Farm Structure Survey 2007. National methodological report, Denmark

A. CONTENTS

SUMMARY

The Danish farm structure survey is based on mailed questionnaires and is generally conducted as a stratified sample survey. The most recent total census was held in 1999.

The survey covers crops and livestock as the most important items, but also certain other questions to meet Eurostat requirements and special national needs.

The survey is conducted by Statistics Denmark by a special section in the division of agricultural statistics.

The base for the survey is a special farm register kept by Statistics Denmark. All Danish farms are contained in the register.

All questionnaires are controlled extremely carefully, and this work implies for instance intense telephone contact with farmers as well as both manual and computer control for validation.

First results of the survey are generally published in March-May the year after the survey, both on paper and Internet.

1. Introduction

1.1 History, scope

Since 1976 the farm structure survey on agriculture and horticulture has been conducted as a mailed questionnaire-based survey, which describes the structure of agricultural and horticultural farms as well as land use, livestock and certain other aspects of Danish agriculture.

Before 1976 the surveys were conducted by the municipalities by means of personal interviews. The results were reported to the central statistical office as aggregated results.

Until 1983 all surveys were conducted as total censuses. From 1984-1989 total censuses were conducted in even-numbered years and sample surveys in odd-numbered years. From 1990-98 only sample surveys were conducted. The survey conducted in 1999 was a total census including all agricultural and horticultural holdings in Denmark. Only sample surveys will be conducted in the years to come. Then next total census will presumably be in 2010.

Questions on crops, livestock, machinery and labour force are included in the surveys as well as certain other questions to meet Eurostat requirements. However, questions on labour force were excluded from the surveys in 1998, 2000-2002 and 2004.

1.2 Legislation

Act on Statistics Denmark, which states that all firms are obliged to answer questionnaires from the statistical office, Regulation 571/88 and Commission Decision 2000/115.

There is thus no special Danish legislation on the farm structure survey.

2. CONTENT

2.1 Characteristics

The questionnaire is not exactly the same year after year but consists generally of these sections:

1) Crops

2) Livestock

3) Storage facilities for manure

4) Labour force

5) Questions on non-agricultural activities, "rural development" (only for years with Eurofarm requirements)

6) Other questions

Some questions are more detailed than required in the EU regulation, for instance related to the section on fruits and berries and including the following characteristics:

Strawberries
Apples
Pears
Sour cherries
Blackcurrant
Redcurrant
Other fruits and berries

Characteristics which are subject to EU requirements but which are considered to be non existing or non significant:

CC06A, CC06B, D02, D06, D07, D09F, D23, D24, D25, D27, D28, D33, E, G01B, G01C, G02, G03, G03A, G03B, G04, G04A, G04B, G04C, G04D, J10, J17, J18, M01D.

2.2 Questionnaires

A copy of the 2007 questionnaire is available in Danish only. The questionnaire is four pages and there is one version which all farmers must complete. There is no Internet version of the questionnaire.

3. Survey methodology

3.1 Survey organisation

The agricultural division of Statistics Denmark conducts the survey. There is only one central statistical office in Denmark, and no regional offices. The agricultural division is divided into several smaller sections where one of these sections is the section of farm structure statistics. This section consists of one academic, who is the head of the section, and 4 clerks.

The head of section is responsible for the overall planning of the survey as well as much of the computer programming and publication of results. Also the deliverance of Eurofarm data to Eurostat is a job of the head of section.

The clerks take care of most of the practical tasks, for instance registration and control of questionnaires and telephonic contact with the farmers.

Staff outside the section naturally assists the farm structure survey when it comes to many practical tasks, for instance printing of questionnaires. Such assistance could also be of an ad hoc nature, and likewise the farm structure section also sometimes assists other sections of Statistics Denmark.

The agricultural division does not have its own computer section, but shares programmer resources with other divisions of business statistics.

3.2 Work process

The farm structure survey in Denmark took place as follows:

- June 1: Questionnaires were sent to the farmers by post to 32.000 farms *

- June 15: Survey date: all reported information should have reference to this date. **However labour force information should refer to the 12 months period before the survey date**.

