sustainable than the rest. In the second case, Cowmen are the most sustainable, which is logical since they have opted for increasing output by optimising the management of their herd.

Finally, self-reliance embodies the capacity of autonomy as well as self-empowerment. External dependency on feeding resources when the animal and the soil management are regarded (self-reliance1) has been considered. Furthermore, the low dependency on external inputs, which are based on non renewable energy sources have been included as well (self-reliance2). The low significance of subsidies regarding the output are considered here as a symptom of autonomy, since what it is, when high, increasing the gross output in monetary terms, is not controlled by the farmer but it depends on the state of political affairs. Finally, the participation, as much as possible, in the different services enhances the self-empowerment of the farmer. In every case, Economical farmers were shown to be more sustainable by having higher autonomy.

In general, after analysing the impact and main attributes as regards sustainability of every style, it stands out that low ecological and high socio-economic impact and higher sustainability are not a question of size but more about how to do farming. And in this respect, Farming Economically is shown to be the best solution.

7.5 POTENTIALS OF FARMING ECONOMICALLY FOR THE COOPERATIVE AND THE REGIONAL CONTEXT

Farming economically by means of low-external input dependency and highest technical efficiency, has been a strategic response to the constraints of the process of modernisation (Ploeg 2000b). The outcomes shown in the former section confirm that in the context of the Cooperative. Moreover, those outcomes enable to foresee the potential of Farming economically, which will be now shown by constructing different hypothetical scenarios on the basis of an *output reallocation* among the different styles, by following the socio-economic parameters of Economical farmers.

7.5.1 POTENTIALS OF FARMING ECONOMICALLY AS REGARDS THE DOMAIN OF THE COOPERATIVE

Thus, in 2004, 14% of the Co-farmers behaved as Economical. The average 'Economical farm' manages 72% of acreage, 58% of the herd, and supplies 53% of the output of the average Co-farm. The Economical farm is, however, 42% more efficient in economic terms (Net Margin per output) and employs 64% more people than the Average farm.

Table 7.6 Real scenario in 2004

Total	*N=63*	*Vanguard*	*Cowmen*	*AvF*	*Intensive*	*FE*
Number Farms	63	11	10	22	11	9
Dairy Herd per farm	55.69	93.4	68.4	47.6	41.7	32.3
UAA per farm	25.9	38.3	34.9	24.6	14	18.7
Output per farm (Av)	508,151	882,148	691,209	403,430	371,870	270,198
Total output per style	32,013,532	9,703,630	6,912,089	8,875,460	4,090,570	2,431,784
LU per Milk output* (Av)	0.45	0.28	0.38	0.54	0.53	0.74
Total Net Margin	3,428,649	1,232,361	946,956	754,414	429,510	369,631
NM per 100kg	10.71	12.7	13.7	8.5	10.5	15.2
%	*N=63*	*Vanguard*	*Cowmen*	*AvF*	*Intensive*	*FE*
Number Farms	100	17.46	15.87	34.92	17.46	14.29
Dairy Herd per farm	100	167.71	122.82	85.47	74.88	*58.00*
UAA per farm	100	147.88	134.75	94.98	54.05	72.20
Output per farm	100	173.60	136.02	79.39	73.18	53.17
Total output per style	100	30.31	21.59	27.72	12.78	7.60
LU per Milk output	100	62.22	84.44	120.00	117.78	164.44
Total Net Margin	100	35.94	27.62	22.00	12.53	10.78
NM per 100kg	100	118.58	127.92	79.37	98.04	141.92

*LU per 100,000 kg of milk.

The first hypothetical scenario I proposed is the one in which every Co-farmer behaves like the average Economical farmer (Table 7.7). If that was the case, the global number of farms involved and the total Net Margin of the Cooperative would increase by 118 and around € 1,440,000, respectively. As it is assumed that everybody behaves as an Economical farmer, output, area and herd should be reallocated. Globally, this would mean that less area and herd would be needed, and Intensive farmers would be the only ones that increased their size – Farming Economically would remain the same, while the others would reduce it. On the contrary, if every Co-farmer would behave as a Vanguard, there will be a reduction in the number of farms and labour involved, while the total Net Margin and the Net Margin per 100 kg would increase to a smaller extent.

Table 7.7 Hypothetical Scenario1: Behaving as economical farmers

	Farming Economically	*Vanguard*
ΔNfarms	118.48	36
ΔN farms (%)	88.07	-42.4
New MN	4,866,057	4,065,719
ΔMN (total)	1,437,408	637,070
ΔMN(100kg)	41.92	18.6
ΔLU per farm(%)	62.78	-37.8
ΔUAA per farm	-27.80	47.9
ΔDairy Cattle per farm	-42.00	67.7

A more realistic, although still hypothetical scenario, would be to consider that farms belonging to other styles, with an output size lower than 396.000 kg (that is the biggest size within the Farming Economically sector), could behave more easily as Farming Economically. This would affect 7 Intensive and 11 Average Farmers. Thus, in this case 27 farms could adapt 'more easily' to the cost reduction strategy of Farming Economically.

Table 7.8 Hypothetical Scenario 2: Potential impact by adopting farming economically patterns below output = 396.000 kilograms

	N=63
ΔNfarms	63
ΔN farms (%)	0
New MN	3,969,169
ΔMN (total E)	540,519
ΔMN(100kg) (%)	13.62
ΔLU per farm(%)	42.48
ΔUAA per farm (%)	49.39
ΔDairy Cattle per farm (%)	-2.28

In the second scenario, 42% of the farms of the Cooperative (against 14%) could be behaving to a larger extent according to the parameters of Economical farmers, enhancing the economic efficiency (13.6%) but also the social dynamics (increasing employment per farm by around 42%), and as it was deduced in the former section, would increase ecological sustainability. This scenario would require more area and a slight diminution of the global herd size.

7.5.2. POTENTIALS OF FARMING ECONOMICALLY AS REGARDS GALICIAN REGION

It would be interesting to assess the potentials of Farming Economically at a regional level. This would entail, however, some difficulties. First, the average Galician dairy farm is smaller in terms of quota than the average Economical farmer, thus we cannot suppose either the first or the second scenario. Second, the statistical sources supply data that are classified by considering herd size and not quota. Furthermore, output and farms related to that herd size are only those with production over the period September-October-November (IGE 2003), which undermines the total production in a year as well as the number of farms[6] involved – 13% and 22% higher for the whole year, according to MAPA (2004).

Considering these restrictions, Table 7.9 shows an estimation of the dairy sector structure in year 2003.

Table 7.9 Galician dairy sector structure in year 2003[7]

Herd size per farm	*N. Farms*	*%Farms*	*Dairy cows*	*Milk Output*(kg)*	*Milk O. year*	*Milk O. per farm year*
1 to 2	1,336	6.5	2,270	3,207,750	12,831,001	9,604
3 to 4	1,035	5.0	3,562	4,540,421	18,161,684	17,548
5 to 9	4,605	22.3	32,356	32,918,387	131,673,546	28,594
10 to 19	6,522	31.6	88,750	109,361,263	437,445,052	67,072
20 to 29	3,490	16.9	82,597	105,853,801	423,415,204	121,322
30 to 40	2,753	13.4	99,987	143,156,515	572,626,060	208,001
>=50	880	4.3	61,078	97,003,594	388,014,376	440,925
Total	20,620	100.0	370,600	496,041,731	1,984,166,923	96,225

Source: Own elaboration from IGE (2003). Enquisa de bovinos.
*September-October-November

According to the former estimation and knowing that the Co-farms are in general rather more intensive and larger than the average Galician farm, there is a group of farms in the region that could reproduce in an easier way[8] the parameters of the Economical Farmers within the Cooperative as regards herd size and output: e.g. farms with a herd between 30 and 40 cows and with an average output per farm of 208,000 kg. Thus, *potentially* 13% of the Galician dairy farms could be Economical farmers and contribute to improving the socio-economic and ecological dynamics of the Galician dairy sector.

There is, moreover, an important group of farms (around 24%) that have fewer than 10 dairy cows. Without any other data, it is supposed that they will have more difficulties in competing in the market than others because of their small output, even when they can be highly efficient in economic, technical and/or social and economic terms. This group probably involves part-time farms, oriented to other farming and off-farming activities and probably some of them are managed by old farmers and may disappear or enlarge other farms in the near future. However, as they are an important part of the

total number of Galician dairy farms, they have to be taken into account, although given their size from a rather different optic than the pure *economicist* (maximising benefits) or *productivistic* (maximising output). Many of these small farms may play a role in promoting rural development from different perspectives: although they manage with fewer resources than others, they should be helped to do it in the most sustainable way: diversifying to other off-farm activities (probably some of them already do), taking care of natural areas (e.g. maintaining areas of *monte* clean), etc. Furthermore, from a social perspective, they are improving social dynamics in rural areas, since they contribute to maintaining and/or fixing the rural population.

The farms with a dairy herd between 10 and 19 cows might be in one of the above mentioned situations but also may be susceptible to carrying out a process of enlargement in the following years. These are the farms that should benefit to a larger extent from the disappearance of small farms, in order to increase their quota to be more competitive in the market; and given their average medium size, they could and should be conscious about the potentials of following cost reduction strategies.

Finally, the last group of farms, with more than 50 cows, involves farms that within the Cooperative belong to Vanguards, Cowmen and Average farmers. With the lack of other data, it is difficult to say how many of them are most involved within scale enlargement and intensification processes, highly based on external inputs and on non renewable energy (re)sources. Although every farmer could follow a strategy as economical farmers do, it is more realistic to think that in the case of big farms the adaptation of such strategy would entail high costs to de-capitalise and thereby economic losses for those farmers in the short and medium run. Thus, the change of strategy should also be accompanied of institutional support based on the promotion of higher socio-economic and ecological sustainability. In any case, considering the smaller farms (those under 50 cows) which are around 95% of the whole sector according to the IGE data, the Galician dairy sector shows a big potential, when policies that consider diversification of rural activities, the use of locally available resources to a larger extent as well as more environmental friendly practise (e.g. organic production) would be implemented.

Furthermore, what the former classification highlights is that the dairy sector is very heterogeneous and therefore there would exist different lines and possibilities to develop. The goal must not be, and it is not possible either, that all farms become big and intensive; probably neither that all farms should be small. The goal must be to achieve a sustainable dairy sector where the differences are considered in order to look for the best solution for every group. Such solutions must take into account criteria of different nature, not only economic but social and ecological. Therefore, they must not be accompanied by political measures that are based on generalist or homogenising criteria, as regards the economic, social and ecological domain.

In this respect, the future of dairy activity in general and of the Co-farms in particular is linked to policy. In the next section, I briefly refer to this question, particularly as regards the milk quota policy.

