Sample of Dutch FADN 2009-2010

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

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Photo cover: Shutterstock

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LEI is ISO 9001:2008 certified.

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 Wageningen UR and the Centre for Economic. This report explains the background of the sample for the years 2009 and 2010. Important changes that took place in the sampling of farms in 2010 are taken into account and elaborated. All phases from the determination of the selection plan through the recruitment of farms to the quality control of the final sample are described in this report, which 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

S.1 Key results

The European Commission requires the yearly establishment of a selection plan describing the sample of agricultural and horticultural holdings in the Dutch FADN. This report describes how this requirement is fulfilled for the years 2009-2010.

More than 70 thousand agricultural and horticultural farms operate in the Netherlands. In 2009 and 2010 this number was 73,008 and 72,324, respectively. The Dutch FADN aims at farms between 16 and 2,000 European Size Units (ESU). This size measure has been changed in 2010 to equal to or larger than 25,000 Standard Outputs. This field of observation covered 56,022 farms in 2009 and 52,391 farms in 2010, which in both years were responsible for 90% of total production capacity.

For the accounting year 2009, 1,565 farm reports have been delivered to the European Commission. For 2010, this number was 1,500. The legal obligation of 1,500 farms has been fulfilled. The data are of major importance for the evaluation of the agricultural policies and the monitoring of the economic developments in the agricultural sector.

In the design of the selection plan, a stratification based on type of farming and size class has been used. Stratification enables a better control over the representativeness of the sample and contributes to more reliable estimates.

Figure S.1   Sampling and selection procedures

FARMERS	

Refusal acceptance

Request for participation

REGIONAL OFFICES

OTHERS …

GOVERNMENT

SUPPLIERS

BANKS

Selection of farm addresses

Info authorizations

Farm numbers

MINISTRY

RANDOM SAMPLING

Statistics Netherlands

Farm adresses

Agricultural census

Selection plan

EU

Other stakeholders

Source: Vrolijk et al. (2006).
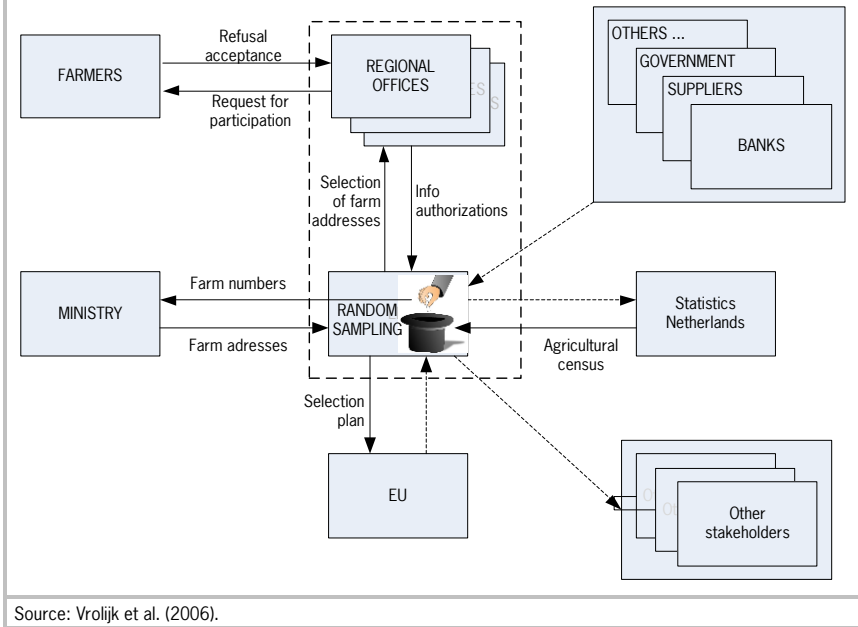
S.2   Complementary results

This report describes all phases of the sample for the years 2009 and 2010, from the determination of the selection plan and the recruitment of farms to the quality of control of the final sample. With this information it provides a solid description of the background of the sample for users of the data or results of the Dutch FADN.

The perceived value a farmer sees in providing data and in the Dutch FADN in general are important factors that determine whether a farmer is willing to participate. Another important factor is that a farmer can rest assured that LEI treats the data with the utmost confidentiality.

S.3 Background

The European Commission requires the yearly establishment of a selection plan for the Dutch contribution to the EU FADN. The selection plans contribute to the harmonisation of the samples from different countries in the EU.

The agricultural census provides the sampling frame for selecting farms to be included in the FADN. Based on the most recent agricultural census, farms are assigned to strata, which are defined by type of farming and economic size class.

For each stratum the number of farms to be included in the Dutch FADN sample is determined. This number is dependent on the economic importance of a sector, the number of farms in a stratum, the policy relevance of a group and the heterogeneity of farms.

Farms are randomly selected from the agricultural census. The selected farms are contacted with a request for participation in the Dutch FADN. The farms that are willing to cooperate are accepted into the network. The farms that refuse to participate are asked a few questions to enable an analysis of the reasons behind and potential effects of non-response.

Samenvatting

Steekproef Bedrijven-Informatienet 2009-2010; Ontwerp-principes en kwaliteit van de steekproef onder land- en tuinbouwbedrijven

S.1 Belangrijkste uitkomsten

De Europese Commissie vereist dat er ieder jaar een selectieplan wordt opgesteld waarin de opbouw van de steekproef onder land- en tuin-bouwbedrijven binnen het Bedrijven-Informatienet wordt beschreven. In deze publicatie wordt beschreven hoe voor 2009-2010 aan deze ver-plichting is voldaan.

In Nederland zijn er meer dan 70.000 bedrijven actief in de land- en tuinbouw. In 2009 en 2010 waren dit er respectievelijk 73.008 en 72.324. Het Bedrijven-Informatienet richt zich op de bedrijven van 16 tot 2.000 Europese grootte-eenheden (EGE). In 2010 is de overstap gemaakt naar standaard outputs (SO), waarbij uitgegaan wordt van bedrijven van 25.000 standaard outputs of meer. Dit waren 56.022 bedrijven in 2009 en 52.391 bedrijven in 2010 die in beide jaren verantwoordelijk waren voor meer dan 90% van de totale productiecapaci-teit.

Voor het boekjaar 2009 zijn 1.565 bedrijfsrapportages aangeleverd aan de Europese Commissie. Voor 2010 waren dit er 1.500. Hiermee is voldaan aan de wettelijke eis van 1.500 bedrijven. Deze gegevens zijn van grote waarde voor de evaluatie van het gemeenschappelijke landbouwbeleid (GLB) en het mo-nitoren van de economische ontwikkelingen in de landbouwsector.

In het selectieplan is gebruikgemaakt van een stratificatie naar bedrijfstype en economische omvang van bedrijven. Stratificatie draagt bij aan een betere representativiteit en betrouwbaarheid van schattingen.

Figuur S.1   Procedures voor het vaststellen van de steekproef en het werven van bedrijven

Bron: Vrolijk et al. (2006).
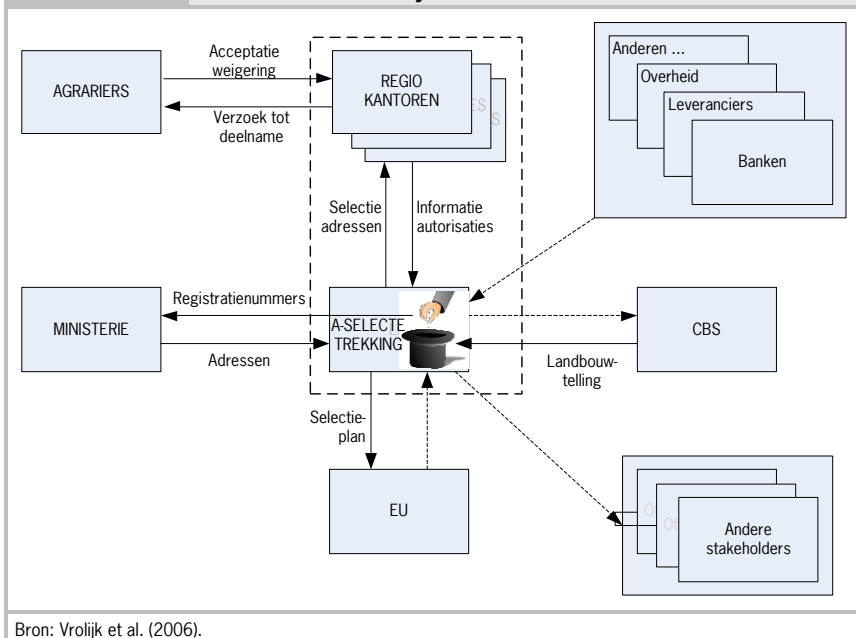
S.2   Overige uitkomsten

In deze rapportage worden alle fasen beschreven van het tot stand komen van de steekproef voor het jaar 2009 en 2010. Het opstellen van het selectieplan, het werven van de bedrijven en het beoordelen van de kwaliteit van de resulterende steekproef komen aan de orde. Zo krijgen gebruikers van de gegevens of resultaten van het Bedrijven-Informatienet een goed beeld van de achtergrond van de steekproef.

Het nut dat een boer ziet in het beschikbaar stellen van gegevens en in het Bedrijven-Informatienet zijn belangrijke factoren die bepalen of een boer al dan niet wil deelnemen. Ook is het vertrouwen van een boer dat het LEI zorgvuldig met zijn/haar gegevens omgaat een belangrijke factor.

S.3 Achtergrond

De Europese Commissie vereist dat jaarlijks een selectieplan wordt opgesteld. Dit selectieplan draagt bij aan de harmonisatie van informatienetten in verschillende EU-landen.

De landbouwtelling vormt het uitgangspunt voor het vaststellen van de steekproef voor het Bedrijven-Informatienet. Op basis van de meest recente landbouwtelling worden bedrijven ingedeeld in strata, die zijn gevormd op basis van het bedrijfstype en de economische omvang.

Voor elk stratum wordt vastgesteld hoeveel bedrijven in de steekproef moeten worden opgenomen. Dit aantal is afhankelijk van onder andere de economische betekenis van de sector, het aantal bedrijven in de groep, de beleidsrelevantie en de heterogeniteit van bedrijven.

Bedrijven worden a-select getrokken uit de landbouwtelling. Vervolgens worden deze bedrijven door het LEI benaderd met het verzoek om deel te nemen aan het Informatienet. De bedrijven die willen deelnemen, worden in het netwerk genomen. De bedrijven die niet willen deelnemen, worden enkele vragen voorgelegd, zodat zicht wordt verkregen op de redenen en consequenties van non-response.

1   Introduction

1.1   Objective

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, Article 6 of the regulation EEG 1859/82 prescribes:

'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.'

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

1.2 Structure

Chapter 2 gives a description of the background of the Dutch FADN system. Chapter 3 describes the agricultural population in the years 2009 and 2010. 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 plans of 2009 and 2010. Chapter 5 provides information on the implementation of the selection plans and the recruitment of new farms. Chapter 6 provides a qualitative and quantitative evaluation of the samples in both years. Figures and tables provided in the main text mainly refer to the 2010 sample (except for cases where a comparison is made). The remaining data for the 2009 sample are presented in Appendix 1.