-Agust-November: Reminders were sent to the farmers who have not returned their questionnaires.

-May-December: Registration (both manually and scanning) and control of results. Different types of register updating.

- February-May: Validation and correction of results by means of different kinds of checks, both micro and macro check procedures are used.

-April 28: First publication of results in a small newsletter and on the Internet. During the year more detailed results were published to different publications.

* Of these 32.000 about 7.000 were small farm below the survey threshold or inactive farm units.

3.3 Preparing the survey operations

3.3.1 Population and frame

The base for an agricultural survey or census should be a complete register, which means a register containing all farms in the country. At least should the number of missing farms be negligible from a statistical point of view.

The unit in the register should be the farm in the sense of an economic and technical unit which produces agricultural products, where these products could be both crop products and livestock products. The farm could be run both by one person, by group of persons or by a company. Firms which are engaged in other economic activities should still be included even if agriculture plays a small part of firm's economy.

Statistics Denmark has for many years had a special register for agriculture, and this register is not directly linked to any other kind of business register. The main source of the register is a special Danish administrative register used for collecting land value taxes from all properties. The land tax system distinguishes between agricultural properties and other properties.

A property is a land tax unit which has been subject to an independent land value assessment. The owner of a property has to pay local land taxes based on this assessment.

If all farms were run by one person, group of persons or company who owned one property only the property register and the farm register would be identical, but in the real world things are not so uncomplicated. Therefore Statistics Denmark has defined different kind of farms:

1) **Owner farms**. This is far the most frequent case in Denmark. An owner farm is a farm where the farmer owns at least one property. If more than one property is owned one property is classified as the **main property** of the farm and other properties as **secondary properties**. An owner farm could, and this is very often the case, have tenanted area in addition to the owned area, and it could also lease some land out to other farms.

2) **Tenancy farms**. Such farms own no land but lease all the land from another farm or from several other farms.

3) **Non active farms**. These farms are not farms in the sense of an economic unit which produces agricultural products. A **Non active** farm has leased all the land out to another farm and is not itself engaged in agriculture, but is still owner of a property. These farms are not included in the statistical tables but are included in the farm register.

4) **Other farms**. This is a very rare case. The concerned farms are not owners or tenants of an agricultural property in the normal way but they are engaged in agriculture in other ways, for example by having leased a stable with pigs or cattle from another farmer. Under these circumstances what seems to be one farm unit by the first glance are in fact two farm units: one unit with crop production and the other unit with livestock. One could imagine that such "other farms" will become more frequent in the future. This is rather unfortunate from a register point of view since these farms are so difficult to "catch". In the survey the owner of the property might tell the statistical office that he has no livestock telling nothing about the stable he has leased out to another farmer.

The Danish farm register has in principle been created and updated year after year in the following way:

A questionnaire with questions on crops, livestock, labour force etc. is sent to every owner of an agricultural property. In cases where one owner has more than one property he will be instructed to give all the information on one questionnaire if the properties are run together as one farm unit. Owners who are not engaged in agriculture because they have leased out the land to other farmers should return the questionnaire with a mention of the name and address of the tenant. The questionnaire should then be sent to the tenant unless he can be identified as the owner of another property, in which case he will include the tenanted area in his total area.

The final result of this procedure will be a new *farm* register with:

1) **Owner farms** in all cases where the owner is an active farmer. In some cases two ore more properties have been merged into farm units.

2) **Tenancy farms** in all cases where a property is tenanted by a farmer who does not own any land himself.

3) **Non active farms** in all cases where an owner of a property is not an active farmer himself but has leased his land out to another farmer, who can be either an owner or a tenant.

4) **Other farmers** in such cases where it has been possible to identify a farmer who is neither an owner nor a tenant in the traditional way.

This procedure shows that a structure census is a double exercise. The primary aim is of course to produce some statistical results on number of farms, crops and livestock, but fulfilling this purpose requires the creation or updating of the register.