7.5.3 ABOUT FUTURE

According to the interviews, three questions stood out as basic for guessing how is going to be the future of the activity and farm dynamics in the coming years: one is linked to the style itself and its goal, the second one is linked to the possibility or not having a heir, and the third one is the political scenario. I will reflect on the first and second questions first, and on the third one later. The analysis will also take as an input the farmers' answers on the topic collected during the interviews.

In general, farmers' answers about how they see the future of their activity is quite positive in contrast with the rather negative opinion they have about the political and institutional domain, as well of society as consumers of their product. There are, therefore, two sorts of dimensions as far as the future is concerned: one is related to the internal environment of the farm, the other is imposed by the institutional and social context.

(i) Future under direct control of the farmer

Co-farmers are expected in general to grow moderately or to maintain their activity. The difference between growing and maintaining is linked to the style's goal as well as to the possibilities of having an heir.

Thus, in the case of Vanguards, the interviewed farmers affirmed that they will maintain the activity. This is logical, since they already have grown very intensively and much more than the rest, as well as they are over their quota to a larger extent than Cowmen, the other large farmers within the Cooperative. They are, moreover, farmers between 35 and 45 years old and succession is not important for the moment.

> *When I started, my goal was to grow 'like crazy', without thinking, but now although I still want to keep on growing, I start to consider the pros and the cons. To buy the 200.000 litres more of quota that I need to be legal (not over production) would mean just that I am 'legal'… but maybe if I do that, I will keep on producing more and more without any control. For example, between September and now (June 2004), I increased 1000 litres per day… I like my work. (…) I would like my daughters to keep the farm, although they are studying. It is a way good of earning your living… well better in the case that you can hire somebody to have more free time or to dedicate more to the animals... but it is difficult. I am the future, my children are too young to know what they will do… but I do not think the farm will disappear, it will keep going and not disappear* (Farm 78).

> *(…) There is no value for the cows (meaning farming is not socially valued). But I am proud of what I do (…) The activity will maintain as it is now, I think* (Farm 25).

The interviewed Cowmen, all expected to grow moderately, as the investment (the highest) in quota suggested. As in the case of Vanguards, they were all quite young farmers (between 25-40 years old) and succession is neither a problem for the moment.

> *About the future… well you know, I have no idea if my daughter is going to keep the activity. She is only 10. I would like her to do so because I like what I do but…(…) I think that farming activity in general will grow moderately. I, personally, want to stop growing in 3 or 4 years…* (Farm 28).

> *I have a successor in the farm. I think my activity will grow moderately if the administration helps, regarding the sector I do not know how it will go* (Farm 31).

> *I am the successor of my father but I am not married and have no children, so I do not know what will happen, but I will grow moderately* (Farm 27).
>
> *The farm has a future, I and/or my sister will stay. I think it will grow moderately.* (Farm 100)
>
> *I am the successor, my parents will retire soon. I think I will grow moderately and the dairy sector in general will maintain as it is now* (Farm 26).

In the case of Average farmers, the succession was assured in the near future in the case of the young farmer who foresaw a moderate growth of the farm (*I am 31 years old and I am the future in this farm and will grow moderately, farm 72)*. In the other case, the farmer (around 50 years old) thought there would be not any successor, and therefore, he planned to maintain the activity as it was:

> *I have two daughters of 18 and 12 but they are studying. One is going to the university. I do not think they will keep the farm. I do not think there is any successor for the farm and for the next 5-10 years it will maintain as now* (Farm 93).

Intensive farmers and Economical farmers were in the same situation as Average farmers: when there was an heir or the farmer was young, they planned to grow moderately; when not, they will maintain or start to reduce their activity:

> *I have not any successor for my farm. My children are studying and I do not believe that they will come back here to farm. You never know, however… My activity will moderately grow if we finally can have the land consolidation, otherwise it will maintain* (Farm 89).
>
> *I am the successor in the farm and I think the farm, and dairy activity in general, will grow moderately in the next 5-10 years (…) No, I am not interested (in other activity)* (Farm 36).
>
> *I think the farm as well will grow moderately. I hope my children will keep on farming. I like it and I think it is a good way of earning your living (…)*(Farm 34).
>
> *Nowadays only my wife (60) and I (64) work on the farm. We have a daughter, who is studying (...) and a son, who is married and working out of agriculture (…); our future is not clear, we decide that we are not investing anymore and we will sell some cows…*(Farm 84).
>
> *Well, I do not think we have a successor so far… But my son is now complaining about the job he has, maybe he will want the farm. In view of this, I want to think that the farm will maintain in the next years, then we will see what my son does (…)* (Farm 66).

Despite their positive personal opinion about the future of their farm, when they were asked about political affairs – on their opinion about policy as well as on the possibilities of reorienting to rural development activities, they reacted more pessimistically.

(ii) Future out of farmers' control: On policy

In general, Co-farmers have a negative opinion about policy, and showed an scarce interest in diversifying their activity. The questions about those two topics were asked separately but there is an underlying connection between them: Co-farmers do not see policy as a driving force for their activity but as more a constraining force. Likewise the decision to not carry out alternative rural development activities is due to not only a lack of interest but to a lack of information and to the difficulties in the view of no

clear institutional support to re-structure their farms according to the needs of those new activities.

Galician Farming activity is driven, politically speaking, by the Common Agricultural Policy (CAP), which establishes the general lines that will be implemented by the different member states. It is generally accepted that this policy has been mainly oriented to the market and only recently, after successive reforms (1992, 2000, 2003), new measures to promote a more sustainable rural development have entered into *its equation*. This responds not only to the fact that agriculture is economically at stake, but that farming activity as it has been developed from the 50s onwards, has jeopardised the environment and rural society. One of the main changes regarding the reorientation of the CAP was the approval of the accompanying measures (R.(EC)2080/02), including the 'early retirement from farming', the 'agri-environmental measures', the 'afforestation of agricultural lands', and the 'compensation payment for mountainous areas'. In Galicia, the afforestation of farm land captured most of the budget, leaving almost totally aside the agri-environmental measures, and the support to farms that are 'behaving' in a different way that the one dictated by intensification, scale enlargement and in general orientated to conventional markets (Castro 2005)[9].

As far as the Cooperative is concerned, subsidies are linked mainly to the *pago único* (decoupling) and cattle rebreeding and/or to the improvement of the farm structure, and early retirement, and in some few cases, which are not included in the sample of this study case, some few farms (3) benefited from the aids to organic farming. Thus, the Co-farms included in this study case are rather far from the new rural development policy and still immersed – more in some styles than in others – within the paradigm of modernisation. This is corroborated by the farmers' answers about, with some few exceptions, their scarce interest in rural development activities:

> *I am not interested in any other activity (RD). I have no experience for that. It would be difficult to reorganise the labour within the farm and what about the market? I should create or look for a market. I have no labour and no time for that. I do not want to diversify…* (Farm 78).
>
> *We are not interested in diversifying our activity, or in farm-processing, direct selling or organic milk, neither in being under any quality designation. We do not do it because then we should reorganize the labour in the farm and it is difficult to find somebody to work. Nobody wants to work in this. Besides, we should look for a market and we have no labour, neither time, nor money to do the investment* (Farm 26).
>
> *We are not interested in diversifying our activity, nor in processing, direct selling or organic milk, neither in being under any quality designation. We do not do it because then we should reorganize the labour in the farm and it is difficult to find somebody to work. Nobody wants to work in this. Besides, we should look for a market and we have no labour, neither time, nor money to do the investment. I am not interested in carrying out any other activity… there is a lack of a market and opportunities in the region… it is not worth it…*(Farm 28).
>
> *No, I am not interested in other activities. This would mean reorganising the labour within the farm and it is not possible, I have no more labour and no time for that. I do not think it*

is viable to sell meat and I am not interested in another type of activity. I prefer to focus in one activity, producing milk. The market for meat is saturated. (Farm 27).

The ones who show some interest see also too many problems:

Yes I am interested in agro-tourism activities, not in organic or quality designations, but in agro-tourism. But I do not do it because this would mean I had to reorganize the labour in the farm. Moreover I have no money to do the investments and it is too complicated, the bureaucracy (Farm 72).

I am specially interested in producing organic milk, but to organise the labour is a problem, is difficult, and the structure of my farm, with so many plots, does not help to carry out other activities. I also sold meat directly to the consumer, it was going well until the mad cows arrived… then everything went up the creek (Farm 89).

From all those activities, I will be interested in organic … Well, it is difficult because of the labour, not enough, and the regulations, they are to bureaucratic and restrictive… besides, we need more subsidies and financing support… and maybe the market is not enough (Farm 25).

The difficulties they foresee about introducing rural development activities are, as I said above, accompanied by a very negative opinion about policy and policy and policy-makers. In fact, if there is something that could *homogenise* these farmers, it is their general rejection of policy-makers' action (at regional and European level). The answers I show below include as well the general negative perception about the lack of Consumers' consciousness on farming activity. I did not separate them, since both policy and consumers are part of the external environment of the farm and I think quite illustrative about farmers' perception of society in general:

The role of other farmers is favourable (for the development of the activity) but the role of other rural inhabitants, development agencies, farming extension services and government is not. The middle-salesmen are allowed to gain the most; this is why the milk is so expensive when it arrives in the supermarket (Farm 72).

I think the role of other farmers is positive as well as the role of the farmers' union and the services of agrarian extension. But I do not like the European policy. I got some subsidies … but the European policy is a 'misfortune'… and the consumers have no money for paying such expensive milk (…) (Farm 36).

In general my vision of other farmers and rural inhabitants is not favourable… neither of the local and provincial government. The role of the farming unions well depends on the farmers who are involved. I am not very optimistic, neither about the role of the agencies for development and services of agrarian extension. Look, governments are not interested in the activity. Consumers do not have information and consume cheap milk, without rewarding quality. (Farm 89).

Well, my opinion about policy makers and in general the national, regional and even the farmers' union, is not positive. I think they 'van o seu' (go off on their own), following their particular interests. There is a total lack of information, courses, participation… (…)(Farm 84).

I think the role of other farmers and the services of agrarian extension is positive. Regarding other rural inhabitants, it is just neutral. The farmers' union… it is as if if they did not exist. They are excessively politicised and do not attend to the reality of the farmers

> *(…)There are problems, you know, to sell off the quota because the administration forbids you to sell it before 5 years after you bought it, before it was 3. Things become more difficult… The case of the mad cows, for example, was a drama. Farmers felt very unfairly treated by society, accused of something they were not really guilty of. And it was nonsense to kill all the cows of a farm just because there was one sick. It was a politica face-washing. The image of the farmers should be 'better sold'… and more information for the consumers should be given, so they could know the true reality of the cattlemen and of the quality of milk. You cannot buy good milk below 60 €cts…consumers should know that. Agricultural policies have not been positive. I do not want subsidies. All that about the decoupling and subsidies … no…I do not believe in that. I want to live from my work* (Farm 78).

I do not know whether these opinions have radicalised even more after the last controversy, provoked by the approval of the new *Plan Lacteo* of 2006/2007, but I think it is worth giving some insights about this new measure adopted since, as I will show, it has also some consequences that affect directly and differently to the different farming styles.

