Sample of Dutch FADN 2006

Design principles and quality of the sample
of agricultural and horticultural holdings

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Mede voor de Europese Unie organiseren het CEI en het LEI jaarlijks de verzameling van technische en financieel economische gegevens van circa 1.500 bedrijven in de akkerbouw, tuinbouw en veehouderij. Voor nationaal beleidsgericht onderzoek wordt die informatie aangevuld met gegevens over bijvoorbeeld milieubelasting, natuurbeheer en plattelandsontwikkeling. Alle gegevens worden vastgelegd in het Bedrijven-Informatienet. In dit rapport wordt verantwoording afgelegd over de steekproef 2006, toegespitst op de Nederlandse bijdrage aan het Farm Accountancy Data Network van de Europese Unie. De diverse fasen, van het opstellen van het selectieplan, het werven van de bedrijven tot het beoordelen van de kwaliteit van de resulterende steekproef, worden beschreven.

The EU Farm Accountancy Data Network (FADN) requires the Netherlands to yearly send bookkeeping data of 1,500 farms to Brussels. This task is carried out by LEI and CEI. The data sent to Brussels mainly involves technical and financial-economic information. For national policy purposes additional data is collected, such as pesticide use, manure production, nature management, non-farm income and rural development. This report explains the background of the farm sample for the year 2006. The report mainly focuses on the Dutch contribution to the European Farm Accountancy Data Network. All phases from the determination of the selection plan, the recruitment of farms to the quality control of the final sample are described in this report.

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Contents

Preface

The EU Farm Accountancy Data Network (FADN) requires the Netherlands to yearly send bookkeeping data of 1,500 farms to Brussels. This task is carried out by LEI and CEI. This report explains the background of the sample for the year 2006. All phases from the determination of the selection plan, the recruitment of farms to the quality control of the final sample are described in this report. This report provides essential background information for the European Commission the Dutch Ministry and researchers of LEI and other organisations to fully understand the statistical aspects of the Dutch FADN sample.

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Summary

1   Introduction

The EU Farm Accountancy Data Network (FADN) requires the Netherlands to yearly send bookkeeping data for 1,500 farms to Brussels. This task is carried out by the Agricultural Economics Research Institute (LEI) and the Center for Economic Information (CEI). The legislation of the FADN demands that the member states prepare a selection plan and a report on the results of the selection. This report fulfils this obligation. Furthermore, the report gives an analysis of the quality of the sample.

2   Population and Selection plan 2006

The population (field of survey) of the FADN is defined as all farms above the threshold of 16 European Size Units (ESU). In the Netherlands farms between 16 and 1,200 ESU are included in the population (table 3.1). A stratified random sample is drawn, in which economic farm size and type of farming are used as stratification variables. The scheme for the types of farming is based on a Dutch version of the Common Agricultural Typology that is also used by EUROSTAT. The total agricultural population contains 79,435 farms according to the agricultural census. The field of survey contains 60,353 farms. These farms cover an important part (87%) of the production capacity (table 3.1). In the selection plan, LEI planned to select 1,500 farms for the 2006 accounting year. The last few years, a lower number of farms were submitted to Brussels due to capacity problems, but in 2006 more than the requirement of at least 1,500 farms has been fulfilled.

3   Result of recruitment and quality of the 2006 sample

For 2006, 1,506 farms were included in the sample and were delivered to
Brussels (table 5.8). Chapter 6 gives a quantitative evaluation of the resulting
sample. A comparison of the field of survey with the total agricultural population
shows that 23% of the farms are below the lower threshold. These farms are
responsible for a small percentage of production only. The sample results in a
coverage of 90% of the production for most of the agricultural activities. In hor-
ticulture, part of the production is not covered because it takes place on farms
above the upper threshold. Therefore the upper threshold has been increased to
2,000 ESU. This increase has been introduced as a trial in 2006 and has been
integrated in the selection plan starting from the year 2007. There are 140
firms larger than 2,000 ESU. Table 6.2 gives a description of the coverage of a
large number of activities. Table 6.3 shows the relationship between types of
farming and agricultural activities. The numbers show that only a limited per-
centage of pigs is produced on specialised pig farms, while at the other ex-
treme almost all mushrooms are produced on specialised mushroom farms.
Two important aspects of a sample, the representativeness of the sample and
the reliability of estimates, are evaluated in section 6.3.3 and 6.3.4. Table 6.4
evaluates for many variables whether there is a difference between the agricul-
tural census and the estimate based on the FADN sample. These tables provide
useful information for specific research projects enabling the researcher to de-
termine whether the sample is representative for his or her topic.

Samenvatting

1   Inleiding

Mede voor de Europese Unie organiseren het CEI en het LEI jaarlijks de verzameling van technische en financieel-economische gegevens van circa 1.500 bedrijven in de akkerbouw, tuinbouw en veehouderij. Voor nationaal beleidsgericht onderzoek wordt die informatie aangevuld met gegevens over bijvoorbeeld milieubelasting, natuurbeheer en plattelandsontwikkeling. Alle gegevens worden vastgelegd in het Bedrijven-Informatienet. In dit rapport wordt verantwoording afgelegd over de steekproef 2006, toegespitst op de Nederlandse bijdrage aan het Farm Accountancy Data Network van de Europese Unie. De diverse fasen, van het opstellen van het selectieplan, het werven van de bedrijven tot het beoordelen van de kwaliteit van de resulterende steekproef, worden beschreven.

2   Populatie en selectieplan 2006

De onderzoekspopulatie van het Bedrijven-Informatienet is gedefinieerd als alle bedrijven groter dan 16 Europese grootte-eenheden (ege) en kleiner dan 1.200 ege (tabel 3.1). Uit het steekproefkader (alle bedrijven in de landbouwtelling tussen 16 en 1.200 ege) wordt een gestratificeerde random steekproef getrokken. Economische omvang en het type bedrijf worden gebruikt als stratificatievariabelen. Voor het jaar 2006 omvat de totale agrarische populatie 79.435 bedrijven (opgenomen in de landbouwtelling). Het steekproefkader omvat 60.353 bedrijven. Deze bedrijven zijn verantwoordelijk voor 87,2% van de totale productiecapaciteit (tabel 3.1). Het selectieplan 2006 is in grote lijnen gelijk aan de selectieplannen van de jaren daarvoor. Het selectieplan geeft aan dat er 1.500 bedrijven in administratie dienen te worden genomen. Het daadwerkelijke aantal bedrijven is de afgelopen jaren lager geweest door capaciteitsproblemen, maar in 2006 zijn er weer meer dan 1.500.

3 Resultaat van de werving en kwaliteit van de resulterende steekproef 2006

Voor het jaar 2006 zijn 1.506 bedrijven uitgewerkt en aangeleverd aan Brussel (tabel 5.8). Hoofdstuk 6 geeft een kwantitatieve evaluatie van de resulterende steekproef. Een vergelijking tussen de onderzoekspopulatie en de totale agrarische populatie zoals beschreven in de landbouwtelling laat zien dat 23% van de bedrijven zich beneden de benedengrens bevinden. Deze bedrijven zijn echter verantwoordelijk voor slechts een klein deel van de totale productie. De onderzoekspopulatie dekt circa 90% van de productie van de meeste agrarische activiteiten. In de tuinbouw ligt het probleem bij de grotere bedrijven. Om dit probleem voor de toekomst te verminderen is de bovengrens van de steekproef opgetrokken naar 2.000 ege. Deze verhoging is in 2006 op proefbasis ingevoerd en in 2007 definitief doorgevoerd in de steekproefopzet. Er zijn nog 140 bedrijven die boven deze grens vallen. Tabel 6.2 geeft een nadere uitwerking van de dekking voor een groot aantal activiteiten. Tabel 6.3 geeft de samenhang weer tussen typen en agrarische activiteiten. Uit de tabel blijken grote verschillen in de mate van specialisatie van activiteiten. Slechts een beperkt percentage van alle vleesvarkens wordt geproduceerd op gespecialiseerde vleesvarkensbedrijven. Aan de andere kant geldt dat bijna alle paddenstoelen worden geproduceerd door gespecialiseerde paddenstoelbedrijven. Twee belangrijke aspecten van steekproeven, de representativiteit en de betrouwbaarheid van schattingen worden geëvalueerd in paragraaf 6.3.3 en 6.3.4. Tabel 6.4 geeft voor een groot aantal variabelen een vergelijking tussen de waarde volgens de landbouwtelling en de schatting op basis van het Bedrijven-Informatienet. Deze informatie stelt de onderzoeker in staat om te beoordelen in hoeverre de steekproef representatief is voor zijn of haar specifieke onderzoeksproject.

1   Introduction

1.1   Objective of the report

In 1965 the European Commission adopted a regulation (nr. 79/65/EEG) in which member states were obliged to set up a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the European Economic Community. The purpose of the data network is defined as the annual determination of incomes on agricultural holdings, and a business analysis of agricultural holdings. The Netherlands were required to provide financial economic information on 1,500 farms to Brussels.

For the management of the system, the EU requires information on the selection of farms that are included in the national FADN systems. In particular the regulation prescribes the provision of data on the establishment of a selection plan and the recruitment of farms.

With respect to the selection plan the regulation EEG 1859/82 prescribes (article 6):

'Each Member State shall appoint a liaison agency whose duties shall be: ...to draw up and submit to the National Committee for its approval, and thereafter to forward to the Commission:
- the plan for the selection of returning holdings, which plan shall be drawn up on the basis of the most recent statistical data, presented in accordance with the Community typology of agricultural holdings,
- the report on the implementation of the plan for the selection of returning holdings.'

This report provides all the relevant background information on the population, the selection plan, implementation of the selection plan and quality of the sample of data that it to be provided to Brussels and which forms the basis for a wide range of national research projects.

1.2   Structure of the report

Chapter 2 gives a description of the background of the Dutch FADN system. Chapter 3 describes the agricultural population in the year 2006. This chapter will also consider the demarcation of the population as used in the Dutch FADN. Also the design of the sample of the Dutch FADN system is described. Chapter 4 reports on the selection plan 2006. Chapter 5 provides information on the implementation of the selection plan and the recruitment of new farms. Chapter 6 provides a qualitative and quantitative evaluation of the sample 2006.

2 Statistical background of the Dutch FADN sample

2.1 Introduction

In the Dutch FADN detailed records on 1,500 agricultural and horticultural farms are kept. Besides financial-economic information, a broad set of technical-economic, socio-economic and environmental-economic data is collected. One of the reasons for the Dutch FADN system is the legal obligation to provide information on the financial economic situation of farms to Brussels. However, an even more important use of the data can be found at the national level. Data from the FADN system is used for many national policy evaluations and research projects.

Based on a sample of farms estimations are made for the whole population. This might raise the question how conclusions can be drawn for the whole population if only a limited number of farms are observed. The answer to this question can be found in the selection of farms that are included in the sample. A cook also doesn't eat all the soup to judge the quality of the soup. It is important to stir well before tasting; the spoon of soup should reflect all flavours in the pan of soup. The spoon of soup should be representative of the whole pan of soup. The same is true for the FADN sample. The farms that are included in the FADN should be representative of the whole population. In this way a sample can provide better information than a census (in which all units are observed). With a fixed budget it is much easier to collect good data on a limited number of farms instead of collecting information on all farms. With a limited number of farms and thus a limited number of data collectors, it is easier to ensure good procedures and good training to collect reliable data.

