

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Statistics**



**Diploma Thesis**

**Methodology and Analysis of Results Agricultural  
censuses in European Union**

**Bc. Anna Fofanova, BS**

# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## DIPLOMA THESIS ASSIGNMENT

Bc. Anna Fofanova, BS

Economics and Management

Economics and Management

Thesis title

**Methodology and Analysis of Results Agricultural censuses in European Union.**

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### Objectives of thesis

The aim of this diploma thesis is to analyse foreign experience in conducting agricultural censuses. Research interests of this diploma thesis include – system of indicators improving Russian agriculture based on foreigner experience, system of key indicators used for Russian agriculture improving.

### Methodology

In diploma thesis, the following methodological tools are used in practice applications – analysis of indicators of variation, analysis of indicators of central tendency, analysis of the kurtosis ratio and the skew ratio, analysis of types of farms, dynamics analysis.

**The proposed extent of the thesis**

50 -70 pages

**Keywords**

Indicators of variation, indicators of central tendency, groupings

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Official Journal of the European Union, L 200, 7 August 2018, ISSN 1977-0677

Results of the All-Russian Agricultural Census of 2016: In 8 volumes, Federal State Statistics Service, Moscow: ISB "Statistics of Russia", 2018, ISBN 978-5-4269-0066-0

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**The Diploma Thesis Supervisor**

Ing. Jiří Zmatlík, Ph.D.

**Supervising department**

Department of Statistics

Electronic approval: 24. 2. 2021

prof. Ing. Libuše Svatošová, CSc.

Head of department

Electronic approval: 24. 2. 2021

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 25. 03. 2021

### **Declaration**

I declare that I have worked on my diploma thesis titled "Methodology and Analysis of Results Agricultural censuses in European Union" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break any copyrights.

In Prague on 31.03.2021

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# **Methodology and Analysis of Results Agricultural censuses in European Union**

## **Abstract**

The master thesis deals with methodology and results of agricultural censuses in European Union. First, it focuses on the methodological and legal framework for agricultural censuses in the European Union. An analysis the distributions of farms based on groupings, analysis of the types of farms in the European Union and Statistical analysis of the dynamics of agricultural development in the European Union based on census of agriculture data is performed. The work present recommendations for improving the system of indicators and proposals for improving the presentation and analysis of the results of all-Russian censuses of agriculture.

**Keywords:** agricultural census, European Union, groupings, holdings, indicators, all-Russian censuses of agriculture.

# **Metodika a analýza výsledků Zemědělské sčítání v Evropské unii**

## **Abstrakt**

Diplomová práce se zabývá metodikou a výsledky zemědělských sčítání v Evropské unii. Nejprve se zaměřuje na metodický a právní rámec pro zemědělské sčítání v Evropské unii. Je provedena analýza rozdělení farem na základě seskupení, analýza typů farem v Evropské unii a statistická analýza dynamiky rozvoje zemědělství v Evropské unii na základě sčítání zemědělských údajů. V práci jsou uvedena doporučení ke zdokonalení soustavy indikátorů a návrhy na zlepšení prezentace a analýzy výsledků celoruských zemědělských sčítání.

**Klíčová slova:** zemědělské sčítání, Evropská unie, seskupení, hospodářství, ukazatele, všeruské sčítání zemědělství.

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## List of abbreviations

AWU	Annual working unit
LSU	Livestock unit
UAA	Utilised agricultural are

# 1 Introduction

An agricultural census is a statistical operation for collecting, processing and disseminating data on the structure of agriculture, covering the entire country or a significant part of it. It is the only statistical program that provides structural information on agricultural holdings at the lowest geographic and administrative levels and is therefore an important source of information for government officials and other policy-makers.

The agricultural census covers aspects of agriculture that change relatively slowly over time, and therefore is usually carried out at least once every ten years. The main objective of an agricultural census is to obtain data on the basic organizational structure of holdings, rather than data that changes rapidly from year to year, such as agricultural production or agricultural prices. Typical structural data that collected in an agricultural census relate to farm size, land tenure, land use, crop area, irrigation, livestock, labour, and other agricultural inputs.

An agricultural census provides an idea of the structure of the agricultural sector in a country and, when compared with previous censuses, provides an opportunity to identify trends and structural changes in this sector, and also indicates areas where policy action is needed. Census data are used as a baseline for current statistics and their value increases when used in conjunction with other data sources. Often, data users find that more in-depth research is needed in specific areas of agriculture and rely on the census as the sampling frame for specific sample surveys targeting specific topics. Thus, the census provides a framework for meeting a wide range of data needs.

The topic of this thesis is relevant for the state agricultural authorities and state statistics bodies of the Russian Federation, scientists, teachers, graduate students and students interested in the problems of agricultural statistics.

The object of the thesis is the agricultural censuses.

The subject of the thesis is methodology and results of the agricultural census in the European Union.

The main aim of this thesis is to analyze foreign experience in conducting agricultural censuses to provide recommendations for improving agricultural censuses in the Russian Federation.

The thesis sets the following questions:

- How can the system of indicators for all-Russian censuses of agriculture be improved based on foreign experience?
- How can the presentation and analysis of the results of all-Russian censuses of agriculture be improved based on foreign experience?

The structure of this work is next: the first part of the thesis presents the theoretical foundation on the topic of research and analysis of the methodology of the thesis, the second part presents the analysis of the results of census of agriculture in the European Union.

In the end, proposals were developed to improve the All-Russian agricultural censuses based on foreign experience.

## 2 Aim of the research and methodology

### 2.1 Aim of the research

The aim of this diploma thesis is to analyze foreign experience in conducting agricultural censuses. For the analysis of distributions of farms based on groupings and for analysis of the types of farms in the European Union will be used data of the Agricultural Census 2010. For the statistical analysis of the dynamics of agricultural development in the European Union, data from the 2010 and 2000 Agricultural Census will be used. Research interests of this diploma thesis include – system of indicators improving Russian agriculture based on foreigner experience, system of key indicators used for Russian agriculture improving.

### 2.2 Methodology

The theoretical foundations have been prepared based on a study of various regulations of the European Parliament and of the Council, as well as the Eurostat website.

The practical part of the work is based on Eurostat data and publications on key farm variables in the European Union in 2010. 2010 was chosen because it is the last year available with data of Agricultural Census. The year 2000 was also used in analysis of time series.

#### 2.2.1 Analysis of indicators of central tendency

Average values can be obtained from all individual values of the characteristic, for example, the arithmetic mean. It is determined by a simple form:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}, \quad (1)$$

where  $n$  is the population size and  $x_i$  is an individual value of a characteristic (Tarasova, 2014) and by a suspended form:

$$\bar{x} = \frac{\sum_{i=1}^n x_i f_i}{\sum_{i=1}^n f_i}, \quad (2)$$

where  $n$  is the population size,  $x_i$  is an individual value of a characteristic and  $f_i$  is the frequency of occurrence of individual values of the characteristic in the population (Tarasova, 2014). Or based on individual characteristic values:

- Modal value is the value with the highest frequency of occurrence. In the interval series, the modal value is determined in stages: first, the interval with the highest

frequency of occurrence of the feature is found, and then the modal value of the feature is calculated using the formula:

$$x_{mo} = x_0 + h \frac{f_{mo} - f_{mo-1}}{(f_{mo} - f_{mo-1}) + (f_{mo} - f_{mo+1})}, \quad (3)$$

where  $x_0$  is the initial value of the modal interval,  $f_{mo}$  is frequency of the modal interval,  $f_{mo-1}$  is interval frequency preceding modal interval,  $f_{mo+1}$  is the frequency of the interval after the modal interval and  $h$  is interval step (Tarasova, 2014).

- The median value is the value that divides the distribution series of units of the population in half, so we should set the address of the unit that is in the middle of the series. For an odd number of values, its address is set by the formula:

$$n_{me} = \frac{N+1}{2}, \quad (4)$$

where  $N$  is total number of population units (Tarasova, 2014) and for an even number, by the following formula:

$$n_{me} = \frac{N}{2}, \quad (5)$$

where  $N$  is total number of population units (Tarasova, 2014). In the interval series, the median value is determined by the formula:

$$x_{me} = x_0 + h \frac{\frac{N(+1)}{2} - S_{me-1}}{f_{me}}, \quad (6)$$

where  $x_0$  is the initial value of the modal interval,  $h$  is interval step,  $N$  is total number of population units,  $(+1)$  is used in distribution series with an odd number of population units,  $S_{me-1}$  is accumulated frequency up to median interval and  $f_{me}$  is frequency of median interval (Tarasova, 2014).

### 2.2.2 Analysis of measures of variability

Measures of variability can characterize the maximum variability of a characteristic – the range:

$$R = x_{max} - x_{min}, \quad (7)$$

where  $x_{max}$  is maximum value of characteristic and  $x_{min}$  is minimum value of characteristic (Tarasova, 2014) and the average variability of a characteristic in the population – an average deviation:

$$L = \frac{\sum_{i=1}^n |x_i - \bar{x}| f_i}{\sum_{i=1}^n f_i}, \quad (8)$$

where  $x_i$  is an individual value of a characteristic,  $\bar{x}$  is arithmetic mean and  $f_i$  is frequency of occurrence of a characteristic in the population (Tarasova, 2014), variance:

$$\delta_x^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2 f_i}{\sum_{i=1}^n f_i}, \quad (9)$$

where  $x_i$  is an individual value of a characteristic,  $\bar{x}$  is arithmetic mean and  $f_i$  is frequency of occurrence of a characteristic in the population (Tarasova, 2014), standard deviation:

$$\delta = \sqrt{\delta^2}, \quad (10)$$

where  $\delta^2$  is variance (Tarasova, 2014). There are also relative indicators of variation – the oscillation coefficient:

$$K = \frac{R}{\bar{x}} \cdot 100\%, \quad (11)$$

where  $R$  is range and  $\bar{x}$  is arithmetic mean (Tarasova, 2014), relative linear deviation:

$$K_d = \frac{L}{\bar{x}} \cdot 100\%, \quad (12)$$

where  $L$  is an average deviation and  $\bar{x}$  is arithmetic mean (Tarasova, 2014), the coefficient of variation:

$$v = \frac{\delta}{\bar{x}} \cdot 100\%, \quad (13)$$

where  $\delta$  is standard deviation and  $\bar{x}$  is arithmetic mean (Tarasova, 2014).

### 2.2.3 Analysis of measures of shape

Measures of shape of distributions characterize the asymmetry (skewness) and peakedness (flatness) of the studied distribution. Many of them are special cases of statistical moments.

The general view of the statistical moment of the distribution is as follows:

$$M_k = \frac{\sum_{i=1}^n (x_i - a)^k n_i}{\sum_{i=1}^n n_i}, \quad (14)$$

where  $x_i$  is an individual value of a characteristic,  $a$  is some constant value,  $k$  is exponent and  $f_i$  is frequency of occurrence of a characteristic in the population (Tarasova, 2014).