(iii) Changing the rules of the Game… once more

It is not my aim to judge whether the new Plan Lácteo[10] is unfair for the Galician community, although I will highlight some of the problems that can affect dairy activity. However, I agree with the opinion[11] that *the Plan is changing the rules of the game, just in the middle of the match*. For years the argument to create a dynamic and pushing dairy sector in particular and farming sector in general was the re-dimension of the farm by means of enlargement of the productive capacity. In order to do so, dairy farmers went often to buy quota to other regions[12], and what is more significant, became involved in a process that would assure the economic viability of their farms. That viability has been shown to be related to far more things than only the quota – as the case study showed, however, the change in the rule will not exempt the sector of some negative consequences that will affect firstly farmers, and later society in general.

Just in a few words, the new *Plan Lacteo* establishes the creation of a *Bank* to which farmers have to sell and buy their quota. Thus, the Bank is basically a system to transfer quota at fixed price. This price will be of € 0.27 per kilogram without making any distinction by age (of the farmer) or by farm size but there will be two sources of quota within the bank: one to be sold (80%) and another to be shared 'for free' (20%). When the period to buy quota starts, farmers will go the bank in their own autonomous community to apply for it. Thus, it is not possible to buy quota outside of the region the farm belongs to.

Concerning the 80% of the milk supply, there are some pre-requirements to obtain the milk: first installation, plan of improvement, farm under association (SAT…), initial quota lower than the average of the region. There are other requirements but these four are minimal. Concerning the 20% that can be obtained for free, the requirements are: a quota lower than 220,001 kilograms, the farm must have a sanitary qualification B3T3 (free/undamaged of/by brucellosis and tuberculosis) or B4T3 (officially undamaged by brucellosis and undamaged by tuberculosis) (more requirements in the law). When

there are enough applications within the region, the part that is not distributed will go to other priority farms in other regions.

At first sight, it is obvious and defendable that the Plan tries to prioritise small farms in getting quota – more populated rural area and a more diverse picture compared to that of the big farms. However, in Galicia around 80% of the farms are below the 220,000 kg of output per farm per year and therefore the part they can finally get is very small as well, around 5000 kg, which is less than a cow can produce in one year[13].

The perversion of the system is that by promoting before the enlargement of the farm, it is not considering now any other measure to prevent the difficulties of average farms (the ones that already transformed to a larger extent are probably in better conditions to depreciate their investment in the basis of a bigger quota), that were following a model that was stated to be the most adequate, just a couple of years before. Another perverse effect is that since the quota price has reduced from around 0.66 to 0.27, the estate of farmers would reduce by around € 0.36 per kilogram.

This change in policy supplies, nevertheless, another argument to defend the sustainability of Farming Economically. Going back to the context of the Cooperative, only six farms (1 belongs to Intensive, two to Farming Economically and three to Av.F) will have access to this 20%, having a quota below 220.000 kilograms. The other 57 farms have a legal quota over 220.000 kilograms per farm per year, and only 11 are respecting their legal limit of production. Thus, most of the farms will have to de-intensify, which is defendable in terms of ecological impact, but will without any doubt cause economic losses in the short-run. For those that will have access, the measure is not assuring automatically any improvement (in economic, social or ecological terms), since as it was shown, that improvement depends on the way one acts.

As regards the reduction of farmers' estate, by means of the reduction of the price quota, those Co-farmers who carried out strong and expensive quota investments (not always the ones with more quota have paid more for it) in the previous years will be more negatively affected. As it is not possible to know which farmers have paid more per kilogram of quota, based on the data of 2004 on quota investments, the quota price reduction affects mostly Cowmen (100% carried out recent quota investment), Intensive (100%, idem) and Vanguard (63%, idem); whereas Av.Farmers (50%, idem) and FE (22%, idem) are less affected in general. If, along with this, the market conjuncture of input and output prices were negative, e.g. milk price reduces and external input prices increase, the situation would become worse for Vanguard and Av.Farmers. Thus, at first sight, the reduction of the estate value caused by the quota policy along with a potential scenario of negative economic conjuncture would squeeze the income of Average and Vanguard farmers to a larger extent than for Cowmen and Farming Economically, and to larger extent to Intensive farmers than to Economical farmers.

NOTES

1 I have assumed that higher quantities of Nitrogen and Phosphate per hectare are indicative of a higher use of fertilisers and entail a negative ecological impact. It was not possible to know the actual soil composition for every farm, which would be a more accurate indicator of the ecological impact of the style concerning the soil.

2 http://www.juntadeandalucia.es/agriculturaypesca/DGPAgraria/fito/productos.form.general.do.

3 This kind of management entails a low ecological impact (and therefore is more environmental friendly), since it requires special maintenance of the pasture – and other ecosystems within a holistic perspective– as well as it increases animal welfare.

4 Thus, in this respect, a high score indicator (close to 5) of the Gross Margin per output indicates high economic impact, and it is derived from high original value (without being transformed within the range 1-5) of the indicator; on the contrary, a high score (close to 5) of the variable costs per output, thereby, entailing high positive economic impact, is derived from a low original value of the indicator.

5 This is only an estimation or a first approximation to sustainability, but it serves to indicate that there is a strong correlation between the impact and the sustainability as regards the different ways of doing. there is another difference with similar studies carried out following the MESMIS approach as it is that in this thesis every indicator and attribute have been given the same weight.

6 The number of farms in Table 7.4 refers to the farms that were producing in the period September-October-November (IGE 2003).

7 There are no data for year 2004.

8 Every farm could theoretical reproduce the style of farming economically, but in the practice this would be more difficult for those that having increased their size in terms of output, quota, herd, area, have carried out stronger investments. In this case, acting as an economical farmer would entail a strong process of de-capitalisation with high costs.

9 The Consello Economico e Social (CES, or Socio-Economic Council) considers very worrying given the scarce dimension of Galician faros, the government had opted for dedicating more attention to promote the afforestation of agricultural lands, leaving aside the agri-environmental measures.

10 http://www.agrodigital.com/images/planlacteo.pdf.

11 Article in www.eleconomista.es. Economía/Ganadería.- La Xunta asegura que el Plan lácteo va contra los intereses de Galicia: *The vice-president of the Xunta de Galicia, Anxo Quintana, affirms that the Plan Lácteo approved (…) is against Galicia's interests because it has changed the rules of the game among the different autonomous communities*. Date: 18/12/2006.

12 Galician dairy sector has been re-structured in the basis of free movement of quota. For instance, in the campaign of 2003/2004, around 1000 dairy Galician farmers bought 55.000 Tons of milk quota outside of Galicia; and, in the campaign 2004/2005, around 578 farmers acquired outside around 22.000 Tons (Conselleria de politica agroalimentaria e desenvolvemento rural 2005).

13 Conselleria de politica agroalimentaria e desenvolvemento rural (2005).

8 DISCUSSION AND CONCLUSIONS

8.1 INTRODUCTION

The situation of the Galician farming sector and Galician rural areas is not very promising nowadays: low profitability, constant reduction of the number of farms and farmers, ageing of population and depopulation, forest fires, high probability of pollution of soil and water, soil acidification, exhaustion and erosion[1]. What is promising, however, is to know that different *ways of doing* agriculture, or specifically dairy farming, still exist.

To arrive at that conclusion required a review of different issues: some of these are rooted in the past but their consequences are still felt today, while others are more recent. In this chapter, I will summarise the main conclusions of this work. In order to do so, the different research questions that were posed in the General Introduction will be answered on the basis of the information collected so far.

The overall goal proposed in the beginning of this Ph-D thesis was to analyse Galician agriculture from a methodological approach which, by considering as much as possible the multiple interests and visions at stake, will serve to show that, 'the way you do it matters'.

In order to do this, it was necessary to give a general overview about the way Galician agriculture has been developing, considering the past and the present. The current specialisation of the Galician farming sector suggests a sort of homogenisation as far as the goals and the management are concerned, and how the consequences of these have not been so positive. This gave an argument for looking for heterogeneity. The exploration for heterogeneity was, however, already one of the aims of this thesis, since implicit in its approach is the idea that not only one optimum or one solution exists. Suspecting that, the next step was to investigate whether within the different solutions, all of them respond to the processes of transformation; were there some that would be better than others to achieve a more sustainable (dairy) farming sector?

8.2 EMPIRICAL RESULTS

The main empirical results will be summarised as far as they relate to every research question.

1. *What is the past and present of the Galician farming sector?, that is, how and why is the Galician farming sector showing a recessive dynamics in the last three decades regarding its economic, social and ecological components, and which role have specific policies and modernisation played in determining such dynamics?*

The global aim of the first part of this thesis was to show the process of de-structuring of the Galician farming sector. Furthermore, it was to show that such a process was not due to the fact that Galician farms are not big enough, or not mechanised enough, or that the number of farms and farmers is still too big. On the contrary, it was due to replacement of a more 'organic' management by another form of management mainly based on technology, biological and/or mechanic, but in general external to the farm, and based on non-renewable energy sources. Such replacement was explained through the process of dismantling of the traditional agroecosystem and the implementation of the last process of modernisation, framed by the Green Revolution. Later on, the farming agrarian sector confronts, after integrating in the European Community in 1986, a stronger market external concurrence – from that moment onwards with the other European Community countries. The pressure of that concurrence forced the Galician sector to further improve its productive potential as well as to reorient production and to avoid outputs with surplus within the new market: traditional polyculture and output diversification reduced more and more, and the specialization towards less diversified and less land-demanding productive orientations takes place. At the same time, mechanical technology is to a larger extent than biological technology – which however, is also important – the main strategy to improve the productive potential. In any case, the last process of modernization is carried out on the basis of replacing internally available inputs by external market inputs, impelling the disappearance of the traditional agroecosystem and causing the recessive socio-economic and ecological dynamics of the Galician farming sector.

The traditional agroecosystem was characterised by an *articulated and joint* management of different subsystems: animal, crops and meadows and *monte* (forest and bushes and scrub) with high degree of integration and interaction among each other. Those subsystems existed in an accurate proportion exchanging energy, matter and information flows.

The dismantling of that agroecosystem took mainly place after 1960, but it was initiated before by factors of a different nature: I refer particularly to socio-demographic economic and political ones. The diminution of labour through the different process of modernisation, the implementation of afforestation policies and the development of wood industry among others, cause the lost of the traditional uses of the *monte*. When one of the components of the traditional agroecosystem fails, the whole system suffers and finally weakens. The consequence is the beginning of a process of abandonment of those *monte* areas that will be more visible in the recent decades, helped by the last process of modernisation that started in the 1960´s.

It is in fact the abandonment of productive lands which determines to a larger extent the scarce territorial re-dimension of the Galician farms. Along with that, the persistence of the traditional smallholding and the high number of scattered plots limit the economic advantage of farming modernisation. At this point, however, the doubt arises, about the logic of imposing a specific model whatever the existing conditions are, or whether the model should be suitable for those existing conditions. This leads at least deep into the consequences of the model that has been implemented.