Next year the newly created farm register of year T should be updated by an up to date version of the administrative property register. The output register will be a farm register which should be used as a base for the census or survey in year T+1. The following changes in the farm register should be made:

For all owner farms is the new owner of the main property transferred from the property register to the farm register if the main property has changed owner since last year. It should be noticed that no new farm in the register is created in this way, but an already existing farm has got a new owner. Tenant farms should of course be excluded from this exercise since in these cases the farmer is not the owner of the property.

All new properties, which means properties contained in the property register but not in the farm register, are added to the farm register as new owner farms.

In all cases where a secondary property of a farm has been sold but the main property still has the same owner a new owner farm is created in the farm register. The reason for this is that what was last year one farm unit now seems to be two farm units.

In all cases where a non active farm has changed owner since last year the farm should have changed its status from non active to the status a an owner farm. In these cases it is assumed that the new owner of the property is an active farmer unlike the former owner.

In a Danish sample survey a special stratum is constructed where all "new farms" are placed. All farms in this stratum are selected.

During the census or survey of year T+1 the farm register should be modified as already described. In this way the farm register will be modified year after year, partly with information from the administrative property register and partly with information from the census or sample survey.

The farm register should of course be open for updating from other sources which may be available. These sources could be:

A general business register where it is investigated if all agricultural business units in the business register are contained in farm register as active farms.

In countries like Denmark with a crop subsidy system or other kind of agricultural subsidies it could be investigated if all applicants of subsidies are contained in farm register as active farms.

Any other sources could be included in such exercises as well.

Using such other sources could be useful to identify cases where a non-active farm in the farm register in fact has become active again. It could also be possible to identify the already described "other farms", the farms which are neither owners nor tenants in the traditional way.

3.3.2 Survey design

The Danish farm structure survey is generally conducted as a sample survey, and more rarely as total censuses. This implies that "the best" sample should be selected, evidently the sample which is expected to generate the smallest sample error.

We have chosen a stratification with 3 dimensions.

The first dimension is the *economic size of farm* by standard gross margin at 1995-prices. There are 8 different groups:

1) < 12.000 ESU
2) 12.000- < 30.000 ESU
3) 30.000- < 50.000 ESU
4) 50.000- < 75.000 ESU
5) 75.000- < 100.000 ESU
6) 100.000- < 135.000 ESU
7) 135.000- < 200.000 ESU
8) >= 200.000 ESU

The second dimension is the *region* where the farm is located. There are 9 different regions.

The third dimension is the *type of farming*. There are 11 different types according to the common European system of typology at the one or two digit level. If we include all subdivisions there are much more than 11 groups but only these 11 groups are felt as necessary in the stratification. The following groups are used: 1.1, 1.2, 2.1, 3.2, 4, 5.1, 5.2, 6.1, 6.2, 7 and 8. Group 6.1 is calculated differently from the common European standard, which states that 6.1 includes all farms where more than 1/3 of the standard gross margin comes from horticulture *and* more than 1/3 from permanent crops. The Danish standard has been changed so that 6.1 includes all farms where more than 1/2 of the standard gross margin comes from the *sum* of horticulture and permanent crops except those farms which are included under 2.1 and 3.2.

This gives 8*9*11=792 different stratums, where some, however, are vacant. There are in practice about 700 different strata. The stratification tries to avoid small strata's with very few units.

When calculating the sample frame the method of optimal allocation is used. This implies that the higher the standard deviation of standard gross margin is in a given stratum the higher is the share of selected farms. This leads in practice to that large farms are "over-represented" in the sample and small farms "under-represented". An exception from this general rule is the farms with the typology codes 2.1, 3.2 and 6.1; all farms in these groups are selected. The reason is that these farms constitute a special small group of horticultural farms. It has been difficult to produce reliable results for this group and particularly subdivisions of the group in a sample so that is why all of these farms are selected, and this has been done since 1996. Likewise all new farms are surveyed. A new farm is defined as farm contained in the farm register but with no survey information from 1999 or any newer survey.