The skewness (asymmetry) ratio characterizes the degree of asymmetry of the distribution. To assess asymmetry, you can use the Pearson coefficient, which is calculated using the following formula:

$$As = \frac{\bar{x} - x_{mo}}{\delta}, \quad (15)$$

where  $\bar{x}$  is arithmetic mean,  $x_{mo}$  is modal value and  $\delta$  is standard deviation (Tarasova, 2014).

The peakedness (kurtosis) ratio is calculated by the formula:

$$E = \frac{M_4}{\delta^4} - 3, \quad (16)$$

where  $M_4$  is fourth order central moment and  $\delta$  is standard deviation (Tarasova, 2014).

#### 2.2.4 Grouping by one attribute, building and analyzing a group table

Statistical grouping is a method of dividing a complex mass phenomenon into significantly different groups. It allows you to calculate indicators for each group and thereby comprehensively characterize the state, development and relationships of the phenomenon under study. At the same time, grouping is a process of combining into groups of homogeneous units, for which it is possible to summarize the values of varying attributes and obtain statistical indicators.

The selection of groups is carried out according to the size and value of the characteristics of the units of the population.

First, a ranked series is built, in which all units of the population are arranged in increasing or decreasing order of the grouping attribute, and it is analyzed.

In the absence of qualitative transitions in the ranked series, an interval distribution series is constructed. To do this, you need to know the number of groups and the boundaries of the intervals. The number of groups depends on the size of the initial population and is determined by the formula:

$$K = 1 + 3.32 \lg N, \quad (17)$$

where  $N$  is total number of population units (Zinchenko, 2007). For a rough estimate, you can also use the formula:

$$K = \sqrt{N}, \quad (18)$$

where  $N$  is total number of population units (Zinchenko, 2007). The result is rounded up to a whole number, since the number of groups cannot be fractional.

To determine the boundaries of the intervals, the interval step is determined:

$$h = \frac{x_{max} - x_{min}}{K}, \quad (19)$$

where  $x_{max}$  is maximum value of characteristic,  $x_{min}$  is minimum value of characteristic and  $K$  is number of groups (Zinchenko, 2007). The interval step is also usually rounded.

Next, count the number of organizations in each interval, that is, distribute the individual values of the units of the population into interval groups. As a result, an interval distribution series is obtained.

To identify typical groups, an intermediate analytical grouping is performed. It allows you to study the relationship between the grouping feature and the features used to characterize groups, to identify the qualitative features of each of them, to combine

homogeneous and small groups. At the same time, only essential features should be used to correctly assess these qualitative features.

To get the intended indicators, you first need to summarize the values of the features for the selected groups of the interval series.

These indicators are not comparable due to the different size of the groups, so you should calculate the relative indicators.

For the characterization of the three distinguished typical groups, it is first necessary for each of them to obtain summary data for all characteristics (absolute values), and then calculate the relative indicators for them. The summary should use the original data and the summary by analytical group. Aggregate totals are obtained as the sum of the groupings.

Then a layout of the group table is developed, in which the names of the groups and the calculated indicators are recorded.

When analyzing the results of the grouping and summary of statistical indicators, the distribution of the units of the population by groups is primarily assessed.

Further, according to the groups, the values of the calculated indicators are compared – first, effective, and then factorial. At the same time, differences are determined both in absolute and in relative terms. Since all indicators naturally change from I to III group, first of all, the extreme groups are compared, and then the features of the middle are noted.

### **2.2.5 Analysis of time series**

Time series is a sequence of numerical indicators ordered in time that characterize the level of development of the phenomenon under study. The series includes two required elements: time and a specific value of the indicator.

When studying the dynamics, various indicators and methods of analysis are used, both elementary, simpler and more complex.

The simplest indicators of analysis, which are used in solving a number of problems, primarily when measuring the rate of change in the level of a number of dynamics, are the absolute growth, the rate of growth and the rate of increase. The calculation of these indicators is based on a comparison of the levels of a number of dynamics. In this case, the level with which the comparison is made is called the baseline, since it is the comparison base. Usually, either the previous or some previous level, for example, the first level of a series, is taken as a comparison base.



The absolute increase shows how many units the level has increased or decreased in comparison with the baseline. The absolute increase is equal to the difference between the compared levels and is measured in the same units as these levels:

$$A_i = y_i - y_{i-1}, \quad (20)$$

where  $y_i$  is level of the current year and  $y_{i-1}$  is level of the previous year (Zinchenko, 2007).

Growth rate is a statistical indicator that reflects the intensity of changes in the levels of a number of dynamics and shows how many times the level has increased compared to the baseline, and in case of a decrease – what part of the baseline is the compared level. It is measured by the ratio of the current level to the previous or baseline:

$$K_i = \frac{y_i}{y_{i-1}}, \quad (21)$$

where  $y_i$  is level of the current year and  $y_{i-1}$  is level of the previous year (Zinchenko, 2007).

#### **2.2.6 Analysis of the influence of the factor on the resulting characteristics**

Taking into account the task and the nature of the initial data, analytical groupings are used, the purpose of which is to study the relationship between the characteristics underlying the grouping and calculated to characterize the selected groups.

Analytical groupings are resulting and factorial. In the first case, the grouping is carried out according to the resulting characteristic, and the groups consider the average values of the factor characteristics. In the second case, groups are distinguished according to one characteristic – a factor and characterized by the average value of the resulting characteristic. Differences in the resulting characteristic can be explained by the influence of the grouping characteristic only if other factors, on average, are leveled across the groups.

## **3 Theoretical foundations**

### **3.1 The regulatory framework for conducting agricultural censuses in the European Union**

Eurostat is responsible for elaborating the legislation that establishes the framework for the EU's Agricultural Census.

The legislation that was elaborated by Eurostat is the Regulation (EU) 2018/1091 of the European Parliament and of the Council of 18 July 2018 on integrated farm statistics and repealing Regulations (EC) No 1166/2008 and (EU) No 1337/2011.

The subject of this legislation is that it establishes a framework for European statistics at the level of agricultural holdings and provides for the integration of information on the structure with that on production methods, rural development measures, agro-environmental aspects and other related information.

The main purpose of this Regulation is the systematic production of European statistics on agricultural holdings in the European Union.

This Regulation gives definitions to such concepts as “farm” or “agricultural holding”, “common land agricultural unit”, “livestock unit” etc.

Comparable statistics from all Member States on the structure of agricultural holdings are important to determine the development of the CAP. Therefore standard classifications and common definitions should be used insofar as possible for variables (EUR-Lex, 2018).

This Regulation sets thresholds. The data required by this Regulation shall cover 98% of the total utilised agricultural area with (excluding kitchen gardens) and 98% of the livestock units of each Member State (EUR-Lex, 2018).

In some Member States, this means that the thresholds listed in this Regulation are too high. However, the agricultural holdings below those thresholds are so small that a sample data collection to be carried out once per decade is sufficient to allow the estimation of their structure and the impact on production, resulting in the reduction of costs and burdens while still enabling the design of effective policy action to support and maintain small farming structures (EUR-Lex, 2018).

To meet those requirements, Member States must provide data representative of the agricultural holdings and common land agricultural units that meet at least one of the physical thresholds for the size of agricultural land or the number of livestock units.

Exceptionally, where the frame represents more than 98% of the national agricultural production which is measured by the standard output in accordance with the Commission Delegated Regulation (EU) No 1198/2014, Member States may, subject to prior approval by the Commission, set higher physical or appropriate economic thresholds to reduce the frame, as long as the 98% coverage of the total utilised agricultural area excluding kitchen gardens and 98% of the livestock units of the Member States is achieved.

If the frame does not represent 98% of the utilised agricultural area and 98% of the livestock units, Member States should expand the frame by establishing lower thresholds or by establishing additional thresholds, or both.

The variables to be collected should be allocated to different collection groups: core data and modules. They differ in frequency or representativeness, or both.

Member States are required to collect and provide the core structural data related to the agricultural holdings. The core data collection for the reference year 2020 shall be carried out in the form of a census.

Member States should collect and submit modules on the following topics and detailed topics:

- “Labour force and other gainful activities” module for 2020, 2023 and 2026;
- “Rural development” module for 2020, 2023 and 2026;
- “Animal housing and manure management” module for 2020 and 2026;
- “Irrigation” module for 2023;
- “Soil management practices” module for 2023;
- “Machinery and equipment” module for 2023;
- “Orchard” module for 2023;
- “Vineyard” module for 2026.

For the reference year 2020, Member States must submit the verified core and module data and the quality report to the Commission within 15 months after the end of the reference year.

The Commission must respect the confidentiality of the transmitted data in accordance with Regulation (EC) No 223/2009.

This Regulation establishes a legal basis for the development, production and dissemination of European statistics based on common statistical principles. It establishes quality criteria, and points to the need to minimize the response burden on survey

respondents and to contribute to the broader objective of reducing the administrative burdens.

For the purposes of this Regulation, the following quality criteria as defined in Article 12 of Regulation (EC) No 223/2009 shall apply:

- “relevance”, which refers to the degree to which statistics meet current and potential needs of the users;
- “accuracy”, which refers to the closeness of estimates to the unknown true values;
- “timeliness”, which refers to the period between the availability of the information and the event or phenomenon it describes;
- “punctuality”, which refers to the delay between the date of the release of the data and the target date (the date by which the data should have been delivered);
- “accessibility” and “clarity”, which refer to the conditions and modalities by which users can obtain, use and interpret data;
- “comparability”, which refers to the measurement of the impact of differences in applied statistical concepts, measurement tools and procedures where statistics are compared between geographical areas, sectoral domains or over time;
- “coherence”, which refers to the adequacy of the data to be reliably combined in different ways and for various uses.

In order to reduce the burden on respondents, the National Statistical Institutes and other national authorities should have access to administrative data, to the extent that those data are necessary for the development, production and dissemination of European statistics, in accordance with Article 17a of Regulation (EC) No 223/2009 (EUR-Lex, 2009).

The confidential information that the national and Community statistical authorities collect for the production of European statistics must be protected, in order to gain and maintain the confidence of the parties responsible for providing this information. Data confidentiality must comply with the same principles in all the Member States.

The availability of confidential data for the needs of the European Statistical System is of particular importance in order to maximize the benefits of the data with the aim of increasing the quality of European statistics and to ensure a flexible response to the newly emerging Community statistical needs (EUR-Lex, 2009).

The necessary data privacy protection should be ensured, among other means, by limiting the use of location parameters to spatial analysis of the information and by appropriate aggregation when publishing statistics.

Any processing of personal data in accordance with Regulation (EU) 2018/1091 is subject to Regulation (EU) 2016/679 of the European Parliament and of the Council and provisions adopted in accordance with that Regulation, and/or Regulation (EC) No 45/2001 of the European Parliament and of the Council, as the case may be.