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 are 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, for example, does not taste all the soup to judge its quality. It is however 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 even 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 than to collect 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. To this end, a disproportionate stratified random sample is used. 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 that define these groups should be chosen such that the farms within one group are similar (at least with respect to the important aspects). The FADN sample differentiates with respect to farm size and type of farming. Using stratification, and selecting farms from each group,

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

Disproportionate 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, will have a lower chance of being included in the sample. After all, if all the farms are very similar, a limited number of observations is enough to draw reliable conclusions (in the extreme case that all farms are exactly identical, it would be enough to have only one observation). Less homogeneous groups require a larger number of observations to make reliable estimates. The choice of the stratification variables has therefore an important impact on the quality of the sample.

This way of selecting farms allows making unbiased estimates for the whole population of farms. Stratification ensures that all groups are properly represented, thereby allowing separate estimations for all groups. All groups together make up the whole population. In the 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 the same group.

Stratification also improves the representativeness of the sample 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 farm type of 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 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 in 2009 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 of observation in the FADN. In 2009 the definition of the field of observation included both a lower threshold and an upper threshold. This is no longer true in 2010: in addition to a new size measure (see below), the field of observation is only restricted by using a lower threshold.

Figure 2.1   Agricultural population and the 2009 FADN sample

Figure 2.1   Agricultural population and the 2009 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
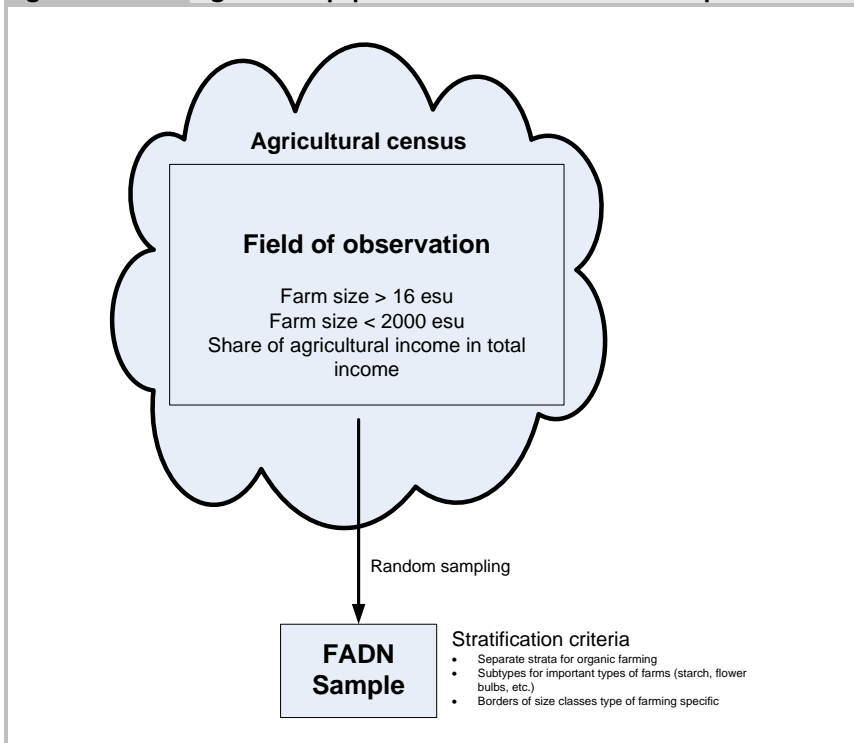
Output measure

In 2010, the Standard Output measure was introduced in FADN as the basis for determining the farm economic size, replacing the previously used Standard Gross Margin (SGM) and accompanying European Size Unit (ESU). Standard Output refers to the standard value of gross production. The Standard Output of an agricultural product (crop or livestock), abbreviated as SO, is the average monetary value of the agricultural output at farm-gate price, in euros per hectare or per head of livestock. There is a regional SO coefficient for each product, as an average value over a reference period (5 years). The Netherlands consists of one region. The sum of all the SO per hectare of crop and per head of livestock in a farm is a measure of its overall economic size, expressed in euros.

Consequently, in this report output data over 2009 are denoted in ESU, while output data over 2010 are denoted in SO.

Lower threshold

Just like in preceding years, in 2009 a lower threshold of 16 ESU was applied. This threshold has been specified in the legislation underlying the FADN. The historical background was to distinguish small farms which were only held as a hobby or as a sideline from real commercial farms producing for the market. In 2010 the lower threshold has been changed[1] to 25,000 SO. Although the number of farms excluded from the field of survey in both years is quite substantial, the percentage of production value which is not covered due to this threshold is very limited.

Upper threshold

The upper threshold has been used for many years 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). Furthermore, the inclusion of these very large farms would result in a substantial decrease in the reliability of estimates due to the large heterogeneity of these farms. Another practical reason to exclude the large farms is the complexity and size of the bookkeeping and therefore the large demand for limited human resources available for data collection.

Due to the growth in size of farming, observed in the last years in horticulture in particular, the upper threshold in 2007-2009 has been kept at 2,000 ESU. This level fulfils the requirement to cover at least 90% of the agricultural productivity.

A general increase in the farm size, especially in horticulture, has been observed in the last years (Berkhout and Roza, 2012). To reflect on this change, starting in 2010, it has been decided to include all larger farms in the field of observation and abandon the upper threshold.

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: the impossibility to allocate costs and revenues to different activities, the refusal of firms to participate anyway because they cannot be motivated to do so, etcetera. Recently clear rules have been specified to determine

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[1] One ESU is equivalent to 1,200 SO, which means that 16 ESU is equivalent to 19,200 SO.

whether a firm belongs to the field of observation or not. A firm should have at least 16 ESU from primary agricultural activities (or 25,000 SO starting from 2010 onwards), at least 25% of the turnover should come from primary agricultural activities and, furthermore, agricultural activities - in the broadest sense, so as to include other gainful activities - should comprise 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 the economic size of the farm and type of farming. Although these criteria are similar to those used by the commission, a more detailed look reveals substantial differences compared 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 is somewhat more complicated due to the fact that the size classes vary across types of farming. The size distribution of, for example, horticultural farms is completely different from the size distribution of arable farms. For 2010, this is illustrated in figure 2.2. This figure shows that almost all arable farms are smaller than 1,200,000 SO, while almost 70% of the tomato growers are larger than 1,200,000 SO. 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 98 strata have been defined in 2009, while in 2010 this number has increased to 129 strata.

Figure 2.2   **Distribution of farms in 2010 a)**
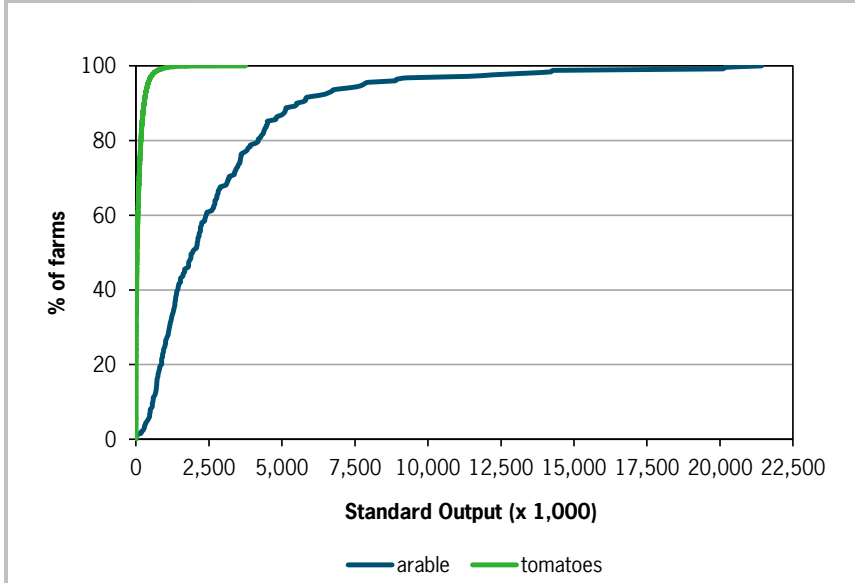
2.2   Sampling and recruitment processes

Figure 2.3 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 re-searchers) does not contain addresses but only farm identifiers. These farm identifiers are coupled to their addresses, which 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 offic-es collect the authorisations and forward them to the central office in The Hague. These authorisations are used to receive electronically available infor-mation from banks, suppliers, governmental institutions and others. The infor-mation on the acceptance and refusal of farmers is also used to verify the quality of the sample (see Chapter 6).

Figure 2.3   Sampling and recruitment processes
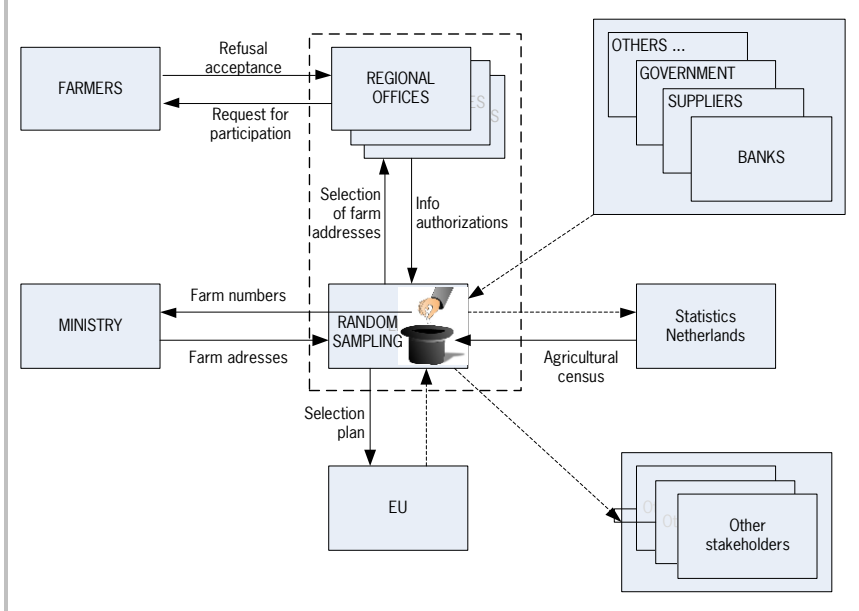
Source: Vrolijk et al. (2006).

3   Population

3.1   Introduction

This chapter will describe the population or, more precisely, the field of observation as covered by the FADN sample, both in 2009 and 2010. In 2009 both a lower and a higher threshold is used to define the field of observation, while in 2010 the upper threshold is abandoned and only a lower threshold is applied. These thresholds and the consequences of their application will be described in Section 3.2. Section 3.3 describes the strata which are used to divide the population and 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. Given the limited capacity it is important to apply a sampling procedure that optimises the reliability of the sample estimates (through stratification).