When stratifying the whole population of the farms the latest information is used for each farm. But some farms have not been surveyed after the latest total census in 1999. This implies that when stratifying the sample for, for example, the 2007 survey the full census 1999 is updated by the subsequent sample surveys 2001-2006.

For each stratum is calculated an extrapolation factor to convert the sample results into total results. This conversion factor is calculated simply as the number of farms in the population divided by the number of farms in the sample within each stratum**. In 2007 the sample consists of 24.865 units which, when extrapolated, gives 44.618 farms.**

3.3.3 Pilot Survey

A pilot survey is generally defined as a survey where the questionnaire is sent to a small number of respondents to test the questionnaire and correct it if necessary. No such pilot surveys are made for the farm structure statistics.

3.3.4 Informing and training the staff and respondents

To be a colleague of the farm structure team generally requires a practical education in Statistics Denmark as a trainee. (Except for the academic). This education gives a broad knowledge of how statistics are produced, and makes the trainee familiar with the computer environment, control of data, telephone contact with users and respondents etc.

New colleagues in the section of farm structure statistics will be guided by experienced colleagues until they are familiar with all steps in survey.

The farmers are not informed in the press or in other ways prior to the survey. They receive the questionnaire one week before the survey date. They also receive instructions on how to complete the questionnaire, and they are furthermore invited to call Statistics Denmark in case of problems. They have to return the questionnaire no later than one week after the day of the survey.

3.4 Sampling, data collection and data entry

3.4.1 Drawing the sample

A new sample is selected every year. In each stratum the farms are selected randomly by means of a computer program. So this means that a farm very well can be selected in year T even if it was also selected in year T-1. Due to the sample method mentioned above big farms, for instance farms with more than 100 hectare of agricultural area, are selected every year.

3.4.2 Data collection

When the questionnaires are returned to Statistics Denmark they are registered in an Oracle based program. When possible the questionnaires are scanned. The paper questionnaires are stored until the survey is completed.

3.4.3 Utilisation of administrative sources

Statistics Denmark collects a number of characteristics from other sources than the questions on the questionnaire. The aim of such a measure is double-fold:

Firstly, we stress the importance of not troubling the respondents with questions already available in other registers.

Secondly, we want naturally to keep down the costs of the survey, and it must generally be expected to be cheaper to collect data from an already existing registers rather then as comprehensive questions on a questionnaire.

The method we use is to link “register variables” with the “questionnaire variables” for each farm in the survey so that we end up with a statistical register containing all variables for all farms in the sample.

IACS

The following characteristics are in 2007 collected from IACS:

Eurofarm code	**Name of the characteristic**
CCO2	Area in tenancy
CC03	Shared area
D01	Wheat
D03	Rye
D04	Barley
D05	Oats
D08	Other cereals
D09, D09E, D09G,	Pulses
D10	Potatoes
D11	Sugar beets
D12	Fodder beets
D18, D18A, D18B, D18B1, D18B2_3	Fodder crops
D19	Seeds for sowing
D20	Other crops
D21	Fallow land without subsidies
D22	Set aside land with no economic use
D26	Rape

D29	Flax
D30	Other oil seed crops
D31	Flax for spinning
D32	Hemp
D34	Aromatic plants etc
D35	Other industrial plants
F, F01, F02, F03	Permanent grass land
I8	Set aside

The Danish IACS-register contains information on all Danish farmers who apply for crop subsidies, from 2005 onwards the single payment system. IACS is kept by the Danish Ministry of Agriculture. Farmers must specify *all crops* when applying for subsidies, **consequently also crops for which no subsidies are paid**. The applicant is in almost all cases identical with the farmer. In rare cases one person has two farms and one subsidy application. In such a case the farmer is obliged to give a full specification of all crops for both farms (if they are in the sample).

The items CC03 and D31 are special. No farms have declared that they have shared area, and no farms in the Danish 2007 sample grow flax. Both characteristics should probably prior to the survey have been flagged as non significant.

There are no differences between IACS definitions and Eurofarm definitions regarding the crops.

IACS is not totally complete as there are few farmers who do not apply for crop subsidies (single payment). However, such farmers are obliged to give a full specification of all crops on the statistical questionnaire.