An important issue is how to ensure that the farms that are included in the FADN sample are representative of the whole population. Use is made of a disproportional stratified random sample. A stratified sample implies that the population is divided into a number of groups. Subsequently farms are selected from each of the groups. The variables on which the groups are defined should be relevant variables to make sure that the farms that are included in one group are similar (at least in the important aspects). Using this stratification, and se-

lecting farms from each group, ensures that farms from all groups and consequently with different characteristics are included in the sample.

Disproportional means that not all farms have the same chance of being included in the sample. Groups which are relatively homogeneous, i.e. farms which show large similarities, have a lower chance of being included in the sample. After all, if all the farms are very similar, a limited number of observations are enough to draw reliable conclusions (in the extreme case that all farms are exactly identical, it would be enough to have only one observation). In case of less homogeneous groups it is important to have a larger number of observations to make reliable estimates.

The choice of the stratification variables has therefore an important impact on the representativeness of the sample.

This way of selecting farms make it possible to make unbiased estimates for the whole population of farms. Based on the sample farms in a certain group, estimations can be made for all the farms in that group. Stratification assures that farms are selected from all groups, thereby allowing estimations for all groups. All groups together make up the whole population. In the Dutch FADN this is achieved by assigning a weight to each sample farm. The weight is calculated by dividing the number of population farms in a group by the number of sample farms in this same group.

Stratification also improves the representativeness in case of non-response. If a farm which is asked to join the FADN system refuses, another farm in the same size class and of the same type of farming can be selected. If there is a difference between the selection plan and the actual implementation, stratification helps to improve the representativeness by taking into account the real sampling fraction.

Finally, stratification makes the maintenance of the sample easier. Due to attrition and changes in the population it is sometimes necessary to supplement certain groups. Stratification makes a more focused replacement possible.

The relationship between the agricultural population and the FADN sample is presented in figure 2.1. The agricultural census provides an almost complete description of the agricultural population. Part of this census or part of this population is defined as the field on observation in the FADN. In the definition of the field of observation a lower threshold and an upper threshold are applied. Furthermore, an additional criterion on the share of agricultural income in total income is used. These criteria will be further discussed.

Figure 2.1	Agricultural population and the FADN sample

Agricultural census

Field of observation

Farm size > 16 esu
Farm size < 2000 esu
Share of agricultural income in total income

Random sampling

FADN Sample

Stratification criteria
- Separate strata for organic farming
- Subtypes for important types of farms (starch, flower bulbs, etc.)
- Borders of size classes type of farming specific
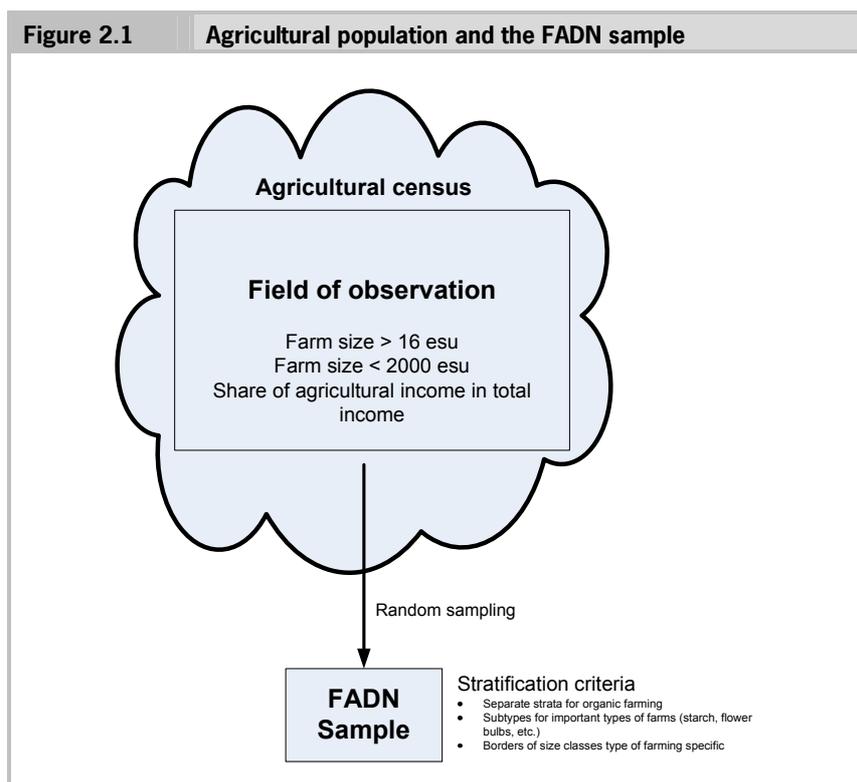
Lower threshold

The lower threshold of 16 ESU has been used for a long period of time. It is specified in the legislation underlying the FADN. The historical background was to distinguish small farms which were only held as a hobby or as side activity from real commercial farms producing for the market. Although the number of farms excluded from the field of survey is quite substantial the percentage of production value which is not covered due to this threshold is very limited.

Upper threshold

The upper threshold was introduced to exclude some non-agricultural organisations from the field of observation. The agricultural census contains some organisations with a lot of land but which are not considered as agricultural holdings (examples are airports, nature organisations and in earlier days organisations which managed the reclamation of land from water bodies). In order not

to judge each individual holding, an upper threshold was introduced to exclude these from the field of survey. Due to the growth in size of farming in especially horticulture it was decided to increase the upper threshold in order to fulfil the requirement to cover at least 90% of the agricultural productivity.

At the current moment a project is being undertaken to assess whether farms above the threshold can be included in the sample in the future. Issues to be addressed will be: are large farms willing to cooperate, how can they be motivated, is the farm comparison report useful for them, how much resources will it take to administer these farms etc. Based on the results of this project a decision will be made whether the upper limit will be maintained in the future.

Other income sources
For practical and methodological reasons a limitation on other income of the holding is used. In earlier times the rules were not clearly specified. Firms with a high share of other income sources were excluded from the sample because of practical reasons such as the impossibility to allocate costs and revenues to different activities, firms would refuse to participate anyway because they cannot be motivated to participate etc. Recently clear rules have been specified whether a firm belongs to the field of observation or not. A firm should have at least 16 ESU from primary agricultural activities, at least 25% of the turnover should come from primary agricultural activities and agricultural activities - in the broadest sense, so as to include other gainful activities - should be the largest share of turnover of the holding.

Stratification criteria
Given these three criteria the field of observation of the FADN system is defined. Within this field of observation a stratification scheme is used. The stratification of the Dutch FADN is based on size of farming and type of farming. Although these criteria are similar to those used by the commission, a more detailed look reveals substantial differences with the EU stratification. Differences are for example the use of separate strata for organic farming, and in several types of farming more detailed subtypes of farming are specified which are relevant for Dutch Agriculture (for example starch potato farms, flower bulb farms, horticultural farms by type of production).

The Dutch situation it is somewhat more complicated due to the fact that the size classes are different within different types of farming. The size distribution of, for example, horticultural farms is completely different than the size distribution of arable farms. To take these differences into account the borders of the

size classes have been established for each type of farming separately. Despite this complication the strata are still a cross section between types of farming and size-classes. In total 87 strata have been defined.

2.2 Sampling and recruitment processes

Figure 2.2 presents an overview of the sampling and recruitment processes. The agricultural census from Statistics Netherlands (CBS) is the starting point for the random sampling of farms. The random sampling takes place based on the selection plan as submitted to the European Commission. The selection plan will be further described in chapter 4. Based on the selection plan farms from the agricultural census are randomly drawn. This census (as available to researchers) does not contain addresses but only farm identifiers. These farm identifiers are sent to the ministry and the ministry returns the addresses. These addresses are forwarded to the regional offices who are responsible for contacting farmers to request their participation. The farmers either refuse or accept the request to participate; this recruitment process and the non-response will be described in chapter 5. The regional offices collect the authorisations and forward them to the central office in The Hague. These authorisations are used to receive electronically available information from banks, suppliers, government and others. The information on the acceptance and refusal of farmers is also used to verify the quality of the sample (see chapter 6).

Figure 2.2   **Sampling and recruitment processes**
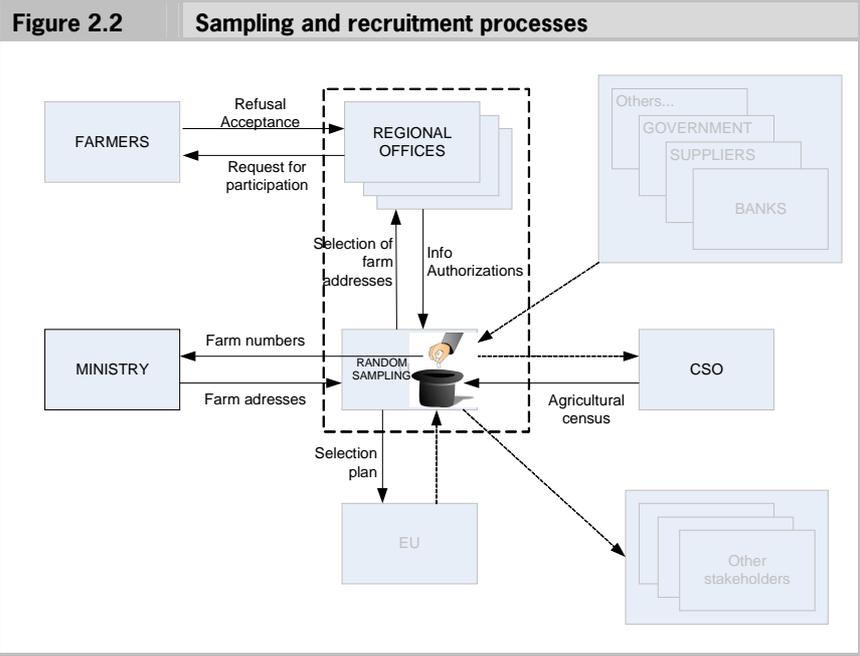
3   2006 population

3.1   Introduction

This chapter will describe the population or, more precisely, the field of observation as covered by the FADN sample. A lower threshold is used to define the field of observation. This threshold and the consequences of this threshold will be described in section 3.2. Section 3.3 describes the strata which are used to subdivide the population. Section 3.4 reports the number of farms in each of the strata.

3.2   Defining the field of observation

Collecting detailed information at farm level requires considerable time and money. To assure an efficient and effective allocation of the available budget, the sample design focuses on certain groups in the population (demarcation of the population). Given limited capacity it is important to apply a sampling procedure that optimises the reliability of the sample estimates (through stratification).

Regulation 1859/82 of the EU Commission (adapted by regulation EEG no. 3548/85) defines the population (field of observation) for the Dutch FADN as those farms with a size of more than 16 European size units (ESU). Until 2001 this threshold was translated into 16 Dutch size units (DSU), which is roughly similar to 18.7 ESU. For the statistical use of the data and the comparability of results it was considered advisable to apply the ESU threshold. Therefore the lower limit of the Dutch FADN system has been 16 ESU since the year 2001.

