Sample of Dutch FADN 2011

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

R.W. van der Meer, H.B. van der Veen and H.C.J. Vrolijk

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Mede voor de Europese Unie organiseren het CEI en het LEI jaarlijks de verzameling van technische en financieel economische gegevens van circa 1.500 bedrijven in de akkerbouw, tuinbouw en veehouderij. In dit rapport wordt verantwoording afgelegd over de steekproef 2011. De diverse fasen, van het opstellen van het selectieplan, het werven van de bedrijven tot het beoordelen van de kwaliteit van de resulterende steekproef worden beschreven.

The EU Farm Accountancy Data Network (FADN) requires The Netherlands to yearly send bookkeeping data of 1,500 farms to Brussels. This task is carried out by LEI and CEI. This report explains the background of the farm sample for the year 2011. All phases from the determination of the selection plan, the recruitment of farms to the quality control of the final sample are described in this report.

Key words: farm accountancy data network, selection plan, coverage, reliability, recruitment, 2011, population, sample

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Contents

Preface

The EU Farm Accountancy Data Network (FADN) requires the Netherlands to yearly send bookkeeping data of 1,500 farms to Brussels. This task is carried out by the Agricultural Economics Research Institute (in Dutch, LEI) and Centre for Economic Information (in Dutch, Centrum voor Economische Informatievoorziening, CEI). This report explains the background of the sample for the year 2011. All phases from the determination of the selection plan, the recruitment of farms to the quality control of the final sample are described in this report. This report pro mation for the European Commission, the Dutch Ministry and research s to fully understand the statistical aspects of the Dutch FADN sampl

Managing Director LEI Wageningen UR

Summary

S.1 Key findings

For the bookkeeping year 2011, 1,491 farm reports have been delivered to the European Commission. The target number of 1,500 farms has nearly been reached. A difference between the target number of 9 farm reports is within the legally allowed boundaries. Farm data are of major importance in the evaluation of the agricultural policies and the monitoring of the economic developments in the agricultural sector.

In 2011, 70,400 agricultural and horticultural farms operated in the Netherlands. The Dutch FADN aims at farms with a Standard Output (SO) of €25,000 or more. This field of observation covers 50,600 farms in 2011. These farms are responsible for 99% of total national production capacity.

S.2 Complementary findings

In the design of the selection plan, 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).

Ninety new farms were recruited for the accounting year 2011. The average response rate for farms asked to participate in FADN is 22%.

S.3 Background

The European Commission requires the yearly establishment of a selection plan describing the sample of agricultural and horticultural holdings in the Dutch FADN. The selection plan contributes 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. Only farms greater than €25,000 of Standard Output (SO) were included in the sampling frame.

For each stratum, the number of farms to be included in the Dutch FADN sample has been 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.

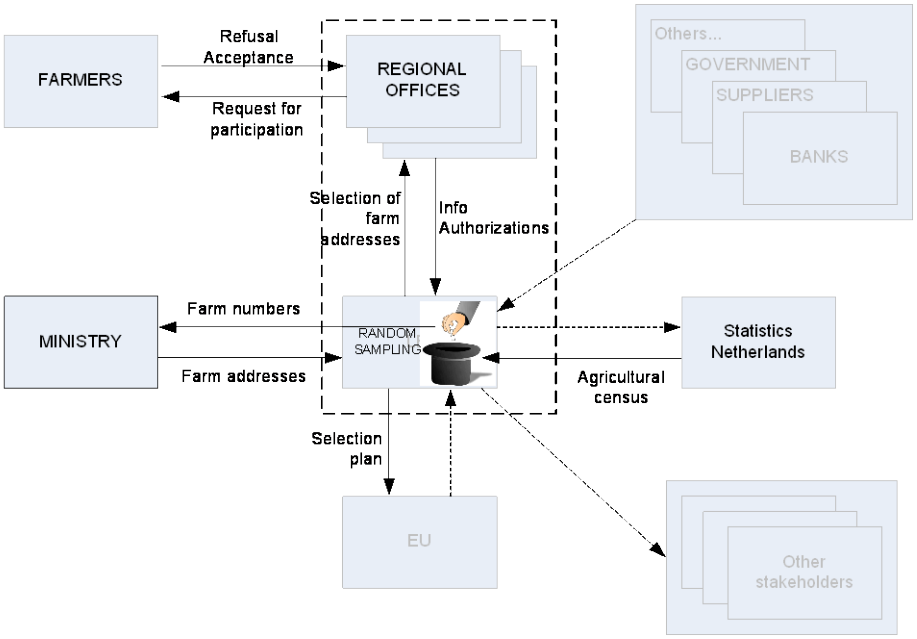


Figure S.1 *Sampling and selection procedures*
Source: Vrolijk et al. (2009a).

Samenvatting

Steekproef Bedrijven-Informatienet 2011; Ontwerpprincipes en kwaliteit van de steekproef onder land- en tuinbouwbedrijven

S.1 Belangrijkste uitkomsten

Voor het boekhoudjaar 2011, zijn 1.491 bedrijfsverslagen aan de Europese Commissie geleverd. Het streefgetal van 1.500 bedrijven is dus bijna gehaald. Het verschil van 9 bedrijven met het streefgetal is binnen de wettelijk toegestane grenzen. Data van agrarische bedrijven zijn van groot belang bij de evaluatie van landbouwbeleid en het monitoren van de economische ontwikkeling in de agrarische sector.

In 2011 zijn er 70.400 land- en tuinbouwbedrijven actief in Nederland. Het Nederlandse FADN richt zich op bedrijven met een Standaard Output (SO) van 25.000 euro of meer. Deze populatie bestaat uit 50,600 bedrijven in 2011. Deze bedrijven vertegenwoordigen 99% van de nationale productiecapaciteit.