3.2.1   Field of observation in 2009

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 (equivalent of 1,026.7 DSU). 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 to 2,000 ESU.

Table 3.1a	Number of farms and their relative economic importance (measured in European size units - ESU) in the 2009 agricultural census	
	Number of farms	**Percentage ESU**
All farms in the agricultural census (a)	73,008	100.0
Minus farms less than 16 ESU	16,881	1.65
Minus farms larger than 2,000 ESU	225	8.81
Total of non-covered farms (b)	17,106	10.47
Total of covered farms (a) - (b)	55,902	89.53
Source: own calculations based on FADN and the agricultural census.		

The 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 the analyses presented for year 2009 are based on the upper threshold of 2,000 ESU. In 2009, 225 farms were excluded from the field of observation because of this upper threshold. These farms were responsible for 8.81% of the total production (see Table 6.2 for additional information). This is a large increase compared with the 6.37% in 2007, and the 7.96% in 2008. Due to the lower threshold, 16,776 farms were not covered by the FADN sample. Although this is a large number of farms, they are only responsible for 1.65% of the total production capacity. Both the number of farms and the production capacity have slightly decreased compared with 2008. The 2009 population (field of observation) of the Dutch contribution to the EU FADN system is displayed in Table 3.1a.

3.2.2 Field of observation in 2010

In 2010, setting the lower threshold to 25,000 SO implied that 19,946 farms were not covered by the FADN sample. This is a large number of farms, but they are only responsible for 1.08% of the total production capacity expressed in SO. The 2010 population (field of observation) of the Dutch contribution to the EU FADN system is displayed in Table 3.1b.

Table 3.1b	Number of farms and their relative economic importance (measured in Standard Output - SO) in the 2010 agricultural census		
		Number of farms	Percentage SO
All farms in the agricultural census (a)		72,324	100.00
Farms less than 25000 SO (b)		19,933	1.08
Total of covered farms (a) - (b)		52,391	98.02
Source: own calculations based on FADN and the agricultural census.			

3.3 Stratification scheme in 2010

Farms are allocated to strata according to the following stratification variables: type of farming and size class. Table A.1 in Appendix 1 presents the classification for year 2009, which closely follows the preceding years 2007 and 2008. In 2010 size classes are redefined due to the change in output measure and the absence of an upper threshold. The number of size classes in 2010 ranges from 4 to 6 depending on particular farm type (see Table 3.2).

In total 27 types of farming are distinguished (see Table 3.2). The Dutch FADN typology differs in its degree of details from the European FADN (FADN, 2012): farms not present in Dutch agriculture (e.g. olives and citrus fruits are not listed) and some types are further detailed (like vegetables and cut flowers within horticulture). 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 because 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 into 'sweet pepper', '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.

Table 3.2	Stratification of the Dutch FADN sample 2010, including the number of farms per stratum according to the 2010 agricultural census								
lower boundary (k€ SO)	25	50	100	250	500	1,000	1,500	3,000	Total
upper boundary (k€ SO)	50	100	250	500	1,000	1,500	3,000	infinity	
Type of farming									
Field crop farms									
- Starch potatoes		368	390	83				21	862
- Organic crops		83	85	50				21	239
- Other field crop farms		2,814	1,973	952				324	6,063
Horticulture									
Vegetables under glass									
- Sweet pepper		0		22	71	52	71	44	260
- Cucumber		1		27	70	42	51	9	200
- Tomato		1		17	43	41	65	81	248
- Other		92		288	94	30	22	9	535
Cut flowers under glass									
- Rose		1		38	38	41	66	25	209
- Chrysanthemum		6		20	23	18	54	30	151
- Other		80		482	304	133	105	27	1,131
Plants		76		297	206	118	159	128	984
Other glass		477		1,023	250			227	1,977
Field vegetables		284		412	90			61	847
Fruit		462	518	389				133	1,502
Tree nursery		766		1,222	273			187	2,448
Flower bulbs		121		308	141			124	694

Table 3.2	Stratification of the Dutch FADN sample 2010, including the number of farms per stratum according to the 2010 agricultural census (continued)								
lower boundary (k€ SO)	25	50	100	250	500	1,000	1,500	3,000	Total
upper boundary (k€ SO)	50	100	250	500	1,000	1,500	3,000	infinity	
Type of farming									
Grazing livestock									
Dairy									
- Organic		24	192	84				13	313
- Non-organic		1,228	8,249	6,734				899	17,110
Calf fattening		239		572	427			165	1,403
Other grazing livestock	3,072	1,514	701	240				68	5,595
Intensive livestock									
Breeding pigs		32	204	510	374			165	1,285
Fattening pigs		549	791	457	279			149	2,225
Integrated pig farms		12	68	262	394			220	956
Consumption eggs		56		348	226			125	755
Broilers		9		129	161			171	470
Other intensive livestock		47		332	242			99	720
Combined		848	876	908	451			126	3,209
Total									52,391

While Table A.1 in Appendix 1 presents upper and lower boundaries (in ESU) for farms in each of the four size classes per farm type, such information is ob-solete for 2010 since the upper boundary has been omitted. Table 3.2 presents the number of farms in the 2010 population according to size class and type of farming (numbers for 2009 are displayed in Table A.2 in the Appendix 1).

Table 3.2 shows that 52,391 farms (compared with 56,022 in 2009 and 57,408 farms in 2008) fall within the field of observation. Dairy farms are clear-ly the largest group of farms. One in every three farms is classified as a dairy farm.

4 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 (distribution of sample capacity over the different size classes) has been applied.

4.2 Selection plan

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 2010 selection plan is provided in Table 4.1 (see Table A.3 in the Appendix 1 for the 2009 selection plan). Given the goals of the FADN system the numbers provided in the table are the required number of observations per type of farming.

The number of farms per type of farming as well as types of farms in 2010 have experienced some changes in comparison with the 2009 selection plan. The category 'other open air' has been renamed to 'other horticulture'. Due to a low number of farms in the category 'mushroom', these farms, together with 'other glass', have been added to 'other horticulture'. The number of farms within 'combined' has also been reduced. Due to an increase in the number of strata, more farms are allocated to, among others, 'other cut flowers under glass', 'plants' and 'other grazing livestock'. Further detailing in definitions applied to poultry farms have resulted in changing from 'Laying hens' to 'Consumption eggs' and from 'Poultry' to 'Broilers'. All other types of poultry are included into 'Other intensive livestock'.

Table 4.1	Desired sampling size per type of farming (selection plan), 2010			
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		530		
Vegetables under glass	2111		130	
- Sweet pepper				31
- Cucumber				29
- Tomato				30
- Other				40
Cut flowers under glass	2121		120	
- Rose				23
- Chrysanthemum				23
- Other				74
Plants	2121		70	
Other horticulture	2331, 3500, 3699		40	
Field vegetables	2210		40	
Fruit	3610		40	
Tree nursery	2320		50	
Flower bulbs	2221		40	
Grazing livestock		440		
Dairy	4500		330	
- Non-organic				300
- Organic				30
Calf fattening	4610		40	
Other grazing livestock	4612, 4810, 4830, 4841, 4842, 4843		70	
Intensive livestock		230		
Breeding pigs	5111		50	
Fattening pigs	5121		50	
Integrated pig farms	5131		40	
Consumption eggs	5211		30	
Broilers	5221		30	
Other intensive livestock	5231, 5301		30	
Combined	6, 7, 8	90		
Total		1500		

5 Recruitment of farms

5.1 Basic principles for 2009 and 2010

The recruitment for 2009 took place from November 2008 to March 2009. An assessment was made of the farms available for the FADN system for 2007 and 2008 (considering farms dropping out of the system).
   The recruitment for 2010 took place during the same period of 2010. An assessment was made of the farms available for the FADN system for 2008 and 2009 (considering farms dropping out of the system).

5.2 Elaboration of selection plan

Table 5.1 gives a more detailed description of the 2010 selection plan as presented in Table 4.1. The corresponding data for 2009 are given in Table A.4 in the Appendix 1.

Table 5.1	Detailed selection plan 2010 per stratum								
lower boundary (k€ SO)	**25**	**50**	**100**	**250**	**500**	**1,000**	**1,500**	**3,000**	**Total**
upper boundary (k€ SO)	**50**	**100**	**250**	**500**	**1,000**	**1,500**	**3,000**	**infinity**	
Type of farming									
Field crop farms									
- Starch potatoes		8	14	5				3	30
- Organic crops		5	12	9				4	30
- Other field crop farms		37	52	35				26	150
Horticulture									
Vegetables under glass									
- Sweet pepper		0		8	11	4	5	3	31
- Cucumber		0		7	11	5	4	2	29
- Tomato		0		7	6	4	7	6	30
- Other		5		21	7	3	3	1	40
Cut flowers under glass									
- Rose		0		5	6	4	6	2	23
- Chrysanthemum		0		6	5	4	7	1	23
- Other		7		28	19	8	9	3	74

Table 5.1	Detailed selection plan 2010 per stratum (continued)								
lower boundary (k€ SO)	25	50	100	250	500	1,000	1,500	3,000	Total
upper boundary (k€ SO)	50	100	250	500	1,000	1,500	3,000	infinity	
Type of farming									
Plants		5		15	15	8	14	13	70
Field vegetables		10		19	6			5	40
Fruit		7	17	10				6	40
Tree nursery		5		20	10			15	50
Flower bulbs		7		10	10			13	40
Other horticulture		8		12	8			12	40
Grazing livestock									
Dairy									
- Organic		5	15	9				1	30
- Non-organic		20	130	110				40	300
Calf fattening		5		14	11			10	40
Other grazing livestock	12	15	20	10				13	70
Intensive livestock									
Breeding pigs		3	6	18	13			10	50
Fattening pigs		6	11	12	12			9	50
Integrated pig farms		5	8	9	9			9	40
Consumption eggs		4		10	8			8	30
Broilers		1		7	8			14	30
Other intensive livestock		5		12	8			5	30
Combined		10	18	28	22			12	90
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 2009 and 2010, an estimate was made of the number of farms to be recruited. Furthermore, the variant of bookkeeping has been explicitly considered. Poppe (2004) notes that the introduction of a new bookkeeping system and budget cuts resulted in much 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.

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 variant, the CSP variant or a combination of both. This meant that some farms had to be switched to the other variant. Based on the number of farms to be recruited, the 2009 and 2010 farms were randomly selected from the 2008 and 2009 agricultural censuses, respectively. The random draw of farms took place per stratum. The number of farms drawn per stratum was 10 times higher than the required number of farms to ensure enough addresses, even with a high non-response rate in specific types of farming. 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. If farms that refuse to participate differ systematically 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 with 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 5.2 describes the response rate for 2010 in the different types of farming. This table only includes those farms which were asked to participate in the detailed CSP variant. Similarly, Table A.5 in the Appendix 1 presents the details for the 2009 sample.