All applications are subject to an extremely careful control by the Ministry of Agriculture, which among other measures include control visits at the farms.

The link between the farm register and IACS is created rather easily: The simply indicates on the questionnaire his application number in IACS if he has applied for subsidies. This makes the computer match an extremely easy exercise.

Legal base: Council regulation 1782/2003

System for the identification and registration of bovine animals

The following characteristics are in 2007 collected from the System for the identification and registration of bovine animals:

Eurofarm code	**Name of the characteristic**
J2	Bovine animals, under one year old, male and female
J3	Male bovine animals, one but less than two years old
J4	Female bovine animals, one but less than two years old
J5	Male bovine animals , two years old and over
J6	Heifers , two years old and over
J7	Dairy cows
J8	Other cows

On the statistical questionnaire we ask the farmer to indicate if he has cattle: yes or no. If yes, the farmer must also indicate his number in the livestock register, and in this way the link is created, exactly as is the case for IACS as described above.

Relevance and comparability: There are no differences between register definitions and Eurofarm definitions.

Completeness: All farms have to report their cattle to the register, and every single animal is registered with its own number.

Legal base: Council regulation 1760/2000

Organic farm register

The following characteristics are in 2007 collected from the Organic farm Register:

Eurofarm code	Name of the characteristic
C5a	The utilised agricultural area of the holding on which organic farming production methods are applied according to European Community rules
C5d	The utilised agricultural area of the holding that are under conversion to organic farming production methods
C5e	Is the holding applying organic production methods also to the animal production?

The link is created by means of the business number, personal code and phone number.

Relevance and comparability: There are no differences between register definitions and Eurofarm definitions.

Completeness: All organic farms are included in the register

Legal base: Council regulation 2092/91

3.4.4 Control of the data

If all farmers would send in the questionnaires before the deadline and if they furthermore would complete these questionnaires absolutely correctly it would be a rather easy task to produce agricultural statistics very rapidly and with few resources.

But in the real world it is necessary to spend a lot of efforts on sending reminders to the farmers. In a few cases it is unfortunately necessary to contact the police when some farmers even ignore the last reminder, which is a registered letter with a new copy of the questionnaire. This tough procedure is felt as necessary since no farmer should be allowed to tell his colleagues that questionnaires from the statistical office can be ignored. This leads to that non-response is a very small problem in the Danish farm structure statistics.

Even more resources are spent on the control of data. The control falls into three steps:

1) Every questionnaire is controlled manually and compared with the questionnaire from previous surveys where the farm has taken part. If for example a farmer had pigs last year but not now the farmer will be contacted on the phone to make sure whether there really are no pigs on the farm or the farmer has forgotten to indicate his pigs. About 15-20 %. of the farmers are contacted on the phone to clarify questionable cases. The figures are at the same time registered on the computer in an Oracle based program, either manually or by scanning. This program makes simultaneous error detection. It should be emphasised that the clerical staff responsible for all this control work are not allowed to "guess" missing information based on answers from previous surveys. The phone must be used, and only in very few completely impossible cases, and after agreement with the head of section, it can be allowed to complete the questionnaire with "non authentic" information.

2) Second step is a computer control where every farm is controlled. An error detection program lists a specified set of cases which *could* be mistakes, for example:[1]

- A big livestock farm has no storage facilities for manure.

- A cattle farm has no fodder areas.

- A farm has sugar beets and is located in a district where sugar beets are very rare. (It should probably be fodder beets).

- A very rare characteristics is registered, for example mushrooms.

- A characteristics has an unrealistic value, for example 1.000 horses.

3) The third step is a control of the aggregated results. For each district and characteristic the aggregated (and extrapolated) result is printed together with the same value for last year's survey. Here it is possible to detect strange developments. Most often mistakes are detected for characteristics which only very few farms have, for example poultry. One single mistake can in such a case be very visible. This could lead to that a new print of for example all farms with turkeys in a given district must be made and controlled for errors. However, there are no formal procedures at this level of the data control, but the check is nevertheless extremely useful.