S.2 Overige uitkomsten

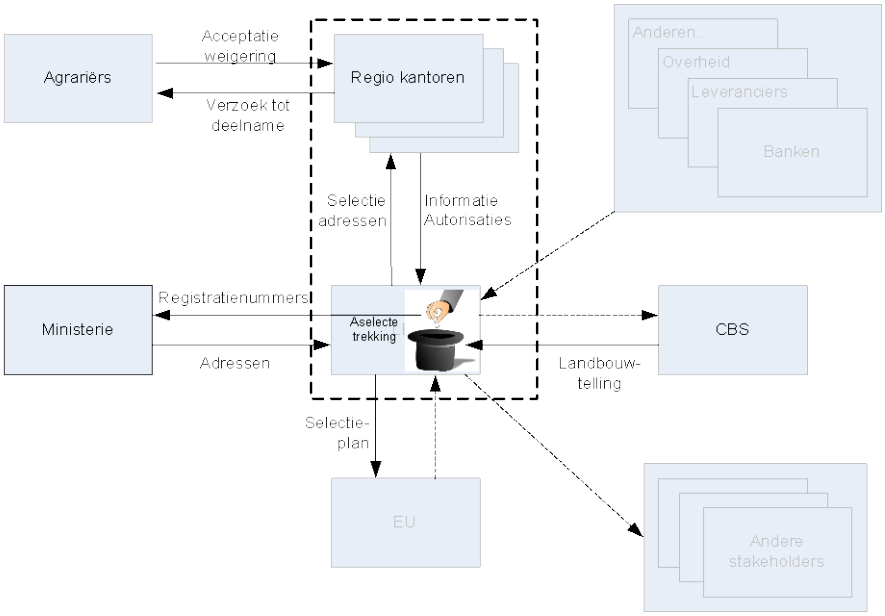
In het steekproefplan wordt gestratificeerd naar bedrijfstype en grootteklasse. Stratificeren waarborgt meer controle over de representativiteit van de steekproef en draagt bij aan betrouwbaardere schattingen (figuur s.1).

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 Bedrijveninformatienet. Op basis van de meest recente Landbouwtelling worden bedrijven ingedeeld in strata, die zijn gevormd op basis van het bedrijfstype en de economische omvang. Alleen bedrijven groter dan 25.000 euro SO vallen binnen het steekproefkader.

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 de bedrijven.



Figuur S.1 *Procedures voor het vaststellen van de steekproef en het werven van bedrijven Bron: Vrolijk et al. (2009a).*

1 Introduction

1.1 Objective of the report

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

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

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

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

This report provides background information on the population, the selection plan, implementation of the selection plan and 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 of the report

Chapter 2 gives a description of the background of the Dutch FADN system. Chapter 3 describes the agricultural population in the year 2011. This chapter will also consider the demarcation of the population as used in the Dutch FADN. Also, the design of the sample of the Dutch FADN system is described. Chapter 4 reports on the selection plan of 2011. Chapter 5 provides information on the implementation of the selection plan and the recruitment of new farms. Chapter 6 provides a qualitative and quantitative evaluation of the sample.

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 for 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 instead of collecting information on all farms. With a limited number of farms and thus a limited number of data collectors, it is easier to ensure good procedures and good training to collect reliable data.

An important issue is how to ensure that the farms that are included in the FADN sample are representative for the whole population. To this end, use is made of a disproportional stratified random sample. A *stratified* sample implies that the population is divided into a number of groups. Subsequently farms are selected from each of the groups. The variables 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 distinguishes groups based on 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.

Disproportional means that not all farms have the same chance of being included in the sample. Groups which are relatively homogeneous, i.e. farms which show large similarities, 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 are enough to draw reliable conclusions (in the extreme case that all farms are exactly identical, it would be enough to have only one observation). In case of less homogeneous groups it is important to have a larger number of observations to make reliable estimates. The choice of the stratification variables has therefore an important impact on the quality of the sample.

This way of selecting farms allows making unbiased estimates for the whole population of farms. Stratification assures 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 type of farming can be selected. If there is a difference between the selection plan and the actual implementation, stratification helps to improve the representativeness by taking into account the real sampling fraction.

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

The relationship between the agricultural population and the FADN sample is presented in Figure 2.1. The Agricultural Census provides an almost complete description of the agricultural population. Part of this census or part of this population is defined as the field of observation in the FADN. In 2011 the field of observation is restricted using a lower threshold based on farm size and share of agricultural income in total income.

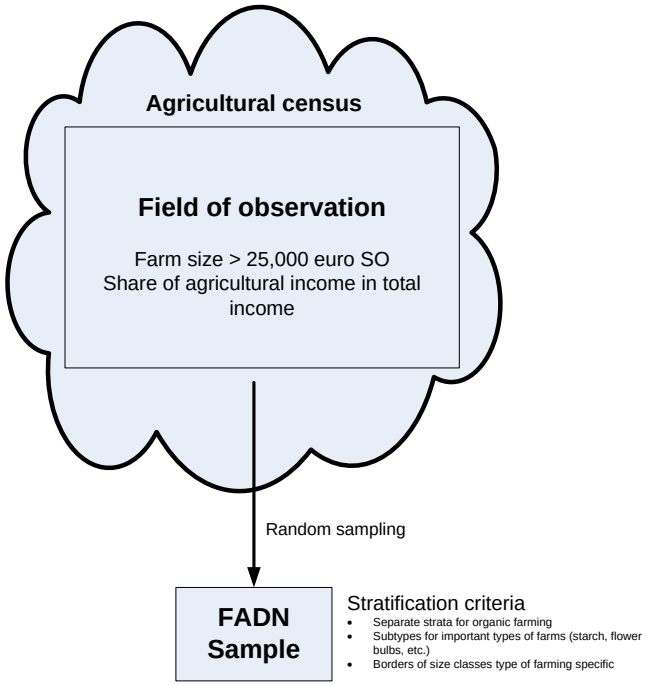


Figure 2.1 *Agricultural population and the 2011 FADN sample*
Source: Vrolijk et al. (2009a).