In addition to a lower threshold there is also an upper threshold. This upper threshold has been adjusted every few years to take into account the growth of the average size of farms. Until 2001 the upper threshold was 800 DSU. In 2001 the upper threshold was raised to 1,200 ESU. The percentage of farms and the agricultural output excluded due to this upper threshold has been growing since 2001. For this reason the upper threshold has been increased again to 2,000 ESU.

Table 3.1	Number of farms and their relative economic importance (measured in European size units - ESU) in the 2006 agricultural census		
		Number of farms	**Percentage ESU**
All farms in the agricultural census (a)		79,435	100
Minus farms smaller than 16 ESU		18,633	1.93
Minus farms larger than 1,200 ESU		449	10.87
Total of non covered farms (b)		19,082	12.80
Total of covered farms (a) - (b) at 1,200 ESU (c)		60,353	87.20
Farms between 1,200 and 2,000 ESU (d)		309	5.61
Total of covered farms (c) + (d) at 2,000 ESU		60,662	92.81

This increase has been introduced on a trial basis in 2006 and has been integrated in the sample and weighting scheme starting from the year 2007. In this report most of the analyses presented still focus on the upper threshold of 1,200 ESU. In 2006, 449 farms were excluded from the field of observation because of the upper threshold of 1,200 ESU (140 farms above 2,000 ESU). These farms were responsible for 12.8% of the total production (5.26% for farms larger than 2,000 ESU). Due to the lower threshold 18,663 farms were not covered by the FADN sample. Although this is a large number of farms, they are only responsible for 1.93% of the total production capacity. The number of farms and the share of economic production of these farms have slightly decreased compared to 2005. The population (field of observation) of the Dutch contribution to the EU FADN system is displayed in table 3.1.

3.3 Design of the stratification scheme

Farms are allocated to strata according to the following stratification variables: type of farming and size class. In the past a more detailed stratification scheme was used, but this resulted in numerous practical problems due to empty or nearly empty cells. Combining cells can easily lead to a distortion in the calculated results (a bias). Farms of a certain type of farming are divided into 3 size classes. In the past 4 size classes were used. The reduction of size classes can be explained by the problem of empty or nearly empty cells and the conclusion that a fourth size class only provided a very limited value in increasing the efficiency of the estimators (Vrolijk and Lodder, 2002).

In total 29 types of farming are distinguished (see table 3.2). For a number of types of farming a distinction is made between organic farming and non-organic farming. A compromise was found to fulfil the increasing demand for research on organic farms. Random selection of organic farms from the total population would result in a very low number of observations because of the low proportion of organic farms. The definition of separate strata would result in many practical problems. The number of strata would double. The problem of empty or nearly empty strata would increase seriously. In line with the existing stratification, a number of types of farming were selected where organic farming is especially relevant. The types that were originally selected were: field crop farms, dairy farms, field vegetables and combined crop farms (Vrolijk and Lodder, 2002). The growth in the organic sector was however lower than expected and aimed for by policy makers. This resulted in practical problems in the recruitment of organic farms, for example due to the fact that the number of farms according to the selection plan was close to or even higher than the actual number of farms in the population. To deal with this problem a number of organic strata have been combined. Organic field crops farms, field vegetables and combined crop farms have been integrated in one stratum organic crop farms (Vrolijk, 2006).

The breakdown in subtypes is as follows: field crop farms have been itemised in starch potato farms, organic crops and all other field crop farms. The vegetables under glass farms have been broken down in paprika, cucumber, tomato and other. Cut flowers under glass are divided into roses, chrysanthemums and other cut flowers. The dairy farms are split into organic and non-organic dairy farms. Within field vegetables and the combined crop farms the organic farms have been separated. These are subsequently combined with the organic field crop farms.

The final stratification and the size thresholds for each of the strata are displayed in table 3.2. The thresholds were determined by optimal stratification in 2000 (see Vrolijk and Lodder, 2002) and have remained unchanged since then. The strata will be reconsidered again in the shift to Standard Outputs.

Table 3.2	Stratification of the Dutch FADN sample			
Type of farming	**Size class**			
	1	**2**	**3**	
Field crop farms				
- Starch potatoes	16.0-73.2	73.2-177.9	177.9-1200.0	
- Organic crops	16.0-45.0	45.0-90.0	90.0-1200.0	
- Other field crop farms	16.0-66.3	66.3-139.7	139.7-1200.0	
Horticulture				
Vegetables under glass				
- Paprika	16.0-245.1	245.1-479.5	479.5-1200.0	+
- Cucumber	16.0-201.3	201.3-392.7	392.7-1200.0	
- Tomato	16.0-268.5	268.5-518.0	518.0-1200.0	+
- Other	16.0-106.1	106.1-335.8	335.8-1200.0	+
Cut flowers under glass				
- Rose	16.0-260.2	260.2-494.7	494.7-1200.0	+
- Chrysanthemum	16.0-193.7	193.7-373.4	373.4-1200.0	+
- Other	16.0-141.9	141.9-342.2	342.2-1200.0	+
Plants	16.0-185.4	185.4-463.5	463.5-1200.0	+
Other glass	16.0-107.5	107.5-292.3	292.3-1200.0	
Field vegetables	16.0-85.8	85.8-256.5	256.5-1200.0	
Fruit	16.0-63.9	63.9-139.2	139.2-1200.0	
Nurseries	16.0-84.9	84.9-250.7	250.7-1200.0	
Mushroom	16.0-187.5	187.5-444.6	444.6-1200.0	+
Bulbs	16.0-185.4	185.4-476.9	476.9-1200.0	+
Other open air	16.0-116.3	116.3-356.1	356.1-1200.0	
Grazing livestock				
Dairy				
- Organic	16.0-86.0	86.0-127.5	127.5-1200.0	
- Non-organic	16.0-88.7	88.7-159.0	159.0-1200.0	
Calf fattening	16.0-63.7	63.7-150.1	150.1-1200.0	
Other grazing livestock	16.0-46.6	46.6-145.5	145.5-1200.0	
Intensive livestock				
Breeding pigs	16.0-115.5	115.5-263.0	263.0-1200.0	
Fattening pigs	16.0-60.4	60.4-160.5	160.5-1200.0	
Integrated pig farms	16.0-128.8	128.8-252.9	252.9-1200.0	
Laying hens	16.0-137.6	137.6-344.8	344.8-1200.0	

Table 3.2	Stratification of the Dutch FADN sample (continued)		
Type of farming	**Size class**		
	1	**2**	**3**
Poultry	16.0-100.2	100.2-203.2	203.2-1200.0
Other intensive livestock	16.0-113.0	113.0-261.1	261.1-1200.0
Combined	16.0-81.1	81.1-205.5	205.5-1200.0
+ Farm types with a substantial part of farms larger than 1,200 ESU (see table 3.3).			

3.4 Number of farms in the 2006 population

Table 3.3 presents the number of farms in the population (2006 agricultural census). In this table the stratification according to size class and type of farming is applied.

Table 3.3	Number of farms per stratum according to the 2006 agricultural census				
Type of farming	**Size class**				
	1	**2**	**3**	**1,200-2,000 ESU**	**total**
Field crop farms					
- Starch potatoes	475	398	190	0	1,063
- Organic crops	62	70	102	0	234
- Other field crop farms	4,083	2,178	663	3	6,927
Horticulture					
Vegetables under glass					
- Paprika	80	144	132	27	383
- Cucumber	87	107	70	4	268
- Tomato	52	111	108	45	316
- Other	431	252	88	11	782
Cut flowers under glass					
- Rose	86	118	152	31	387
- Chrysanthemum	77	64	85	5	231
- Other	763	654	292	20	1,729
Plants	498	370	260	58	1,186
Other glass	353	212	156	11	732
Field vegetables	507	292	108	7	914

Table 3.3	Number of farms per stratum according to the 2006 agricultural census (continued)				
Type of farming	**Size class**				
	1	**2**	**3**	**1,200-2,000 ESU**	**total**
Fruit	593	615	238	0	1,446
Nurseries	998	703	301	20	2,022
Mushroom	152	73	33	8	266
Bulbs	437	283	191	37	948
Other open air	745	441	122	9	1,317
Grazing livestock					
Dairy					
- Organic	149	100	74	0	323
- Non-organic	7,074	9,171	2,953	0	19,198
Calf fattening	376	512	183	1	1,072
Other grazing livestock	5,412	2,092	311	0	7,815
Intensive livestock					
Breeding pigs	851	493	109	0	1,453
Fattening pigs	869	463	103	0	1,435
Integrated pig farms	504	385	106	1	996
Laying hens	612	291	42	2	947
Poultry	178	184	63	0	425
Other intensive livestock	161	108	71	4	344
Combined	3,065	1,786	647	5	5,503
Total	29,730	22,670	7,953	309	60,662

This table shows that 60,353 farms fall within the field of observation. Dairy farms are clearly the largest group of farms. Almost one in every three farms is classified as a dairy farm.

4   2006 selection plan

4.1   Introduction

The allocation of the total capacity of sample farms is based on the relative importance and the heterogeneity of the different types of farming (see Dijk et al., 1995a and Vrolijk and Lodder, 2002). Within each type of farming an optimal stratification (determination of thresholds of size classes) and optimal allocation is applied (distribution of sample capacity over the different size classes).

4.2   2006 selection plan

The EU regulation prescribes the use of size class and type of farming as important variables in the stratification and the choice of farms. Due to differences in the exact stratification scheme it is necessary to take into consideration the different weights of farms in different strata (Dijk et al., 1995b).

    The design principles of the sample of the FADN system facilitate an efficient alignment with the goals of the system (see chapter 2). A summary of the 2006 selection plan is provided in table 4.1. Given the goals of the FADN system the numbers provided in the table are the required number of observations per type of farming.

    For the sample of 2006 a few changes have been made. The number of farms specialised in field vegetables has been reduced. This capacity was needed to fulfil the request to include large farms into the sample. The upper limit of the sample has been increased to 2,000 ESU to solve the problem of an increasing share of agricultural production not covered by the sample. Therefore the number of sample farms in a number of farm types, those with a substantial share above 1,200 ESU, has been increased. This concerns the glasshouses (vegetables as well as flowers), plant growers, mushroom growers and bulb growers. These are the types of farms where the share of production above the upper limit increased substantially during the last years.