Table 5.2	Response rate in different types of farming, recruitment for CSP variant, 2010					
Farming types a)	**Number of refusals**	**Recruited farms**	**Unsuitable farms**	**Total farms**	**Unsuit- able (%)**	**Response (%)**
Field crop farms						
- Starch pota-toes	3	0	0	3	0	0
- Organic crops	18	9	5	32	16	33
- Other field crop farms	8	5	0	13	0	38
Horticulture						
Vegetables under glass						
- Sweet pepper	7	5	0	12	0	42
- Cucumber	3	4	2	9	22	57
- Other	9	5	3	17	18	36
Cut flowers under glass						
- Rose	2	0	0	2	0	0
- Other	20	2	6	28	21	9
Plants	47	7	4	58	7	13
Fruit	1	1	0	2	0	50
Tree nursery	3	0	0	3	0	0
Other open air	19	1	3	23	13	5
Grazing livestock						
Non-organic dairy	8	7	1	16	6	47
Calf fattening	0	0	0	0		
Intensive livestock						
Breeding pigs	1	3	0	4	0	75
Fattening pigs	0	1	0	1	0	100
Consumption eggs	0	2	0	2	0	100
Broilers	1	0	0	1	0	0
Combined	1	0	2	3	67	0
Total	151	52	26	229	11	26
a) Only farming types with positive response are displayed, other farm types have zero new recruitments.						

To develop a better understanding of the reasons for non-response a number of questions were asked to all farmers approached. Table 5.3 shows combined results for the questions asked in 2009 and 2010 (minor differences between years). In these questions, farmers had to indicate to which extent they agreed with a statement about their knowledge or their 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. 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 higher among the participants. In contrast to previous years there is no significant difference in trust in the government between participants and non-participants.

Using the 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 show that 'usefulness of providing data' is the most important factor in predicting the participation of an individual farmer. The next important factors are 'Usefulness of FADN system' and 'Carefulness of LEI'. These results are in line with the previous recruitment (Vrolijk et al., 2009). Compared with some other years, trust in the government is not a strong predictor.

Table 5.3	Attitude of farmers (-2 = disagree, 2 = agree), jointly 2009 and 2010				
	Non participant		Participant		
	average	SE	average	SE	
1 Informed about LEI	1.12	0.06	1.43	0.09	*
2 Informed about the FADN system	0.27	0.07	0.42	0.11	
3 Informed about the use of FADN data	0.07	0.06	0.33	0.11	*
4 Usefulness of FADN system	0.37	0.05	0.98	0.08	*
5 Usefulness of providing data	0.41	0.05	1.12	0.07	*
6 Carefulness of LEI	0.51	0.05	1.06	0.08	*
7 Objectivity of LEI	0.52	0.05	0.96	0.08	*
8 Trust in the government	-0.28	0.05	-0.05	0.09	*
SE - standard error; * - significant difference between participant and non-participant.					

Table 5.4 describes the number of farms where accounts were completed for the first time for the bookkeeping year 2010 (data for 2009 can be found in Table A.6 in the Appendix 1). Due to several factors this is not exactly the same

as the number of newly recruited farms. 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 5.4	Number of farms with 2010 as first year of completion of bookkeeping, recruited for EU or CSP								
lower boundary (k€ SO) upper boundary (k€ SO)	25 50	50 100	100 250	250 500	500 1,000	1,000 1,500	1,500 3,000	3,000 infinity	Total
Type of farming a)									
Field crop farms									
- Starch potatoes		1	1	2					4
- Organic crops		1	2	5				1	9
- Other field crop farms		4	1	3				2	10
Horticulture									
Vegetables under glass									
- Sweet pepper							1		1
- Other		1		1	1				3
Cut flowers under glass									
- Other				1					1
Plants						1	1	1	3
Field vegetables		2		1				1	4
Fruit		1						2	3
Other open air				1				1	2
Grazing livestock									
Dairy									
- Non-organic								3	3
Other grazing livestock	1								1
Intensive livestock									
Breeding pigs		1	1		1			1	4
Fattening pigs		1							1
Integrated pig farms									
Consumption eggs									
Broilers					1				1
Other intensive livestock									
Total									50
a) Only farming types with new recruitments are displayed, other farms types have zero new recruitments.									

Comparison of the field of observation (population) and the sample available for research purposes in 2010 is presented in Table 5.5. The same characteristics for the 2009 sample are presented in Table A.7 in the Appendix 1. The total number of farms selected in 2010 is 1,500, of which only 1,467 are available for research providing standard list of variables supplied to the EU. Farms that are too small or too large are not suitable for research purposes. More detailed data available for research can be drawn from a sample of 1,133 farms (CSP variant).

5.4 Supply of farm results to the European Commission

The final delivery of 2009 and 2010 data to the EU has taken place in December 2010 and 2011 respectively. Data of 1,565 farms of the bookkeeping year 2009 and of 1.501 farms of 2010 have been provided to Brussels (Table 5.6). The number for 2009 is somewhat higher than in 2008 (1,511) and 2007 (1,510).

Table 5.5		Number of farms in the population and sample according to the EU and CSP variant, 2010		
Type of farming	**Code**	**Number of farms**		
		Population	**Total sample (EU+CSP)**	**CSP**
Field crop farms	1			
- Starch potatoes		862	28	28
- Organic crops		239	30	30
- Other field crop farms		6,063	153	143
Horticulture	2+3			
Vegetables under glass	2111			
- Sweet pepper		260	32	32
- Cucumber		200	32	32
- Tomato		248	23	23
- Other		535	31	31
Cut flowers under glass	2121			
- Rose		209	17	17
- Chrysanthemum		151	17	17
- Other		1,131	55	46
Plants	2122	984	58	55
Field vegetables	2210	847	32	8
Fruit	3610	1,502	43	32
Tree nursery	2320	2,448	41	14
Bulbs	2221	694	36	22
Other horticulture		1,977	85	32
Grazing livestock	4			
Dairy	4500			
- Organic		313	34	34
- Non-organic		17,110	317	255
Calf fattening	4611	1,403	50	19
Other grazing livestock	4843	5.595	50	30
Intensive livestock	5			
Breeding pigs	5111	1,285	51	44
Fattening pigs	5121	2,225	49	44
Integrated pig farms	5131	956	43	38
Consumption eggs	5211	755	34	30
Broilers	5022	470	28	24
Other intensive livestock	other 5	720	32	14
Combined	6-8	3,209	66	39
Total		52,391	1,467	1,133

Table 5.6	Number of farms supplied to the EU		
Bookkeeping year	Provided to the European Commission	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
2007	1,510	1,485	25
2008	1,511	1,462	49
2009	1,565	1,529	36
2010	1,501	1,467	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 too small according to the information in the agricultural census. In alternative weighting systems (based on the characteristics of the farm these farms might 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 2009 and 2010 samples

6.1 Introduction

In this chapter the FADN sample for the years 2009 and 2010 are 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. This section focuses on the quality of the estimations based on the sample. This chapter is based on the standard approach of making estimations based on weights assigned to farms.

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., 2002, for a more extensive description of ratio estimators and other estimators).

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 practical 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 to the agricultural census and the number of farms in the sample (in the FADN system). The population in a specific stratum is continually changing. Therefore the sample and population farms that belong to a stratum in year 2010 are not exactly the same as the farms that belong to that stratum in year 2009. The (post) stratification of the farms in 2010 is based on the 2010 agricultural census (2009 census for farms in 2009). 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 cannot 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 homogeneous 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 homogeneous units have a lower sampling fraction than very heterogeneous strata. This also implies that farms have very diverging weights. Farms from a homogeneous 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 3.2). Table A.8 in the Appendix 1 presents the sampling fractions for the 2009 sample.

lower boundary (k€ SO)	25	50	100	250	500	1,000	1,500	3,000
upper boundary (k€ SO)	50	100	250	500	1,000	1,500	3,000	infinity
Type of farming								
Field crop farms								
- Starch potatoes		0.02	0.04	0.06				0.14
- Organic crops		0.06	0.14	0.18				0.19
- Other field crop farms		0.01	0.03	0.04				0.08
Horticulture								
Vegetables under glass								
- Sweet pepper		0.00		0.36	0.15	0.08	0.07	0.07
- Cucumber		0.00		0.26	0.16	0.12	0.08	0.22
- Tomato		0.00		0.41	0.14	0.10	0.11	0.07
- Other		0.05		0.07	0.07	0.10	0.14	0.11
Cut flowers under glass								
- Rose		0.00		0.13	0.16	0.10	0.09	0.08
- Chrysanthemum		0.00		0.30	0.22	0.22	0.13	0.03
- Other		0.09		0.06	0.06	0.06	0.09	0.11
Plants		0.07		0.05	0.07	0.07	0.09	0.10
Field vegetables		0.04		0.05	0.07			0.08
Fruit		0.02	0.03	0.03				0.05
Tree nursery		0.01		0.02	0.04			0.08
Flower bulbs		0.06		0.03	0.07			0.10
Other horticulture		0.02		0.01	0.03			0.05
Grazing livestock								
Dairy								
- Organic		0.21	0.08	0.11				0.08
- Non-organic		0.02	0.02	0.02				0.04
Calf fattening		0.02		0.02	0.03			0.06
Other grazing livestock	0.00	0.01	0.03	0.04				0.19
Intensive livestock								
Breeding pigs		0.09	0.03	0.04	0.03			0.06
Fattening pigs		0.01	0.01	0.03	0.04			0.06
Integrated pig farms		0.42	0.12	0.03	0.02			0.04
Consumption eggs		0.07		0.03	0.04			0.06
Broilers		0.11		0.05	0.05			0.08
Other intensive livestock		0.11		0.04	0.03			0.05
Combined		0.01	0.02	0.03	0.05			0.10

Table 6.1 Sampling fractions in different strata (2010 sample)

6.2.3 Remarks on the weights

In the report on farm results for 2010 the research population is defined as all farms in the 2010 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 aggregate results (averages, frequencies and totals) for the year 2010, the 2010 agricultural census is the starting point. Because of the registration of farms in the population (almost all farms are registered in the agricultural census) the aggregate numbers of farms are exactly the same as the numbers of farms in the census. However, in using these numbers in the calculation of weights for estimations for 2010 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 number of farms tend to fall significantly (this trend is stronger for certain types of farms and weaker for others). As a consequence, estimations for the year 2010 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. From a theoretical point of view weighting based on the characteristics of the farm in the census is more correct. The census is used as the sampling frame; the weights should reflect information from this sampling process. Furthermore, if there are substantial differences, then the variables type and size of farming in the agricultural census are different from the variables size and type of farming in the FADN. In a weighting procedure based on the population numbers in the census and the characteristics in the FADN these variables are considered to be the same.

6.3 Quantitative evaluation of 2009 and 2010 samples

6.3.1 Introduction

This section focuses on the quality of the estimations based on the 2009 and 2010 FADN samples. A comparison is made between the sampling based on ESU and SO. The removal of the upper threshold in particular has implications. Figure 6.1 shows the same structure as displayed in Figure 2.1, but it adds the quality aspects: coverage, response rate, representativeness and reliability of estimates. The response rate and the accompanying non-response have already been described in the previous chapter. Section 6.3.2 provides information on the coverage of the sample; the coverage compares the total population 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 underrepresentation of farms with specific characteristics; it compares the characteristics of the field of observation and the actual FADN sample. Section 6.3.4 provides information on the reliability of estimates based on the FADN sample.