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.

Lower threshold
A lower threshold of €25,000 of SO is 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 side activity from real commercial farms producing for the market. Although the number of farms excluded from the field of survey is quite substantial, the percentage of production value which is not covered due to this threshold is very limited.

Other income sources
For practical and methodological reasons a limitation on 'other income of the holding' is used. Clear rules have been specified whether a firm belongs to the field of observation or not. A firm should have at least €25,000 of SO from primary agricultural activities, at least 25% of the turnover should come

from primary agricultural activities and agricultural activities - in the broadest sense, so as to include other gainful activities - should be the largest share of turnover of the holding.

Stratification criteria
Given the abovementioned 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 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 because 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 2011, this is illustrated in Figure 2.2. This figure shows that 99% of all arable farms are smaller than €1,000,000 of SO, while almost 80% of the tomato firms are larger than €1,000,000 of SO (the dashed line marks the €1,000,000 of SO level). 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 129 strata have been defined.

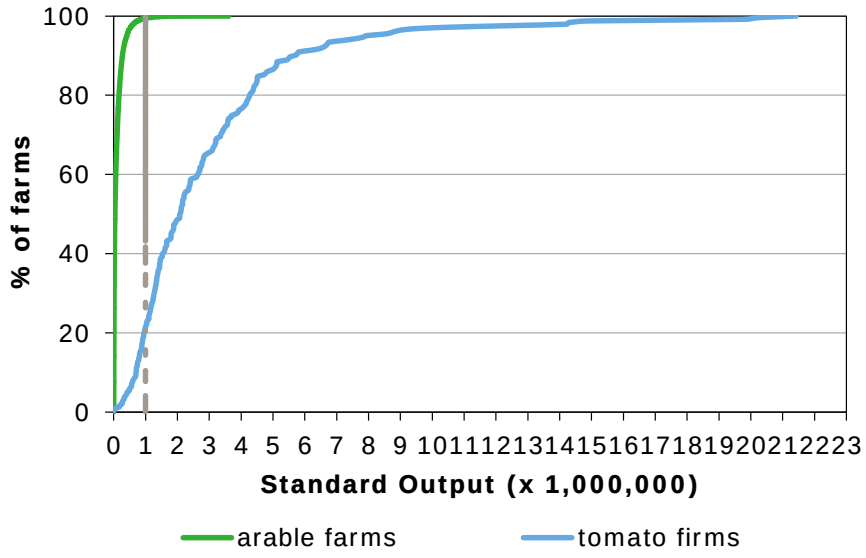


Figure 2.2 *Distribution of arable farms and tomato firms in 2011*
Source: Agricultural Census, Statistics Netherlands, calculations LEI Wageningen UR.

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 researchers) does not contain addresses but only farm identifiers. The farm addresses from the selected farms are received from the ministry of Economic Affairs. Farm identifiers are coupled to their addresses and forwarded to the regional offices that are responsible for contacting farmers to request their participation. The farmers either refuse or accept the request to participate. The non-response will be described in Chapter 5. The regional offices collect the authorisations and forward them to the central office in The Hague.

These authorisations are used to receive electronically available information from banks, suppliers, governmental institutions and others. The information on the acceptance and refusal of farmers is also used to verify the quality of the sample (see Chapter 6).

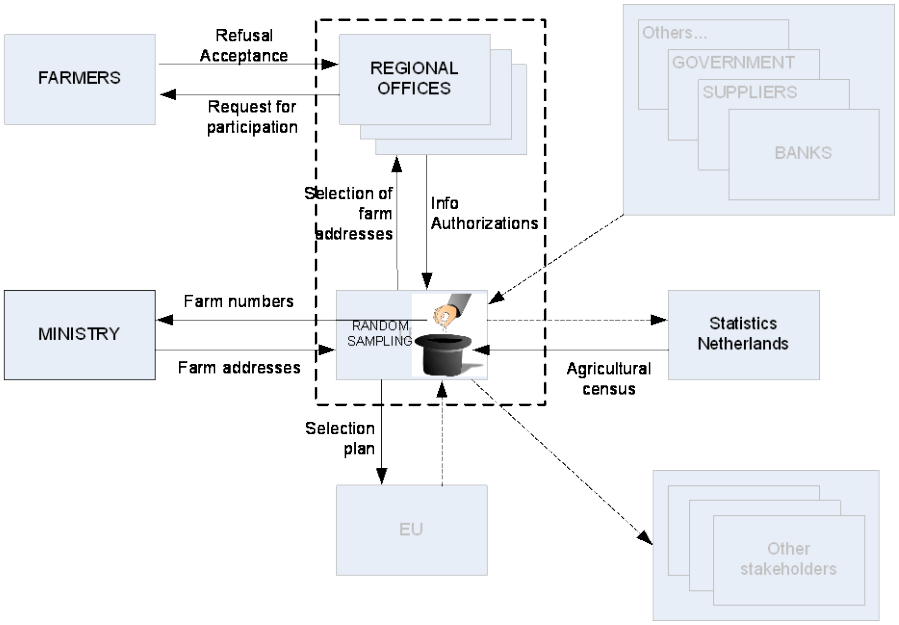


Figure 2.3 *Sampling and recruitment processes*
Source: Vrolijk et al. (2009a).

3 Population

3.1 Introduction

This chapter describes the population or, more precisely, the field of observation as covered by the FADN sample. The lower threshold and the consequences of its application will be described in Section 3.2. Section 3.3 describes the strata which are used to divide the population. Section 3.4 reports the number of farms in each of the strata.