Table 4.1	Desired sampling size per type of farming (selection plan) 2006			
Type of farming	**Code**	**Number of farms**		
		main type	**type**	**sub type**
Field crop farms	*1*	*210*		
- Starch potatoes			30	
- Organic crops			30	
- Other field crop farms			150	
Horticulture	*2 + 3*	*520*		
Vegetables under glass	2012		134	
- Paprika				34
- Cucumber				33
- Tomato				34
- Other				33
Cut flowers under glass	2022		108	
- Rose				34
- Chrysanthemum				32
- Other				42
Plants	2022		34	
Other glass	other 2022 and 2013, 2023, 2039, 349 (> 50% glass)		30	
Field vegetables	2011		30	
Fruit	3210		40	
Nurseries	3480		40	
Mushroom	2033		32	
Bulbs	2021		42	
Other open air	other 2022 and 2013, 2023, 2039, 349 (< 50% glass)		30	
Grazing livestock		*420*		
Dairy	4110, 4120, 4370		340	
- Non-organic				310
- Organic				30
Calf fattening	4380		30	
Other grazing livestock	4410, 4420, 4430		50	
Intensive livestock	*5*	*230*		
Breeding pigs	5011		50	

Table 4.1	Desired sampling size per type of farming (selection plan) 2006 (continued)			
Type of farming	**Code**	**Number of farms**		
		main type	**type**	**sub type**
Fattening pigs	5012		50	
Integrated pig farms	5013		40	
Laying hens	5021		30	
Poultry	5022		30	
Other intensive livestock	other 5		30	
Combined	*6, 7 and 8*	*120*		
Total		*1,500*		

5 Recruitment of farms in 2006

5.1 Basic principles for 2006

The recruitment for 2006 took place in two steps. At the end of 2005 farms were recruited for the bookkeeping year 2006. The selection of farms was based on the 2004 agricultural census. A substantial part of these farms were also used for the 2005 sample. In the summer of 2006 additional farms were recruited by a number of accounting offices to fill in remaining gaps. In the meanwhile some changes were made in the exact allocation of farms. The main change is the reduction of the number of sample farms in the type 'other open air' and the increase of the number of large farms in the types glasshouses, mushrooms and bulbs. The goal of this change was to improve the coverage in the largest size class.

5.2 Elaboration of selection plan

Table 5.1 gives a more detailed description of the selection plan as presented in table 4.1.

Table 5.1	Detailed selection plan 2006 per stratum				
Type of farming	**ESU size class**				
	1	**2**	**3**		**total**
Field crop farms					
- Starch potatoes	10	10	10		30
- Organic crops	10	10	10		30
- Other field crop farms	45	51	54		150
Horticulture					
Vegetables under glass					
- Paprika	11	11	10	2	34
- Cucumber	11	11	11		33
- Tomato	10	11	11	2	34
- Other	11	11	11		33

Table 5.1	Detailed selection plan 2006 per stratum (continued)				
Type of farming	**ESU size class**				
	1	**2**	**3**		**total**
Cut flowers under glass					
- Rose	11	11	10	2	34
- Chrysanthemum	10	11	11		32
- Other	13	15	14		42
Plants	11	11	10	2	34
Other glass	10	10	10		30
Field vegetables	10	10	10		30
Fruit	12	14	14		40
Nurseries	13	13	14		40
Mushroom	10	10	10	2	32
Bulbs	13	13	14	2	42
Other open air	10	10	10		30
Grazing livestock					
Dairy					
- Organic	10	10	10		30
- Non-organic	103	104	103		310
Calf fattening	10	10	10		30
Other grazing livestock	17	16	17		50
Intensive livestock					
Breeding pigs	20	16	14		50
Fattening pigs	16	16	18		50
Integrated pig farms	14	12	14		40
Laying hens	10	10	10		30
Poultry	10	10	10		30
Other intensive livestock	10	10	10		30
Combined	37	41	42		120
Total					1,500

5.3 Recruitment of farms

Based on the available number of farms in the FADN sample and the expected number of farms ending their participation before or during 2006 an estimate

was made of the number of farms to be recruited. Furthermore, the variant of bookkeeping has been explicitly considered. An evaluation has been made of the policy and research relevance of sectors and based on this importance a decision has been made whether a type of farming is assigned to the EU vari- ant, the corporate social performance (CSP) variant or a combination of both. This implied that some farms had to be switched to the other variant. In some cases this would result in the drop-out of the farm. This has been taken into consideration in the number of farms to be recruited.

Table 5.2	Number of farms to be recruited				
Type of farming	**Variant**	**ESU size class**			
		1	**2**	**3**	**total**
Field crop farms					
- Starch potatoes	combi	4	0	0	4
- Organic crops	csp	0	0	2	2
- Other field crop farms	combi	9	12	17	38
Horticulture					
Vegetables under glass					
- Paprika	csp	3	3	2 (2)	8
- Cucumber	csp	2	2	0	4
- Tomato	csp	5	3	2 (2)	10
- Other	csp	5	2	8	15
Cut flowers under glass	csp				
- Rose	csp	8	4	4 (2)	16
- Chrysanthemum	csp	4	3	5	12
- Other	csp	1	2	3	6
Plants	csp	1	6	2 (2)	6
Other glass	combi	8	3	3	14
Field vegetables	combi	5	0	5	10
Fruit	combi	5	0	0	5
Nurseries	eu	12	9	12	33
Mushroom	eu	9	4	9 (2)	22
Bulbs	combi	4	4	2 (2)	10
Other open air	eu	5	1	4	10

Table 5.2	Number of farms to be recruited (continued)				
Type of farming	**Variant**	**ESU size class**			
		1	**2**	**3**	**total**
Grazing livestock					
Dairy					
- Organic	combi	0	2	0	2
- Non-organic	csp	16	0	3	19
Calf fattening	combi	4	0	0	4
Other grazing livestock	combi	12	4	5	21
Intensive livestock					
Breeding pigs	csp	0	0	2	2
Fattening pigs	csp	3	0	3	6
Integrated pig farms	csp	0	0	2	2
Laying hen	csp	0	0	0	0
Poultry	csp	0	0	0	0
Other intensive livestock	eu	5	5	5	15
Combined	combi	3	7	12	22
Total					318 (12)

Based on the number of farms to be recruited, as displayed in table 5.2, farms were randomly selected from the 2004 agricultural census. The random draw of farms took place per stratum. The number of drawn farms per stratum was 7 times higher than the required number of farms to ensure enough addresses, even with a high non-response rate in specific types of farming. The addresses were requested from an agency (Dienst Regelingen) of the Ministry of Agriculture. The farm identifiers of the randomly selected farms were sent to the Ministry who sent back the addresses of these farms (under the strict condition that this information was only used for the recruitment of farms for the FADN). Using these addresses farms were contacted and asked to participate in the FADN.

Farms are asked to participate in the system in order to compensate for attrition and to take structural changes in agriculture into account. Some of the farms approached during the recruitment phase refused to participate. These refusals do not cause problems if these farms do not differ from farms that participate in their place. In the case where farms that refuse to participate systematically differ from the participating farms, this could result in a bias. If for example older farmers are less inclined to participate, this will result in a different age distribution in

the sample compared to the population. The representativeness of the data with respect to age will be called into question - whether this is a problem or not depends on the research goals and the extent to which the important variables correlate with age. The representativeness is analysed in chapter 6. Table 5.3 describes the response rate in the different types of farming. This table only includes those farms which were asked to participate in the CSP variant. This variant will be explained in more detail at the end of this section.

Table 5.3	Response rate in different types of farming, recruitment for CSP variant					
	Refusals	Recruited	Unsuitable	Total	Unsuitable %	Response %
Field crop farms						
- Starch potatoes	5	1	0	6	0	17
- Organic crops	9	4	5	18	28	31
- Other field crop farms	79	26	13	118	11	25
Horticulture						
Vegetables under glass						
- Paprika	8	1	3	12	25	11
- Cucumber	13	4	2	19	11	24
- Tomato	31	6	4	41	10	16
- Other	42	7	9	58	16	14
Cut flowers under glass						
- Rose	22	0	7	29	24	0
- Chrysanthemum	22	3	3	28	11	12
- Other	31	7	8	46	17	18
Plants	7	1	2	10	20	12
Other glass	0	0	0	0		
Field vegetables	0	0	0	0		
Fruit	0	0	0	0		
Nurseries	0	0	0	0		
Mushroom	0	0	0	0		
Bulbs	0	0	0	0		
Other open air	0	0	0	0		

Table 5.3	Response rate in different types of farming, recruitment for CSP variant (continued)					
	Refusals	Recruited	Unsuitable	Total	Unsuitable %	Response %
Grazing livestock						
Dairy						
- Organic	5	1	1	7	14	17
- Non-organic	1	0	0	1		
Calf fattening	0	0	0	0		
Other grazing livestock	1	0	0	1		
Intensive livestock						
Breeding pigs	1	0	0	1		
Fattening pigs	57	11	15	83	18	16
Integrated pig farms	0	0	0	0		
Laying hens	0	0	0	0		
Poultry	0	0	0	0		
Other intensive livestock	0	0	0	0		
Combined	0	0	0	0		
Total	334	72	72	478		

To develop a better understanding of the reasons for non-response a number of questions were asked to all farmers approached. Table 5.4 shows the results for the questions asked. In these questions the farmer had to indicate to which extent he/she agrees with a statement about his knowledge or his attitude. The table shows a clear difference between those farmers who are willing to cooperate and those who are not. The ones who are willing to participate are more informed about the activities of LEI and the use of FADN data. Providing data and the FADN system is considered more useful by those who are willing to participate. The opinion about LEI with respect to objectivity and carefulness is better among the participants. The last question shows that non-participants have a significantly lower trust in the government.

Table 5.4	Attitude of farmers (-2 = disagree, 2 = agree)					
	Non participant		Participant		
	average	SE	average	SE	
1 Informed about LEI	1.70	0.09	2.15	0.08	s
2 Informed about the FADN system	0.82	0.11	1.14	0.17	ns
3 Informed about the use of FADN data	0.39	0.10	1.03	0.15	s
4 Usefulness of FADN system	0.96	0.08	1.66	0.11	s
5 Usefulness of providing data	0.88	0.08	1.72	0.09	s
6 Carefulness of LEI	1.08	0.08	1.74	0.11	s
7 Objectivity of LEI	1.03	0.07	1.35	0.12	s
8 Trust in the government	0.00	0.07	0.35	0.12	s
SE - standard error; s - significant difference, ns - non-significant difference.						

Using these same variables discriminant analysis was applied to find the factors that are most discriminating between farmers who are willing to participate and farmers who refuse to participate. The analyses of the attitude of farmers shows that 'usefulness of FADN system', 'usefulness of providing data' are the most important factors in predicting the participation of an individual farmer. This is a similar result compared to the previous recruitment (Vrolijk et al., 2008).

Table 5.5 describes the number of farms where accounts were completed for the first time for the bookkeeping year 2006. Due to several factors this is not exactly the same as the number of farms recruited. First, farms can drop out during the first year of participation. Second, some farms were already recruited during a previous year, but due to capacity problems their bookkeeping was not completed for that year.