In accordance with Regulation (EC) No 1059/2003 of the European Parliament and of the Council (the purpose of this Regulation is to establish a common statistical classification of territorial units in order to enable the collection, compilation and dissemination of harmonized regional statistics in the Community), territorial units should be defined in accordance with the Nomenclature of Territorial Units for Statistics classification (EUR-Lex, 2018).

Funding should be required from both the Member States and the European Union over a number of years to carry out the data collection. It is therefore necessary to envisage a European Union grant to support that program through the European Agricultural Guarantee Fund under Regulation (EU) No 1306/2013 of the European Parliament and of the Council. This Regulation lays down the rules on: financing expenditures under the Common Agricultural Policy, including expenditures for rural development; farm advisory system; management and control systems to be put in place by the Member States; cross-compliance system; clearance of accounts.

### **3.2 The agricultural census program**

A census of agriculture is a statistical operation for collecting, processing and disseminating data on the structure of agriculture, covering the whole or a significant part of the country. Typical structural data collected in an agricultural census are size of holding, land tenure, land use, crop area harvested, irrigation, livestock numbers, labor and other agricultural inputs.

In an agricultural census, data are collected directly from farms, but some data may be collected at the community level. In an agricultural census, important structural data are usually collected by a comprehensive enumeration of all agricultural land, together with more detailed structural data using sampling techniques.

Table 1 shows the core data of agricultural census in the European Union.

Table 1 Core structural data

Items	Units/Categories for values
1. General variables	
Survey information	
Agricultural holding identifier	Agricultural holding ID
Location of the agricultural holding	
Geographical location	The cell code of the INSPIRE statistical units grid for pan-European usage
NUTS 3 region	NUTS 3 code
The agricultural holding has areas designated as facing natural constraints under Regulation (EU) No 1305/2013	L/M/O/N
Legal personality of the agricultural holding	
Legal and economic responsibility of the agricultural holding is assumed by a:	
Natural person who is sole holder, where the agricultural holding is independent	Yes/No
If yes, is the holder also the manager	Yes/No
If no, is the manager a member of the holder's family?	Yes/No
If yes, is the manager the spouse of the holder?	Yes/No
Shared ownership	Yes/No
Two or more natural persons who are partners, where the agricultural holding is a holding-group	Yes/No
Legal person	Yes/No
If yes, is the agricultural holding part of an enterprise group?	Yes/No
The agricultural holding is a common land unit	Yes/No
The holder is a beneficiary of EU support for land or animals on the agricultural holding and thus included in IACS	Yes/No
The holder is a young farmer or new entrant into farming who has received financial support for this purpose under the CAP in the previous three years	Yes/No
Manager of the agricultural holding	
Year of birth	Year
Sex	Male/Female
Farm work on the agricultural holding (apart from household work)	AWU bands
Year when classified as manager of agricultural holding	Year
Agricultural training of manager	Training codes
Vocational training undertaken during the last 12 months	Yes/No
Type of tenure of the UAA (in relation to the holder)	
Farming on own land	ha

<b>Items</b>	<b>Units/Categories for values</b>
Farming on rented land	ha
Share farming or other tenure modes	ha
Common land	ha
Organic farming	Yes/No
Total UAA of the agricultural holding on which organic farming production methods are applied and certified according to national or European Union rules	ha
Total UAA of the agricultural holding that is under conversion to organic production methods to be certified according to national or European Union rules.	ha
Participation in other environmental certification schemes	Yes/No
<b>2. Variables of land</b>	
Total main area	
Utilised agricultural area	ha
Arable land	ha
Cereals for the production of grain (including seed)	ha
Common wheat and spelt	ha
Durum wheat	ha
Rye and winter cereal mixtures (maslin)	ha
Barley	ha
Oats and spring cereal mixtures (mixed grain other than maslin)	ha
Grain maize and corn-cob mix	ha
Triticale	ha
Sorghum	ha
Other cereals n.e.c. (buckwheat, millet, canary seed, etc.)	ha
Rice	ha
Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	ha
Field peas, beans and sweet lupins	ha
Root crops	ha
Potatoes (including seed potatoes)	ha
Sugar beet (excluding seed)	ha
Other root crops n.e.c.	ha
Industrial crops	ha
Oilseeds	ha
Rape and turnip rape seeds	ha
Sunflower seed	ha
Soya	ha
Linseed (oilflax)	ha
Other oilseed crops n.e.c.	ha
Fibre crops	ha

<b>Items</b>	<b>Units/Categories for values</b>
Fibre flax	ha
Hemp	ha
Cotton	ha
Other fibre crops n.e.c.	ha
Tobacco	ha
Hops	ha
Aromatic, medicinal and culinary plants	ha
Energy crops n.e.c.	ha
Other industrial crops n.e.c.	ha
Plants harvested green from arable land	ha
Temporary grasses and grazings	ha
Leguminous plants harvested green	ha
Green maize	ha
Other cereals harvested green (excluding green maize)	ha
Other plants harvested green from arable land n.e.c.	ha
Fresh vegetables (including melons) and strawberries	ha
Fresh vegetables (including melons) and strawberries grown in rotation with horticultural crops (market gardening)	ha
Fresh vegetables (including melons) and strawberries grown in rotation with non-horticultural crops (open field)	ha
Flowers and ornamental plants (excluding nurseries)	ha
Seeds and seedlings	ha
Other arable land crops n.e.c.	ha
Fallow land	ha
Permanent grassland	ha
Pasture and meadow, excluding rough grazings	ha
Rough grazings	ha
Permanent grassland no longer used for production purposes and eligible for the payment of subsidies	ha
Permanent crops (including young and temporarily abandoned plantations, excluding areas producing for own consumption only)	ha
Fruits, berries and nuts (excluding citrus fruits, grapes and strawberries)	ha
Pome fruits	ha
Stone fruits	ha
Fruits from subtropical and tropical climate zones	ha
Berries (excluding strawberries)	ha
Nuts	ha
Citrus fruits	ha
Grapes	ha
Grapes for wines	ha
Grapes for wines with protected designation of origin (PDO)	ha



<b>Items</b>	<b>Units/Categories for values</b>
Grapes for wines with protected geographical indication (PGI)	ha
Grapes for other wines n.e.c. (without PDO/PGI)	ha
Grapes for table use	ha
Grapes for raisins	ha
Olives	ha
Nurseries	ha
Other permanent crops including other permanent crops for human consumption	ha
Christmas trees	ha
Kitchen gardens	ha
Other farmland	ha
Unutilised agricultural land	ha
Wooded area	ha
Short rotation coppices	ha
Other land (land occupied by buildings, farmyards, tracks, ponds and other non-productive areas)	ha
Special agricultural holding areas	
Cultivated mushrooms	ha
UAA under glass or high accessible cover	ha
Vegetables, including melons and strawberries under glass or high accessible cover	ha
Flowers and ornamental plants (excluding nurseries) under glass or high accessible cover	ha
Other arable land crops under glass or high accessible cover	ha
Permanent crops under glass or high accessible cover	ha
Other UAA under glass or high accessible cover n.e.c.	ha
Irrigation on cultivated outdoor area	
Total irrigable area	ha
of which organic farming certified and/or under conversion	
Utilised agricultural area	ha
Arable land	ha
Cereals for the production of grain (including seed)	ha
Common wheat and spelt	ha
Durum wheat	ha
Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	ha
Root crops	ha
Potatoes (including seed potatoes)	ha
Sugar beet (excluding seed)	ha
Industrial crops	ha
Oilseeds	ha
Soya	ha

<b>Items</b>	<b>Units/Categories for values</b>
Plants harvested green from arable land	ha
Temporary grasses and grazings	ha
Leguminous plants harvested green	ha
Fresh vegetables (including melons) and strawberries	ha
Seeds and seedlings	ha
Permanent grassland	ha
Pasture and meadow, excluding rough grazings	ha
Rough grazings	ha
Permanent crops (including young and temporarily abandoned plantations, excluding areas producing for own consumption only)	ha
Fruits, berries and nuts (excluding citrus fruits, grapes and strawberries)	ha
Citrus fruits	ha
Grapes for wines	ha
Olives	ha
Vegetables, including melons and strawberries under glass or high accessible cover	ha
<b>3. Variables of livestock</b>	
<b>Total number of animals</b>	
<b>Bovine animals</b>	
Bovine animals less than one year	head
Bovine animals, 1 to less than 2 years	head
Male bovine animals, 1 to less than 2 years	head
Heifers, 1 to less than 2 years	head
Male bovine animals two years old and over	head
Female bovine 2 years and over	head
Heifers two years old and over	head
Cows	head
Dairy cows	head
Non-dairy cows	head
Buffalo-cows	head
<b>Sheep and goats</b>	
Sheep (all ages)	head
Breeding females	head
Other sheep	head
Goats (all ages)	head
Breeding females	head
Other goats	head
<b>Pigs</b>	
Piglets, live weight of under 20 kg	head
Breeding sows, live weight 50 kg and over	head
Other pigs	head

<b>Items</b>	<b>Units/Categories for values</b>
Poultry	
Broilers	head
Laying hens	head
Other poultry	head
Turkeys	head
Ducks	head
Geese	head
Ostriches	head
Other poultry fowls n.e.c.	head
Rabbits	
Breeding females	head
Bees	hives
Deer	Yes/No
Fur animals	Yes/No
Livestock n.e.c.	Yes/No
Total number of animals	
Bovine animals	head
Dairy cows	head
Non-dairy cows	head
Buffalo-cows	head
Sheep and goats	
Sheep (all ages)	head
Goats (all ages)	head
Pigs	head
Poultry	head
Broilers	head
Laying hens	head

Source: EUR-Lex

When a variable shown in a table has a low or zero prevalence in a Member State, that variable may be excluded from the data collection, provided that the Member State concerned provides information duly justifying its exclusion to the Commission in the calendar year preceding the reference year.

Member States should also collect and provide modules on the topics and detailed topics listed in the table 2.