3.2 Defining the field of observation

Collecting detailed information at farm level requires considerable time and money. To assure an efficient and effective allocation of the available budget, the sample design focuses on certain groups in the population. 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 2011, a lower threshold of €25,000 of SO implied that 19,835 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 2011 population (field of observation) of the Dutch contribution to the EU FADN system is displayed in Table 3.1.

Table 3.1
Number of farms and their relative economic importance (measured in Standard Output - SO) in the 2011 Agricultural Census

	Number of farms	Percentage SO
All farms in the Agricultural Census (a)	70,392	100.00
Farms less than €25,000 of SO (b)	19,835	1.08
Total of covered farms (a) - (b)	50,557	98.92

Source: Agricultural Census, Statistics Netherlands and FADN, calculations by LEI Wageningen UR.

3.3 Stratification scheme in 2011

Farms are allocated to strata according to the following stratification variables: type of farming and size class. The number of size classes within a type of farming in 2011 ranges from 4 to 6 (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): some farm types are not present in Dutch agriculture (e.g. olives, 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 due to the fact that the number of farms according to the selection plan was close to or even higher than the actual number of farms in the population. To deal with this problem a number of organic strata have been combined. 'Organic field crops farms', 'field vegetables' and 'combined crop farms' have been integrated in one stratum 'organic crop farms' (Vrolijk, 2006).

The breakdown in subtypes is as follows: 'field crop farms' have been itemised in 'starch potato farms', 'organic crops' and all 'other field crop farms'. The 'vegetables under glass' farms have been broken down in '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 presents the number of farms in the 2011 population according to size class and type of farming. The table shows that 50,557 (compared to 52,391 in 2010) farms fall within the field of observation. Dairy farms are clearly the largest group of farms. About one in every three farms is classified as a dairy farm.

Table 3.2

Stratification of the Dutch FADN sample 2011, including the number of farms per stratum according to the 2011 Agricultural Census

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									
Field crop farms									
- Starch potatoes	358		379	104	24				865
- Organic crops	90		87	49	25				251
- Other field crop farms	2,831		1,935	899	347				6,012
Horticulture									
Vegetables under glass									
- Sweet pepper	1		17		58	48	65	45	234
- Cucumber	0		26		63	41	52	8	190
- Tomato	1		12		38	42	65	84	242
- Other	97		268		98	29	25	12	529
Cut flowers under glass									
- Rose	1		32		35	34	62	23	187
- Chrysanthemum	8		19		20	17	51	30	145
- Other	79		467		290	136	108	34	1,114
Plants	59		239		188	124	144	125	879
Field vegetables	283		409		88	64			844
Fruit	445		517	388	135				1,485
Tree nursery	774		1,176		290	199			2,439
Flower bulbs	115		295		123	131			664
Other horticulture	490		952		244	214			1,900
Grazing livestock									
Dairy									
- Organic	26		202	93	12				333
- Non-organic	1,163		8,023	6,659	958				16,803
Calf fattening	209		548		388	169			1,314
Other grazing livestock	2,819	1,348	647	212	76				5,102
Intensive livestock									
Breeding pigs	42		177	431	344	185			1,179
Fattening pigs	528		685	441	297	166			2,117
Integrated pig farms	12		68	219	368	235			902
Consumption eggs	59		332		209	114			714
Broilers	9		101		149	179			438
Other intensive livestock	42		315		229	106			692
Other farms									
Combined	807		794	820	450	112			2,983
Total									50,557

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). Several strata may be combined for 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 2011 selection plan is provided in Table 4.1. Given the goals of the FADN system the numbers provided in the table are the required number of observations per type of farming.

Compared to the 2010 selection plan, the number of open air horticultural farms has increased. This had led to a decrease in the number of 'other grazing livestock' farms.

Table 4.1

Desired sampling size per type of farming (selection plan), 2011

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		550		
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		45	
Fruit	3610		45	
Tree nursery	2320		55	
Flower bulbs	2221		45	
Grazing livestock		420		
Dairy	4500		330	
- Non-organic				300
- Organic				30
Calf fattening	4610		40	
Other grazing livestock	4612, 4810, 4830, 4841, 4842, 4843		50	
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		1,500		

5 Recruitment of farms

5.1 Basic principles

An assessment was made of the farms available for the FADN system for 2010 (considering farms dropping out of the system. The recruitment for 2011 took place during November 2010 – January 2011).

5.2 Elaboration of selection plan

Table 5.1 gives a more detailed description of the 2011 selection plan as presented in Table 4.1.

Table 5.1

Detailed selection plan 2011 per stratum.

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									
Organic crops	5		12	9	4				30
Starch potatoes	8		14	5	3				30
Other field crops	37		52	35	26				150
Vegetables under glass	5		43		35	16	19	12	130
Plants under glass	5		15		15	8	14	13	70
Flower under glass	7		39		30	16	22	6	120
Field vegetables	11		21		7	6			45
Flower bulbs	8		11		12	14			45
Other horticulture	8		12		8	12			40
Tree nurseries	7		20		13	15			55
Fruits	8		18	12	7				45
Organic dairy	5		15	9	1				30
Non-organic dairy	20		130	110	40				300
Calf fattening	5		14		11	10			40
Other grazing livestock	8	11	15	7	9				50
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
Other intensive livestock	5		12		8	5			30
Broilers	1		7		8	14			30
Combined farms	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 2011 an estimate was made of the number of farms to be recruited. Furthermore, the variant of bookkeeping has been explicitly considered. Poppe (2004) describes that the introduction of a new bookkeeping system and budget cuts resulted in a large pressure on available capacity. To deal with this pressure, a flexible data collection system has been introduced with two main variants in the data collection: the EU variant and the Corporate Social Performance (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 sustainability 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.

Based on the number of farms to be recruited, the 2011 farms were randomly selected from the 2010 Agricultural Census. 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.

Ninety new farms were recruited for the accounting year 2011. The average response rate is 22%. Despite the effort, no new tree nursery farms were willing to participate.