Figure 6.1   Quality aspects of the Dutch FADN

Source: Vrolijk et al. (2006).
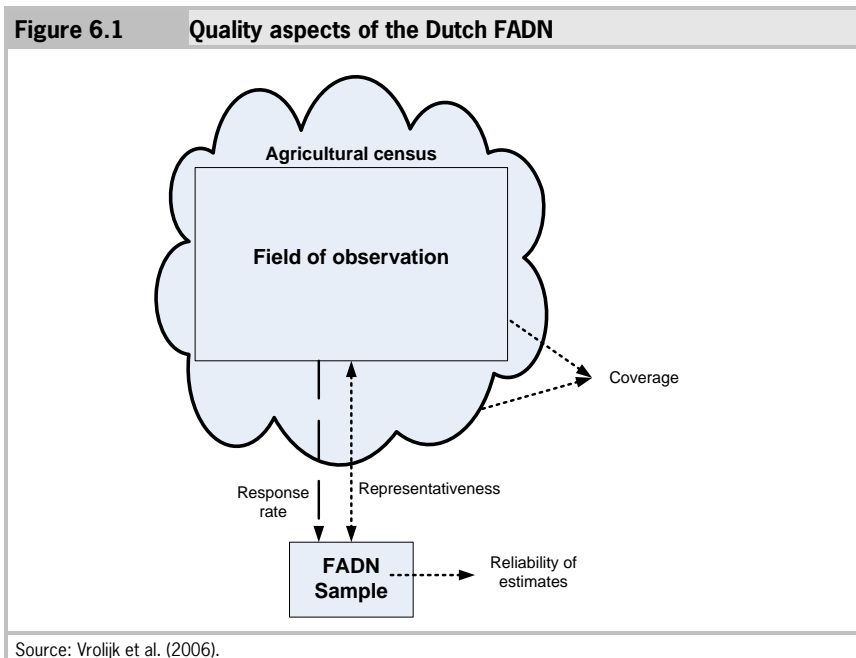
6.3.2 Coverage

It is desirable to have a sample that represents the population as accurately 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 that fulfil the size criteria: in 2009 farms are larger than 16 ESU and smaller than 2,000 ESU and in 2010 farms are larger than 25,000 SO. From this sampling frame the sample is drawn (d).

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)
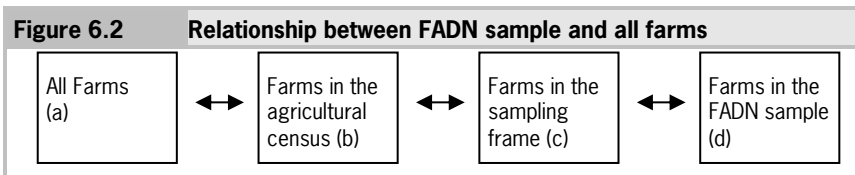
Table 6.2 gives an indication to what extent the FADN sample in 2009 and 2010 covers the whole population in these years. Table 6.2 presents the end products found on the farming types and thus lists more categories within, for example, horticultural farm types. A comparison is made between the farms 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 size (calculated in ESU for 2009 and in SO for 2010), the coverage has improved from 89.5% to 98.9% due to elimination of the upper threshold in 2010. However, the sample farms do not yet include many farms above the former upper threshold. This implies that the average size of the farms in the sample is smaller than the average size in the population. This is especially the case for bulbs, tomatoes and roses (see Table 6.2). The work is ongoing to improve the sample's representativeness. The upper threshold has been abolished from 2010 onwards.

Table 6.2	Coverage of the sample compared to agricultural census					
	2009				2010	
Selected characteristics of the sample a)	Number according to census	Not covered by sample (%)		Covered by sample (%)	Number according to census	Covered by sample (%)
		< 16 ESU	>2,000 ESU			≥ 25,000 SO
Farms	73,008	23.1	0.3	76.6	72,324	73.4
Dutch size units	7,429,661	1.7	8.8	89.5		
Standard output (million euro)					19,607	98.9
Total labour (AWU)	163,251	7.3	5.4	87.3	159,645	90.3
Family labour (AWU)	100,074	10.9	0.3	88.7	98,928	86.2
Paid labour (AWU)	63,177	1.6	13.4	85	60,717	97.1
Area (hectare)						
Agricultural area	1,917,480	5	0.5	94.5	1,872,356	93.4
Grassland	827,247	6.5	0	93.4	813,314	90.8
Green maize	240,220	7.2	0	92.7	228,840	90.9
Arable crops	992,901	4.1	0.3	95.6	962,468	94.9
Winter wheat	128,894	3.6	0.3	96.1	134,999	95.4
Sugarbeet	72,701	1.6	0.4	98	70,584	97.7
Starch potatoes	46,570	0.8	0	99.1	46,698	99.0
Seed potatoes	38,142	0.2	0.3	99.5	38,537	99.9
Ware potatoes	70,520	1.6	0.3	98.1	73,035	99.1
Seed onion	19,531	0.7	0.2	99.1	22,216	99.6
Horticulture in the open air	87,009	0.8	5.6	93.6	86,266	99.4
Headed cabbage	2,789	1.2	0	98.8	2,753	99.4
Leek	2,926	0.4	2.3	97.3	2,843	99.8
Brussels sprouts	2,997	0.4	0	99.6	2,950	99.8
Asparagus	2,620	1.6	2.1	96.3	2,695	98.1
Cauliflower	2,400	0.6	0	99.4	2,369	99.6
Apple	9,129	1.6	0	98.4	8,681	99.4
Pear	7,800	1.3	0	98.7	7,995	99.2
Park trees	5,991	0.6	13.5	85.9	5,907	99.4
Hedges	2,760	1.6	0.1	98.4	2,764	99.3

Table 6.2	Coverage of the sample compared to agricultural census (continued)					
	2009				**2010**	
Selected character-istcs of the sample a)	Number according to census	Not covered by sample (%)		Covered by sample (%)	Number according to census	Covered by sample (%)
		< 16 ESU	>2,000 ESU			≥ 25,000 SO
Tulip bulbs	11,728	0.1	7	92.9	11,399	99.9
Horticulture under glass	10,324	0.1	20.1	79.8	10,308	100.0
Cucumber	626	0	2.2	97.8	664	100.0
Sweet pepper	1,331	0	23.8	76.2	1,403	100.0
Tomatoes	1,628	0	50.6	49.4	1,676	100.0
Chrysanthemum	493	0	0.2	99.8	504	100.0
Roses	532	0	12.8	87.2	499	100.0
Pot plant flower	953	0	27.4	72.6	878	100.0
Pot plant green	511	0.1	16.2	83.8	504	100.0
Number (thousands)						
Dairy cows	1,489.1	0.1	0	99.9	1,478.6	99.9
Fattening calves	894.2	0.6	0	99.4	927.7	99.9
Breeding pigs	1,245.6	0.1	1.2	98.7	1,227.0	100.0
Fattening pigs	5,872.4	0.8	1	98.2	5,904.2	99.9
Broilers	43,285.1	0.1	0.3	99.6	44,747.9	100.0
Consumption eggs	45,546.7	0.2	1.4	98.4	47,904.1	99.9
a) Main crops and livestock are listed and not farming types.						

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

To give a complete picture of a certain agricultural activity it is 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). Table 6.3 describes to which extent a certain activity can be found on certain types of farming as defined in 2010. For example, 76% of the cattle activities can be found on the

dairy farms and 18% on the farms that belong to the 'other cattle farms' category with the remaining 1% to be found on pig farms. The numbers for 2009 are presented in Table A.9 in the Appendix 1.

Table 6.3	Relationship between types of farming and agricultural activities - share of SO 2010									
Animals or crops	Cattle	Pigs	Poultry	Arable crops	Vegetables open air	Fruit	Tree Nursery	Flower bulbs	Vegetables glass	Ornamental plants
Type of farming										
Dairy	76.2	1.5	0.2	14.1	0.9	0.6	0.3	0.5	0.0	0.0
Pig	0.5	87.9	0.7	3.2	2.1	0.3	1.0	0.9	0.0	0.0
Poultry	0.3	0.4	88.7	1.6	0.5	0.0	0.2	0.2	0.0	0.0
Arable	0.2	0.1	0.1	62.5	3.5	0.6	0.2	0.7	0.0	0.0
Vegetables open air	0.0	0.0	0.0	0.7	59.2	0.4	0.1	0.1	0.2	0.0
Fruit	0.0	0.0	0.0	0.3	0.4	85.3	0.2	0.0	0.0	0.0
Tree nursery	0.1	0.1	0.1	0.3	0.5	0.2	88.1	0.3	0.0	0.1
Flower bulbs	0.0	0.0	0.0	0.7	0.6	0.0	0.0	70.3	0.0	0.1
Vegetables under glass	0.0	0.0	0.0	0.0	1.7	0.3	0.1	0.0	88.7	0.0
Ornamental plants a)	0.0	0.0	0.0	0.0	0.2	0.2	0.2	5.9	0.5	92.7
Combined	4.8	8.6	7.2	12.2	19.4	10.3	6.8	8.5	0.2	0.0
Other	17.9	1.4	2.9	4.2	11.2	1.7	2.7	12.5	10.3	7.0
Total agriculture b)	100	100	100	100	100	100	100	100	100	100

a) Consists of cut flowers under glass and pot plants; b) Columns may not add up to 100 due to rounding off.

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 necessarily imply that the sample is representative of all variables. Such a full representativeness is impossible unless the sample size approximates the whole population or all variables highly correlate with the stratification variables. For 2009 and 2010, Table 6.4 shows to what extent the sample is representative of a number of variables in the agricultural census. Averages per farm in the census and in the FADN are compared. To make a proper comparison, farms in the census are selected according to FADN criteria. Farms between 16 and 2,000 ESU were selected in 2009 and farms of 25,000 or more SO were selected in the 2010 census.

The last columns for both years indicate statistical significance at the 5% level in averages per farm from the FADN and from the census. If the relative difference in averages is more than twice the relative standard error, then it is less likely that these differences can be explained by sampling errors. An asterisk (*) next to a specific variable indicates that the difference between the FADN and census average is significant, i.e. the variable is estimated to be statistically correct with a margin of error of 5%.