Table 2 Topics and detailed topics within the module data

<b>Module</b>	<b>Topic</b>	<b>Detailed topic</b>
Labour force and other gainful activities	Farm management	Holder
		Labour input
		Gender balance
		Safety measures, including farm safety plan
	Family labour force	Labour input
		Number of persons involved
		Gender balance
	Non-family labour force	Labour input
		Number of persons employed
		Gender balance
		Non-regular labour force employed by the farm
		Labour input by contractors
	Other gainful activities directly related to the agricultural holding	Types of activities
		Importance to the agricultural holding
		Labour input
Other gainful activities not directly related to the agricultural holding	Labour input	
Rural development	Agricultural holdings supported by rural development measures	Advisory, farm management and farm relief services
		Farm and business development
		Quality schemes for agricultural products and foodstuffs
		Investments in physical assets
		Restoring agriculture production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention actions
		Investments in forest area development and improvement of the viability forests
		Agri-environment payments climate
		Organic farming
		Payments link to Natura 2000 and the water framework directive
		Payments to areas facing natural or other specific constraints
		Animal welfare
		Risk management
		Animal housing and manure management
Pig housing		
Laying hen housing		
Nutrient use and manure on the farm	UAA fertilised	
	Manure exported from and imported to the agricultural holding	

<b>Module</b>	<b>Topic</b>	<b>Detailed topic</b>
		Organic and waste based fertilizers other than manure
	Manure application techniques	Incorporation time per type of spread
	Facilities for manure	Manure storage facilities and capacity

Source: EUR-Lex

The program of the 2016 All-Russian Agricultural Census was developed in accordance with the FAO World Agricultural Census Program, taking into account the experience of the 2006 All-Russian Agricultural Census and the 2012 pilot agricultural census.

The All-Russian Census of 2016 consists of several programs: the program for the census of agricultural organizations (except for micro-enterprises), the program for the census of micro-enterprises, subsidiary agricultural enterprises of non-agricultural organizations, the program of peasant (farmer) households and individual entrepreneurs, the program for personal subsidiary and other individual farms of citizens, the program for horticultural, gardening and dacha non-profit associations of citizens.

The program for the census of agricultural organizations (excluding microenterprises) is the most extensive and contains the most indicators. For example, it contains the following topics: general characteristics, labor resources and their demographic characteristics, land resources and their use, sown areas of agricultural crops and areas of perennial plantings, livestock of farm animals, sale of agricultural products, production infrastructure, technical means and technologies, conditions conducting business activities.

The main differences between the census program of agricultural organizations (except for microenterprises) compared to other programs are the lack of information in other programs on the age composition of permanent workers employed in agricultural production, the level of education of these workers; as of July 1, 2016, not all other programs contain information on the purposes of obtaining credit funds and indicators on the capacity of one-time storage, and also differs information about agricultural crops in the sown areas of agricultural crops for the 2016 harvest and agricultural products sold.

### **3.3 The organization of conducting agricultural censuses**

Each Member State of the European Union will be tasked to collect necessary data set for farmers and the holdings that should exceed certain physical thresholds in their country.

The member states of the European Union will have to establish teams of supervisors and enumerators for the agricultural census, which will be overseen by civil servants from the Ministry of Agriculture and the Statistical Office. They will use all data collection methods to complete the agricultural census, including farm registers, administrative sources and surveys. To conduct surveys, enumerators will contact farmers via the Internet, by phone, letter or face-to-face. By allowing wider use of administrative sources in 2020, the total cost of the census will be reduced. At the same time, the burden on farmers will decrease, since they will receive questionnaires that have already been partially completed.

Eurostat will begin receiving data on millions of European holdings from each Member State in 2021, with the bulk of the data coming in the first quarter of 2022. Its role is:

- To ensure data quality;
- To anonymize personal data;
- To aggregate data to obtain general or European Union averages;
- To disseminate data in their database and analyze the results.

Covid-19 has created opportunities to modernize a process of data collection and working methods. Some countries use more administrative data sources, online and telephone questionnaires. This will save money and speed up data collection.

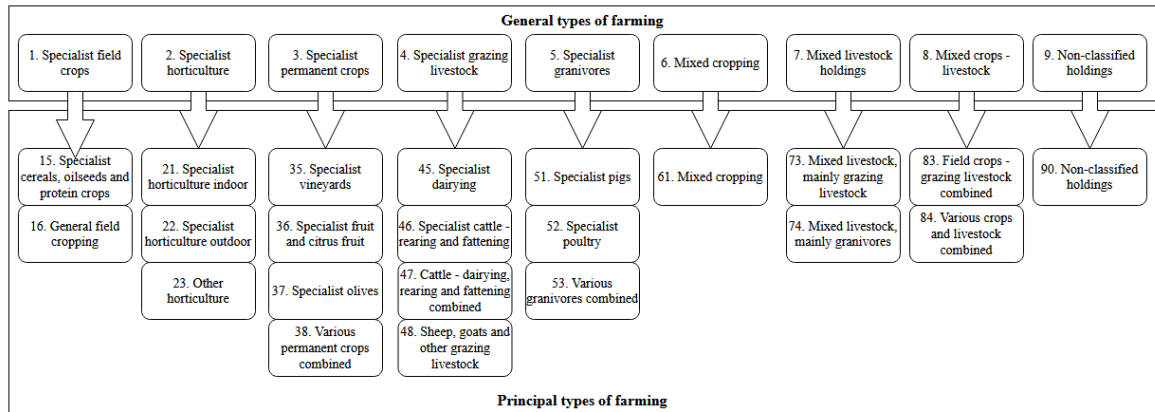
### **3.4 The grouping and presentation of agricultural census data**

Agricultural holdings shall be classified in a uniform manner according to the European Union typology for agricultural holdings, depending on their type of farming, their economic size and the importance of other gainful activities directly related to them.

The typology shall be used in particular for the presentation, by type of farming and by economic size class.

Image 1 shows general and principal types of farming and correspondence between them.

Image 1 General and principal types of farming



Source: EUR-Lex

The type of farming of a holding shall be determined by the relative contribution of the standard output of the different characteristics of that holding to the total standard output of the holding.

Holdings shall be classified by a limited number of types of farming. General types of farming shall be specified. Depending on the amount of detail required, the general types of farming shall be divided into principal types of farming.

The economic size of a holding is measured as the total standard output of the holding expressed in EUR.

Holdings are classified by size classes, the limits of which are set in the table below.

Table 3 Economic size classes of holdings

Classes	Limits in euro
1	less than 2 000
2	from 2 000 to less than 4 000
3	from 4 000 to less than 8 000
4	from 8 000 to less than 15 000
5	from 15 000 to less than 25 000
6	from 25 000 to less than 50 000
7	from 50 000 to less than 100 000
8	from 100 000 to less than 250 000
9	from 250 000 to less than 500 000
10	from 500 000 to less than 750 000
11	from 750 000 to less than 1 000 000
12	from 1 000 000 to less than 1 500 000
13	from 1 500 000 to less than 3 000 000
14	from 3 000 000

Source: EUR-Lex

Size classes 2 and 3 or 3 and 4, 5 and 6, or from 3 to 5, 6 and 7, 8 and 9, 10 and 11 and from 12 to 14 or from 10 to 14 can be grouped together.

The economic size of the holding shall be determined on the basis of the total standard output of the holding.

The 2010 agricultural census contains the following groupings:

- Number of holdings by size of the holding based on utilised agricultural area – 0 ha, less than 2 ha, 2 - 4.9 ha, 5 - 9.9 ha, 10 - 19.9 ha, 20 - 29.9 ha, 30 - 49.9 ha, 50 - 99.9 ha, over 100 ha;
- Utilised agriculture area by size of the holding based on utilised agricultural area – 0 ha, less than 2 ha, 2 - 4.9 ha, 5 - 9.9 ha, 10 - 19.9 ha, 20 - 29.9 ha, 30 - 49.9 ha, 50 - 99.9 ha, over 100 ha;
- Number of holdings by farm type based on standard output – specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings;
- Utilised agricultural area by type of crops – utilised agricultural area total, arable land, kitchen gardens, permanent grassland and meadow, permanent crops;
- Livestock units by type of livestock – total livestock, cattle, sheeps, goats, pigs, poultry, other livestock units;
- Number of holdings by standard output size classes – 0 euro, less than 2 000 euro, 2000 - 3999 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, 100000 – 249999 euro, 25 000 - 499999 euro, over 500000 euro.
- Standard output by standard output size classes – 0 euro, less than 2 000 euro, 2000 - 3999 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, 100000 – 249999 euro, 25 000 - 499999 euro, over 500000 euro.
- Utilised agricultural area by standard output size classes – 0 euro, less than 2 000 euro, 2000 - 3999 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, 100000 – 249999 euro, 25 000 - 499999 euro, over 500000 euro.
- Livestock by standard output size classes – 0 euro, less than 2 000 euro, 2000 - 3999 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, 100000 – 249999 euro, 25 000 - 499999 euro, over 500000 euro.
- Share of labour force directly employed by the holding, by standard output size classes – 0 euro, less than 2 000 euro, 2000 - 3999 euro, 4000 - 7999 euro, 8000 -



14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, 100000 – 249999 euro, 25 000 - 499999 euro, over 500000 euro.

- Number of farms classified by farm size based on utilised agricultural area – less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha and economic size based on standard output – less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro.
- Number of farms classified by economic size based on standard output – less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro and type of farm – specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings.
- Number of farms with livestock classified by livestock size unit – less than 2 LSU, 2 - 9 LSU, 10 - 19 LSU, 20 - 29 LSU, 30 - 49 LSU, 50 - 99 LSU, over 100 LSU and type of farm - specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings.
- Number of farms with livestock classified by farm size based on utilised agricultural area – less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha and livestock size unit: 0 - 4 LSU, 5 - 9 LSU, 10 - 19 LSU, 20 - 29 LSU, 30 - 49 LSU, 50 - 99 LSU, over 100 LSU.
- Farms growing agricultural crops classified by farm size based on utilised agricultural area: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha and area under agricultural crops: 0 - 0.9 ha, 1 - 1.9 ha, 2 - 4.9 ha, 5 - 9.9 ha, 10 - 19.9 ha, 20 - 49.9 ha, over 50 ha.
- Farms growing agricultural crops classified by type of farm: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings and area under agricultural crops: 0 - 0.9 ha, 1 - 1.9 ha, 2 - 4.9 ha, 5 - 9.9 ha, 10 - 19.9 ha, 20 - 49.9 ha, over 50 ha.
- Farms growing agricultural crops classified by economic size based on standard output: less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro and area under

agricultural crops: 0 - 0.9 ha, 1 - 1.9 ha, 2 - 4.9 ha, 5 - 9.9 ha, 10 - 19.9 ha, 20 - 49.9 ha, over 50 ha.