Table 5.2

Response rate in different types of farming, recruitment for CSP variant, 2011.

Farming types a)	Number of refusals	Recruited farms	Unsuitable farms	Total farms	Unsuitable, %	Response, %
Field crop farms						
- Other field crop farms	6	3	2	11	18	33
Horticulture						
Vegetables under glass						
- Tomato	16	3	11	30	37	16
- Other	32	7	27	66	41	18
Cut flowers under glass						
- Rose	14	8	10	32	31	36
- Chrysanthemum	10	3	8	21	38	23
- Other	72	18	41	131	31	20
Plants	3	1	1	5	20	25
Fruit	10	4	4	18	22	29
Tree nursery	3	0	5	8	63	0
Flower bulbs	50	13	18	81	22	21
Grazing livestock						
Other grazing livestock	11	2	6	19	32	15
Intensive livestock						
Breeding pigs	36	17	16	69	23	32
Fattening pigs	13	2	1	16	6	13
Integrated pig farms	19	5	12	36	33	21
Total	323	90	170	583	29	22

a) Only farming types with recruiting activities are displayed.

Table 5.3 describes the number of farms where accounts were completed for the first time for the bookkeeping year 2011. 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 or even right after recruitment. Or the quality of their bookkeeping is too poor to process. Second, this table includes the farms in the EU variant as well.

Table 5.3

Number of farms with 2011 as first year of completion of bookkeeping, recruited for EU or CSP variant

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
Farming types a)									
Field crop farms									
- Organic crops			1						1
- Other field crop farms			1						1
Horticulture									
Vegetables under glass									
- Tomato						3	1	1	5
- Other			2						2
Cut flowers under glass									
- Rose			1		1		1		4
- Chrysanthemum			1		1				2
- Other			5		5			1	11
Plants		1			2		1		4
Field vegetables		1	4						5
Tree nursery					3		2		5
Fruit			2	3					5
Flower bulbs		1			1		1		3
Other open air			1						1
Intensive livestock									
Breeding pigs		1	2	2	2		1		8
Fattening pigs					2				2
Broilers							1		1
Other intensive livestock			2						2
Mixed farms			2	8					10
Total									72

a) Only farming types with farms with first year of completion of bookkeeping are displayed.

Comparison of the field of observation (population) and the sample available for research purposes in 2011 is presented in Table 5.4. The total number of farms available in 2011 is 1,491, of which only 1,453 are available for research providing standard list of variables supplied to the EU.

Table 5.4

Number of farms in the population and available for research in the sample according to the EU and CSP variant, 2011.

Type of farming	Code	Number of farms		
		Population	Total sample (EU+CSP)	CSP
Field crop farms	*1*			
- Starch potatoes	1601	865	29	28
- Organic crops		251	31	31
- Other field crop farms		6,012	148	138
Horticulture	*2+3*			
Vegetables under glass	2111			
- Sweet pepper		234	26	26
- Cucumber		190	32	32
- Tomato		242	25	24
- Other		529	34	34
Cut flowers under glass	2121			
- Rose		187	16	16
- Chrysanthemum		145	17	17
- Other		1,114	72	60
Plants	2122	879	59	57
Field vegetables	2210	844	37	16
Fruit	3610	1,485	43	34
Tree nursery	2320	2,439	47	23
Bulbs	2221	664	35	23
Other horticulture		1,900	69	28
Grazing livestock	*4*			
Dairy	4500			
- Organic		333	35	35
- Non-organic		16,803	306	261
Calf fattening	4611	1,314	42	20

Type of farming	Code	Number of farms		
		Population	Total sample (EU+CSP)	CSP
Other grazing livestock	4843	5,102	53	30
Intensive livestock	*5*			
Breeding pigs	5111	1,179	54	51
Fattening pigs	5121	2,117	50	46
Integrated pig farms	5131	902	34	31
Consumption eggs	5211	714	33	29
Broilers	5221	438	31	31
Other intensive livestock	other 5	692	28	9
Combined	*6-8*	2,983	67	35
Total		50,557	1,453	1,165

5.4 Supply of farm results to the European Commission

The final delivery of 2011 data to the EU has taken place in December 2012. Data of 1,491 farms of the bookkeeping year 2011 have been provided to Brussels (Table 5.5).

Table 5.5

Number of farms supplied to the EU

Bookkeeping year	Provided to the European Commission	Farms available for research	Other available farms 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
2011	1,491	1.453	38

a) Other available farms are farms that are also available but without a weight. Reasons for not having a weight are: a farm appears to be outside of the defined field of observation. In alternative weighting systems (based on the characteristics of the farm these farms might get a weight.

6 Evaluation of the 2011 sample

6.1 Introduction

In this chapter the FADN sample for the year 2011 is evaluated in a qualitative and quantitative way. Section 6.2 provides an evaluation of the methodology of stratification and weighting. A crucial element is the calculation of weights. Section 6.3 provides the quantitative evaluation. 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 continuously changing. Therefore the sample and population farms that belong to a stratum in year 2011 are not exactly the same as the farms that belong to that stratum in year 2010. The (post) stratification of the farms in 2011 is based on the 2011 Agricultural Census. 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 6.1

Sampling fractions in different strata (2011 sample)