3.4.4 Non-response

As already mentioned non-response is a very small problem in the Danish farm structure census. In addition to the few farmers who refuse to complete the questionnaire there is a small group of farms where it is impossible to collect information. One obvious example is that the farmer is dead, and no new farmer has taken over.

So non-response occurs but amounts to about ½ percent only. For strata's with non-response the extrapolation factor is increased proportionately to the non-response.

Obviously this method cannot be used in a total census. Here it is necessary to "guess" the information from previous surveys. This would be the case for approximately 0,5 percent of the farms.

3.5 Data processing, estimation and analysis

[1] This computer control takes place *after* the integration with administrative crop data. Otherwise the check would hardly make any sense.

3.5.1 Methods for handling missing or incorrect data items

No sophisticated methods of imputation are used to calculate missing information. As mentioned above farmers are in almost all cases contacted telephonically if the questionnaires are filled in incompletely.

This is a procedure which requires a lot of resources, and one could ask if it would matter so much if more automatic imputation procedures were introduced thereby saving resources for other tasks. Most likely aggregated results would not be influenced significantly. But this is not a sufficient argument. The farm structure survey is not just conducted to produce aggregated results. An important aim is also to create a register which can be used as a sample base for other surveys, for instance special livestock surveys and harvest surveys. Therefore it is of crucial importance that the farm register created by the farm structure surveys/censuses consists of absolutely reliable information, not only as aggregated results, but also for individual farms.

3.5.2 Estimation and sampling errors

For all the statistical results at the national level standard deviations are calculated. This gives the statistical user a fair chance to assess the quality of the statistics. The table below shows the results for some selected values.

Statistical results and standard deviations for selected characteristics, Denmark 2007

Characteristic:	Statistical results (number or hectares)	Standard deviation
Number of farms	44.618	0,3
Number of pigs	13.723.467	0,7
Number of cattle	1 566 218	0,9
Number of sheep	156.503	9,3
Agricultural area	2.662.761	0,2
Area with winter wheat	683 764	0,3
Area with pulses	5 639	3,5
Area with strawberries	1 135	3,3

The table shows that for the most important crops and animals in Danish agriculture extremely reliable figures can be made, but for other categories which only few farmers have one must be satisfied with a rough estimate.

3.5.3 Non sampling errors

Nothing to mention in addition to what is mentioned in 3.4.4.

3.5.4 Evaluation of estimates

Nothing to mention in addition to what is mentioned in 3.4.4.

4. PUBLICATION AND DISSEMINATION

The first publication of the farm structure results takes generally place in March, April or May depending on the size of the survey.

This first publication is a small newsletter with only one statistical table on number of farms distributed by size of the agricultural area. A brief comment of the development compared to last year is included.

The next publication is a more comprehensive statistical report with detailed tables on farm structure, livestock and land use. This report also includes regional results, which traditionally are felt as particularly interesting by many users.

Tables on agricultural statistics are also included in several general statistical publications issued by Statistics Denmark. One example is Statistical Yearbook, which covers all aspects of the Danish society, and accordingly also agriculture. The Statistical Yearbook is available in English translation on the homepage of Statistics Denmark www.dst.dk

On the homepage can also be found a table bank where the user can create his own statistical tables. The aim of the table bank is that all detailed tables should be available here, and that tables in paper publications should be less detailed. At least any table on paper should also be available electronically. Everybody has access to the table bank free of charge.

The table bank is available in both Danish and English, for the English version see:

www.statbank.dk

The most detailed publication of farm structure results takes place in the yearly publication *Landbrug* (*Agriculture*). It contains very detailed tables, not only on number of farms, land use and livestock, but also typology tables, machinery, labour force as well as special tables on farms by size of livestock and special crops. Also agri-environmental tables on livestock density could be mentioned. *Landbrug* has also several chapters on agriculture from other fields than farm structure statistics, for instance crops and livestock production.

5. SUGGESTIONS FOR FURTHER TASKS

REFERENCES

ANNEX Questionnaire(s)

The 2007 questionnaire is only available in Danish.