- Farms with livestock classified by farm size based on utilised agricultural area: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha and number of livestock: 1 - 9 heads, 10 - 19 heads, 20 - 29 heads, 30 - 49 heads, 50 - 99 heads, over 100 heads.
- Farms with livestock classified by type of farm: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings and number of livestock: 1 - 9 heads, 10 - 19 heads, 20 - 29 heads, 30 - 49 heads, 50 - 99 heads, over 100 heads.
- Farms with cattle classified by economic size based on standard output: less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro and number of livestock: 1 - 9 heads, 10 - 19 heads, 20 - 29 heads, 30 - 49 heads, 50 - 99 heads, over 100 heads.
- Number of farms having land rented in and area rented in classified by proportion of rented land: 100% of utilised agricultural area rented in (farms, ha), more than 75% and less than 100% of utilised agricultural area rented in (farms, ha), more than 50% and less than 75% of utilised agricultural area rented in (farms, ha), more than 25% and less than 50% of utilised agricultural area rented in (farms, ha), more than 0% and less than 25% of AAU rented in (farms, ha), and farm size based on utilised agricultural area: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha.
- Number of farms having land rented in and area rented in classified by proportion of rented land: 100% of utilised agricultural area rented in (farms, ha), more than 75% and less than 100% of utilised agricultural area rented in (farms, ha), more than 50% and less than 75% of utilised agricultural area rented in (farms, ha), more than 25% and less than 50% of utilised agricultural area rented in (farms, ha), more than 0% and less than 25% of AAU rented in (farms, ha), and farm type: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings.
- Number of farms having land rented in and area rented in classified by proportion of rented land: 100% of utilised agricultural area rented in (farms, ha), more than 75%

and less than 100% of utilised agricultural area rented in (farms, ha), more than 50% and less than 75% of utilised agricultural area rented in (farms, ha), more than 25% and less than 50% of utilised agricultural area rented in (farms, ha), more than 0% and less than 25% of AAU rented in (farms, ha), and and economic size based on standard output: less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro.

- Number of family farms classified by farm size based on utilised agricultural area: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha and: age of holder: less than 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years, more than 65 years, AWU: less than 0.25 AWU, 0.25 - 0.49 AWU, 0.5 - 0.74 AWU, 0.75 - 0.99 AWU, more than 1 AWU, significance of farm work: sole occupation, major occupation, subsidiary occupation.
- Number of family farms classified by farm type: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings and age of holder: less than 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years, more than 65 years, AWU: less than 0.25 AWU, 0.25 - 0.49 AWU, 0.5 - 0.74 AWU, 0.75 - 0.99 AWU, more than 1 AWU, significance of farm work: sole occupation, major occupation, subsidiary occupation.
- Number of family farms classified by economic size based on standard output: less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro and age of holder: less than 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years, more than 65 years, AWU: less than 0.25 AWU, 0.25 - 0.49 AWU, 0.5 - 0.74 AWU, 0.75 - 0.99 AWU, more than 1 AWU, significance of farm work: sole occupation, major occupation, subsidiary occupation.
- Family workers: total family workers (persons, AWU), holder (persons, AWU), spouse (persons, AWU), other family (persons, AWU) and regular non-family workers (persons, AWU) classified by farm size based on AAU: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha, farm type: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings and economic size based on standard output: less than 4000 euro, 4000 - 7999 euro,

8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro.

- Family workers: holder (persons, AWU), spouse (persons, AWU), other family (persons, AWU) and regular non-family workers (persons, AWU) classified by sex: male, female, age: less than 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years, more than 65 years, AWU: less than 0.25 AWU, 0.25 - 0.49 AWU, 0.5 - 0.74 AWU, 0.75 - 0.99 AWU, more than 1 AWU and significance of farm work: sole occupation, major occupation, subsidiary occupation.
- Level of training of farm managers: full-time 3rd level qualification (%), certificate in farming or farmapprenticeship (%), other formal course of at least 60 hours (%), other courses (%), practical experience only (%), classified by age: less than 35 years, 35 - 44 years, 45 - 54 years, 55 - 64 years, more than 65 years, farm size based on AAU: less than 2 ha, 2 - 9 ha, 10 - 19 ha, 20 - 29 ha, 30 - 49 ha, 50 - 99 ha, over 100 ha, farm type: specialist field crops, specialist horticulture, specialist permanent crops, specialist granivores, mixed cropping, mixed livestock, mixed crop-livestock, non-classifiable holdings and economic size based on standard output: less than 4000 euro, 4000 - 7999 euro, 8000 - 14999 euro, 15000 - 24999 euro, 25000 - 49999 euro, 50000 - 99999 euro, over 100000 euro.

The groupings by standard output size classes are based on the standard output indicator. It is calculated as the average value of agricultural products of crop or livestock production in euro per hectare of area or in euro per livestock unit.

Each product has its own regional coefficient, which is an average value for a reporting period of 5 years (except for the standard output coefficient for 2004, which was calculated using an average value of three years). The sum of all standard output per hectare of land or livestock is a measure of the total economic size of an agricultural holding, expressed in euro.

The standard output coefficient in 2007 was calculated based on the average prices of 2005-2009. This coefficient was used for the Farm Structure Survey in 2010, which was carried out as a census. Standard output is used to classify holdings by type of farming and economic size.

In accordance with the commission decision of June 7, 1985, establishing a community typology for agricultural holdings, until 2007, the Farm Structure Survey and the Farm Accounting Data Network used standard gross margin to classify agricultural

holdings by type of farming and economic size. According to the Commission Regulation (EC) No 1242/2008 of 8 December 2008 establishing a Community typology for agricultural holdings, starting with the survey of the structure of farms in 2010, to classify agricultural holdings by type of farming and economic size, they began to use standard output instead of standard gross margin. This regulation has been superseded by Commission Delegated Regulation (EU) No 1198/2014 of 1 August 2014 supplementing Council Regulation (EC) No 1217/2009 setting up a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the European Union.

In general, standard gross margin differs from standard output only in the way it is calculated: standard gross margin is equal to the sum of output and direct payments minus costs, and standard output is equal to output.

The decision to abandon the standard gross margin was prompted by the transition of the Common Agricultural Policy from tied to split payments. Since the split direct payments cannot be attributed to any specific production, they were excluded from the calculation. If cost were retained in the calculations, it would be possible to obtain negative values of the standard gross margin in cases where the costs were higher than the output. Therefore, only the output is counted.

The main differences between standard output and standard gross margin are as follows:

- Standard output excludes direct payments and includes production costs;
- The feed requirement for some characteristics of the livestock is included in the calculation of the standard output;
- The unit of measure for the standard output is euro instead of the European size unit (1200 euro) as for the standard gross margin.

## 4 Analysis of the results of censuses of agriculture in the European Union

### 4.1 Analysis the distributions of farms and the influence of factors on resulting indicators based on groupings

Table 4 presents indicators from the 2010 agricultural census conducted in the European Union, grouped by standard output, which will be used to analyze the distribution of farms.

Table 4 Grouping of holdings by standard output size classes

<b>Groups by standard output size classes, euro</b>	<b>Number of holdings, thous. holdings</b>	<b>Standard output, million Euro</b>	<b>Utilised agricultural area, thous. ha</b>	<b>Livestock, thous. LSU</b>	<b>Labour force directly employed by the holding, thous. AWU</b>
0	238.0	0.0	1020.9	0.0	46.8
< 2000	5095.6	4116.9	6773.9	1576.0	1708.4
2000 - 3999	1859.9	5345.7	6004.8	2183.5	1204.7
4000 - 7999	1454.0	8214.6	8688.4	3386.3	1229.4
8000 - 14999	926.4	10145.3	10206.4	4307.7	949.6
15000 - 24999	567.0	10982.6	10144.4	4761.1	680.8
25000 - 49999	588.1	20836.9	17444.8	8825.2	823.3
50000 - 99999	433.6	30743.4	22658.3	12599.3	726.2
100000 - 249999	372.7	58133.1	32534.4	23410.4	840.0
250000 - 499999	129.3	44253.7	17321.1	18819.9	445.8
≥ 500000	70.2	85557.9	21455.3	36926.0	749.8

Source: Eurostat

In order to assess the qualitative state of the population, it is necessary to analyze the measures of variability. And also it is necessary to analyze the indicators of the central tendency and measures of shape according to the data of the interval series of distribution of the number of holdings by the size of the standard output. The calculation results are presented in the table 5.

Table 5 Measures of variability, indicators of central tendency and measures of shape of standard output

<b>Indicators</b>	<b>Standard output, Euro</b>
Mean	21606.54
Mode	1200.20
Median value	3099.88
Range	749999.00
Average deviation	30289.27
Variance	4706478341.53
Standard deviation	68603.78
Oscillation coefficient, %	3471.17
Relative linear deviation, %	140.19
Coefficient of variation, %	317.51
Skew ratio	0.30
Kurtosis ratio	41.37

Source: Author, 2021

The mean value of the standard output in the studied population is 21606.54 euro.

Most often, in the population of number of holdings, they receive a standard output of 1200.2 euro.

Half of the number of holdings of the studied population receives standard output of 3099.88 Euro and less, half - 3099.88 or more euro.

In the studied population of the number of holdings, the maximum differences in the standard output size classes are 749999 euro.

The average deviation of the characteristic from the mean is 30289.3, that is, on average by the number of holdings, the standard output deviates from the mean standard output by 30289.3 euro.

The variance is 4706478341.5.

The standard deviation shows that all values deviate from the mean by an average of 68603.78 euro.

The relative volatility of the extreme values of the standard output by holdings is high.

The average variability of the standard output by the number of holdings is high and amounts to 140.2%, which indicates the heterogeneity of the population.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.

The skew ratio is equal to 0.297. Since it is positive, it can be concluded that the skewness is positive, right-sided. This ratio is slightly different from 0, therefore, it can be concluded about low, moderate asymmetry.

The kurtosis ratio is equal to 41.37. Since it is positive and differs significantly from 0, it can be concluded that the peakedness is large in comparison with the normally distributed population.

This interval series of distribution has moderate right-sided skewness and significant peakedness in comparison with the normal distribution.

Let's calculate the measures of variability of the remaining indicators: utilised agricultural area, livestock, labour force directly employed by the holding. Table 6 shows this measures.

Table 6 Measures of variability of utilised agricultural area, livestock and labour force directly employed by the holding

<b>Measures of variability</b>	<b>Utilised agricultural area by standard output size classes, thous. ha</b>	<b>Livestock by standard output size classes, thous. LSU</b>	<b>Labour force directly employed by the holding, by standard output size classes, thous. AWU</b>
Mean	9350.28	4099.73	1298.08
Variance	34681407.15	28241832.69	174674.77
Standard deviation	5889.09	5314.30	417.94
Coefficient of variation, %	62.98	129.63	32.20

Source: Author, 2021

The mean value of utilised agricultural area is 9350.28 thous. ha.

The variance of utilised agricultural area is 34681407.15.

The standard deviation shows that all values deviate from the mean by an average of 5889.09 thous. ha.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.

The mean value of livestock is 4099.73 thous. LSU.

The variance of livestock is 28241832.69.

The standard deviation shows that all values deviate from the mean by an average of 5314.3 thous. LSU.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.



The mean value of labour force directly employed by the holding is 1298.08 thous. AWU.

The variance of labour force directly employed by the holding is 174674.77.

The standard deviation shows that all values deviate from the mean by an average of 417.94 thous. AWU.