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
Type of farming								
Field crop farms								
- Starch potatoes	0.02		0.04	0.06	0.12			
- Organic crops	0.06		0.14	0.17	0.20			
- Other field crop farms	0.01		0.03	0.04	0.07			
Horticulture								
Vegetables under glass								
- Sweet pepper	0.00		0.18		0.20	0.08	0.08	0.06
- Cucumber	0.00		0.19		0.20	0.13	0.08	0.25
- Tomato	0.00		0.19		0.13	0.09	0.10	0.07
- Other	0.06		0.10		0.09	0.12	0.12	0.09
Cut flowers under glass								
- Rose	0.00		0.08		0.11	0.11	0.10	0.09
- Chrysanthemum	0.00		0.13		0.17	0.19	0.13	0.03
- Other	0.09		0.07		0.08	0.07	0.09	0.10
Plants	0.08		0.06		0.09	0.07	0.10	0.11
Field vegetables	0.05		0.06		0.08	0.10		
Fruit	0.02		0.04	0.03	0.05			
Tree nursery	0.01		0.02		0.05	0.08		
Flower bulbs	0.07		0.05		0.09	0.11		
Other horticulture	0.02		0.01		0.03	0.06		
Grazing livestock								
Dairy								
- Organic	0.16		0.08	0.11	0.05			
- Non-organic	0.01		0.02	0.02	0.04			
Calf fattening	0.02		0.03		0.03	0.06		
Other grazing livestock	0.00	0.01	0.02	0.03	0.10			
Intensive livestock								
Breeding pigs	0.05		0.04	0.05	0.04	0.05		
Fattening pigs	0.01		0.02	0.03	0.04	0.05		
Integrated pig farms	0.20		0.10	0.04	0.03	0.04		
Consumption eggs	0.08		0.03		0.04	0.07		
Broilers	0.06		0.07		0.05	0.09		
Other intensive livestock	0.12		0.04		0.04	0.05		
Other types								
Combined	0.01		0.02	0.04	0.05	0.09		

6.2.3 Remarks on the weights

In the report on farm results for 2011 the research population is defined as all farms in the 2011 Agricultural Census (above the lower 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 2011, the 2011 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 2011 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 tends to decrease

significantly (this trend is stronger for certain types of farms and less strong for others). As a consequence, estimations might be overestimations of reality. Distortions in the number of farms in the census can therefore cause incorrect estimations of aggregates.

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. 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 the 2011 sample

6.3.1 Introduction

This section focuses on the quality of the estimations based on the 2011 FADN sample. 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, has 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 under-representation 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.

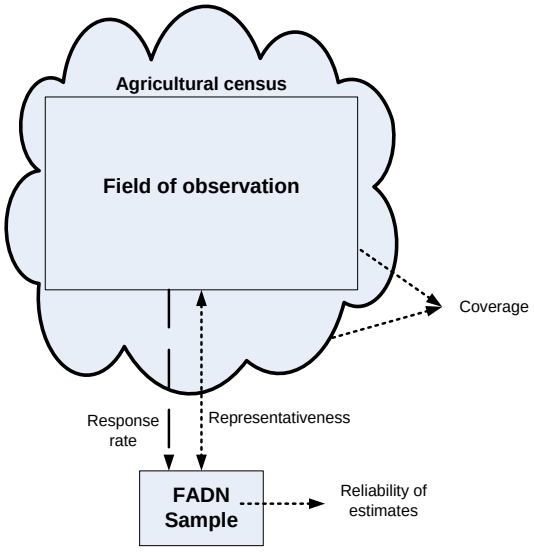


Figure 6.1 *Quality aspects of the Dutch FADN*
Source: Vrolijk et al. (2009a).

6.3.2 Coverage

It is desirable to have a sample that represents the population as accurate 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 (Figure 6.2). 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: larger than €25,000 of SO. From this sampling frame the sample is drawn (d).

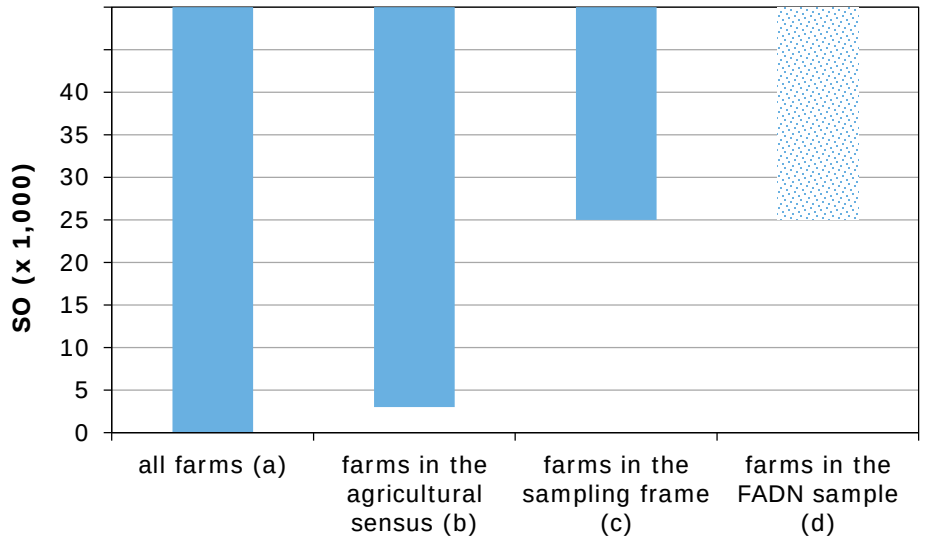


Figure 6.2 *Relationship between all farms and FADN sample concerning lower threshold*

Table 6.2 gives an indication to what extent the FADN sample in 2011 covers the whole population. Table 6.2 presents some characteristics for the total sample for example: area of crops, number of animals and labour. A comparison is made between the farms in the sampling frame (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 frame covers the population to a large extent. For example with respect to size (calculated in euros of SO), the coverage is 99% (Table 3.1). The upper threshold has been abolished from 2010 on. 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 (compare Table 6.4).

Table 6.2

Coverage of the sample compared to Agricultural Census, 2011.