Table 5.5	Number of farms with 2006 as first year of completion of bookkeeping, recruited for EU or CSP		
Type of farming	ESU size class		
	1	2	3
Field crop farms			
- Starch potatoes	2		
- Organic crops			
- Other field crop farms	2	12	14
Horticulture			

Table 5.5	Number of farms with 2006 as first year of completion of bookkeeping, recruited for EU or CSP (continued)		
Type of farming	**ESU size class**		
	1	**2**	**3**
Vegetables under glass			
- Paprika	1		
- Cucumber	5		1
- Tomato	2	3	1
- Other	1	5	
Cut flowers under glass			
- Rose			2
- Chrysanthemum	2		3
- Other		8	
Plants		2	
Other glass	4		
Field vegetables		2	
Fruit			3
Nurseries	1	4	2
Mushroom			2
Bulbs			
Other open air		1	3
Grazing livestock			
Dairy		1	3
- Organic		2	
- Non-organic	2	3	14
Calf fattening			
Other grazing livestock	3	2	1
Intensive livestock			
Breeding pigs			
Fattening pigs	2	1	2
Integrated pig farms			
Laying hens			
Poultry			1
Other intensive livestock	1	2	
Combined	5	4	4
Total	33	52	56

Table 5.6	Comparison of the field of observation (population) and the sample available for research purposes in 2006 (2006 agricultural census)			
Type of farming	**Code**	**Number of farms**		
		population	**total**	**CSP**
Field crop farms	*1*			
- Starch potatoes		1,063	32	28
- Organic crops		234	28	23
- Other field crop farms		6,924	131	114
Horticulture	*2+3*			
Vegetables under glass	2012			
- Paprika		356	37	34
- Cucumber		264	38	31
- Tomato		271	31	22
- Other		771	30	22
Cut flowers under glass	2022			
- Rose		356	29	26
- Chrysanthemum		226	26	24
- Other		1,709	56	38
Plants	2022	1,128	32	28
Other glass		721	27	11
Field vegetables	2011	907	32	7
Fruit	3210	1,446	40	31
Nurseries	3480	2,002	34	2
Mushroom	2033	258	21	0
Bulbs	2021	911	39	26
Other open air		1,308	32	8
Grazing livestock	*4*			
Dairy	4110+4120+4370			
- Organic		323	30	29
- Non-organic		19,198	314	237
Calf fattening	4380	1,071	30	14
Other grazing livestock	4410+4420+4430	7,564	7815	55
Intensive livestock	*5*			
Breeding pigs	5011	1,453	51	43
Fattening pigs	5012	1,435	39	24

Table 5.6	Comparison of the field of observation (population) and the sample available for research purposes in 2006 (2006 agricultural census) (continued)			
Type of farming	Code	Number of farms		
		population	total	CSP
Integrated pig farms	5013	995	46	40
Laying hens	5021	945	42	39
Poultry	5022	425	34	27
Other intensive livestock	other 5	340	23	4
Combined	*6-8*	5,498	113	62
Total		60,353	1,472	1,030

In table 5.6 a distinction is made between CSP observations (corporate social performance) and the total number of observations. Poppe (2004) describes that the introduction of a new bookkeeping system and budget cuts have resulted in a large pressure on available capacity. To deal with this pressure, a flexible data collection system has been introduced with two main variants in the data collection: the EU variant and the CSP variant. In the EU farm-income variant the most essential financial economic information is collected. This is the information that each member state is obliged to provide to Brussels. The information covered in this variant mainly focuses on family farm income, the balance sheet, a limited number of technical data (cropping pattern, livestock) and information on the EU subsidies. In the second variant, the CSP variant, a wide range of data is collected for EU and national purposes. It covers all the topics that are nowadays considered relevant in a report on the corporate social performance of a company or a farm. Therefore, besides the financial economic information as collected in the EU variant, a wide range of data is collected such as environmental data, other farm incomes, off-farm income, animal welfare, animal health and the level of innovation of firms.

5.4 Supply of 2006 farm results to the European Commission

The final delivery of 2006 data to the EU has taken place in December 2007. Data of 1,506 farms have been provided to Brussels (table 5.7). This is the highest number of farms since many years and it fulfils the obligation of 1,500 farms.

Table 5.7	Comparison between the number of farms supplied to the EU and those available for research		
Bookkeeping year	**Provided to the European Commission**	**Weighted farms available for research**	**Other available farms a)**
1990/91	1,587	1,576	12
1991/92	1,505	1,547	8
1992/93	1,513	1,516	7
1993/94	1,525	1,520	7
1994/95	1,546	1,534	13
1995/96	1,536	1,530	6
1996/97	1,551	1,545	6
1997/98	1,529	1,522	7
1998/99	1,368	1,363	5
1999/00	1,341	1,334	7
2000 b)	N/A	N/A	N/A
2001	1,330	1,310	20
2002	1,358	1,344	14
2003	1,437	1,399	38
2004	1,420	1,392	28
2005	1,458	1,406	52
2006	1,506	1,472	34

a) Other available farms are farms that are also available but without a weight. Reasons for not having a weight are: a farm is outside of the defined field of observation because a farm is too large or to small according to the information in the agricultural census. In alternative weighting systems (based on the characteristics of the farm these farms do get a weight; b) Bookkeeping year 1999/00 ended for arable farms and husbandry at 30 April 2000. Due to capacity problems related to IT problems, farm data for the period from 30 April 2000 to 31 December 2000 (respectively 1 January 2000 to 31 December 2000) are not processed but estimated based on data of 1999/00 and 2000/01.

6   Evaluation of 2006 sample

6.1   Introduction

In this chapter the FADN sample for the year 2006 is evaluated in a qualitative and quantitative way. Section 6.2 provides an evaluation of the methodology of stratification and weighting. A crucial element is the calculation of weights. Section 6.3 provides the quantitative evaluation of the year 2006. This section focuses on the quality of the estimations that can be made based on the sample.

6.2   Evaluation of stratification and weighting

6.2.1 Introduction

This section deals with some practical problems related to the estimation process. Weights of individual farms are used to make estimations of frequencies, totals and averages of groups of farms (aggregated results) based on the data from the agricultural census and the FADN data.

The method to calculate the weights of individual farms is crucial. The goal is to achieve unbiased estimates with a minimal variance. This enables the estimation of the confidence interval of the real population value and the minimisation of the total error. This is true for direct estimators. In the case of a ratio estimator this is not necessarily true, but ratio estimators are outside the scope of this publication (see Vrolijk et al., 2001) for a more extensive description of ratio estimators and other estimators).

In the next section the method to calculate the weights of the farms is described in general terms. The method applied to calculate the weights is evaluated from a practical and theoretical perspective.

6.2.2 Method of calculation of weights

The objective of the Dutch FADN system is to give a representative view of the total population. The question is therefore how to draw conclusions on totals, averages and frequencies that are valid for the whole population based on individual farm data. For example, how much is the average family farm income of

all farms in agriculture and horticulture? The solution is found in weighting: the individual farm data are raised to the population level (for some variables the estimated values can be compared to the data that is available for the whole population, i.e. data which are included in the yearly agricultural census). A weight is assigned to every observed farm in the FADN system. The weight is defined as the ratio between the number of farms in a stratum according the agricultural census and the number of farms in the sample (in the FADN system). For the assignment of farms in the FADN system to strata the information from the year 2006 is used. These data can be different from the data when the farm was chosen in the system for the first time. This implies some kind of post-stratification. Weights can be calculated as soon as a substantial number of farms have been completed. During the year, when additional farms are completed, the weights are recalculated. The weights of the farms are recalculated until the accounts of all farms are completed and the final set of weights can be established. For preliminary estimations based on for example 50% of the farms, one should be aware of the fact that this 50% is not necessary representative for the whole population.

The (post) stratification of the farms is based on the 2006 agricultural census. The population in a specific stratum is continuously changing. Therefore the farms that belong to a stratum in 2005 are not exactly the same as the farms that belong to that stratum in 2006. Due to these changes farms included in one stratum could have had different inclusion probabilities at the time of recruitment. In theory, to achieve unbiased estimators these differences in inclusion probabilities should be taken into account in the estimation process. However, the consequence of this would be a very complicated system with many different substrata with different inclusion probabilities. Therefore this complicated procedure is not applied. As a result, the theoretical assumption of a strict a-select sample can not be validated.

Although the calculation method applied in practice can lead to systematic distortions between estimated values and real values, the assumption of a random sample is made. This leads to several attractive consequences. The method to calculate weights is relatively easy, involving a limited set of homogenous strata and resulting in a more effective use of data.

Because of the applied sampling procedure (see section 2.1) the different strata have different sampling fractions. Strata with relatively homogenous units have a lower sampling fraction than very heterogeneous strata. This also implies that farms have very diverging weights. Farms from a homogenous cluster will have a larger weight (in principal the reciprocal of the sampling fraction) and

therefore represent a larger number of farms. The differences in sampling fractions are shown in table 6.1. These percentages are calculated by dividing the required number of farms in the selection plan (table 5.1) by the number of population units (table 3.3).

Table 6.1	Sampling fractions in different strata (2006 sample)		
Type of farming	**ESU size class**		
	1	**2**	**3**
Field crop farms			
Starch potatoes	0.02	0.03	0.05
- Organic crops	0.16	0.14	0.10
- Other field crop farms	0.01	0.02	0.08
Horticulture			
Vegetables under glass			
- Paprika	0.14	0.08	0.09
- Cucumber	0.13	0.10	0.16
- Tomato	0.19	0.10	0.12
- Other	0.03	0.04	0.13
Cut flowers under glass			
- Rose	0.13	0.09	0.08
- Chrysanthemum	0.13	0.17	0.13
- Other	0.02	0.02	0.05
Plants	0.02	0.03	0.05
Other glass	0.03	0.05	0.06
Field vegetables	0.02	0.03	0.09
Fruit	0.02	0.02	0.06
Nurseries	0.01	0.02	0.05
Mushroom	0.07	0.14	0.36
Bulbs	0.03	0.05	0.08
Other open air	0.01	0.02	0.08
Grazing livestock			
Dairy			
- Organic	0.07	0.10	0.14
- Non-organic	0.01	0.01	0.03
Calf fattening	0.03	0.02	0.05

Table 6.1	Sampling fractions in different strata (2006 sample) (continued)		
Type of farming	**ESU size class**		
	1	**2**	**3**
Other grazing livestock	0.00	0.01	0.05
Intensive livestock			
Breeding pigs	0.02	0.03	0.13
Fattening pigs	0.02	0.03	0.17
Integrated pig farms	0.03	0.03	0.13
Laying hens	0.02	0.03	0.24
Poultry	0.06	0.05	0.16
Other intensive livestock	0.06	0.09	0.14
Combined	0.01	0.02	0.06

6.2.3 Remarks on the weights of 2006

In the report on farm results for 2006 the research population is defined as all farms in the 2006 agricultural census (between the lower and upper threshold). The weight per farm is calculated as the ratio between the number of farms in the census and the number of farms in the sample.

In the calculation of aggregated results (averages, frequencies and totals) for the year 2006 the 2006 agricultural census is the starting point. Because of the complete registration of farms in the population (almost all farms are registered in the agricultural census) the aggregated numbers of farms are exactly the same as the number of farms in the census. However, in using these numbers in the calculation of weights for estimations for 2006 two remarks should be made.

Every year all horticultural and agricultural farms are registered in the agricultural census, but this registration only represents the situation at a certain moment during the year. Therefore it is possible that farms are missing from this registration. Furthermore, the trend is for number of farms to fall significantly (this trend is stronger for certain types of farms and less strong for others). As a consequence estimations for the year 2006 might be overestimations of reality.

Distortions in the number of farms in the census can therefore cause incorrect estimations of aggregates.

Furthermore, the typology of farms according to the agricultural census might differ from the typology according to the FADN data. The census reflects the situation at a certain point in time, while the FADN system describes the farm during a whole year. In order to take these differences into account two weighting methodologies are available in the Dutch FADN system.

6.3 Quantitative evaluation of 2006

6.3.1 Introduction

This section focuses on the quality of the estimations based on the 2006 FADN sample. Figure 6.1 shows the same structure as displayed in figure 2.1, but it adds the quality aspects. Section 6.3.2 provides information on the coverage of the sample; the coverage compares the total populations as described by the census and the field of observation of the FADN sample. Section 6.3.3 analyses the extent to which distortions might occur between the sample and the population due to over or under representation of farms with specific characteristics; it compares the characteristics between the field of observation and the actual FADN sample. Section 6.3.4 provides information on the reliability of estimates as made based on the FADN sample. The last quality aspect listed in figure 6.1, the response rate and the non-response, has already been described in the previous chapter.