Chapter 4 is exemplary in this respect by showing that the outcomes of modernisation were not the expected ones. Modernisation failed because was carried out on the basis of mechanical technology to a larger extent than on biological technology, and this is something small sized farms cannot profit from as much as big farms. Secondly, because intensification was carried out by biological technology, by external inputs, not always expensive but anyway subdued to market dynamics that were not always benefiting farmers' interests. The replacement of locally available resources and, more important in ecological terms, of renewable energetic sources contributed to limiting not only the economic outcomes but to restricting the maintenance of the environment in good condition for the future.

At this point there was an urgent need of modernising the farm structure to adopt new biological and mechanical technologies that would increase the output, a necessary condition to increase the earnings. It was a time when ecological and quality questions were not 'in vogue'.

The *Leitmotiv* of farming modernisation was the poor economic outcomes expressed by the low labour productivity, which was said to be due to the inefficient endowment of productive factors: excess of labour and lack of capital. That inefficiency served to denounce the need of reforming a complicated territorial organisation based on small and scattered plots of land that made it difficult to obtain big outputs and/or to apply an efficient use of machinery. Parallel to that reform, the old building and installation structure of the farms should be replaced as well. Thus, the solution required a transformation of the farm structure regarding both its territorial basis and the introduction of new technologies and installations; moreover, less labour was needed (and available, given the socio-demographic trends) and its tasks would be replaced by machinery regarding land work and by biological technology regarding yield increase. In order to do this, governments implemented different measures/subsidies that supported the improvement of farm structure and early retirement and gave courses to apply the new management as well as to explain its economic *advantages*. Moreover, farming modernisation was necessary in order to adapt to the increasingly global market economic system and to improve income. In this respect, the sector became highly specialised (mainly in dairy farming) and was expected also to become homogeneous as regards output, size and management. As regards specialisation within the productive orientation, it is evident that this happened[2]; as regards output and farm size obviously not. As regards management, this is what the case study aims to discover.

The Galician farming sector is nowadays rather different from the one of four decades ago. However, it is rather similar in economic terms since it has not improved its dynamics in this respect, and neither has it done so in social terms, and it is rather worse in ecological terms. The abandonment of productive land (*monte*) and the agrarian squeeze due to high cost dependency and output stagnation are the main problems of a model that did not take into account that farmers did not want to sell their lands, and as they were small, they could not benefit to the same extent from mechanisation, not being able to reproduce economies of scale. For those that enlarge, the situation is better in economic terms but they do not contribute to improving the

global dynamics of the whole sector; neither can it prevent rural depopulation, promote social cohesion in rural areas, nor improve the environment.

The new farming model was not questioned and by doing so, it was neither question of whether the starting conditions of Galician farming – the former more environmentally friendly way of farming, the lack of soil mobility and how properties were structured, the family character of Galician farms, etc., fit the model. The 'new' productive conditions were devised for other kind of productive and economic structures. The solution imported from a totally different – and more developed- context regarding market and economy, brought 'unexpected' results within the entrepreneurial domain and not so unexpected within the socio-ecological domain.

The review of the current model is urgent, not only because the economic benefit of the farm or farmer is small, but also because of the social and ecological crisis that it is generating. The continuous reduction of the number of farmers is just the reflection of a more global problem: the depopulation of rural areas that occupy most of the Galician geography and the increasing demographic pressure of the urban areas. Depopulation finishes with the social weave in rural areas and finally with the cultural and economic development. Furthermore, there is the important undermining of the peasant, a perfect connoisseur of the natural environment and of more friendly agricultural techniques than the current ones.

One can wonder whether a different model would have been possible. Although four decades ago, there were already some calls to slow down resource consumption (Naredo and Valero 1999) and to reframe the boundaries of market economy, to think that Galicia could have implemented a more sustainable way of farming is probably naïve. It would have been desirable but difficult given the political, economic and social conditions of that time. Spain was going out of the autarchic period and the (western) countries to be followed had implemented the same model, being extremely market and technology oriented. Furthermore, scientific and technological advances promoted in agriculture by the green revolution were rather more fashionable than quality and environmental preservation, which in that time, were concepts certainly not 'in vogue'.

Nowadays, by considering the structural and historical conditions of Galician farming that still persist (lack of mobilisation, disperse habitats and population, smallholdings), and the recessive dynamics of the sector in the last decades, a different model must be implemented. In order to do so, it is important to accept that having a right dimensioned farm does not mean having a big land-sized farm, but a balanced agroecosystem. This means that for achieving high output levels, the process of intensification – concerning land and animal production – and specialisation – mainly towards stockbreeding orientation – should not be goals, but the result (or not) of a former and more basic structural transformation. By doing so, the real structural basis and socio-ecological conditions are the ones that should shape the model and set up the limits or constraints to it, and not the other way around.

Four decades after modernisation started, small sized farms, with excessive number of plots, persist and especially the first will be under different conditions more an advantage than a disadvantage. More important, it should be considered that Galician

farming is still strongly family based and the Galician farmers are more peasants than expected. This is why they have resisted and resist under inexplicable conditions from the classical economic perspective. This resistance has created different ways of interacting within the social, economic and environmental domains. Those ways are analysed in the case study through farming styles. Moreover, the current situation of the Galician farming sector requires research to look for alternative ways to develop. It requires therefore looking for heterogeneity. This heterogeneity, as I pointed out above, is present, despite what statistics and the main trend to specialisation show.

2. *Which have been the responses of farmers to the recent recessive dynamics of the Galician farming sector? And particularly, What are the different styles of farming present in a small but representative sample of dairy farmers?*

The second part of this thesis confirms that despite farming modernisation, the tendency to specialisation in cattle orientations, and the configuration of the model of modernisation itself, the Galician farming sector is still heterogeneous not only as regards the structural and economic differences but also as concerns the way of doing. In few words, there is no global farmer, even when small farmers have accepted the need for farming modernisation. Reality is diverse and shows more than one optimal solution. The existence of such diversity gives, furthermore, the possibility of showing the inadequacy of a unique solution based on specialisation and intensification in a world where resource depletion, pollution, and socio-economic inequities are increasing. Diversity will show, in short, that another (dairy) agroecosytem and another dairy sector are possible.

The exploration for heterogeneity was carried out following the farming styles approach. As regards the methods, firstly, 17 interviews were conducted to know about the about the context and farmers' opinions and perspectives, as well as to choose the variables for carrying out a Principal Component Analysis (PCA). Secondly, a Cluster analysis by using the factors obtained with the PCA served to encounter the farming styles within the Cooperative. From the PCA analysis, three different underlying strategies to manage and understand dairy farming activity within this 63-farm sample arose.

LAND INTENSIFICATION STRATEGY

The first factor from the PCA gathered variables that offer information about the intensification of the available agricultural area: the density of cattle, dairy cows and Major Cattle Units per hectare, land productivity in terms of milk output, and the costs derived from the production of the own forage. This factor showed the strategy of those farmers who intensify the use of their land. It was expected to find two types of farms within this component: one, where land was a scarce factor - usually linked to scattered property as well, and was due to intensification for that reason. The other includes larger-sized farms in terms of acreage but where herd density is too high in order to obtain high production levels. Here the costs derived from producing own forage are more linked to the scale (big area) than to the excessively fragmented land structure, although this can exist as well and contribute to cost increase.

In the past, land intensification due to its scarcity was very common. However, the management and the farmer's goal, the reproduction of the farm, were carried out in such ways that enabled the soil to maintain its fertility and recover. Nowadays, when there is an intensive use of land, it is in general realised beyond the ecological boundaries.

DUAL STRATEGY

The second factor is an ambiguous one, meaning that it combines variables that entail different strategies. Thus, there are three variables that are indicative of scale: total acreage, herd and output. The other two variables are representatives of other processes: milk yield per cow, when high, indicates intensification. Intensification may be the result of 'care', when avoiding excess, and therefore attention to the animal in order to keep a certain level of output, or the use of biological technology, by means of the use of specific breeds and feeding (specific diets in order to increase the production). The second variable, dairy cow per total labour unit indicates, when high, mechanisation.

Therefore, this factor includes variables showing scale, intensification and mechanisation, which are in fact, three of the goals of the modernisation project. With modernisation, it was expected that farms reduced labour and increased machinery, became larger in terms of area, output, herd, and more efficient in productive terms, that is obtaining high yields per cow thanks to improvement of diet, and the breeding specialisation. Thus, the factor shows to a large extent a specific empirical pattern of modernisation in Galicia, a dual strategy that is carried out mainly by increasing milk yield production and scale enlargement, when in other studies both questions appear clearly separated. This strategy is important when considering another specific feature of the Galician dairy sector, namely the power to negotiate what scale enlargement supplies. In this respect, a dual strategy gives the opportunity of obtaining a good price for the milk even when quality will be not the best.

COST REDUCTION STRATEGIES

The third factor gathers information about the annual management of the farm through two economic ratios: the variable costs per 100 kilograms of milk and the Gross Margin per 100 kilograms of milk. The first ratio gives information about the significance of the use of external-input through the costs of such inputs, and the second variable gives information about the gross income (free of the influence of fix costs, linked to depreciations, interest payment, external labour and social insurance). Moreover, this strategy is linked to high costs linked to the maize production and to high dependency on external feeding. The different, positive and negative signs of the variables within this factor indicate the existence of a combination of low costs and high Gross Margin per 100 kg of milk, with a low dependency on external feeding and low maize costs; or on the contrary, the strategy that combines high variable costs and low Gross Margin is also present and represents a high market dependency.

The three components obtained by running the PCA were used to run a second model: a Cluster Analysis, which helped to identify more accurately which strategy or strategies every farm chooses. The combination of the different strategies within every cluster profiled five styles of farming within the Cooperative.

VANGUARD FARMERS

In the first cluster, 11 farms were grouped. They scored positively on the first and second factor and negatively on the third factor. Thus, this cluster was discriminating against farms very much involved in strategies related to scale enlargement and milk yield intensification (dual strategy), thus with very high positive loadings on the second factor); rather intensive, as regards land use (with a positive loading in the first factor); and highly dependant on the market or not opting for cost reduction strategies, as the high negative loading of the third component shows.

Vanguard farmers are carrying out strategies based on scale enlargement by means of having the highest absolute output, acreage and herd size per farm. They are highly intensive regarding the units of cattle per hectare and labour, complementing family labour with off-family labour to the largest extent. They are highly (at most) involved in markets, as regards both variable and fixed inputs. This is why their Gross Margin per output is smaller than for the other five styles and the Net Margin per output is smaller than for Cowmen and Farming Economically. Thus, in comparative terms they are less economically efficient than other styles as well as less technically efficient – as they need a higher quantity of input to obtain the same output. The high involvement in markets increases considerably, regarding the other styles, their variable costs per output. As they combined strategies of scale enlargement and intensification regarding both milk yield and livestock density and were highly dependant on external (market) inputs, they reproduced farming modernisation to a larger extent than the other groups.