Selected characteristics a)	Number according to census	Covered by sampling frame ≥ €25,000 of SO (%)
Farms	70,392	71.8
Standard output (million euros)	19,313	98.9
Total labour (AWU)	165,781	90.0
Family labour (AWU)	97,614	85.4
Paid labour (AWU)	68,168	96.7
Area (hectare)		
Agricultural area	1,858,434	93.2
Grassland	815,952	90.5
Green maize	227,814	90.7
Arable	944,858	94.9
Winter wheat	113,153	95.6
Sugarbeet	73,329	97.5
Starch potato	49,168	99.0
Seed potato	37,911	99.9
Ware potato	72,607	99.0
Seed onion	23,295	99.5
Open air horticulture	87,374	99.5
Headed cabbage	2,775	99.4
Leek	2,748	99.8
Brussels sprouts	2,917	99.8
Asparagus	2,922	98.3
Cauliflower	2,267	99.6
Apple	8,266	99.4
Pear	8,203	99.2
Park trees	5,921	99.4
Hedges	2,746	99.2
Tulip bulbs	11,861	99.9
Horticulture under glass	10,249	100.0
Cucumber	656	100.0
Sweet pepper	1,357	100.0
Tomatoes	1,702	100.0
Chrysanthemum	511	100.0
Roses	459	100.0
Pot plant flower	872	100.0
Pot plant green	493	100.0
Number		
Dairy cows	1,469,720	100.0
Fattening calves	906,176	99.9
Breeding pigs	1,226,662	100.0
Fattening pigs	5,905,007	99.9
Broilers	43,911,647	100.0
Laying hens	44,459,945	100.0

a) Main crops and livestock are listed and not farming types.

Source: Agricultural Census, Statistics Netherlands, calculations by LEI Wageningen UR.

In policy analysis and research it is essential to distinguish between farming types (for example specialised pig fattening farms) and agricultural activities (pig fattening). In the report on the redesign of the FADN sample it was illustrated that types of farming should not 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 in 2011. For example, 77% of the cattle activities can be found on the dairy farms and 17% on the farms that belong to 'other farms' category and 4% on combined farms. The intensive livestock sector pigs and poultry are highly specialised. Almost 90% of the activities can be found on the specialised farms. Open air vegetable cultivation is more diverse. On the specialised farms, 61% of open air vegetable cultivation (in SO) can be found. The combined and other farms also have a large share of open air vegetable cultivation.

Table 6.3

Relationship between types of farming and agricultural activities - share of SO 2011

Animals or crops	Cattle	Pigs	Poultry	Arable crops	Open air vegetables	Fruit	Tree Nursery	Flower bulbs	Vegetables glass	Orna-mental plants
Type of farming										
Dairy	77.1	1.4	0.2	13.9	0.9	0.6	0.3	0.5	0.0	0.0
Pig	0.5	88.7	0.4	3.2	2.9	0.3	1.1	0.9	0.0	0.0
Poultry	0.3	0.4	89.1	1.4	0.6	0.2	0.2	0.1	0.0	0.0
Arable	0.1	0.1	0.1	63.1	2.8	0.8	0.1	1.0	0.0	0.0
Open air vegetables	0.0	0.1	0.0	0.8	61.3	0.8	0.2	0.0	0.2	0.0
Fruit	0.0	0.0	0.0	0.3	0.4	85.3	0.1	0.0	0.0	0.0
Tree nursery	0.1	0.2	0.1	0.4	0.6	0.4	89.2	0.3	0.0	0.1
Flower bulbs	0.0	0.0	0.0	0.8	0.4	0.0	0.1	70.2	0.0	0.0
Vegetables under glass	0.0	0.0	0.0	0.0	1.8	0.5	0.1	0.0	88.2	0.0
Ornamental plants[1)]	0.0	0.0	0.0	0.0	0.1	0.2	0.2	5.6	0.5	92.7
Combined	4.4	7.7	7.0	11.9	16.5	8.8	6.0	8.7	0.3	0.0
Other	17.4	1.5	3.0	4.1	11.7	2.2	2.4	12.5	10.7	7.1
Total agriculture	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1)] Consists of cut flowers under glass and pot plants.

Source: Agricultural Census, Statistics Netherlands, calculations by LEI Wageningen UR.

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 for 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. Table 6.4 shows to what extent the sample is representative for a number of variables in the Agricultural Census. Averages per farm in the census and in the FADN are compared. To make a relevant comparison, farms in the census are selected according to FADN size criteria. The last column indicates statistical significance at 5% level. If the relative difference in averages is more than two times 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 difference between FADN and census average is significant, i.e. there is no significant difference between the sample and the population.

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

Table 6.4

Comparison of farms in the Agricultural Census and farms in the Dutch FADN

Variable	Average per farm 2011		Significant
	Census ≥ €25,000 of SO	FADN	
Size (Standard Output)			
Total	381.675,48	385.270,26	
Arable crops	37.143,72	39.186,98	
Grassland	10.589,77	10.733,63	
Open air horticulture	47.464,28	50.825,77	
Horticulture under glass	100.151,56	89.168,74	*
Dairy	74.544,64	78.973,54	*
Veal	14.116,45	13.874,43	
Fattening pigs	25.935,09	26.790,96	
Breeding pigs	22.433,60	23.529,68	
Broilers	9.298,48	9.179,62	
Laying hens	9.773,71	10.702,96	
Size (ha)			
Total	34,60	36,45	*
Arable crops	17,90	19,27	*
Cereals	3,98	4,34	
Tuberous and root crops	4,60	4,89	
Permanent grassland	13,84	14,03	
Open air horticulture	1,74	1,97	*
Pome and stone fruit	0,34	0,38	
Tree nursery	0,31	0,33	
Flower bulbs	0,48	0,58	*
Open air vegetables	0,48	0,54	
Horticulture under glass	0,20	0,18	*
Vegetables under glass	0,10	0,09	*
Tomatoes	0,03	0,03	*
Cucumber	0,01	0,01	
Sweet pepper	0,03	0,02	
Cutflowers	0,05	0,05	*
Roses	0,01	0,01	*
Chrysanthemum	0,01	0,01	
Pot plants	0,04	0,04	
Labour (AWU)			
Male	1,79	1,76	
Paid labour	1,32	1,12	*

Source: Agricultural Census, Statistics Netherlands and FADN, calculations by LEI Wageningen UR.