The average measure of variability in this series is low (less than 33%) and the population is homogeneous according to the studied characteristic.

In order to assess the impact of each factor separately, it is necessary to use the factorial grouping by standard output size classes.

The table 7 shows the factorial grouping by standard output size classes for next indicators: number of holdings, standard output, utilised agricultural area, livestock and labour force directly employed by the holding.

Table 7 Factorial grouping by standard output size classes

<b>Groups by standard output size classes, euro</b>	<b>Number of holdings, thous. holdings</b>	<b>Average standard output, million Euro</b>	<b>Average utilised agricultural area, thous. ha</b>	<b>Average livestock, thous. LSU</b>	<b>Average labour force directly employed by the holding, thous. AWU</b>
0 - 3999	7193.5	4298.4	6384.7	1680.9	1523.2
4000 - 49999	3535.5	11264.0	10776.2	4752.9	1000.6
≥ 50000	1005.8	46455.3	25547.8	19102.9	734.0
Average	11734.8	10010.3	9350.3	4099.7	1298.1

Source: Author, 2021

From the obtained data, it can be seen that, along with the standard output size classes, standard output, utilised agricultural area, livestock is also growing, and number of holdings and labour force directly employed by the holding are decreasing. Growth in livestock (1036.5%) and standard output (980.8%) is much higher than in utilised agricultural area (300.1%).

Table 8 shows the indicators for the 2010 agricultural census in the European Union, grouped by size of the holding. These indicators will be used to analyze farm distributions.

Table 8 Grouping of holdings by size of the holding

<b>Groups by size of the holding, ha</b>	<b>Number of holdings, holdings</b>	<b>Utilised agriculture area, thous.ha</b>
0	258.10	0.00
< 2	5608.46	4177.57
2 - 4.9	2407.42	7598.64
5 - 9.9	1303.04	9130.13
10 - 19.9	900.53	12633.67
20 - 29.9	377.58	9204.69
30 - 49.9	395.21	15279.51
50 - 99.9	391.35	27435.73
≥100	324.84	85968.53

Source: Eurostat

In order to assess the qualitative state of the population, it is necessary to analyze the measures of variability. And also it is necessary to analyze the indicators of the central tendency and measures of shape according to the data of the interval series of distribution of the number of holdings by size of the holding. The calculation results are presented in the table 9.

Table 9 Measures of variability, indicators of central tendency and measures of shape of size of the holding

<b>Indicators</b>	<b>Size of the holding, ha</b>
Mean	11.28
Mode	1.63
Median value	2.02
Range	149.90
Average deviation	13.64
Variance	578.88
Standard deviation	24.06
Oscillation coefficient, %	1328.55
Relative linear deviation, %	120.92
Coefficient of variation, %	213.24
Skew ration	0.40
Kurtosis ration	12.21

Source: Author, 2021

The mean value of size of holding in the studied population is 11.28 ha.

Most often, in the population of number of holdings, they have a size of the holding of 1.63 ha.

Half of the number of holdings of the studied population have size of the holding of 2.02 ha and less, half - 2.02 or more ha.

In the studied population of the number of holdings, the maximum differences in size of holding are 149.9 ha.

The average deviation of the characteristic from the mean is 13.64, that is, on average by the number of holdings, the size of holding deviates from the mean size of holding by 13.64 ha.

The variance is 578.88.

The standard deviation shows that all values deviate from the mean by an average of 24.06 ha.

The relative volatility of the extreme values of the standard output by holdings is high.

The average variability of the size of holding by the number of holdings is high and amounts to 120.92%, which indicates the heterogeneity of the population.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.

The skew ratio is equal to 0.4. Since it is positive, it can be concluded that the skewness is positive, right-sided. This ratio is slightly different from 0, therefore, it can be concluded about low, moderate asymmetry.

The kurtosis ratio is equal to 12.21. Since it is positive and differs significantly from 0, it can be concluded that the peakedness is large in comparison with the normally distributed population.

This interval series of distribution has moderate right-sided skewness and significant peakedness in comparison with the normal distribution.

Let's calculate the measures of variability of utilised agricultural area. Table 10 shows the results.

Table 10 Measures of variability of utilised agricultural area

<b>Measures of variability</b>	<b>Utilised agricultural area by size of the holding, ha</b>
Mean	9457.54
Variance	187062010.84
Standard deviation	13677.06
Coefficient of variation, %	144.62

Source: Author, 2021

The mean value of utilised agricultural area is 9457.54 ha.

The variance of utilised agricultural area is 187062010.84.

The standard deviation shows that all values deviate from the mean by an average of 13677.06 ha.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.

Table 11 shows the indicators of number of holdings and share of holdings by farm type in the total number of holdings in the 2010 agricultural census in the European Union, grouped by farm type. These indicators will be used to analyze farm distributions.

Table 11 Grouping of holdings by farm type

<b>Farm type</b>	<b>Number of holdings by farm type, thous. holdings</b>	<b>Share of holdings by farm type in the total number of holdings, %</b>
1 - Specialist field crops	2935.10	25.01
2 - Specialist horticulture	234.30	2.00
3 - Specialist permanent crops	2392.70	20.39
4 - Specialist grazing livestock	1762.00	15.01
5 - Specialist granivores	1388.80	11.83
6 - Mixed cropping	503.90	4.29
7 - Mixed livestock	777.60	6.63
8 - Mixed crop-livestock	1502.70	12.81
9 - Non-classifiable holding	238.00	2.03

Source: Eurostat

Also let's calculate the measures of variability of share of holdings by farm type in the total number of holdings. Table 12 shows the results.

Table 12 Measures of variability of share of holdings by farm type in the total number of holdings

<b>Measures of variability</b>	<b>Share of holdings by farm type in the total number of holdings, %</b>
Mean	16.41
Variance	47.16
Standard deviation	6.87
Coefficient of variation, %	41.84

Source: Author, 2021

The mean value of share of holdings in the total number of holdings is 16.41%.

The variance of share of holdings in the total number of holdings is 47.16.

The standard deviation shows that all values deviate from the mean by an average of 6.87%.

The average measure of variability in this series is high and the population is heterogeneous according to the studied characteristic.

In general, it can be noted that all populations are heterogeneous according to the studied characteristic, with the exception of labor force directly employed by the holding by standard output size classes. The following characteristics vary the most: standard output, size of the holding, utilised agricultural area by size of the holding. The following characteristics vary least of all: labour force directly employed by the holding by standard output size classes, share of holdings by farm type in the total number of holdings, utilised agricultural area by standard output size classes.

## 4.2 Analysis of the types of farms in the European Union

Table 13 shows key farm variables by standard output size classes. They contain indicators of the agricultural census that was conducted in 2010 in the European Union.

Table 13 Key farm variables by standard output size classes

<b>№</b>	<b>Interval by standard output size classes, Euro</b>	<b>Number of holdings, thous. holdings</b>	<b>Standard output, thous. Euro</b>	<b>Utilised agricultural area, thous. ha</b>	<b>Livestock, thous. LSU</b>	<b>Labour force directly employed by the holding, thous. AWU</b>
1	0	238.0	0.0	1020.9	0.0	46.8
2	1 - 2000	5095.6	4116.9	6773.9	1576.0	1708.4
3	2000 - 3999	1859.9	5345.7	6004.8	2183.5	1204.7
4	4000 - 7999	1454.0	8214.6	8688.4	3386.3	1229.4
5	8000 - 14999	926.4	10145.3	10206.4	4307.7	949.6
6	15000 - 24999	567.0	10982.6	10144.4	4761.1	680.8
7	25000 - 49999	588.1	20836.9	17444.8	8825.2	823.3
8	50000 - 99999	433.6	30743.4	22658.3	12599.3	726.2
9	100000 - 249999	372.7	58133.1	32534.4	23410.4	840.0
10	250000 - 499999	129.3	44253.7	17321.1	18819.9	445.8
11	≥ 500000	70.2	85557.9	21455.3	36926.0	749.8
	<b>Sum</b>	<b>11734.8</b>	<b>278330.1</b>	<b>154252.7</b>	<b>116795.4</b>	<b>9404.8</b>

Source: Eurostat

The indicators given in the table 13 are not comparable with each other due to the different size of the groups, therefore, the relative indicators should be calculated – per 1 ha utilised agricultural area and per 1 holding. The results of these calculations are presented in the table 14.

Table 14 Intermediate analytical grouping for key farm variables by standard output size classes

<b>№</b>	<b>Interval by standard output size classes, Euro</b>	<b>Standard output per 1 ha, Euro</b>	<b>Standard output per 1 holding, Euro</b>	<b>Livestock per 1 holding, LSU</b>	<b>Livestock per 1 ha, LSU</b>	<b>Labour force directly employed by the holding per 1 ha, AWU</b>	<b>Labour force directly employed by the holding per 1 holding, AWU</b>
1	0	0.00	0.00	0.00	0.00	0.05	0.20
2	< 2000	607.76	807.93	0.31	0.23	0.25	0.34
3	2000 - 3999	890.24	2874.19	1.17	0.36	0.20	0.65
4	4000 - 7999	945.47	5649.66	2.33	0.39	0.14	0.85
5	8000 - 14999	994.01	10951.32	4.65	0.42	0.09	1.03
6	15000 - 24999	1082.63	19369.66	8.40	0.47	0.07	1.20
7	25000 - 49999	1194.45	35430.88	15.01	0.51	0.05	1.40
8	50000 - 99999	1356.83	70902.68	29.06	0.56	0.03	1.67
9	100000 - 249999	1786.82	155978.27	62.81	0.72	0.03	2.25
10	250000 - 499999	2554.90	342255.99	145.55	1.09	0.03	3.45
11	≥ 500000	3987.73	1218773.50	526.01	1.72	0.03	10.68
Average		1400.08	169363.10	72.30	0.59	0.09	2.16

Source: Author, 2021

To assess the qualitative characteristics of the groups, it is need to compare them with each other according to the obtained indicators. Groups 1, 2, 3 differ from all the others: the lowest standard output per 1 ha and standard output per 1 holding, the lowest livestock per 1 holding and livestock per 1 ha. Groups 8, 9, 10, 11 with small labour force directly employed by the holding per 1 ha, high standard output per 1 ha, standard output per 1 holdings, livestock per 1 holding, livestock per 1 ha, labour force directly employed by the holding per 1 holding are close to each other in all these characteristics. Given their small number, it is advisable to combine them into the highest typical group. Groups 4, 5, 6, 7 n almost all indicators occupy an intermediate position between the lower and higher typical groups. Their characteristics are close to each other, so they should also be combined.

Since neighboring analytical groups are close to each other in terms of size and intensity of production, therefore, it it need to distinguish 3 typical groups that have

fundamental differences from each other. Therefore, further let's carry out a typological grouping.

To do this, it is need to summarize statistical data by typical groups and, on its basis, calculate and compose a typology grouping. This grouping is presented in table 15.