Figure 6.1	Quality aspects of the Dutch FADN
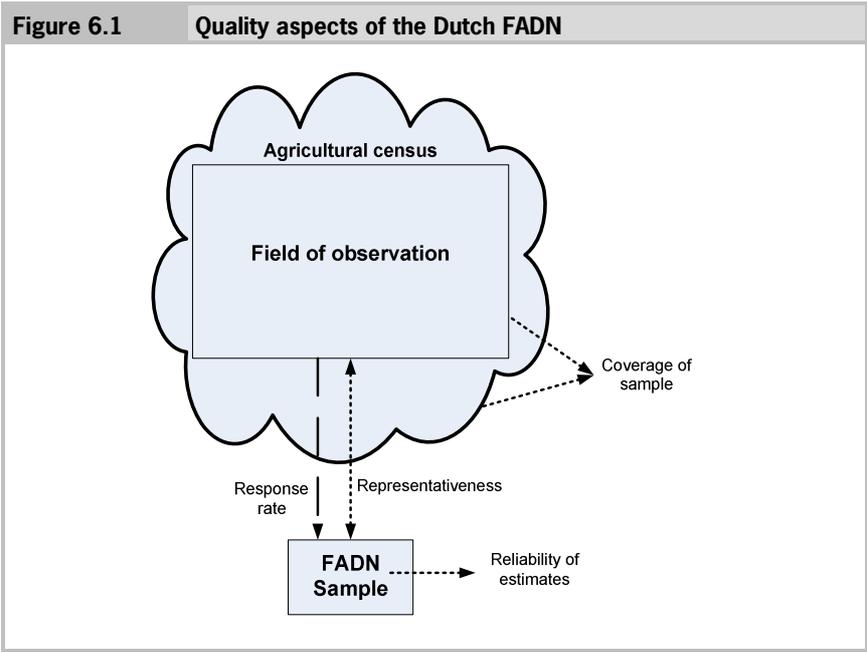
6.3.2 Coverage

It is desirable to have a sample that represents the population as well as possible. A clear distinction should be made between the coverage and the representativeness. This section describes the coverage, section 6.3.3 deals with the representativeness. To get an idea about the extent to which the total population is covered by the sample it is relevant to distinguish several aspects. Farms that are too small or are not registered in time are not part of the agricultural census (b). The sampling frame (c) is the basis for the choice of sample farms and consists of farms registered in the agricultural census and have a size of more then 16 ESU and less then 2,000 ESU. From this sampling frame the sample is drawn (d).

   In policy analysis and research it is essential to distinguish between farming types (for example specialised pig fattening farms) and agricultural activities (pig fattening). In the report on the redesign of the FADN sample it was illustrated that types of farming should not only be the focus of research (Vrolijk and Lodder, 2002). Agricultural activities are important in many research projects.

Figure 6.2	Relationship between FADN sample and all farms

All Farms (a)	↔	Farms in the agricultural census (b)	↔	Farms in the sampling frame (c)	↔	Farms in the FADN sample (d)
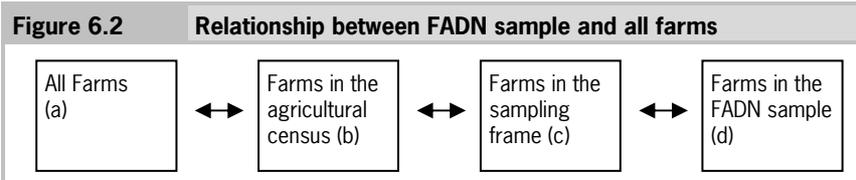
Table 6.2 gives an indication to what extent the FADN sample covers the whole population. Therefore a comparison is made between the farms in the sampling framework (all the farms that have a chance of being included in the FADN sample) (c) and the total population as described by the agricultural census (b). Direct comparison with all farms (a) would be better but the unregistered farms are unknown, and the practical difference is very limited. The sampling framework covers the population to a large extent. For example with respect to the production, almost 93% is covered by the sample. Small farms are excluded from the sampling framework, this means that a substantial number of the farms and to a lesser extent also of labour are outside of the sampling frame. With respect to agricultural activities, the table shows that some activities are not well covered by the sample. This mainly concerns the activities that are commonly found on very small or on very large specialised farms.

Table 6.2	Coverage of the sample compared to 2006 agricultural census		
Variable-agricultural census	Number according to census	Not covered in sample (%)		Percentage covered - by sample
		of which <16 ESU	of which >2,000 ESU	
Farms	79,435	23.5	0.2	76.4
Dutch size units	7,216,896	1.9	5.3	92.8
Farm managers	63,808	13.9	0.2	85.8
Family labour	106,597	10.8	0.2	89.0
Paid labour	43,685	2.6	7.7	89.7
Total labour	150,282	8.5	2.4	89.2
Size in hectares				
Agricultural area	1,919,704	5.5	0.6	94.0
Arable	1,007,616	4.5	0.6	94.9

Table 6.2	Coverage of the sample compared to 2006 agricultural census (continued)		
Variable-agricultural census	Number according to census	Not covered in sample (%)		Percentage covered - by sample
		of which <16 ESU	of which >2,000 ESU	
Grassland	817,129	7.1	0.0	92.8
Horticulture under glass	10,381	0.1	11.5	88.4
Vegetables in the open air	84,579	1.0	4.2	94.8
Number of animals				
Dairy cows	1,419,716	0.1	0.1	99.8
Fattening calves	843,725	0.9	0.0	99.1
Ewes	680,684	21.2	0.0	78.7
Fattening pigs	5,475,689	1.4	0.8	97.8
Breeding pigs	1,233,769	0.2	0.7	99.1
Laying hens	41,641,960	0.4	0.0	99.6
Poultry	41,913,979	0.1	0.1	99.8
Size in hectares				
Winter cereal	121,502	4.7	0.5	94.8
Seed potatoes	37,428	0.2	0.1	99.8
Consumption pota-toes	69,478	1.3	0.6	98.1
Starch potatoes	49,592	0.9	1.8	97.3
Sugar beets	82,782	2.8	0.5	96.7
Peas for canning	5,302	1.5	4.3	94.3
Seed onions	18,486	0.5	0.2	99.3
Grass seed	26,142	3.4	0.3	96.3
Green maize	218,036	7.9	0.2	91.9
Brussel sprouts	3,354	0.4	0.3	99.2
Cabbage all types	2,667	0.5	1.3	98.2
Asparagus	2,461	2.3	0.4	97.2
Tulips	10,362	0.1	5.1	94.7
Hedges	2,605	2.3	1.5	96.2

Table 6.2	Coverage of the sample compared to 2006 agricultural census (continued)		
Variable-agricultural census	Number according to census	Not covered in sample (%)		Percentage covered - by sample
		of which <16 ESU	of which >2,000 ESU	
Trees	5,246	0.8	8.8	90.4
Apples	9,562	1.6	0.0	98.4
Pears	6,914	1.5	0.0	98.5
Tomatoes under glass	1,481	0.0	32.0	68.0
Cucumbers under glass	638	0.0	1.6	98.4
Paprika under glass	1,214	0.0	12.5	87.5
Roses	754	0.0	7.7	92.3
Chrysanthemum	597	0.1	0.2	99.7
Fresia	152	0.0	0.0	100.0
Ornamentals leave	548	0.1	12.9	87.1
Ornamentals flower	838	0.0	11.5	88.5
Mushrooms	71	0.0	15.7	84.1

To give a complete picture of a certain agricultural activity it is therefore important to look at the activities on all farm types. For example, not only pig fattening farms will create added value from pig fattening, also other types of farms can be involved in this activity (although it is not their main business). The next table describes to which extent a certain activity can be found on certain types of farming. The figures in italics express that an activity belongs to that type of farming (based on the principal types of farming). For example, 82.8% of the agricultural activity fattening pigs can be found on the intensive livestock farms. This means that 17.2% of this activity can be found on farms that belong to other types of farming, for example arable farms. Looking in more detail, the skewness is even larger. Type of farming 5011, the specialised pig fattening farms are responsible for 56% of the pig fattening activity. This implies that 44% of this activity takes place within other types. Production of mushrooms is a highly specialised agricultural activity. More than 99% of this activity takes place on specialised mushroom farms.

Table 6.3	Relationship between types of farming and agricultural activities - share of ESU 2006								
Type of farming	Dairy	Cattle	Sheep	Goat	Grass-land	Fattening pig	Other pig	Laying hen	Poultry
Field crop farms									
- Starch potatoes	0.01	0.37	0.18	0.01	0.20	0.00	0.25	0.12	0.67
- Organic crops	0.00	0.17	0.08	0.00	0.26	0.00	0.05	0.07	0.00
- Other field crop farms	0.06	2.15	3.37	0.20	4.48	0.15	0.82	0.67	2.40
Horticulture									
Vegetables under glass									
	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00
- Cucumber	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
- Tomato	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
- Other	0.00	0.00	0.07	0.01	0.06	0.00	0.03	0.00	0.00
Cut flowers under glass									
- Rose	0.00	0.00	0.04	0.01	0.02	0.00	0.00	0.00	0.00
- Chrysanthemum	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
- Other	0.00	0.00	0.08	0.01	0.06	0.00	0.00	0.17	0.00
Plants	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.00
Other glass	0.00	0.00	0.02	0.01	0.03	0.00	0.00	0.00	0.00
Field vegetables	0.01	0.27	0.07	0.01	0.15	0.03	0.12	0.04	0.10
Fruit	0.01	0.17	0.21	0.01	0.28	0.01	0.07	0.18	0.00
Nurseries	0.02	0.23	0.18	0.01	0.34	0.25	0.23	0.07	0.00
Mushroom	0.00	0.06	0.02	0.00	0.05	0.00	0.00	0.00	0.00
Bulbs	0.04	0.12	0.15	0.00	0.16	0.07	0.20	0.00	0.26
Other open air	0.04	0.28	0.18	0.01	0.30	0.03	0.27	0.05	0.30
Grazing livestock									
Dairy									
- Organic	92.58	40.08	21.67	1.29	3.03	2.05	8.18	1.09	1.01
- Non-organic	1.32	0.75	0.49	0.05	0.46	0.05	0.07	0.24	0.00
Calf fattening	0.02	0.71	0.55	0.09	0.07	0.00	0.22	0.15	0.14

Table 6.3	Relationship between types of farming and agricultural activities - share of ESU 2006 (continued)								
Type of farming	Dairy	Cattle	Sheep	Goat	Grass-land	Fattening pig	Other pig	Laying hen	Poultry
Other grazing livestock	1.59	36.89	60.99	91.23	73.56	0.26	1.22	0.50	0.09
Intensive livestock									
Fattening pigs	0.03	0.24	0.93	0.11	1.46	56.04	3.92	0.19	0.11
Breeding pigs	0.01	0.38	0.62	0.03	1.05	0.26	36.88	0.03	0.05
Integrated pig farms	0.02	0.53	0.52	0.02	0.79	25.26	25.37	0.01	0.37
Laying hens	0.01	0.15	0.58	0.01	0.81	0.14	0.33	80.02	0.11
Poultry	0.02	0.03	0.23	0.00	0.28	0.03	0.15	0.04	70.42
Other intensive livestock	0.02	0.15	0.15	0.01	0.17	1.11	1.56	4.80	3.83
Mixed	4.19	16.26	8.50	6.88	11.84	14.26	20.06	11.54	20.13
Total	100	100	100	100	100	100	100	100	100