Table 6.4	Comparison of farms in the agricultural census and farms in the Dutch FADN					
	Average per farm 2009		Sign.	Average per farm 2010		Sign.
Variable	Census, 16 - 2,000 ESU	FADN		Census, ≥ 25,000 SO	FADN	
Size (DSU in 2009 and SO in 2010)						
Total	118.99	124.51	*	370,314.10	370,875.54	
Arable crops	14.00	15.06	*	35,821.85	38,595.23	*
Permanent grassland	2.16	1.91		10,188.51	10,408.66	
Horticulture open air	18.66	19.38		44,591.65	47,170.02	
Horticulture under glass	24.57	23.23	*	98,482.32	87,702.31	*
Dairy	32.06	34.63	*	71,670.71	76,121.40	*
Veal	2.23	2.31		13,963.67	13,497.91	
Fattening pigs	4.50	4.86		24,780.69	25,525.37	
Breeding pigs	4.83	5.02		21,530.30	21,748.18	
Broilers	1.03	1.05		9,056.02	9,578.90	
Consumption eggs	1.85	2.42	*	9,931.19	10,145.76	

Table 6.4	Comparison of farms in the agricultural census and farms in the Dutch FADN (continued)					
	Average per farm 2009		Sign.	Average per farm 2010		Sign.
Variable	Census, 16 - 2,000 ESU	FADN		Census, ≥ 25,000 SO	FADN	
Size (ha)						
Total	32.42	34.01	*	33.38	35.08	*
Arable crops	16.98	18.36	*	17.44	18.98	*
Cereals	3.85	4.00		3.89	4.39	*
Tuberous and root crops	4.02	4.39	*	4.32	4.93	*
Permanent grassland	13.12	13.34		13.32	13.61	
Horticulture open air	1.46	1.54		1.64	1.76	
-Pome and stone fruit	0.31	0.36		0.33	0.37	
-Tree nursery	0.24	0.21		0.30	0.34	
-Flower bulbs	0.39	0.44	*	0.44	0.45	
Vegetables open air	0.41	0.44		0.46	0.51	
Horticulture under glass	0.15	0.15		0.20	0.17	*
Vegetables under glass	0.06	0.06		0.10	0.08	*
-Tomato	0.01	0.01		0.03	0.03	*
-Cucumber	0.01	0.01		0.01	0.01	
-Sweet pepper	0.02	0.02		0.03	0.02	
-Cutflowers	0.05	0.05		0.05	0.05	
-Roses	0.01	0.01		0.01	0.01	
-Chrysanthemum	0.01	0.01		0.01	0.01	
-Pot plants	0.03	0.03		0.03	0.03	
Labour (AWU)						
Male	1.65	1.66		1.75	1.72	
Paid labour	0.96	0.88		1.13	0.95	*

Table 6.4 gives a description for the whole population. For research projects on specific types of farming, similar tables could be generated for only farms of that type of farming.

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. The quality of a farm's management for example is not recorded in the data and thus cannot be statistically tested. Consequently, it is possible that farms with relatively good or

bad management skills and therefore performance are overrepresented in the sample.

6.3.4 Reliability

The previous subsection provides some indicators of 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 the true population value. These differences may 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 in 2010 sample. Similar information for 2009 is provided in the Appendix 1 in Table A.10.

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). Tables 6.5 and 6.6 present the standard errors of estimated goal variables as well as their relative standard error (coefficient of variation). The coefficient of variation is defined as the standard error divided by the group average. A higher coefficient of variation implies less reliable estimates, but the value is strongly affected by the absolute value of the average. If the average value approaches zero, the coefficient of variation can become very large.

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. For example, the standard error 8,918 for starch potatoes farms signal that average farm income on such farms can vary within the confidence interval 54,036 +/- 1.96*8,918, i.e. (€36,557-€71,515).

Table 6.5	**Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2010**					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return, a)	Savings, €	Total income, €	Net farm result, €
Field crop farms						
- Starch potatoes	8,918	11,798	2.7	11,056	10,116	6,440
	0.17	*0.05*	*0.03*	*0.51*	*0.13*	*-4.71*
- Organic crops	57,207	98,751	9.0	72,329	88,001	48,758
	0.35	*0.21*	*0.09*	*0.52*	*0.42*	*0.58*
- Other field crop farms	6,829	21,426	2.1	11,113	9,185	5,939
	0.06	*0.06*	*0.02*	*0.19*	*0.08*	*0.15*
Horticulture						
Vegetables under glass						
- Sweet pepper	59,022	289,107	1.8	58,009	58,737	48,580
	-1.01	*0.12*	*0.02*	*-0.39*	*-1.12*	*-0.49*
- Cucumber	45,066	91,797	1.7	42,223	45,385	40,849
	0.19	*0.05*	*0.02*	*0.26*	*0.18*	*0.25*
- Tomato	155,517	700,302	3.3	148,699	155,702	156,294
	0.23	*0.16*	*0.03*	*0.26*	*0.23*	*0.25*
- Other	22,444	73,493	3.0	20,692	21,493	16,560
	0.77	*0.09*	*0.03*	*-0.78*	*0.57*	*-0.30*
Cut flowers under glass						
- Rose	94,085	250,143	4.1	100,857	94,168	81,400
	-1.10	*0.12*	*0.05*	*-0.60*	*-1.26*	*-0.52*
- Chrysanthemum	48,306	100,291	2.8	47,759	48,481	56,043
	-1.06	*0.05*	*0.03*	*-0.38*	*-1.10*	*-0.51*
- Other	22,444	73,493	3.0	20,692	21,493	16,560
	0.77	*0.09*	*0.03*	*-0.78*	*0.57*	*-0.30*
Plants	24,032	166,967	2.4	22,415	23,831	22,127
	0.25	*0.10*	*0.03*	*3.10*	*0.23*	*3.57*
Field vegetables	15,363	30,127	9.0	21,866	14,652	17,266
	0.40	*0.08*	*0.11*	*-1.84*	*0.32*	*-0.41*

Table 6.5	Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2010 (continued)					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return, a)	Savings, €	Total income, €	Net farm result, €
Fruit	16,958	41,554	4.1	17,337	16,690	15,169
	0.25	*0.12*	*0.05*	*0.60*	*0.22*	*-0.90*
Nurseries	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Flower bulbs	38,097	201,152	5.4	34,683	40,055	37,469
	0.24	*0.19*	*0.05*	*0.45*	*0.24*	*0.57*
Other horticulture	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Grazing livestock						
Dairy						
- Organic	8,219	11,119	2.4	8,790	8,280	7,747
	0.25	*0.04*	*0.03*	*4.65*	*0.17*	*-0.14*
- Non-organic	3,610	6,310	0.8	3,760	3,750	3,135
	0.08	*0.02*	*0.01*	*0.26*	*0.06*	*-0.07*
Calf fattening	10,509	37,923	3.7	10,311	10,618	9,323
	0.21	*0.16*	*0.04*	*0.70*	*0.18*	*-0.46*
Other grazing livestock	13,308	20,288	5.0	9,642	12,316	13,489
	-4.09	*0.17*	*0.09*	*-3.38*	*0.36*	*-0.21*
Intensive livestock						
Breeding pigs	11,635	34,257	2.2	12,350	12,401	10,071
	0.98	*0.06*	*0.03*	*-0.32*	*0.73*	*-0.15*
Fattening pigs	6,933	23,248	1.7	9,806	11,261	5,982
	0.38	*0.07*	*0.02*	*1.38*	*0.25*	*-0.21*
Integrated pig farms	11,170	47,136	1.3	12,433	12,459	11,525
	0.41	*0.05*	*0.01*	*-3.18*	*0.28*	*-0.21*
Consumption eggs	31,083	62,573	2.9	39,602	34,066	22,722
	0.81	*0.09*	*0.03*	*-0.99*	*1.04*	*-0.78*

Table 6.5	Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2010 (continued)					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return, a)	Savings, €	Total income, €	Net farm result, €
Broilers	17,625	78,389	1.3	14,489	16,111	13,843
	0.30	*0.07*	*0.01*	*0.88*	*0.23*	*-0.93*
Other intensive livestock	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Combined	33,432	46,851	5.3	24,518	33,306	32,615
	0.27	*0.10*	*0.06*	*0.33*	*0.25*	*1.05*

a) Revenues per 100 euro costs; n.a. Insufficient number of observations.

Table 6.6	Aggregated results of standard error of estimates and coefficient of variation (in Italics) of important goal variables per main type of farming, based on CSP variant, 2010					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return a)	Savings, €	Total income, €	Net farm result, €
Field crops	6,143	18,482	1.9	9,768	8,341	5,310
	0.06	*0.05*	*0.02*	*0.18*	*0.07*	*0.15*
Vegetables under glass	35,538	158,608	1.9	34,100	35,569	34,439
	0.17	*0.08*	*0.02*	*0.25*	*0.17*	*0.25*
Cut flowers under glass	22,084	66,637	2.4	21,671	21,544	17,894
	3.92	*0.06*	*0.03*	*-0.38*	*1.56*	*-0.24*
Pigs	5,372	18,251	1.1	6,601	7,164	4,834
	0.29	*0.04*	*0.01*	*-0.77*	*0.19*	*-0.11*
Poultry	20,316	48,906	1.9	25,033	21,887	14,978
	0.44	*0.05*	*0.02*	*-1.37*	*0.46*	*-0.63*
Grazing livestock	4,009	6,776	1.3	3,490	3,905	3,830
	0.11	*0.03*	*0.02*	*0.34*	*0.07*	*-0.08*
All farms	3,387	10,015	0.8	3,112	3,469	3,218
	0.06	*0.02*	*0.01*	*0.16*	*0.05*	*-0.16*

There are clear differences in the significance of estimates between different types of farming. As can be seen in Table 6.5, the estimates for the dairy sector (non-organic) are the most reliable (the lowest coefficient of variation) because of the large number of farms included in the sample, which reflects the importance of the dairy sector in Dutch agriculture. Moreover, this group is also rather homogenous, which helps improve econometric estimates. The decision on the number of farms is described in Vrolijk and Lodder (2002).

Table A.10 and Table A.11 in the Appendix 1 illustrate the reliability of estimates for the 2009 sample.

The previous tables give an indication of the reliability of estimates for certain types of farming. These tables are used to evaluate the allocation of sampling capacity to the different types of farming. Also for research projects, the tables give an indication of the reliability of estimates and should therefore be considered before drawing statistical conclusions.

The tables also give an indication of the dispersion (variability) of observations. A large dispersion makes it more difficult to make precise estimates of group characteristics. Dispersion is however also one of the main advantages of the FADN systems. The micro-economic information at farm level makes it possible to show and analyse differences between farms, for example research about poverty among farmers.

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Appendix 1

Statistical details for the 2009 sample

Tables in this Appendix refer to the data from bookkeeping year 2009 regarding the recruitment of farms, classification of farm types, the quality control of the final sample. There are differences between size classes in 2009 and 2010 due to changes in definitions as explained in paragraph 3.2.2.