Table 15 Typology grouping

Indicators	Groups			Average
	I	II	III	
Per 1 ha utilised agricultural area:				
Standard output, Euro	685.72	1079.50	2327.23	1804.38
Livestock, LSU	0.27	0.46	0.98	0.76
Labour force directly employed by the holding, AWU	0.21	0.08	0.03	0.06
Per 1 holding:				
Standard output, Euro	1315.44	14193.01	217427.02	23718.35
Livestock, LSU	0.52	6.02	91.23	9.95
Labour force directly employed by the holding, AWU	0.41	1.04	2.75	0.80
Utilised agricultural area, ha	1.92	13.15	93.43	13.14

Source: Author, 2021

In this case, the highest typical group prevails.

Standard output per 1 ha in the third typical group is higher than in the first by 1641.52 euro and higher than the second by 1247.74 euro. Livestock per 1 ha in the third typical group is higher than in the first by 0.7 LSU and higher than the second by 0.52 LSU. Labour force directly employed by the holding per 1 ha in the third typical group is lower than in the first by 0.19 AWU and lower than the second by 0.05 AWU.

Standard output per 1 holding in the third typical group is higher than in the first by 216111.59 euro and higher than the second by 203234.04 euro. Livestock per 1 holding in the third typical group is higher than in the first by 90.7 LSU and higher than the second by 82.21 LSU. Labour force directly employed by the holding per 1 holding in the third typical group is higher than in the first by 2.33 AWU and higher than the second by 1.7 AWU. Utilised agricultural area per 1 holding in the third typical group is higher than in the first by 91.51 ha and higher than the second by 80.28 ha.

In general, it can be noted that average standard output per ha is 1804.38 euro, average livestock is 0.76 LSU and average labour force directly employed by the holding is 0.06 AWU. In addition, average standard output per holding is 23718.35 euro, average

livestock is 9.95 LSU, average labour force directly employed by the holding is 0.8 AWU and average size of farm is 13.14 ha.

Also let's make a Typology grouping by 27 countries of the European Union. The grouping characteristic will be standard output per 1 ha in euro.

Table 16 shows key farm variables by European Union countries. They contain indicators of the agricultural census that was conducted in 2010 in the European Union.

Table 16 Key farm variables by European Union countries

Country	Standard output per 1 ha, euro	Total number of holdings, holdings	Utilised agricultural area, ha	Livestock, LSU	Labour force directly employed by the holding, AWU	Standard output, thous. euro
Latvia	432.66	83390.00	1796290.00	474630.00	85150.00	777190.96
Lithuania	556.52	199910.00	2742560.00	900080.00	146770.00	1526276.56
Bulgaria	566.79	370490.00	4475530.00	1149470.00	406520.00	2536665.61
Estonia	631.91	19610.00	940930.00	306280.00	25120.00	594584.27
Romania	783.12	3859040.00	13306130.00	5444180.00	1610260.00	10420314.21
Ireland	861.03	139890.00	4991350.00	5787400.00	165360.00	4297715.74
Slovakia	913.22	24460.00	1895500.00	668340.00	56110.00	1731014.36
Czechia	1105.84	22860.00	3483500.00	1722460.00	107990.00	3852209.74
Hungary	1118.36	576810.00	4686340.00	2483790.00	423490.00	5241037.24
United Kingdom	1158.35	185200.00	16881690.00	13308420.00	265660.00	19554979.69
Sweden	1217.52	71090.00	3066320.00	1751890.00	56850.00	3733311.44
Portugal	1264.87	305270.00	3668150.00	2205950.00	363400.00	4639745.66
Poland	1314.23	1506620.00	14447290.00	10377220.00	1897240.00	18987070.90
Greece	1327.44	723060.00	5177510.00	2406520.00	429520.00	6872835.24
Finland	1352.10	63870.00	2290980.00	1121050.00	59730.00	3097634.11
Spain	1438.70	989800.00	23752690.00	14830940.00	888970.00	34173074.93
France	1822.49	516100.00	27837290.00	22674170.00	779660.00	50733216.72
Slovenia	1892.04	74650.00	482650.00	518480.00	76650.00	913194.01
Austria	2042.71	150170.00	2878170.00	2517170.00	114270.00	5879273.59
Luxembourg	2048.35	2200.00	131110.00	167660.00	3700.00	268559.30
Germany	2484.08	299130.00	16704040.00	17792560.00	545500.00	41494097.65
Denmark	3185.21	41360.00	2646860.00	4919400.00	51060.00	8430808.83
Italy	3847.24	1620880.00	12856050.00	9911520.00	953790.00	49460329.71
Cyprus	3875.75	38860.00	118400.00	200750.00	18590.00	458888.50
Belgium	5337.01	42850.00	1358020.00	3798680.00	61550.00	7247768.31
Malta	8374.68	12530.00	11450.00	41650.00	4870.00	95890.13
Netherlands	10110.27	72320.00	1872350.00	6711500.00	161690.00	18929955.99

Source: Eurostat



Next, it is necessary to construct a ranked series of distribution of the countries of the European Union by grouping characteristic and analyze it. The results are presented in table 17.

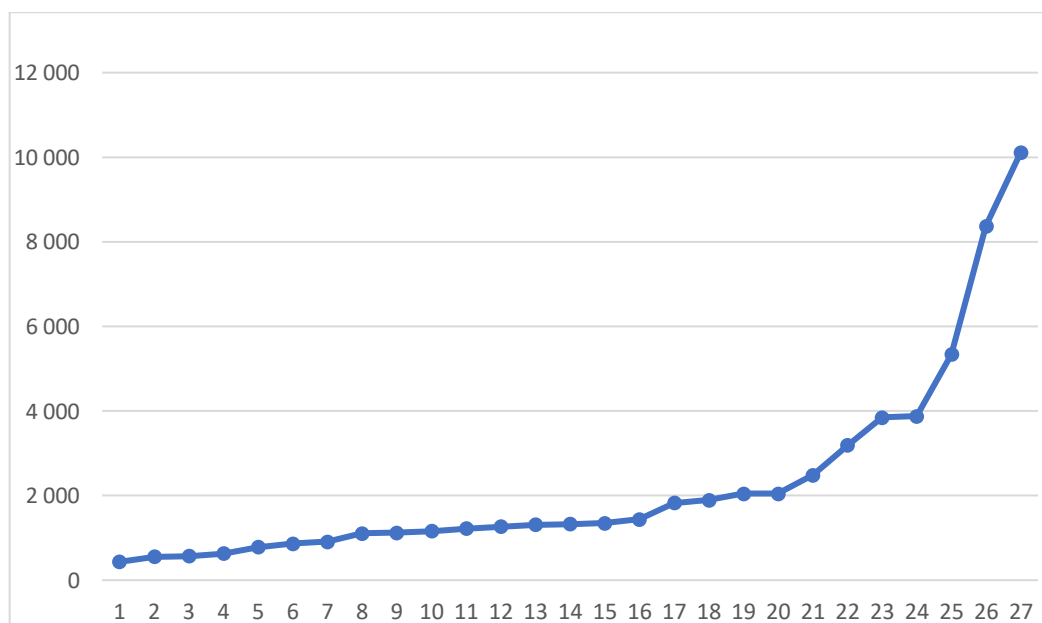
Table 17 Ranked series of standard output per 1 ha, euro

№	Country	Standard output per 1 ha, euro	№	Country	Standard output per 1 ha, euro
1	Latvia	432.66	15	Finland	1352.10
2	Lithuania	556.52	16	Spain	1438.70
3	Bulgaria	566.79	17	France	1822.49
4	Estonia	631.91	18	Slovenia	1892.04
5	Romania	783.12	19	Austria	2042.71
6	Ireland	861.03	20	Luxembourg	2048.35
7	Slovakia	913.22	21	Germany	2484.08
8	Czechia	1105.84	22	Denmark	3185.21
9	Hungary	1118.36	23	Italy	3847.24
10	United Kingdom	1158.35	24	Cyprus	3875.75
11	Sweden	1217.52	25	Belgium	5337.01
12	Portugal	1264.87	26	Malta	8374.68
13	Poland	1314.23	27	Netherlands	10110.27
14	Greece	1327.44			

Source: Author, 2021

Let's construct a graph of this ranked series of standard output per 1 ha in euro. The result is shown in figure 2. On the abscissa axis there is a number in order, and on the ordinate axis the values of this characteristic are located.

Figure 1 Distribution of standard output per 1 ha, euro



Source: Author, 2021

Let's single out the last 6 countries into a separate group.

Next, it is necessary to construct an interval series of distribution of countries by grouping characteristic. In order to construct it, it is need to know the number of groups and the boundaries of the intervals.

The number of groups will be 5. The step of the interval will be calculated as the ratio of the range of variation to the number of groups. The interval step is 512.85.

Next, let's construct an interval distribution series for this grouping characteristic. The result is presented in table 18.

Table 18 Interval distribution of countries based on standard output per 1 ha, euro

<b>Interval</b>	<b>Lower border</b>	<b>Upper border</b>	<b>Frequency</b>
1	432.66	945.52	7
2	945.52	1458.37	9
3	1458.37	1971.22	2
4	1971.22	2484.08	3
5	more than 2500		6
Sum			27

Source: Author, 2021

Group 1 includes 7 countries: Latvia, Lithuania, Bulgaria, Estonia, Romania, Ireland and Slovakia, group 2 includes 12 countries: Czech Republic, Hungary, United Kingdom, Sweden, Portugal, Poland, Greece, Finland and Spain, group 3 includes 2 countries: France and Slovenia, group 4 includes 3 countries: Austria, Luxembourg and Germany, and the last group includes 6 countries: Denmark, Italy, Cyprus, Belgium, Malta and Netherlands.

Next, let's carry out an intermediate analytical grouping. The result is presented in table 19.

Table 19 Intermediate analytical grouping for key farm variables by standard output per 1 ha, euro

<b>№</b>	<b>Interval by standard output per 1 ha, euro</b>	<b>Number of countries</b>	<b>Standard output per 1 ha, euro</b>	<b>Standard output per 1 holding, euro</b>	<b>Livestock per 1 ha, LSU</b>	<b>Livestock per 1 holding, LSU</b>	<b>Labour force directly employed by the holding per 1 ha, AWU</b>	<b>Labour force directly employed by the holding per 1 holding, AWU</b>
1	432.66 - 945.52	7	725.87	4659.30	0.49	3.14	0.08	0.53
2	945.52 - 1458.37	9	1293.04	22533.49	0.65	11.30	0.06	1.01
3	1458.37 - 1971.22	2	1823.68	87425.16	0.82	39.26	0.03	1.45
4	1971.22 - 2484.08	3	2416.74	105519.23	1.04	45.35	0.03	1.47
5	more than 2500	6	4486.19	46272.77	1.36	13.99	0.07	0.68
	Sum	27	353.89	25469.28	0.77	11.17	0.06	0.81

Source: Author, 2021

To assess the qualitative characteristics of the groups, it is need to compare them with each other according to the obtained indicators. Group 1 differs from all the others: the lowest standard output per 1 ha and standard output per 1 holding, the lowest livestock per 1 ha and livestock per 1 holding, labour force directly employed by the holding per 1 holding and the highest labour force directly employed by the holding per 1 ha. Group 4 and 5 with high standard output per 1 ha, livestock per 1 ha and livestock per 1 holding are close to each other. Therefore, it is advisable to combine them into the highest typical group. Group 2 and 3 in almost all indicators occupy an intermediate position between the lower and higher typical groups. Their characteristics are close to each other, so they should also be combined.