COWMEN

The second cluster grouped 10 farms with a high positive factor loading in the second component, so very much involved in the dual strategy, that is scale enlargement along with milk yield intensification, but rather extensive in terms of livestock density – low negative loading on the intensification strategy, and following cost reduction strategies – high positive loading on the third component. Thus, the farms included here have high positive loadings on variables related to size (output, area and herd) with a high negative loading in the first component (land intensification), but intensifying milk yield per cow. Furthermore, farms within this group are following to a good extent cost reduction strategies (high positive loading in the third component). Thus, on average this group is formed of big farmers, extensive regarding the land, and low market dependant. In general, Cowmen maximised the Gross Margin per cow and in order to do so, they opted to extensify regarding livestock density and to reduce the use of external feeding. The care they dedicate to the animal turns into high milk yield per cow.

AVERAGE FARMERS

The third cluster was the biggest, including 22 farms. Their loadings in the first and second component were negative, showing that they do not opt for intensification or the dual strategy. The common feature was the negative loadings in the third component, showing a strategy of dependency on external market inputs, as in the first cluster, but now in small and rather extensive farms. This cluster could have been named as 'Marginal Farmers', 'Losers'', since their gross and Net Margin was rather low as they were *punished* by its excessive market dependency and not rewarded with good milk prices. But they represent the 'Average farmer', not because they represent strictly the average Galician farmer in terms of output, herd and/or area (although they are close in terms of area and herd), but because they represent the average recessive dynamic of the farming sector in general.

Average farmers are, by comparison with the other four styles, medium sized, rather extensive and highly dependant on external market inputs. Thus, regarding production, land and cattle, they are smaller than Cowmen and Vanguards but bigger than Intensive and Farming Economically; regarding livestock density they have the same value as for Cowmen farmers and lower than Vanguard; and milk yield per cow is only higher than for Farming Economically. They are only clearly attached to high variable costs per output as well as to fixed costs.

Average farmers aim at becoming bigger following the strategy of Cowmen as the costs devoted to rent land show and as Vanguards as external dependency is concerned. For that they are spending and investing too fast and too much according to the benefits they are obtaining by selling their output. The technician defined them also as farmers without a fixed strategy, 'a bit messy' since they do not follow the advice from the Cooperative technicians in order to become more economically and technically efficient.

INTENSIVE FARMERS

The fourth cluster was formed of 11 farms with high positive loadings in the first component and high negative loadings in the second one. They are on average lower market dependant (mainly high positive values in the third component) than cluster 3 and higher dependant than cluster 2 and cluster 5. The main feature of Intensive farmers is the small acreage they manage: around 14 hectares per farm. They operate with the highest livestock density of the five styles, trying to increase their output in this way. They show themselves to be quite efficient regarding their scarce factor, trying to reduce their variable costs, and to increase milk quality. With no land restriction, probably they will be closer to Cowmen than to Vanguards.

ECONOMICAL FARMERS OR THE STYLE OF FARMING ECONOMICALLY

Finally, the fifth cluster contained nine farms. They had high negative loadings in the first and second component and high positive loadings in the third component. Thus, these farms were reproducing the dual and intensification strategies to a lower extent than cost reduction strategies, at which they really aim.

Economical farmers are the smallest ones in terms of production, with 270198 kilograms of milk per farm and year, and cattle, with 32 cows and 40 cattle major units; and only bigger than Intensive in terms of area (19 hectares). Thus, they are extensive regarding cattle density with the lowest value of the whole sample: 2.2 cattle major units and 1.8 cows per hectare. The only two farmers within the Cooperative that have extensive pasture systems belong to this style. Economical farmers reproduce in this context the features of low-external-input use to a large extent. They minimise the use of external input, as the low variable costs per output highlight. The management is to a larger extent based on pasture and on grass. Maize is a complement to grass and concentrates but they use it to a smaller extent than other styles and this translates into lower costs on biocides. They use own labour and are lower intensive (labour per object of labour) in this respect than other styles, which potentially entails the possibility of generating more employment at regional level. Furthermore, they economise fixed costs, reducing their dependency on external financing. The result is that despite having a smaller output than other styles, their gross and Net Margins per output are the highest (along with the Cowmen). They show in short high economic and technical efficiency.

3. *How sustainable are the different styles of farming, taking into account the social, economic and ecological impact of the activity?*

After having characterised every style in depth, the question was whether they were different as regards their ecological, social and economic impact. The first step was to assess impact through different indicators. The second was to approach sustainability.

The ecological impact of farming economically is lower than for the other styles regarding every indicator by means of using less inorganic fertilisers, pesticides, lower intensification and fuel oil, therefore contributing less to soil pollution. In fact, the differences with the other styles are specially related to soil and to a smaller extent to herd care. After Farming economically, the ones with lowest ecological impact are Cowmen and very close to Average farmers. The difference between these two styles is that Cowmen are making higher use of concentrates while Av. Farmers are making higher use of inorganic fertilisation and pesticides, in this case also with higher degree of toxicity. In the case of Intensive, the restriction of land makes them to be quite intensive in the use of external feeding and the high density cattle, which is pressing the soil quality is accompanied also of higher use of inorganic fertilisation. Vanguards show the highest ecological impact by means of higher quantity of all kinds of external inputs (fertilisers, pesticides with high degree of toxicity, concentrates, fossil energy), as well as the more problems regarding herd care (higher ratio of deaths regarding calves and cows).

The styles with higher economic impact are Farming Economically and Cowmen. Intensive occupied an intermediate position and Av. Farmers and Vanguards, by this order, are behaving less efficiently in this respect. Farming economically is performing the best in every economic indicator except for the one that shows income per family labour unit, and which is only higher than in the case of Intensive. It is, however, compensated for in both cases by higher income stability. On the contrary, in terms of Net Margin per output, showing the potential of cost reduction strategies as regards

variable and fixed inputs, Farming Economically shows the highest economic impact and Average farmers and Vanguard the lowest.

Vanguard shows the most negative impact in general because of their highest involvement in using external (market) inputs related to concentrates per dairy cow to a larger extent than for soil management. On the contrary, Av. Farmers showed comparatively lower costs on concentrates than on soil management. Thus, their economic impact is more negative regarding the second ones. This was observed already in the ecological impact when they show lower consumption of concentrates per dairy cow than Vanguards and even than Cowmen. As the milk yield per cow is lower than in Av. Farmers, they should reconsider not so much the quantity but the composition of those concentrates in order to improve their yields, as well as they should reconsider the way they manage their soil, aiming at reducing their dependency on external inputs linked to maintaining fertility and/or biocides.

Farming Economically shows the highest social impact due to a higher capacity to generate employment, to the lower dependency on external turnover, to high participation within the services provided within the Cooperative and to the capacity to decide internally on quality over quantity. The differences with the other styles are regarding the decision on quality, specifically with Cowmen and Intensive, as well as on the dependency on Subsidies regarding Intensive farmers. Vanguards show once again the lowest impact.

Sustainability is approached by considering different indicators related to productivity, ecological and economic stability, equity and self-reliance. In general, Farming Economically shows higher sustainability as regards any of those attributes. Thus, after analysing the impact and main attributes as regards sustainability of every style, it stands out that low ecological and high socio-economic impact and higher sustainability are not a question of size but more about how to do farming. And in this respect, Farming Economically can be shown to be the best solution to solve the environmental and socio-economic problems of the Galician farming sector.

4. *What are the potentials of farming economically for generating a more sustainable rural development within Galician agriculture?*

The first hypothetical scenario I proposed is that one when every Co-farmer behaves like the average economical farmer. For doing so, there should be an output re-allocation, by considering the average economical farm. If this was the case, the global number of farms involved and the total Net Margin of the Cooperative would increase 118 and around € 1,500,000. As it is assumed that everybody behaves as an economical farmer, area and herd should be reallocated as well. Globally, this would imply that less area and herd would be needed and Intensive farmers would be the only ones that increased the size of their operation – farming economically will remain the same, while the others would reduce it.

A more realistic, although still hypothetical, scenario would be to consider that farms belonging to other styles, with an output size lower than 396.000 kg, that is the biggest size within the farming economically, could behave easier than farming economically. This would affect 7 Intensive and 11 Average farmers. Thus, in this case, 27 farms could adapt ‘more easily’ to the cost reduction strategy of farming economically.

In the second scenario, 42% of the farms of the Cooperative (against 14%) could be behaving to a larger extent according to the parameters of economical farmers, enhancing the economic efficiency (13.6%) but also the social dynamics (increasing employment per farm by around 42%) and as it was deduced in the former section would increase ecological sustainability. This scenario would require more area and a slight diminution of the global herd size.

It would be interesting to assess the potentials of farming economically at a regional level. This would entail, however, some difficulties. First, the average Galician dairy farm is smaller in terms of quota than the average economical farmer, thus we cannot suppose either the first or the second scenario. Second, the statistical sources supply data that are classified by considering herd size and not quota. Furthermore, output and farms related to that herd size are only those with production over the period September-October-November (IGE 2003) which undermines the total production in a year as well as the number of farms involved – 13% and 22% higher for the whole year, according to MAPA (s.y, in Anuario 2004).

According to the former estimation and knowing that the Co-farms are in general rather more intensive and larger than the average Galician farm, there is a group of farms regarding the region that, reproducing similar features to the Economical Farmers within the Cooperative as regards the herd size and the output (e.g. farms with a herd between 30 and 40 cows and with an average output per farm of 208000 kg), would be susceptible to reproducing the style of farming economically in an easier way and contribute to improving the socio-economic and ecological dynamics of the Galician dairy sector. This group was about 13% of the Galician dairy farms.

There is, moreover, an important group of farms (around 24%) that have less than 10 dairy cows. Without any other data, they will have more difficulties to compete in the market than others because of their small output; even when they can be highly efficient in economic, technical and/or social and economic terms. This group probably involves part-time farms, oriented to other farming and off-farming activities and probably some of them are managed by old farmers and may disappear or enlarge other farms in a near future. However, as they are an important part of the total number of Galician dairy farms, they have to be taken into account, although given their size from a rather different optic than the pure *economicist* (maximising benefits) or *productivistic* (maximising output). Many of these small farms may play a role in promoting rural development from different perspectives: although they manage less resources than others, they should be helped to do it in the most sustainable way: maximising the use of internal inputs (thus, reproducing farming economically), diversifying to other off-farm activities (probably some of them already do), taking care of natural areas (e.g. maintaining areas of *monte* clean), etc. From a social perspective, they are, moreover, improving social dynamics in rural areas, since they contribute to maintain and/or fix rural population.