Table A.1	Stratification of the Dutch FADN sample 2009			
Type of farming	Size class			
	1	2	3	4
Field crop farms				
- Starch potatoes	16-66	66-140	140-2,000	
- Organic crops	16-45	45-90	90-2,000	
- Other field crop farms	16-73	73-178	178-2,000	
Horticulture				
Vegetables under glass				
- Sweet pepper	16-245	245-480	480-900	900-2,000
- Cucumber	16-201	201-393	393-800	800-2,000
- Tomato	16-269	269-518	518-1100	1100-2,000
- Other	16-106	106-336	336-600	600-2,000
Cut flowers under glass				
- Rose	16-260	260-495	495-900	900-2,000
- Chrysanthemum	16-194	194-373	373-750	750-2,000
- Other	16-142	142-342	342-550	550-2,000
Plants	16-186	186-464	464-850	850-2,000
Other glass	16-108	108-292	292-500	500-2,000
Field vegetables	16-86	86-257	257-2,000	
Fruit	16-64	64-139	139-2,000	
Tree nursery	16-85	85-251	251-2,000	
Mushroom	16-188	188-445	445-900	900-2,000
Flower bulbs	16-185	185-477	477-900	900-2,000
Other open air	16-116	116-356	356-2,000	
Grazing livestock				
Dairy				
- Organic	16-86	86-128	128-2,000	
- Non-organic	16-89	89-159	159-2,000	
Calf fattening	16-64	64-150	150-2,000	
Other grazing livestock	16-47	47-146	146-2,000	
Intensive livestock				
Breeding pigs	16-116	116-263	263-2000	
Fattening pigs	16-60	60-161	161-2000	
Integrated pig farms	16-129	129 -253	253-2000	
Consumption eggs	16-138	138-345	345-2000	

Table A.2	Number of farms per stratum according to the 2009 agricultural census (for year 2010 see Table 3.2, main text)				
Type of farming	**Size class**				
	1	**2**	**3**	**4**	**Total**
Field crop farms					
- Starch potatoes	379	352	201	0	932
- Organic crops	64	65	112	0	241
- Other field crop farms	3,623	2,104	776	0	6,503
Horticulture					
Vegetables under glass					
- Sweet pepper	30	75	79	73	257
- Cucumber	31	78	69	29	207
- Tomato	23	47	72	58	200
- Other	355	216	57	51	679
Cut flowers under glass					
- Rose	50	64	71	45	230
- Chrysanthemum	44	34	59	23	160
- Other	593	479	207	153	1,432
Plants	414	303	182	125	1,024
Other glass	253	201	71	71	596
Field vegetables	421	260	132	0	813
Fruit	548	581	321	0	1,450
Tree nursery	837	695	415	0	1,947
Mushroom	99	44	28	16	187
Flower bulbs	363	252	128	73	816
Other open air	594	366	121	0	1,081
Grazing livestock					
Dairy					
- Organic	110	96	99	0	305
- Non-organic	4,866	8,561	4,503	0	17,930
Calf fattening	344	483	281	0	1,108
Other grazing livestock	5,394	2,223	301	0	7,918
Intensive livestock					
Breeding pigs	516	530	178	0	1,224
Fattening pigs	817	508	221	0	1,546
Integrated pig farms	306	400	225	0	931

Table A.2	**Number of farms per stratum according to the 2009 agricultural census (for year 2010 see Table 3.2, main text) (continued)**				
Type of farming	**Size class**				
	1	**2**	**3**	**4**	**Total**
Laying hens	510	342	51	0	903
Poultry	148	157	90	0	395
Other intensive livestock	69	35	21	0	125
Combined	2,468	1,586	828	0	4,882
Total	24,269	21,137	9,899	717	56,022

The number of farms per type of farming has slightly altered in comparison with the 2008 selection plan. The number of farms in the 'other intensive livestock' sector has been adjusted downwards in response to the low number of farms in the population. On the contrary, the number of farms in 'poultry' and 'other cut flowers under glass' has been raised. In the glasshouse sector some minor changes in the allocation of farms over the different size classes have occurred to reflect the continuing changes in the sector (fewer small farms and more large farms).

Table A.3	Desired sampling size per type of farming (selection plan), 2009 (for year 2010 see Table 4.1, main text)			
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*	*538*		
Vegetables under glass	2012		134	
- Sweet pepper				34
- Cucumber				33
- Tomato				34
- Other				33
Cut flowers under glass	2022		116	
- Rose				30
- Chrysanthemum				30
- Other				56
Plants	2022		44	
Other glass	other 2022 and 2013, 2023, 2039, 349 (> 50% glass)		30	
Field vegetables	2011		30	
Fruit	3210		40	
Tree nursery	3480		40	
Mushroom	2033		32	
Flower bulbs	2021		42	
Other open air	other 2022 and 2013, 2023, 2039, 349 (< 50% glass)		30	
Grazing livestock		*410*		
Dairy	4110, 4120, 4370		330	
- Non-organic				300
- Organic				30
Calf fattening	4380		30	
Other grazing livestock	4410, 4420, 4430		50	
Intensive livestock	*5*	*222*		
Breeding pigs	5011		50	

Table A.3	Desired sampling size per type of farming (selection plan), 2009 (for year 2010 see Table 4.1, main text) (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		34	
Other intensive livestock	other 5		18	
Combined	*6,7 and 8*	*120*		
Total		*1500*		

Type of farming	ESU size class				
	1	**2**	**3**	**4**	**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					
- Sweet pepper	9	13	8	4	34
- Cucumber	9	13	6	5	33
- Tomato	9	9	8	8	34
- Other	10	10	8	5	33
Cut flowers under glass					
- Rose	10	8	8	4	30
- Chrysanthemum	10	8	8	4	30
- Other	17	18	13	8	56
Plants	12	13	13	6	44
Other glass	10	10	6	4	30
Field vegetables	10	10	10		30
Fruit	12	14	14		40
Tree nursery	13	13	14		40
Mushroom	10	10	8	4	32
Flower bulbs	13	13	11	5	42
Other open air	10	10	10		30
Grazing livestock					
Dairy					
- Organic	10	10	10		30
- Non-organic	100	100	100		300
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

Table A.4 Detailed selection plan 2009 per stratum (for year 2010 see Table 5.1, main text)

Table A.4	Detailed selection plan 2009 per stratum (for year 2010 see Table 5.1, main text) (continued)				
Type of farming	**ESU size class**				
	1	**2**	**3**	**4**	**Total**
Laying hens	12	12	10		34
Poultry	10	10	10		30
Other intensive livestock	6	6	6		18
Combined	37	41	42		120
Total					1,500

Table A.5	**Response rate in different types of farming, recruitment for CSP variant 2009 (for year 2010 see Table 5.2, main text)**					
	Refus-als	Recruit-ed	Unsuita-ble	Total	Unsuitable (%)	Response (%)
Field crop farms						
- Starch potatoes	8	2	0	10	0	20
- Organic crops	6	1	0	7	0	14
- Other field crop farms	11	0	1	12	8	0
Horticulture						
Vegetables under glass						
- Sweet pepper	17	4	0	21	0	19
- Cucumber	31	3	1	35	3	9
- Tomato	7	1	0	8	0	13
- Other	21	5	4	30	13	19
Cut flowers under glass						
- Rose	20	0	1	21	5	0
- Chrysanthemum	8	1	2	11	18	11
- Other	14	4	2	20	10	22
Plants	15	4	6	25	24	21
Other glass	7	0	0	7	0	0
Field vegetables	0	0	0	0	0	0
Fruit	9	2	8	19	42	18
Tree nursery	0	0	0	0	0	0
Mushroom	0	0	0	0	0	0
Flower bulbs	1	0	0	1	0	0
Other open air	0	1	0	1	0	100
Grazing livestock						
Dairy						
- Organic	0	0	0	0	0	0
- Non-organic	0	0	0	0	0	0
Calf fattening	0	0	0	0	0	0
Other grazing live-stock	13	5	3	21	14	28

Table A.5	Response rate in different types of farming, recruitment for CSP variant 2009 (for year 2010 see Table 5.2, main text) (continued)					
	Refus-als	Recruit-ed	Unsuita-ble	Total	Unsuitable (%)	Response (%)
Intensive livestock						
Breeding pigs	19	3	2	24	8	14
Fattening pigs	0	0	0	0	0	0
Integrated pig farms	0	3	0	3	0	100
Laying hens	0	0	0	0	0	0
Poultry	2	0	0	2	0	0
Other intensive live-stock	0	0	0	0		
Combined	4	0	3	7	43	0
Total	213	39	33	285		

Table A.6	**Number of farms with 2009 as first year of completion of bookkeeping, recruited for EU or CSP (for year 2010 see Table 5.4, main text)**			
Type of farming	**ESU size class**			
	1	**2**	**3**	**4**
Field crop farms				
- Starch potatoes		3		
- Organic crops			5	
- Other field crop farms	3	3	1	
Vegetables under glass				
- Sweet pepper	1	3	2	
- Cucumber		4	2	
- Tomato				1
- Other	2	5		
Cut flowers under glass				
- Rose				
- Chrysanthemum				
- Other	2	2		
Plants	4	2	2	1
Other glass				
Field vegetables	2	1		
Fruit	1	5	1	
Tree nursery		1	6	
Mushroom				
Flower bulbs				
Other open air				
Grazing livestock				
Dairy				
- Organic				
- Non-organic		1	14	
Calf fattening	4	2	5	
Other grazing livestock	2		8	
Intensive livestock				
Breeding pigs	3	5	2	
Fattening pigs				
Integrated pig farms	2	2	1	

Table A.6	Number of farms with 2009 as first year of completion of bookkeeping, recruited for EU or CSP (for year 2010 see Table 5.4, main text) (continued)			
Type of farming	ESU size class			
	1	2	3	4
Laying hens		1		
Poultry	1	1		
Other intensive livestock	2	2		
Combined	1	2	3	
Total	**30**	**45**	**52**	**2**

Table A.7	Number of farms in the population and sample according to the EU and CSP variant, 2009 (for year 2010 see Table 5.5, main text)			
Type of farming	**Code**	**Number of farms**		
		population	**Total (EU+CSP)**	**CSP**
Field crop farms	*1*			
- Starch potatoes		932	29	27
- Organic crops		241	23	21
- Other field crop farms		6,503	152	142
Horticulture	*2+3*			
Vegetables under glass	2012			
- Sweet pepper		257	33	32
- Cucumber		207	38	37
- Tomato		200	25	23
- Other		679	39	36
Cut flowers under glass	2022			
- Rose		230	20	19
- Chrysanthemum		160	17	17
- Other		1,432	65	54
Plants	2022	1,024	54	50
Other glass		596	29	7
Field vegetables	2011	813	33	9
Fruit	3210	1,450	38	26
Tree nursery	3480	1,947	37	0
Mushroom	2033	187	16	0
Flower bulbs	2021	816	40	21
Other open air		1,081	22	4
Grazing livestock	*4*			
Dairy	4110+4120+4370			
- Organic		305	37	37
- Non-organic		17,930	327	255
Calf fattening	4380	1,108	40	13
Other grazing livestock	4410+4420+4430	7,918	60	34
Intensive livestock	*5*			
Breeding pigs	5011	1,224	49	40
Fattening pigs	5012	1,546	40	34