Table 6.3	Relationship between types of farming and agricultural activities - share of ESU 2006 (continued)									
Type of farming	Wheat	Root crops	Vegetable open air	Fruit	Tree	Mushroom	Bulbs	Vegetables glass	Cut flowers glass	Ornamentals glass
Field crop farms										
- Starch potatoes	6.45	14.51	0.24	0.04	0.00	0.00	0.00	0.00	0.00	6.45
- Organic crops	1.64	0.95	2.62	0.48	0.07	0.00	0.07	0.03	0.00	1.64
- Other field crop farms	55.92	60.69	2.93	0.80	0.09	0.00	0.73	0.00	0.01	55.92

Table 6.3		Relationship between types of farming and agricultural activities - share of ESU 2006 (continued)								
Type of farming	Wheat	Root crops	Vegetable open air	Fruit	Tree	Mushroom	Bulbs	Vegetables glass	Cut flowers glass	Ornamentals glass
Horticulture										
Vegetables under glass										
- Paprika	0.01	0.00	0.04	0.02	0.01	0.00	0.00	27.00	0.04	0.01
- Cucumber	0.02	0.00	0.05	0.00	0.00	0.00	0.00	10.76	0.03	0.02
- Tomato	0.01	0.00	0.02	0.00	0.01	0.00	0.00	36.94	0.02	0.01
- Other	0.17	0.02	2.17	0.18	0.04	0.00	0.00	21.70	0.12	0.17
Cut flowers under glass										
- Rose	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.03	29.29	0.00
- Chrysan-themum	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	10.01	0.01
- Other	0.09	0.03	0.16	0.06	0.13	0.00	1.14	0.15	48.75	0.09
Plants	0.02	0.00	0.03	0.02	0.19	0.00	0.00	0.11	0.92	0.02
Other glass	0.07	0.02	1.50	0.25	3.02	0.00	3.32	1.81	5.45	0.07
Field vegetables	0.64	0.54	59.97	0.29	0.06	0.00	0.01	0.41	0.02	0.64
Fruit	0.42	0.20	0.22	85.15	0.10	0.00	0.00	0.02	0.00	0.42
Nurseries	0.55	0.22	0.32	0.42	84.59	0.00	0.02	0.01	0.08	0.55
Mushroom	0.02	0.00	0.00	0.11	0.00	99.34	0.00	0.00	0.00	0.02
Bulbs	0.83	1.03	0.54	0.00	0.03	0.00	76.98	0.01	1.21	0.83
Other open air	0.75	0.75	7.56	2.14	3.50	0.02	9.54	0.66	3.42	0.75
Grazing livestock										
Dairy										
- Organic	3.02	3.26	0.80	0.42	0.27	0.00	0.35	0.00	0.00	3.02
- Non-organic	0.18	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.18
Calf fattening	0.28	0.10	0.09	0.02	0.02	0.00	0.00	0.00	0.00	0.28

Table 6.3	Relationship between types of farming and agricultural activities - share of ESU 2006 (continued)									
Type of farming	Wheat	Root crops	Vegetable open air	Fruit	Tree	Mushroom	Bulbs	Vegetables glass	Cut flowers glass	Ornamentals glass
Other grazing livestock	4.27	0.60	0.32	0.24	0.09	0.00	0.04	0.00	0.00	4.27
Intensive livestock										
Fattening pigs	1.99	0.34	0.23	0.06	0.01	0.00	0.02	0.00	0.00	1.99
Breeding pigs	1.33	0.20	0.07	0.01	0.04	0.00	0.00	0.00	0.00	1.33
Integrated pig farms	2.09	0.58	0.31	0.04	0.09	0.00	0.01	0.00	0.00	2.09
Laying hens	0.62	0.17	0.26	0.04	0.05	0.00	0.00	0.00	0.00	0.62
Poultry	0.38	0.07	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.38
Other intensive livestock	0.22	0.05	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.22
Mixed	18.00	15.65	19.43	9.19	7.49	0.64	7.77	0.35	0.62	18.00
Total	100	100	100	100	100	100	100	100	100	100

6.3.3 Representativeness

Because of the stratification scheme the sample will provide a good representation of the population on the main characteristics (stratification variables) at the beginning of a year. During the year farms might drop out of the sample and changes might occur in the population. Despite these changes the representativeness is maintained by applying post-stratification on the resulting sample and the changed population. Representativeness with respect to the stratification variables does not necessary imply that the sample is representative for all variables. Such a full representativeness is impossible unless the sample size approximates the whole population. Table 6.4 shows to what extent the sample is representative for a number of variables in the agricultural census.

The following guideline can help in the interpretation of the table: a relative difference which is close to the relative standard error cannot be regarded as proof of systematic differences between the sample and the population. If the relative difference is more than two times the relative standard error then it is less likely that these differences can be explained by sampling errors. It is very unlikely that the difference is caused by coincidence if the relative difference is more than 3 times the relative standard error.

An example can illustrate how the table should be interpreted. The average number of DSU (Dutch size units) of pigs as measured in the 2006 agricultural census is 7.68 (i.e. the average of all farms within the field of observation). If the same variable is estimated based on the FADN sample an average of 8.18 is calculated. It might seem that the number of pigs is slightly overestimated in the sample. However, the relative standard error of the estimate is 3.3%. When this standard error is compared to the relative difference between both values (6%), then the conclusion that there is a significant difference, cannot be supported.

Table 6.4	Comparison of farms in the agricultural census (16-1,200 ESU) and farms in the Dutch FADN (2006 agricultural census)					
Variable	Average calculated based on		Relative standard error (FADN)	Ratio Census and FADN		
				all farms	farms with value >0	
	census (1)	FADN (2)		average (1/2)	number	average
dsu	110.41	110.66	0.79	99.8	100.37	99.4
Activities (dsu)						
Field crops	13.18	14.11	2.5	93.4	91.65	101.9
Grassland	1.66	1.94	14.06	85.5	99.23	86.2
Horticulture in the open	17.08	15.89	2.88	107.5	101.19	106.2
Horticulture under glass	26.57	24.85	1.96	106.9	99.7	107.2
Cattle	34.68	36.3	1.57	95.5	98.21	97.3
Dairy cows	28.2	29.61	1.69	95.2	96.3	98.9
Fattening cattle	0.85	1.05	17.98	81.3	95.13	85.5
Veal	1.77	1.76	7.06	100.3	112.33	89.3
Horses	2.51	1.27	20	196.7	136.22	144.4

Table 6.4	Comparison of farms in the agricultural census (16-1,200 ESU) and farms in the Dutch FADN (2006 agricultural census) (continued)					
Variable	Average calculated based on		Relative standard error	Ratio Census and FADN		
				all farms	farms with value >0	
	census (1)	FADN (2)	(FADN)	average (1/2)	number	average
Sheep	0.46	0.63	24.36	73.4	94.7	77.5
Goats	0.32	0.98	29.01	32.4	75.9	42.7
Pigs	7.68	8.18	3.33	93.9	92.56	101.4
Fattening pigs	3.47	3.51	4.77	98.8	95.39	103.5
Breeding pigs	4.19	4.64	4.39	90.4	92.56	97.7
Poultry	3.3	3.44	5.43	96	82.72	116
Fattening peepers	0.94	0.91	12.52	102.5	102.29	100.2
Laying hens	1.58	1.93	8.31	82	68.9	119
Dugs	0.06	0.04				
Turkey	0.1	0.16	33.54	63.4	71.6	88.6
Rabbits	0.03	0.05	49.27	72.3	178.87	40.4
Fur animals	0.59	0.36	30.38	164.8	92.12	178.9
Sizes (ha)						
UAA	29.74	31.55	1.64	94.3	100.45	93.8
Field crops	15.76	17.09	2.75	92.2	95.43	96.6
Horticulture open air	1.32	1.35	4.11	98	101.19	96.9
Horticulture glass	0.15	0.15	2.26	102.9	99.7	103.2
Permanent grass	12.16	12.65	3.87	96.1	98.29	97.8
Other	4.31	0.96	8.16	449.8	96.85	464.4
Forest	0.31	0.04	35.53	720.1	81.36	885
eigendom	16.87	17.39	2.65	97	99.34	97.6
erfpacht	0.52	0.57	20.91	91.9	109.14	84.2
pacht	1.22	1.34	11.42	91.1	88.83	102.6
pacht anders	0.32	0.36	28.83	87.7	102.99	85.1
Acreages field crops						
Grains	3.36	3.63	5.42	92.4	94.54	97.7
Leguminous plants	0.04	0.07	29.47	62.9	64.12	98.1
Commercial crops	0.18	0.22	21.15	81.4	85.23	95.5

Table 6.4	Comparison of farms in the agricultural census (16-1,200 ESU) and farms in the Dutch FADN (2006 agricultural census) (continued)					
Variable	Average calculated based on		Relative standard error (FADN)	Ratio Census and FADN		
				all farms	farms with value >0	
	census (1)	FADN (2)		average (1/2)	number	average
Seeds	0.43	0.67	12.03	63.7	61.7	103.3
Tuberous and carrots	3.86	4.12	3.23	93.6	90.56	103.4
Green fodder	6.63	6.96	4.76	95.2	95.49	99.7
Green fertiliser	0.32	0.51	26.99	63	83.79	75.2
Horticulture in the open air						
Vegetables (market garden)	0.39	0.42	9.94	91.3	82.21	111.1
Stone fruit	0.28	0.31	6.7	88	109.75	80.2
Small fruits	0.02	0.04	45.39	60.6	74.72	81.1
Flower nursery	0.04	0.03	21.03	148	98.39	150.4
Tree nursery	0.21	0.17	11.99	124.2	123.25	100.8
Flower bulbs	0.36	0.37	6.38	97.9	79.56	123
Glass houses						
Vegetables	0.06	0.06	3.32	95.4	92.71	102.9
Tomatoes	0.02	0.02	3.25	106.1	91.91	115.4
Cucumbers	0.01	0.01	3.87	71.2	89.38	79.7
Paprika	0.02	0.02	4.38	100.5	81.78	122.9
Fruit	0	0	49.93	34.9	52.32	66.7
Cut flowers	0.05	0.05	3.45	98.4	101.57	96.8
Roses	0.01	0.01	6.05	118	108.9	108.3
Chrysanthemum	0.01	0.01	7.9	104.2	88.11	118.3
Plants	0.03	0.02	5.59	115.7	111.89	103.4
Tree nursery	0.01	0	23.93	160.6	111.07	144.6
Standing glass	0.15	0.14	2.21	104	100.7	103.2
Mushrooms						
Cell	0.03	0.03	9.21	96.2	77.18	124.6
Size (are)	0	0	9.09	102	77.18	132.2

Table 6.4	Comparison of farms in the agricultural census (16-1,200 ESU) and farms in the Dutch FADN (2006 agricultural census) (continued)					
Variable	**Average calculated based on**		**Relative standard error (FADN)**	**Ratio Census and FADN**		
				all farms	**farms with value >0**	
	census (1)	**FADN (2)**		**average (1/2)**	**number**	**average**
Chicory						
Size (are)	0.03	0.06	40.99	54.2	51.04	106.2
Bulbs						
Tulips (pieces)	22.22	30.75	17.15	72.3	92.44	78.2
Narcissus (kg)	0.05	0.02	72.43	250.8	200.53	125.1
Substrate growing (are)						
Vegetable	0.05	0.05	3.4	90.1	90.41	99.7
Flowers	0.02	0.02	11.09	88	83.72	105.1
Pot- en containerteelt						
Oppervlakte (aren)	0.02	0.02	28.57	84.7	97.75	86.7
Stable capacity (number of animals)						
Fattening calves	16.76	16.07	7.33	104.3	111.65	93.4
Fattening pigs	111.59	113.85	5.12	98	97.72	100.3
Peepers	841.41	934.28	15.06	90.1	93.56	96.3
Laying hens	642.19	892.76	13.35	71.9	70.6	101.9
Characteristics entrepreneur						
Age	51.13	49.62	0.7	103	100.37	102.7
Labour						
Total	3.14	3.57	10.34	88.2	100.16	88
Male	1.99	2.1	8.33	94.7	99.56	95.2
Female	1.15	1.46	13.38	78.8	93.37	84.4
Paid labour	0.96	1.23	29.77	77.8	92.02	84.5
Source: 2006 agricultural census.						