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. Quality of farm management for example is not recorded in the data and thus cannot be statistically tested. Thus it is possible that farms with relatively good or bad management skills and therefore performance are over represented in the sample.

6.3.4 Reliability

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

The calculation of averages of groups based on sampling units implies that there can be differences between the estimated value and 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 2011 sample.

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. If the average value is negative, the coefficient of variation is negative as well. This is the case with for example savings.

The precision of estimates is determined 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 twice the standard error to the calculated average plus two times the standard error. For example, the standard error 6,964 for starch potatoes farms signals that average farm income on such farms can vary within the confidence interval 70,730 +/- 1.96*6,964, i.e. (€57,081 - €84,379).

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	6,964	17,571	2	8,096	6,914	4,614
	0.10	*0.06*	*0.02*	*0.23*	*0.08*	*0.23*
- Organic crops	22,879	56,075	5	13,631	17,543	17,148
	0.88	*0.14*	*0.06*	*-0.37*	*0.73*	*-0.38*
- Other field crop farms	6,246	13,938	3	8,150	6,604	5,565
	0.29	*0.05*	*0.03*	*-0.34*	*0.20*	*-0.11*
Horticulture						
Vegetables under glass						
- Sweet pepper	57,428	413,116	2	56,386	57,358	40,978
	-1.15	*0.17*	*0.02*	*-0.39*	*-1.22*	*-0.68*
- Cucumber	51,951	150,709	2	53,520	51,877	44,601
	-0.26	*0.09*	*0.03*	*-0.20*	*-0.26*	*-0.18*
- Tomato	180,245	598,666	2	171,078	180,722	84,158
	-0.55	*0.16*	*0.02*	*-0.37*	*-0.57*	*-0.44*
- Other	21,259	58,810	3	20,213	21,114	15,727
	0.56	*0.10*	*0.03*	*-0.60*	*0.48*	*-0.36*
Cut flowers under glass						
- Rose	80,477	155,565	3	86,734	80,654	60,687
	-1.47	*0.08*	*0.04*	*-0.60*	*-1.59*	*-0.65*
- Chrysanthemum	49,669	137,886	4	45,403	49,751	42,885
	0.85	*0.06*	*0.04*	*-2.51*	*0.81*	*-4.98*
- Other	20,256	85,470	2	19,798	20,159	17,694
	0.31	*0.10*	*0.02*	*-1.91*	*0.29*	*-0.80*
Plants	40,722	240,689	3	37,395	40,670	37,885
	0.38	*0.13*	*0.03*	*-7.28*	*0.36*	*1.23*
Field vegetables	43,050	104,634	7	39,566	41,993	51,052
	0.80	*0.20*	*0.08*	*-4.08*	*0.66*	*-2.35*
Fruit	11,602	38,959	5	9,748	12,592	12,967
	0.71	*0.12*	*0.06*	*-0.28*	*0.47*	*-0.22*
Nurseries	41,514	136,786	4	25,707	41,144	31,401
	0.34	*0.23*	*0.04*	*1.16*	*0.33*	*0.93*
Flower bulbs	34,555	251,974	4	44,809	39,158	24,128
	0.35	*0.21*	*0.04*	*0.84*	*0.34*	*1.79*
Other horticulture	27,621	115,555	5	22,998	27,028	20,230
	0.31	*0.19*	*0.06*	*0.89*	*0.27*	*5,619.42*
Grazing livestock						
Dairy						
- Organic	8,847	12,647	3	8,780	7,364	8,766
	0.18	*0.04*	*0.03*	*0.59*	*0.11*	*-0.24*
- Non-organic	4,005	8,251	1	4,511	4,504	3,436
	0.07	*0.02*	*0.01*	*0.18*	*0.06*	*-0.13*
Calf fattening	11,119	41,851	5	12,106	11,649	9,948
	0.19	0.16	0.05	0.77	0.16	-1.14
Other grazing livestock	12,497	25,720	6	14,159	15,678	10,458
	1.29	*0.16*	*0.09*	*3.25*	*0.36*	*-0.24*

Type of farming	Goal variable					
	farm income, €	total revenues, €	return, a)	savings, €	total income, €	net farm result, €
Intensive livestock						
Breeding pigs	10,965	49,826	2	10,152	10,936	10,667
	-0.21	*0.08*	*0.02*	*-0.10*	*-0.27*	*-0.09*
Fattening pigs	7,774	35,431	2	6,135	7,883	7,517
	0.14	*0.05*	*0.02*	*0.29*	*0.11*	*1.14*
Integrated pig farms	14,941	77,260	1	14,280	16,040	12,789
	-1.39	*0.07*	*0.01*	*-0.27*	*2.60*	*-0.15*
Consumption eggs	37,116	52,065	3	34,221	36,724	34,882
	-0.26	*0.08*	*0.04*	*-0.19*	*-0.28*	*-0.16*
Broilers	13,067	84,966	1	15,485	13,849	14,103
	0.28	*0.06*	*0.01*	*1.15*	*0.23*	*-1.06*
Other intensive livestock	19,407	113,414	7	24,461	18,412	20,527
	0.42	*0.17*	*0.08*	*5.68*	*0.31*	*-2.01*
Combined	11,347	20,128	3	22,626	12,606	12,365
	0.65	*0.05*	*0.04*	*-0.88*	*0.38*	*-0.24*

a) Revenues per 100 euro of costs.

There are clear differences in the significance of estimates between different types of farming. Following 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. The decision on the number of farms is described in Vrolijk and Lodder (2002).

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 in 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 system. The microeconomic information at farm level makes it possible to show and analyse differences between farms, for example research about sustainability performance (Dolman et al., 2012).

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