Table A.7	Number of farms in the population and sample according to the EU and CSP variant, 2009 (for year 2010 see Table 5.5, main text) (continued)			
Type of farming	**Code**	**Number of farms**		
		population	**Total (EU+CSP)**	**CSP**
Integrated pig farms	5013	931	46	40
Laying hens	5021	903	37	32
Poultry	5022	395	28	23
Other intensive livestock	other 5	125	16	4
Combined	*6-8*	4,882	120	54
Total		56,022	1,510	1,091

Table A.8	Sampling fractions in different strata (2009 sample) (for year 2010 see Table 6.1, main text)			
Type of farming	**ESU size class**			
	1	**2**	**3**	**4**
Field crop farms				
Starch potatoes	0.03	0.03	0.05	
- Organic crops	0.16	0.15	0.09	
- Other field crop farms	0.01	0.02	0.07	
Horticulture				
Vegetables under glass				
- Sweet pepper	0.30	0.17	0.10	0.05
- Cucumber	0.29	0.17	0.09	0.17
- Tomato	0.39	0.19	0.11	0.14
- Other	0.03	0.05	0.14	0.10
Cut flowers under glass				
- Rose	0.20	0.13	0.11	0.09
- Chrysanthemum	0.23	0.24	0.14	0.17
- Other	0.03	0.04	0.06	0.05
Plants	0.03	0.04	0.07	0.05
Other glass	0.04	0.05	0.08	0.06
Field vegetables	0.02	0.04	0.08	
Fruit	0.02	0.02	0.04	
Tree nursery	0.02	0.02	0.03	
Mushroom	0.10	0.23	0.29	0.25
Flower bulbs	0.04	0.05	0.09	0.07
Other open air	0.02	0.03	0.08	
Grazing livestock				
Dairy				
- Organic	0.09	0.10	0.10	
- Non-organic	0.02	0.01	0.02	
Calf fattening	0.03	0.02	0.04	
Other grazing livestock	0.00	0.01	0.06	
Intensive livestock				
Breeding pigs	0.04	0.03	0.08	
Fattening pigs	0.02	0.03	0.08	
Integrated pig farms	0.05	0.03	0.06	

Table A.8	Sampling fractions in different strata (2009 sample) (for year 2010 see Table 6.1, main text) (continued)			
Type of farming	**ESU size class**			
	1	**2**	**3**	**4**
Laying hens	0.02	0.04	0.20	
Poultry	0.07	0.06	0.11	
Other intensive livestock	0.09	0.17	0.29	
Combined	0.01	0.03	0.05	

Table A.9	Relationship between types of farming and agricultural activities - share of ESU 2009 (for year 2010 see Table 6.3, main text)									
Animals or crops	Cattle	Pigs	Poultry	Arable crops	Vegetables open air	Fruit	Tree Nursery	Flower bulbs	Vegetables glass	Ornamental plants
Type of farming										
Dairy	76.2	1.9	0.1	15.4	0.8	0.7	0.3	0.6	0.0	0.0
Pig	0.5	86.4	0.5	3.1	2.4	0.5	0.6	0.7	0.0	0.0
Poultry	0.3	0.4	88.8	1.6	0.3	0.1	0.2	0.0	0.0	0.0
Arable	0.1	0.1	0.1	60.2	2.9	0.8	0.1	0.6	0.0	0.0
Vegetables open air	0.0	0.0	0.0	0.7	62.4	1.2	0.2	0.1	0.3	0.0
Fruit	0.0	0.0	0.0	0.3	0.4	83.9	0.1	0.0	0.0	0.0
Tree nursery	0.1	0.2	0.1	0.4	0.6	0.5	90.0	0.4	0.0	0.1
Flower bulbs	0.0	0.0	0.0	0.9	0.3	0.0	0.0	71.1	0.0	0.1
Vegetables glass	0.0	0.0	0.0	0.1	1.9	0.2	0.0	0.0	87.8	0.3
Ornamental plants	0.0	0.0	0.0	0.0	0.2	0.3	0.3	3.3	0.5	91.8
Combined	4.9	9.5	7.1	12.5	17.1	9.9	5.5	7.5	0.2	0.0
Other	17.8	1.6	3.3	4.7	10.7	1.9	2.7	15.6	11.1	7.6
Total agriculture	100	100	100	100	100	100	100	100	100	100

Table A.10	**Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2009 (for year 2010 see Table 6.5, main text)**					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return a)	Savings, €	Total income, €	Net farm result, €
Field crop farms						
- Starch potatoes	11,260	60,185	3.1	8,617	12,828	9,046
	0.22	*0.21*	*0.04*	*0.97*	*0.18*	*-0.41*
- Organic crops	27,184	111,747	3.2	30,351	27,273	23,342
	0.31	*0.28*	*0.04*	*0.45*	*0.27*	*-44.35*
- Other field crop farms	6,712	17,217	2.2	12,231	6,989	7,326
	0.12	*0.06*	*0.03*	*1.51*	*0.10*	*-0.25*
Horticulture						
Vegetables under glass						
- Sweet pepper	74,559	155,078	1.8	63,406	71,794	57,053
	-0.14	*0.09*	*0.02*	*-0.11*	*-0.14*	*-0.10*
- Cucumber	34,387	72,774	2.1	36,536	37,399	33,427
	-0.17	*0.05*	*0.03*	*-0.14*	*-0.21*	*-0.12*
- Tomato	86,797	502,050	1.8	82,115	85,807	68,272
	-0.35	*0.18*	*0.02*	*-0.23*	*-0.35*	*-0.21*
- Other	21,831	55,966	2.3	18,097	23,090	18,354
	-0.73	*0.08*	*0.03*	*-0.22*	*-1.31*	*-0.13*
Cut flowers under glass						
- Rose	57,703	236,424	2.7	52,265	56,259	49,937
	-0.20	*0.15*	*0.04*	*-0.15*	*-0.20*	*-0.15*
- Chrysanthemum	162,464	89,744	3.7	187,482	183,492	55,336
	-0.33	*0.06*	*0.05*	*-0.32*	*-0.37*	*-0.13*
- Other	21,831	55,966	2.3	18,097	23,090	18,354
	-0.73	*0.08*	*0.03*	*-0.22*	*-1.31*	*-0.13*
Plants	18,842	140,222	2.3	21,918	17,916	18,355
	0.39	*0.13*	*0.03*	*-1.46*	*0.31*	*-0.50*
Other glass	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table A.10	**Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2009 (for year 2010 see Table 6.5, main text) (continued)**					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return a)	Savings, €	Total income, €	Net farm result, €
Field vegetables	41,232	175,608	6.3	25,059	42,830	33,829
	0.58	*0.22*	*0.07*	*18.99*	*0.54*	*-1.02*
Fruit	18,844	23,643	3.8	20,853	18,767	17,378
	-1.33	*0.09*	*0.05*	*-0.37*	*-2.50*	*-0.19*
Tree nursery	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Mushroom	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Flower bulbs	77,285	248,501	4.9	74,032	77,359	69,333
	0.92	*0.24*	*0.06*	*3.04*	*0.85*	*-4.22*
Other open air	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Grazing livestock						
Dairy						
- Organic	6,925	16,246	2.2	10,983	6,415	8,953
	3.53	*0.07*	*0.03*	*-0.40*	*0.34*	*-0.09*
- Non-organic	3,546	8,266	0.7	4,303	4,197	3,118
	-21.66	*0.03*	*0.01*	*-0.12*	*0.26*	*-0.03*
Calf fattening	6,970	20,564	3.0	5,971	8,947	6,635
	0.19	*0.12*	*0.04*	*2.04*	*0.18*	*-0.17*
Other grazing livestock	67,013	80,516	12.5	150,410	107,353	56,735
	0.93	*0.36*	*0.17*	*0.99*	*0.69*	*-7.61*
Intensive livestock						
Breeding pigs	12,816	42,024	2.1	16,581	14,511	12,101
	0.23	*0.06*	*0.02*	*0.80*	*0.19*	*-0.45*
Fattening pigs	9,083	36,199	1.6	9,034	10,780	7,040
	-0.31	*0.09*	*0.02*	*-0.22*	*-1.41*	*-0.09*

Table A.10	Standard error of estimates and coefficient of variation (in *Italics*) of important goal variables per type of farming, based on CSP variant, 2009 (for year 2010 see Table 6.5, main text) (continued)					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return a)	Savings, €	Total income, €	Net farm result, €
Integrated pig farms	15,861	50,074	1.1	17,183	17,017	14,054
	-2.02	*0.06*	*0.01*	*-0.38*	*1.54*	*-0.13*
Laying hens	27,897	69,354	4.0	32,025	28,199	25,251
	0.13	*0.08*	*0.04*	*0.22*	*0.12*	*0.20*
Poultry	9,956	47,289	1.8	8,801	7,510	9,990
	0.23	*0.05*	*0.02*	*2.11*	*0.14*	*-0.36*
Other intensive livestock	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Combined	7,250	28,279	2.9	15,426	16,730	8,698
	0.48	*0.09*	*0.04*	*6.61*	*0.36*	*-0.13*
a) Revenues per 100 euro costs; n.a. Insufficient number of observations.						

Table A.11	Aggregated results of standard error of estimates and coefficient of variation (in *italics*) of important goal variables per main type of farming, based on CSP variant (2009) (for year 2010 see Table 6.6, main text)					
Type of farming	**Goal variable**					
	Farm income, €	Total revenues, €	Return a)	Savings, €	Total income, €	Net farm result, €
Field crops	5,911	16,687	1.9	10,458	6,182	6,346
	0.11	*0.06*	*0.02*	*1.04*	*0.09*	*-0.23*
Vegetables under glass	22,445	83,947	2.7	20,189	22,237	18,893
	-0.15	*0.07*	*0.03*	*-0.09*	*-0.16*	*-0.08*
Cut flowers under glass	23,474	53,737	1.8	22,735	25,287	16,475
	-0.23	*0.06*	*0.02*	*-0.14*	*-0.27*	*-0.09*
Pigs	6,949	24,093	1	7,937	7,851	6,096
	1.56	*0.04*	*0.01*	*-0.37*	*0.32*	*-0.09*
Poultry	19,643	50,349	2.8	22,440	19,750	17,828
	0.12	*0.06*	*0.03*	*0.22*	*0.11*	*0.23*
Grazing livestock	19,605	24,025	3.7	43,779	31,305	16,608
	0.88	*0.10*	*0.05*	*2.18*	*0.54*	*-0.23*
All farms	10,218	14,087	1.9	22,490	16,167	8,698
	0.486	*0.036*	*0.025*	*324*	*0.340*	*-0.128*
a) Revenues per 100 euro costs.						

LEI Wageningen UR develops economic expertise for government bodies and industry in the field of food, agriculture and the natural environment. By means of independent research, LEI offers its customers a solid basis for socially and strategically justifiable policy choices.

Together with the Department of Social Sciences and the Wageningen UR, Centre for Development Innovation, LEI Wageningen UR forms the Social Sciences Group.

More information: www.wageningenUR.nl/en/lei