The information in table 6.4 gives an indication for which variables and consequently for which research projects it might be wise to perform post-stratification or use alternative estimation techniques to take into account the differences between the sample and the population. For example, in studies in which the age of the

farmer plays an important role it might be useful to apply alternative estimation techniques.

The last two columns of table 6.4 provide more detailed information on the difference between the population and the sample. These differences can be explained on one hand by differences in the number of farms on which a certain activity occurs (a value larger than zero) and on the other by the average of this activity on farms which are in this activity. For example: the number of DSU dairy cows in the FADN is higher than in the agricultural census. This difference is partly explained by a higher estimation of the number of farms with dairy cows and partly by a lower estimation of DSU of dairy cows on farms with dairy cows (95.2 = 96.3% * 98.9).

A comparison between the sample and the population as registered in the agricultural census does not fully answer the question whether estimations of financial, economic and technical characteristics are bias free. It is for example possible that farms with relatively good or bad management skills and therefore performance are over represented in the sample.

6.3.4 Reliability

The previous subsection provides some indicators whether there are systematic differences between the sample and the population (representativeness of sample). This section focuses on the reliability of the estimates.

The calculation of averages of groups based on sampling units implies that there can be differences between the estimated value and true population value. These differences can occur due to the random selection of units to be included in the sample. Table 6.5 provides an indication of the level of precision of the estimates for a set of important goal variables.

The precision of estimates can be measured by the standard error of the estimate of a variable. The standard error is used to calculate the confidence interval. This confidence interval describes the range in which the true population value will be given a certain level of certainty. The confidence interval ranges from the calculated average minus two times the standard error to the calculated average plus two times the standard error. The calculated averages of two groups are significantly different (with a 95% certainty) if the difference is larger than two times the square root of the sum of squares of the standard errors of the two group averages.

This section provides the reliability of estimates for a number of important goal variables for different types of farming. This calculation is based on the available CSP observations (see section 5.3).

Table 6.5	Reliability of estimates of important goal variables per type of farming, based on FADN sample (2006)					
Type of farming	**Goal variable**					
	family farm income	total revenues	return a)	savings	income farm	net farm result
Field crop farms						
- Starch potatoes	7,305	92,277	2.5	13,688	10,273	5,495
- Organic crops	27,732	97,390	5.9	28,292	30,990	30,878
- Other field crop farms	7,821	25,748	2.7	7,474	7,519	6,191
Horticulture						
Vegetables under glass						
- Paprika	52,307	59,850	2.2	61,058	61,274	33,781
- Cucumber	53,478	248,069	1.8	48,200	55,738	39,248
- Tomato	23,336	156,883	1.4	25,585	23,951	21,550
- Other	10,566	45,152	3.2	9,111	9,796	10,151
Cut flowers under glass						
- Rose	47,315	161,263	2.6	31,273	47,052	36,500
- Chrysanthe-mum	21,055	174,968	1.7	18,983	21,162	20,180
- Other	14,455	61,880	2.2	22,399	14,978	13,389
Plants	22,771	93,086	3.5	15,515	23,223	21,399
Other glass	11,342	53,895	2.8	9,840	11,377	12,215
Field vegetables	34,105	104,755	3.0	17,625	33,970	27,875
Fruit	10,363	23,497	4.7	12,117	10,736	11,517
Nurseries	*	*	*	*	*	*
Mushroom	*	*	*	*	*	*
Bulbs	29,747	113,164	3.5	27,606	31,235	22,149
Other open air	34,554	51,711	6.0	30,091	37,563	31,531

Table 6.5	Reliability of estimates of important goal variables per type of farming, based on FADN sample (2006) (continued)					
Type of farming	Goal variable					
	family farm income	total revenues	return a)	savings	income farm	net farm result
Grazing livestock						
Dairy						
- Organic	8,033	8,166	1.8	11,353	10,521	7,184
- Non-organic	2,608	4,728	0.8	3,514	3,151	2,361
Calf fattening	4,880	13,326	1.8	6,029	5,154	5,675
Other grazing livestock	6,833	18,197	3.4	7,669	9,370	7,484
Intensive livestock						
Breeding pigs	12,123	51,503	2.1	12,457	12,011	10,931
Fattening pigs	7,456	18,147	2.5	7,455	10,341	4,627
Integrated pig farms	10,990	33,530	1.2	8,711	11,965	8,094
Laying hens	12,601	26,428	2.4	12,063	11,694	11,354
Poultry	9,485	37,123	1.8	15,723	9,937	8,884
Other intensive livestock	*	*	*	*	*	*
Mixed	9,524	19,913	3.2	10,560	10,281	9,215

a) Revenues per 100 euro costs; * Insufficient number of observation in CSP variant.

Table 6.6	Reliability of estimates of important goal variables per main type of farming, based on FADN sample (2006)					
Type of farming	Goal variable					
	family farm income	total revenues	return	savings	income farm	net farm result
Field crops	6,701	24,906	2.3	6,588	6,530	5,335
Vegetables under glass	17,166	59,613	1.6	18,415	18,625	13,519
Cut flowers under glass	13,215	55,286	1.7	17,502	13,515	11,657
Pigs	6,008	22,141	1.2	5,857	6,649	4,894

Table 6.6	Reliability of estimates of important goal variables per main type of farming, based on FADN sample (2006) (continued)					
Type of farming	Goal variable					
	family farm income	total revenues	return	savings	income farm	net farm result
Poultry	9,177	21,563	1.8	9,645	8,635	8,303
Grazing livestock	2,585	5,961	1.1	3,187	3,351	2,615
All farms	2,296	6,724	0.7	2,447	2,573	2,113

There are clear differences in the significance of estimates between different types of farming. The estimates for the dairy sector are the most reliable because of the large number of farms included in the sample, which reflects the importance of the dairy sector in Dutch agriculture. The decision on the number of farms is described in Vrolijk and Lodder (2002).

Tables 6.7 and 6.8 describe the relative standard error (coefficient of variance). This is the standard error divided by the group average. A higher relative standard error implies less reliable estimates, but the value is strongly affected by the absolute value of the average. If the average value approaches zero, the relative standard error can become very large. A meaningful evaluation of the standard error requires a simultaneous use of tables 6.5 and 6.6 on one hand and tables 6.7 and 6.8 on the other.

Table 6.7	Coefficient of variation of estimates of important goal variables per main type of farming, based on FADN sample (2006)					
Type of farming	Goal variable					
	family farm income	total revenues	return	savings	income farm	net farm result
Field crops	0.085	0.092	0.026	0.151	0.068	-5.625
Vegetables under glass	0.246	0.066	0.017	2.226	0.238	-0.457
Cut flowers under glass	0.171	0.067	0.019	-1.819	0.162	-0.309
Pigs	0.072	0.044	0.013	0.157	0.069	2.471
Poultry	-1.041	0.043	0.021	-0.279	1.969	-0.099
Grazing livestock	0.067	0.030	0.016	0.279	0.059	-0.041

Table 6.8	Coefficient of variation of estimates of important goal variables per type of farming, based on FADN sample (2006)					
Type of farming	**Goal variable**					
	family farm income	total revenues	return	savings	income farm	net farm result
Field crop farms						
- Starch potatoes	0.20	0.34	0.03	1.30	0.18	-0.13
- Organic crops	0.28	0.28	0.06	0.36	0.24	1.17
- Other field crop farms	0.09	0.10	0.03	0.16	0.07	1.33
Horticulture						
Vegetables under glass						
- Paprika	0.50	0.05	0.02	1.80	0.55	0.93
- Cucumber	0.63	0.18	0.02	9.98	0.59	-1.12
- Tomato	0.59	0.11	0.01	-1.26	0.53	-0.23
- Other	0.18	0.12	0.04	1.15	0.14	-0.28
Cut flowers under glass						
- Rose	0.52	0.11	0.03	-1.72	0.51	5.60
- Chrysanthemum	0.11	0.11	0.02	0.18	0.11	0.29
- Other	0.24	0.11	0.03	-0.99	0.22	-0.22
Plants	0.34	0.12	0.04	-2.25	0.31	-0.96
Other glass	0.49	0.21	0.05	0.65	0.29	-0.26
Field vegetables	0.59	0.23	0.04	5.87	0.47	-0.78
Fruit	0.29	0.09	0.06	-3.86	0.25	-0.22
Nurseries	*	*	*	*	*	*
Mushroom	*	*	*	*	*	*
Bulbs	0.22	0.14	0.04	0.45	0.21	1.27
Other open air	0.43	0.14	0.07	1.08	0.39	-5.15
Grazing livestock						
Dairy						
- Organic	0.15	0.04	0.02	0.55	0.15	-0.12
- Non-organic	0.05	0.02	0.01	0.17	0.05	-0.04
Calf fattening	0.09	0.08	0.02	0.47	0.08	-0.24

Table 6.8	Coefficient of variation of estimates of important goal variables per type of farming, based on FADN sample (2006) (continued)					
Type of farming	**Goal variable**					
	family farm income	**total revenues**	**return**	**savings**	**income farm**	**net farm result**
Other grazing livestock	8.45	0.15	0.07	-0.65	0.32	-0.10
Intensive livestock						
Breeding pigs	0.11	0.08	0.02	0.30	0.10	0.64
Fattening pigs	0.22	0.06	0.03	0.34	0.19	-0.26
Integrated pig farms	0.10	0.05	0.01	0.16	0.10	1.01
Laying hens	-1.62	0.06	0.03	-0.31	4.10	-0.13
Poultry	-0.85	0.06	0.02	-0.61	1.28	-0.11
Other intensive livestock	*	*	*	*	*	*
Mixed	0.18	0.07	0.04	0.47	0.14	-0.21

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