The farms with a dairy herd between 10 and 19 cows might be in one of the above mentioned situations but also may be susceptible to carrying out a process of enlargement in the following years. These are the farms that should benefit to a larger extent from the disappearance of small farms, in order to increase their quota to be

more competitive in the market; and given their average medium size, they could and should be conscious about the potentials of following the premises of farming economically.

Finally, the last group of farms, with more than 50 cows, involves farms that within the Cooperative belong to Vanguards, Cowmen and Average farmers. With the lack of other data, it is difficult to say how many of them are most involved within scale enlargement and intensification processes, highly based on external inputs and on non renewable energy (re)sources. Although every farmer could follow a strategy of farming economically, it is more realistic to think that in the case of big farms the adaptation of such a strategy would entail high costs to de-capitalise and thereby economic losses for those farmers in the short and medium run. Thus, the change of strategy should also be accompanied of institutional support based on the promotion of higher socio-economic and ecological sustainability. In any case, considering farms with less than 50 dairy cows (around 95% of the whole sector), the Galician dairy sector shows a big potential, when policies would really consider and implement diversification of rural activities, the use of locally available resources to a larger extent as well as more environmental friendly practise (e.g. organic production) would be implemented.

Furthermore, what the former classification highlight is that the dairy sector is very heterogeneous and therefore there different lines and possibilities to develop would exist. The goal must not be, and it is not possible either, that all farms are big and intensive; probably neither that all farms are small. The goal must be to achieve a sustainable dairy sector where the differences are considered in order to look for the best solution for every group. Such solutions must take into account criteria of different nature, not only economic but social and ecological. Therefore, they must not be accompanied by political measures that are based on generalist or homogenising criteria, as regards the economic, social and ecological domain.

The future of dairy activity in general and of the Co-farms in particular is strongly linked to policy. This question was analysed as regards farmer's opinion about policy measures, its attitude to new rural development activities and potential impact of the milk quota policy for every style.

In general Co-farmers have a negative opinion about policy, and showed a scarce interest on diversifying their activity. The questions about those two topics were asked separately but there is an underlying connection between them: Co-farmers do not see policy as a driving force for their activity but more as a constraining force. Likewise the decision to not carry alternative rural development activities is due to not only a lack of interest but to a lack of information and to the difficulties in the view of no clear institutional support to re-structure their farms according to the needs of those new activities.

As regards the quota policy, *the rules of the game are changing, just in the middle of the match*. For years the argument to create a dynamic and pushing dairy sector in particular and farming sector in general was the re-dimension of the farm by means of enlargement of the productive capacity. In order to do so, dairy farmers often went to buy quota to other regions, and which is more significant became involved in a process

that would assure the economic viability of their farms. That viability however has been shown to be related to far more things than only the quota. In any case, the change in the rule will not exempt the sector of some negative consequences that will affect firstly, farmers, and later society in general.

At first sight, it is obvious and defendable that the Plan tries to prioritise small farms to get quota – more populated rural area and a more diverse picture besides that one of the big farms. However, in Galicia around 80% of the farms are below the 220000 kg of output per farm and year and therefore the part they can finally get is very small as well, around 5000 kg, which is less than a cow can produce in one year. Thus the impact of the new rules will be hardly noticeable for most of the farms at least in terms of output.

The perversion of the system is that by promoting before the enlargement of the farm, it is not considering now any other measure to prevent the difficulties of average farms (the ones that already transformed to a larger extent are probably in better conditions to depreciate their investment in the basis of a bigger quota), that were following a model that was said to be the most adequate, just a couple of years before. In this respect the perverse effect is that since the quota price reduces from around € 0.66 to 0.27 per kilogram, reducing the farmers' estate in around € 0.36 per kilogram.
This change in policy supplies, nevertheless, another argument to defend the sustainability of farming economically. Going back to the context of the Cooperative, only 6 farms (1 belongs to Intensive, 2 to farming economically and 3 to Av.F) will have access to this 20%, having a quota below 220,000 kilograms per farm and year. The other 57 farms have a legal quota over that quantity, and only 11 are respecting their legal limit of production. Thus, most of the farms will have to deintensify, which is defendable in terms of ecological impact, but will without any doubt cause economic losses in the short-run. For those that will have access, the measure is not assuring automatically any improvement (in economic, social or ecological), since as it was shown that improvement depends on the way one does.

As regards the reduction of estate, by means of the reduction of the price quota, those Co-farmers who carried out strong and expensive quota investments (not always the ones with more quota have paid more for it) in the previous years will be more negatively affected. As it is not possible to know which farmers have paid more per kilogram of quota, based on the data of 2004 on quota investments, the quota price reduction affects mostly Cowmen, Intensive and Vanguard, Av.Farmers and FE. If along with this the market conjuncture of input and output prices would be negative, and a reduction of the milk price takes place along or not with an increase of the external input prices, the situation would become worse for Vanguard and Av.Farmers. Thus, at first sight, the reduction of the estate value caused by the quota policy along with a potential scenario of negative economic conjuncture would squeeze the income of Average and Vanguard farmers to a larger extent than for Cowmen and farming economically, and to larger extent to Intensive farmers than to Economical farmers.

8.3 THEORETICAL IMPLICATIONS AND RECOMMENDATIONS: FROM RURAL DEVELOPMENT TO SUSTAINABLE AGRICULTURE

From the case study, it is generally concluded that farming economically is very promising to promote sustainability and rural development by means of lower ecological impact and high socio-economic impact. Furthermore, farming economically is closer to low-external-input agriculture and to the features of the traditional agroecosystem as far as the use of locally energetic resource is concerned. In this respect, farming economically is a phenomenon of the past and of the future, designed by the farmer and quite suitable to respond to the negative consequences modernisation.

As they are smaller in absolute terms than other styles, but still show themselves to be highly sustainable, it is confirmed that nowadays, it does not make sense to think that small farms are less efficient than the big ones. In the framework of a multifunctional agriculture and rural development that aims at fixing rural population and diversifying the functions of agriculture, the quality of the products and the environment, small farms show to have an important role to play.

Rural Development (RD) as is defined after the last CAP reform identifies RD activities with those that generate higher income for producers (keeping more value added) and higher employment. It pleads for a transformation and broadening of the traditional farmer role and although it includes environmental questions (environmental measures), the budget destined to such aim is still proportionally lower to those destined to market domains (Aguilar 2007)

Thus, this new age of agricultural development in Europe is to a certain extent further away from what we can call conventional agriculture, since it aims at transforming the farmer and rural domain roles. It keeps, however, on operating under the same productive principles, subject to the same market forces and causing similar environmental externalities. It is neither noticeable as a modification in the making-decision processes that still operate from top to down nor a change in the assessing criteria, which keep prices as the only tool to valorise how agricultural systems work. Even within this framework, it is possible to distinguish between conventional and RD agriculture and the main differences between them:

1 The *conventional farmer* produces homogeneous raw matters that are incorporated to the process of transformation by others, losing in this way the generated value added. The *RD farmer* participates, individually or collectively, in the process of transformation. These activities enable a reallocation of the agrarian activity within the supply food chain.
2 The *conventional farmer* only produces food and fibres following the monoculture schemes. The *RD farmer*, on the other hand, diversifies the productive structure going to all kind of production, both good and services: agro-tourism, energy-producing crops, and so on. That is, the farmer tries to take profit from the different options that the rural world supplies and not exclusively from those which have to do with food production.

3 The *conventional farmer* obtains her/his income from agrarian production whereas the *RD farmer* diversifies her/his income sources very often from off-farm activities.

Thus, the farmers who operate further away from the most conventional agriculture and are relocated within the new RD framework carry out activities from different nature: under certain quality patterns and labels, own processing, diversifying crops, giving new services such agrotourism and leisure oriented, protecting landscape, etc. All of these activities generate additional income, new in the case of diversification and new activities. They give as well an extra income, just as in the case of quality production, because of the higher prices they get (van der Ploeg 2002).

On the other hand, *Sustainable Agriculture* (SA) should be that one that enables us to obtain additional income and employment (as RD activities do) but entails, moreover, an important *structural change in the productive processes*. SA breaks with the dominant agricultural model, *imposing new production and social relations*, which entails significant changes both in the nature of the process of production and in the kind of relation with nature. Furthermore, SA must impose *new exchange environments or domains between the social actors.*

SA must focus on the low external input agriculture and this should be the previous step to achieving a more organic way of production, one mostly based on the own natural and human resources, with the clear goal of preserving them in the long-run. This way will have positive consequences in different domains, starting from at least three main considerations:

1 *The agrarian productive activity is part of the ecosystems*. Producing in agriculture, as in all sorts of sectors, entails managing, consciously or not, all kinds of natural resources, which are 'underlying' to the production unit. Water and soil, local and rural biodiversity and landscape condition and at the same time are influenced by rural productive practices. It is not possible to understand production and nature management separately: production must be done according to environmental criteria that guarantee nature conservation. In this respect, farming economically is, to a large extent, built up from the local resource endowment through a management which integrates as an organising principle the re-production of the ecological 'underlying' process involved in the local ecosystems and the minimisation of the impact on the global ecosystems. This entails adopting productive strategies that follow a multiple use pattern and that guarantee the regeneration of the resources involved in the production.
2 *Agriculture is part of the socio-economic system*. Farming economically opts for quality before quantity, promoting and increasing a heterogeneous supply as far as the output is concerned. The market should reflect such heterogeneity, creating new channels of commercialisation, new market structures where power is not concentrated, where producers and consumers may relate as directly as possible, and where the local ecosystems become the main resource and input provider. This will enable them to reduce the income 'drain' from the production unit, which in

accountancy is conventionally gathered as the Outside Sector Costs. This leads to the third consideration.

3 *The reduction of external monetary costs is the principle of management.* The production requires mobilising a set of resources. Basically, one can classify them as external and internal, using as criterion the level of control over them. Thus, the replacement of external inputs, bought in the market, by internal inputs available within the farm or in the managed ecosystems, allowing farmers to reach their output goal with lower expenses per unit of product. This causes economic as well as ecological benefits by means of the second principle.

The former three principles adapt better to farming economically than to other styles. However, strategies of production that aim at reducing monetary costs by replacing external by internal inputs, but by using as much as possible organic management would be preferred; in other words, by developing farming economically further into the direction of organic farming sustainability would increase. In this respect, it would be possible to develop new agrarian systems that have little or nothing to do with the old models, which had the aim of maximising productivity independently from the origin of the resources and without considering environmental externalities. The consideration of those three principles narrows the relationship between SA and Rural Development as it is mainly promoted by the current European agricultural policy.

As for the particular case of Galicia, the assumption of homogenisation derived from the implementation of specialised sector is not real. This has been shown by the case study: there is heterogeneity and it is, furthermore, necessary (van Dijk 1995) in order to promote qualitative and balanced rural development as well as sustainability. Heterogeneity is formed by the responses of farmers to the implementation of farming modernisation that does not take into account the initial conditions and features of Galician agriculture. Some of those responses take us along a more sustainable path, although the benefits in the short run may not be clear since they entail high costs and necessarily public and political support. This thesis showed up the inconsistency of different policies that could not take advantage of the internal resources of the system and that inserted the Galician agrarian activity in an economic system for which the initial conditions were not suitable, and for which those conditions are not yet really created.

Furthermore, it can be concluded as well that in Galicia it is necessary to re-activate the use of local resources that have been abandoned. In this respect, the *monte* and thereby the traditional agroecosystem needs to be re-invented. That has to be done not only through forest policies but through agrarian sustainable policies. In that process, it is necessary to recognise the family character of Galician farming as well as to consider its different rationality. It is necessary to take into account that farmers are not only economic agents, but also actors, who are able to generate sustainability. By doing so, it will be easier to look for alternatives that make the sector more efficient in ecological, social and economic terms.

NOTES

1 Although I did not go deeply into the different negative ecological consequences of modernisation further than forest fires, Galician agriculture has become as well less diverse in flora and fauna. The increasing use of biological inputs causes soil and water pollution. Also the changes in the management enhanced the negative consequences of specialisation. Thus, by means of uniform fertilisation animal and vegetal biodiversity are also destroyed; pesticides damage directly flora and fauna; water sources exhaust with the subsequent destruction of humid biotopes; hedgerows are destroyed by means of land consolidation; systematic reaping destroy bird nests; manure and slurry (due to increase livestock density) from cattle and chemical fertilisers pollute superficial water and aquifers as well as contribute to acid rain by ammonia and nitric oxides produced in stables, pigsty and excessive fertilisation. Moreover, there are other problems related to technology consumption: thus, the excess of machinery can produce soil compacting; consumption of non renewable sources of energy contribute to depletion and exhaustion of those resources; depending on the vegetation and soil use, rain and wind can cause erosion, etc. (Pérez 2002).

2 In fact cattle specialisation is also one of the reasons of abandonment and at the same time a good reason to recover the abandoned lands.

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GLOSSARY

Angazo: farming tool consisting of a long wooden handle that ends in a crosswise stick with wooden or iron teeth with a comb shape. It was used to gather or scatter the grass, straw, leaves or *estrume*.

Comunero: co-user within communal *montes*.

Espalladoira: farming tool consisting of a wooden or iron handle and with iron teeth in the end. It is used to separate the straw from the grain.

Estivadas: The *rozas* culture or *estivadas* was usual until the 1970s. It consisted in burning in summer of previously uprooted brush and scrub (*matogueira*) in spring. Once it had been burned the ashes were spread over the area in order to be seeded in autumn. Usually, only one (or two depending on the quality of the soil) harvests of cereal or *toxo* 'Gorse' (*Ulex Europeus*) was obtained. After harvesting, the area rested without being cropped for several years (from 8 to 30), depending on the soil (Bouhier1979; Balboa 1990; Soto 2006)

Estrume: set of vegetables, which covers the floor of the shed, yard or part of the street in front of the house.

Foral system/contract: the *foro* or *foral* contract was in Galicia a sort *emphyteusis*. The Law of *emphyteusis* is a right, susceptible of assignment and of descent, charged on productive real estate, the right being coupled with the use of the property with the condition of taking care of the estate and paying taxes, and sometimes a small rent. Thus, the *emphyteusis* gave the right of use but not the property of the land for a long period, while in the *foral* contract the time for land cession was reduced to the duration of three generations or king lives.

Lugares: set of inherited lands around a house where the farmer who works those lands lives.

Mallas: the act of threshing, normally carried out in August.

Matogueira: uncultivated are full with bushes and scrub.

Monte: area basically covered by bushes and by trees to a smaller extent (Chapter 2 for wider definition).

Monte baixo: bushes, brushes, and scrub.

Montes de varas: a particular type of *communal monte*. They were under co-property of a peasant community but entailed different shares of the right to access to the use: depending on the family or *linaje*

Montes veciñais: collective property linked to specific neighbourhood associations.

Palleiro: Conical pile of straw or dry grass.

Parroquias rurales: rural parishes: a local administrative demarcation within rural municipalities, although without legal recognition.

Purin: slurry or liquid manure.

Rubia: a 'red' Galician cow, which was especially appreciated for the meat but enabled to obtain milk, and which was used to work the fields; the *ratina* (or *pardo-alpina* cow) started to be imported from Switzerland around 1885. The Frisian cow has gained importance progressively since 1950s was the first step towards milk specialisation. Later on, the variety Holstein-Frisian replaced to a large extent the Frisian herd (Calcedo 1996).

Villas: small population settlements, with more rights than *aldeas* and *lugares*; a small town.

SUMMARY

This thesis aims to study the sustainability of agriculture in Galicia (Spain) in a new and integrative way. Therefore not only economic but also social and ecological data and interest are drawn into the analysis. Farming, undoubtedly, is an economic activity. However, in order to obtain and market the final product natural resources are used and transformed. When pollution and depletion or exhaustion of those resources takes place, the future of the activity is at stake. Furthermore, social relations play an important role. The use of labour, for instance, is based on economic deliberations but also regulated by social interests. Social and political factors are at stake at the institutional level as well. These factors determine not only the orientation of agricultural production but also its volume, and prices.

Agriculture is a multi-dimensional activity. It is an ecological activity by its use of natural resources. It is a social activity as production and consumption are based on a specific organisation of social relations. And it is a cultural activity as agriculture roots in a way of living which is time- and place specific and characterized by locally and historically specific norms and values. In short, it is not only an activity that generates economic value.

In order to study the sustainability of an agricultural system, it is therefore important to analyse its impact on different (social, economic and ecological) domains but also to look into their interrelation and, hence, interaction. Theoretically there are two possible ways of interaction: (1) the interaction between the different domains has a positive effect and strengthen the sustainability of the whole system (synergy), or (2) the different domains counteract each other and a positive effect in one domains works to the detriment of another domain (trade off effect).

In this thesis an integrative approach was chosen which made use of the insights and methods of different disciplines: ecological economics, agro-ecology and sociology. On the basis of the integrative approach we analysed if and how the economic, ecological and social effects of an agricultural system vary depending on the chosen style of farming.

In order to understand actual Galician agriculture it is necessary to know the past. The first part of the thesis describes the recent history of Galician agriculture. Since the Second World War the traditional peasant agro-ecosystem transformed into an industrial system; this period is also described as a process of de-structuring. It included the dismantling of the traditional agro-ecosystem in force until the middle of the 20th century; and the recessive dynamics derived from the most recent process of modernisation throughout the period 1960-2005.

In this thesis, the traditional agroecosystem is defined as an articulated and joint management of cattle, crops and nature with a high degree of integration and

interaction. It analyses of political and socio-demographic factors that have jeopardised the continuation of that model. The dismantling of the traditional agroecosystem is effective during the last process of modernisation after 1960. Its effects come to the fore quite clearly in the changes in land use during that period, demonstrated by the evolution of the Useful Agricultural Area and the Total Area, as well as by the reduction in the number of farms. The main features of this process of modernisation are the alignment of farm management strategies based on intensification, specialisation and the increasing dependency on external market inputs as regards both biological and, specially, mechanical technology. Income squeeze, reduction of labour and abandonment of productive natural resources are the main consequences of that process so far.

Although the study of the farming dynamics at the regional level suggests homogeneity of management-strategies, the second part of the thesis *–looking for heterogeneity–* shows that the practice is actually heterogeneous. Heterogeneity in the practice or the different ways of doing are encountered by applying the Farming Styles approach and methodology. Styles of farming are analysed at the level of the farmer and his/her farm, within the context of a cooperative of services, Os Irmandiños, located in Ribadeo (Lugo, Galicia).

In a following step we analysed the social, economic and ecological impact of every style by means of different indicators. In this way we wanted to find out if the way of doing matters in terms of sustainability. This is interesting not only in order to evaluate the farmers' response of the past, but also to see which of the styles might have promising results also for the future and the possibility to achieve a more sustainable agriculture and balanced rural development. Within the different styles of farming, the style characterized as 'Farming Economically' comes to the fore as an interesting point of departure for the construction of sustainability in a multi-dimensional way.

SAMENVATTING

Het doel van dit proefschrift is om *de duurzaamheid van het Galicische landbouwsysteem* op een nieuwe, integratieve manier te bestuderen. Behalve economische zijn daarom ook sociale en ecologische gegevens en belangen in de analyse betrokken. Landbouwbeoefening is zonder twijfel een economische activiteit. Echter, om eindproducten te creëren en vermarkten worden natuurlijke hulpbronnen gebruikt en verbruikt. In het geval de hulpbronnen vervuilen, verminderen of uitgeput raken, is de toekomst van de activiteit in gevaar. Naast natuurlijke hulpbronnen zijn sociale relaties in het geding. De inzet van arbeid, bijvoorbeeld, wordt niet alleen op grond van economische bepaald maar ook op basis van sociale afwegingen. Ook spelen sociale en politieke factoren op institutioneel niveau een belangrijke rol. Deze factoren bepalen zowel de oriëntatie van de productie als ook het volume en het prijsniveau van de producten.

Landbouwbeoefening is een meerledige activiteit. Het is een ecologische activiteit door het gebruik van natuurlijke hulpbronnen. Het is een sociale activiteit door de organisatie van sociale relaties waarop productie en consumptie rusten. En het is ook een culturele activiteit omdat zij wortelt in een manier van (samen) leven die kenmerkend is voor een bepaalde tijd en plaats en mede bepaald wordt door tijd- en plaatsgebonden normen en waarden. Kortom, het is niet uitsluitend een activiteit die een economische waarde genereert.

Om de duurzaamheid van een landbouwsysteem te onderzoeken is het daarom belangrijk om diens effect in verschillende (sociale, economische en ecologische) domeinen te onderzoeken. Onderwerp van onderzoek zijn daarbij vooral de samenhang en interactie tussen de domeinen. In principe zijn er twee mogelijkheden: (1) de interactie tussen verschillende domeinen werkt positief en versterkt de duurzaamheid (synergie), of (2) de verschillende systemen werken tegen elkaar in waarbij winst in één van de domeinen ten koste gaat van de duurzaamheid van een ander domein (trade off).

In dit proefschrift is een *geïntegreerde benadering* gekozen. In de benadering wordt gebruik gemaakt van de inzichten en methoden van verschillende disciplines: ecologische economie, agro-ecologie en sociologie. Op basis van de geïntegreerde benadering is onderzocht *of en hoe het economische, ecologisch en sociaal effect van een landbouwsysteem kan variëren, afhankelijk van de gekozen manier van landbouwbeoefening*.

Om de stand van zaken in de hedendaagse Galicische landbouw te begrijpen is het nodig het verleden te kennen. In het eerste deel van het proefschrift is de recente geschiedenis van de Galicische landbouw beschreven. De ontwikkeling sinds de tweede wereldoorlog behelst een transformatie van een traditioneel *peasant*

agroecosysteem naar een industrieel systeem, dat ook als “destructureringsproces” is benoemd. Het omvat zowel de ontmanteling van het traditionele agro-ecosysteem zoals dat tot midden 20e eeuw van kracht was als ook het meer recente moderniseringsproces in de periode van 1960 tot 2005.

Dit proefschrift definieert het traditionele agro-ecosysteem als een *gearticuleerd en gezamenlijk* beheer van vee, gewassen en natuur met een hoge onderlinge integratie en interactie. Aan de orde komen politieke en sociaal-geografische factoren die de continuering van dat model in gevaar brachten. De ontmanteling van het traditionele agroecosysteem had plaats ten tijde van de laatste fase van het laatste moderniseringsproces (van na 1960). De veranderingen in het landgebruik zijn een goede indicatie van het ontmantelingsproces. Dat blijkt uit een afname van het totale areaal van bruikbare landbouwgrond en een afname van het aantal boerderijen.

Tegelijkertijd veranderen de gebruikelijke strategieën van bedrijfsvoering in de richting van toenemende intensivering en specialisering. Landbouwbeoefening wordt in toenemende mate gebaseerd op externe, via de markt te verwerven hulpbronnen. Dit betreft zowel biologische als ook mechanische technologieën. De belangrijkste gevolgen van dat proces zijn: toenemende kosten en afnemende opbrengsten (en dus minder inkomen), arbeidsreductie en het niet langer operationeel houden van natuurlijke hulpbronnen.

Onderzoek naar de dynamiek van de landbouw op regionaal niveau wekt de indruk van een homogeen beeld bestaande uit de hiervoor beschreven bedrijfsvoeringstrategieën. Het tweede deel van het proefschrift – *op zoek naar heterogeniteit* – laat zien dat de praktijk, en daarmee landbouwbeoefening, heterogeen van aard is. Deze heterogeniteit, verschillende manieren van doen, is in kaart gebracht met behulp van de bedrijfsstijlenbenadering en –methodologie. De bedrijfsstijlen zijn geanalyseerd op het niveau van de boer(in) en zijn / haar bedrijf in de context van een coöperatie, Os Irmandiños, in Ribadeo (Lugo, Galicië).

Vervolgens zijn de sociale, economische en ecologische effecten van iedere stijl geanalyseerd, gebruik makend van verschillende indicatoren. Op basis daarvan wordt een schatting gemaakt van de mate van duurzaamheid van de verschillende bedrijfsstijlen. De stijl van het zuinige boeren komt daarbij naar voren als een veelbelovend vertrekpunt voor de constructie van een meerledige duurzaamheid.

RESUMO

Para o estudo da realidade agraria en Galicia (España), esta tese de doutaramento propón un enfoque que vai máis alá da simple consideración dos factores estritamente económicos. Un enfoque que ten como obxectivo prestar atención, tanta como sexa posible, ós diferentes intereses e visións que entran en xogo cando analizamos a realidade agraria dun país. Aínda que a agricultura é, sen dúbida, unha actividade económica, a cuestión é que para obter un produto final susceptible de ser comercializado, é necesaria a apropiación directa, o uso e a transformación dos ecosistemas e dos seus recursos naturais.

Ademais, non podemos deixar de lado o tipo de sistema social no que se desenvolve a actividade agraria. Hai que ter en conta a natureza diversa das relacións sociais e laborais presentes e o xeito no que se toman as decisións dentro das unidades económicas. O investigador non debe supoñer os seus comportamentos, debe tratar de entender a razón de ser da súa racionalidade económica. Por outro lado, as institucións e as políticas agrarias e de todo tipo xogan un papel importante, determinando non só a orientación estrutural senón tamén os prezos, o volumen e as condicións nas que a renda é distribuída.

Entender a agricultura como unha actividade que combina o uso da natureza cunha organización social específica require un enfoque diferente daquel que a considera como un simple sector con capacidade para xerar un valor engadido (pouco, por certo). Débense considerar, entón, o dominio social, económico e ecolóxico, as súas compeñentes e as relacións que se establecen entre elas.

Nesta tese combínanse as perspectivas (visión do mundo) e os métodos da economía ecolóxica, da agroecoloxía e dos estilos de agricultura para analizar a dinámica agraria dos últimos cincoenta anos da agricultura galega facendo énfase na análise das unidades produtivas cooperativizadas de produción de leite, a principal orientación técnico económica daquela aqgricultura.

A agricultura galega representa, na análise realizada, un modo de vida particular resultado da interacción histórica de factores sociais e os ambientais. Este proceso de coevolución pode ser observado a través dos diferentes impactos nos dominios ambiental, social e económico.

A primeira parte desta tese contén tres capítulos baixo o nome “o proceso de desestruturación”, referíndose á recesiva dinámica socio-económica e ecolóxica da agricultura tradicional. O proceso de desestruturación supón o desmantelamento do agroecosistema tradicional, vixente maioritariamente ate mediados do século XX, e a súa conversión en industrial. O proceso de modernización agraria máis recente no período 1960-2005 precipitou a aparición do agrobussines (poor agrobussines no caso

galego) e tamén un conxunto de problemas, entre os que o principal é o abandono de terras.

A serodia modernización da gandaría galega, visible a través dos cambios dos usos do terra, da dinámica das unidades produtivas e da dinámica demográfica e laboral das zonas rurais, non permitiu substitución completa do modelo agrario tradicional. A industrialización dos procesos de produción e a estandarizacións dos produtos ocorreu só nunha parte do rural, e as unidades produtivas cooperativizadas como as que se estudan aquí foron as máis exitosas.

Sen embargo, unha parte significativa do rural galego está sometido a un claro proceso de abandono de recursos. E este proceso ten importantes (e negativos) impactos sociais, ambientais e económicos.

Esta tese conclúe que é necesario un esforzo colectivo para definirmos novas estratexias de produción que permitan solventar o problema do "poor agrobusiness" galego e ocuparse ó mesmo tempo de definir solucións para as zonas abandonadas. A esta tarefa complexa quérense apuntar argumentos para defender estratexias que garantan simultaneamente resultados que sean social, económica e ambientalmente desexables.

O traballo realizado a nivel de explotación, dentro do contexto dunha Cooperativa de Servizos, Os Irmandiños, sita en Ribadeo na provincia de Lugo, para identificar estratexias de manexo, a segunda parte desta tese *–Buscando a Heteroxeneidade –* demostra que a práctica é moito máis heteroxénea do que podiamos imaxinar. A análise dos Estilos Agrarios identificados pon de manifesto que o *Farming Economically*, esa estratexia que pretende minimizar os gastos monetarios externos, amosa as maiores potencialidades para resolvermos aqueles problemas.

Salvando as diferenzas, o *Farming Economically* é o estilo de agricultura que máis achegado estaría a aquel que chamamos agricultura tradicional. A aposta pola xestión "en finca", polo uso máis intensivo dos recursos e coñecementos dispoñíbeis localmente, concede a esta agricultura un valor positivo en relación coa sustentabilidade. Esta singularidade demóstranos que *o xeito de facer agricultura, importa*. Fronte á modernización homoxeneizante que acarrexa tantos problemas sociais e ambientais e que empobrece ós agricultores, as estratexias fincadas nos ecosistemas, nos recursos e nas economías locais que colocan no centro ás propias comunidades rurais estanse a demostrar como unha resposta acaída para avanzar cara unha agricultura máis sustentable e un desenvolvemento rural máis equilibrado e xusto.

CURRICULUM VITAE

M. Dolores Domínguez García was born in Gehrden, Germany on 17 August 1971. In 1994, she graduated in Economics at the University of Vigo (Spain). From 1994 to 1996, she followed PhD courses at the Department of Human Ecology and Population at the *Universidad Complutense de Madrid* (Spain), and at the same time, the Post-Degree course "Expertise in planning and management of gerontological services in the rural world". Since 1998, she has been a member of the Agroecology and Ecological Economics Research Group (EA5) belonging to the Applied Economics Department at Vigo University. In that department, she followed new PhD courses in Economics from 1998 to 2000. Moreover, she worked as a lecturer in between 1999 and 2004 teaching regional and national economics and statistical techniques.

In the EA5 research group, she was involved in several regional and international research projects, dealing with agriculture and rural development issues. From 1998 to 1999, she participated in the research project "Organic farming, an alternative for the European agriculture?". From 1999 to 2002, she participated in the EU funded IMPACT-Project (FAIR CT98-4288) on the Socio-Economic Impact of Rural Development, coordinated by the Rural Sociology Group of Wageningen University (The Netherlands). During 2002 and 2003, she collaborated in the research project "Rural Development assessment in Galicia (Spain); Analysis in terms of Agrarian Income and Employment". In 2003, she successfully applied for a fellowship from the Foundation ProVigo (Vigo, Spain), which allowed her to stay at Wageningen University, at the Rural Sociology Group for six months. During that time, she elaborated the proposal for the research project "Farming Economically" and applied for an Intra-European Marie Curie Fellowship. This was approved in August 2004. She then worked as an experienced researcher at the University of Wageningen from October 2004 to October 2006. At the same time, she followed courses within the Mansholt Graduated School to defend her thesis in Wageningen University. Since 2006 she has been actively involved in the elaboration of the new project "Network of European Deltas. Sustainable Delta Governance" within the networking DELTANET, leaded by the Rijn-Schelde Delta.

Annex to statement
Name Maria Dolores Domínguez García
PhD student, Mansholt Graduate School of Social Sciences (MG3S)
Completed Training and Supervision Plan

Description	Institute / Department	Year	ECTS*
Courses:			
Mansholt Introduction course	Mansholt Graduate School of Social Sciences (MG3S)	2002	1
The art of writing	The Language Centre Wageningen University	2005	1.8
English scientific writing	The Language Centre Wageningen University	2005	1.5
Quantitative Research Methods	MG3S	2005	4
Rural Gender Studies	Wageningen University, SCH 50306	2005-2006	6
Course program in economics and econometrics: • Methodological Basis of Economics • Work Research Methods in Economics • Natural Resource Economics I – II • Environmental Economics I – II • Public Economics I and II • Ecological Economics I and II • Macroeconomics I and II • Econometrics • Endogenous Development • Statistics • Assessment methods • History of Economic Thought • Microeconomics	Applied Economics Department at Vigo University (Spain)	1998-2000	13.5
Presentations at conferences and workshops:			
Mansholt Multidisciplinary seminar: Presentation at the XXI Congress of the European Society for Rural Sociology		2007	1
XXI Congress A Common European Countryside? Change and continuity, diversity and cohesion in the enlarged Europe. XXI Annual Congress of ESRS in Keszthely (Hungary)		2005	1
VI Congress of SEAE, I Ibero-American Congress of Agroecology and I meeting of students of agroecology and organic farming in Almería (Spain)		2004	1
Total (minimum 30 ECTS)			**30.8**