Based on this, the following countries were included in the first group: Latvia, Lithuania, Bulgaria, Estonia, Romania, Ireland and Slovakia, the second group includes the following countries: Czech Republic, Hungary, United Kingdom, Sweden, Portugal, Poland, Greece, Finland, Spain, France and Slovenia, and the third group includes the following countries: Austria, Luxembourg, Germany, Denmark, Italy, Cyprus, Belgium, Malta and Netherlands.

Since neighboring analytical groups are close to each other in terms of size and intensity of production, therefore, it it need to distinguish 3 typical groups that have

fundamental differences from each other. Therefore, further let's carry out a typological grouping.

To do this, it is need to summarize statistical data by typical groups and, on its basis, calculate and compose a typology grouping. This grouping is presented in table 20.

Table 20 Typology grouping

Indicators	Groups			Average
	I	II	III	
Number of countries	7	11	9	27
Per 1 ha utilised agricultural area:				
Standard output, Euro	725.87	1435.11	3428.66	1753.29
Livestock, LSU	0.49	0.69	1.19	0.77
Labour force directly employed by the holding, AWU	0.08	0.05	0.05	0.06
Per 1 holding:				
Standard output, Euro	4659.30	30146.65	58003.58	25469.28
Livestock, LSU	3.14	14.58	20.20	11.17
Labour force directly employed by the holding, AWU	0.53	1.06	0.84	0.81
Utilised agricultural area, ha	6.42	21.01	16.92	14.53

Source: Author, 2021

In this case, the highest typical group prevails.

Standard output per 1 ha in the third typical group is higher than in the first by 2702.79 thous. euro and higher than the second by 1993.55 thous. euro. Livestock per 1 ha in the third typical group is higher than in the first by 0.71 LSU and higher than the second by 0.5 LSU. Labour force directly employed by the holding per 1 ha in the third typical group is lower than in the first by 0.03 AWU and lower than the second by 0.001 AWU.

Standard output per 1 holding in the third typical group is higher than in the first by 53344.28 euro and higher than the second by 27856.94 euro. Livestock per 1 holding in the third typical group is higher than in the first by 17.06 LSU and higher than the second by 5.62 LSU. Labour force directly employed by the holding per 1 holding in the third typical group is higher than in the first by 0.31 AWU and lower than the second by 0.22 AWU. Utilised agricultural area per 1 holding ha in the third typical group is higher than in the first by 10.5 ha euro and lower than the second by 4.09 ha.

In general, it can be noted that average standard output per ha equals 1753.29 euro, average livestock is 0.77 LSU and average labour force directly employed by the holding is 0.06 AWU. In addition, average standard output per holding equals 25469.28 euro, average

livestock is 11.17 LSU, average labour force directly employed by the holding is 0.81 AWU and average size of farm is 14.53 ha.

When comparing this grouping based on standard output per 1 ha and grouping based on standard output size classes, it can be noted that, in general, very similar results were obtained.

### 4.3 Statistical analysis of the dynamics of agricultural development in the European Union based on census of agriculture data

Table 21 shows calculated dynamics and structure by indicators of total number of holdings by farm type and number of holdings by different types of farming according to the data of agricultural censuses in the European Union in 2000 and 2010.

Table 21 Dynamics and structure of number of holdings by farm type in European Union

Indicators	2000	2010	2010 in relation to 2000, %	Structure, %		
				2000	2010	Absolute increase
Specialist field crops, thous. holdings	1409.0	2935.1	208.3	20.8	25.0	4.2
Horticulture, thous. holdings	186.0	234.3	126.0	2.7	2.0	-0.8
Permanent crops, thous. holdings	2405.0	2392.7	99.5	35.5	20.4	-15.1
Grazing livestock, thous. holdings	1460.0	1762.0	120.7	21.6	15.0	-6.6
Granivores, thous. holdings	101.0	1388.8	1375.0	1.5	11.8	10.3
Mixed cropping, thous. holdings	537.0	503.9	93.8	7.9	4.3	-3.6
Mixed livestock, thous. holdings	180.0	777.6	432.0	2.7	6.6	4.0
Mixed crops and livestock, thous. holdings	442.0	1502.7	340.0	6.5	12.8	6.3
Non-classifiable holdings, thous. holdings	49.0	238.0	485.7	0.7	2.0	1.3
Number of holdings by farm type, thous. holdings	6769.0	11734.7	173.4	100.0	100.0	0.0

Source: European Commission, Eurostat

It follows from the dynamics indicators that number of holdings for almost all types of farming (except for permanent crops and mixed cropping) has increased. In general, total number of holdings by farm type increased by 73.4%. The largest increase was seen in number of holdings by granivores type of farming (by 1275%) and in number of non-classifiable holdings (by 385.7%). It should be noted that the growth in number of holdings

is mainly due to the accession to the European Union of the following countries: Estonia in 2004, Czech Republic in 2004, Cyprus in 2004, Hungary in 2004, Latvia in 2004, Lithuania in 2004, Malta in 2004, Poland in 2004, Slovakia in 2004, Slovenia in 2004, Bulgaria in 2007, Romania in 2007. And also changes in methodology should be taken into account - the transition from standard gross margin to standard output.

Share by number of holdings by specialist field crops type of farming, number of holdings by granivores type of farming, number of holdings by mixed livestock type of farming, number of holdings by mixed crops and livestock type of farming, number of holdings by non-classifiable holdings type of farming has increased. The most significant change was in the proportion of number of holdings by granivores type of farming. And also the share of number of holdings with permanent crops type of farming decreased the most.

Next, let's study the dynamics and structure of utilised agricultural area by type of crops. Table 22 shows calculated dynamics and structure by indicators of utilised agricultural area by type of crops in European Union according to the data of agricultural censuses in the European Union in 2000 and 2010.

Table 22 Dynamics and structure of utilised agricultural area by type of crops in European Union

Indicators	2000	2010	2010 in relation to 2000, %	Structure, %		
				2000	2010	Absolute increase
Arable land, thous. ha	71760.7	102949.2	143.5	56.6	60.1	3.5
Kitchen gardens, thous. ha	112.1	345.8	308.6	0.1	0.2	0.1
Permanent grassland and meadow, thous. ha	44931.5	57572.2	128.1	35.4	33.6	-1.9
Permanent crops, thous. ha	9993.3	10561.3	105.7	7.9	6.2	-1.7
Utilised agricultural area, thous. ha	126797.6	171428.5	135.2	100.0	100.0	0.0

Source: European Commission, Eurostat

It follows from the dynamics indicators that utilised agriculture area for all type of crops has increased. Overall, total utilised agriculture area increased by 35.2%. The largest increase was observed in utilised agriculture area by kitchen gardens type of crops (by 208.6%) and utilised agriculture area by arable land type of crops (by 43.5%).

It should be noted that the share of utilised agricultural area by arable land type of crops and utilised agricultural area by kitchen gardens type of crops has increased. Most of all, the share of utilised agricultural area by arable land type of crops has changed. And also

the share of the utilised agricultural area by permanent grassland and meadow type of crops decreased the most.

Next, let's consider the dynamics of the following indicators presented in table 23, taken from the results of agricultural censuses in the European Union for 2000 and 2010: total livestock, sole holders, total family labour force, regular non-family labour force, regular labour force, non-regular non-family labour force, labour force directly employed by the holding.

Table 23 Dynamics of livestock and labour force

<b>Indicators</b>	<b>2000</b>	<b>2010</b>	<b>2010 in relation to 2000, %</b>
Total livestock, thous. LSU	117610.0	133994.2	113.9
Sole holders, thous. persons	6484.0	11621.6	179.2
Total family labour force, thous. persons	12185.5	22684.3	186.2
Regular non-family labour force, thous. persons	1323.2	1955.5	147.8
Regular labour force, thous. persons	13508.7	24957.2	184.7
Sole holders, thous. AWU	2849.3	4398.8	154.4
Non-regular non-family labour force, thous. AWU	664.3	757.5	114.0
Labour force directly employed by the holding, thous. AWU	6331.6	9759.5	154.1

Source: European Commission, Eurostat

It follows from the dynamics indicators that all indicators have increased. Sole holders (in thous. persons) increased by 79.2%, regular non-family labour force increased by 47.8%, sole holders (in thous. AWU) increased by 54.4%, non-regular non-family labour force increased by 14% and labour force directly employed by the holding increased by 54.1%.

The largest increases were in total family labour force (by 86.2%) and regular labour force (by 84.7%). The least increase was in total livestock (by 13.9%) and non-regular non-family labour force (by 14%).

Let's also consider the dynamics of the indicators presented in the previous table per 1 holding. The calculation results are presented in table 24.

Table 24 Dynamics of indicators of the size of holdings per 1 holding

<b>Indicators</b>	<b>2000</b>	<b>2010</b>	<b>2010 in relation to 2000, %</b>
Utilised agriculture area, ha	18.73	14.61	77.99
Total livestock, LSU	17.37	11.42	65.72
Sole holders, persons	0.96	0.99	103.39
Total family labour force, persons	1.80	1.93	107.38
Regular non family labour force, persons	0.20	0.17	85.25
Regular labour force, persons	2.00	2.13	106.57
Sole holders, AWU	0.42	0.37	89.05
Non-regular non-family labour, AWU	0.10	0.06	65.78
Labour force directly employed by the holding, AWU	0.94	0.83	88.91

Source: European Commission, Eurostat

As can be seen from this table, almost all indicators in 2010 decreased compared to 2000. Utilised agriculture area decreased by 22.01%, total livestock decreased by 34.28%, sole holders (in person) increased by 3.39%, total family labour force increased by 7.38%, regular non family labour force decreased by 14.75%, regular labour force increased by 6.57%, sole holders (in AWU) decreased by 10.95%, non-regular non-family labour force decreased by 34.22%, labour force directly employed by the holding decreased by 11.09%.

And also let's consider the dynamics of the indicators presented in table 23 per 1 ha of utilised agricultural area. The calculation results are presented in table 25.

Table 25 Dynamics of intensification of production per 1 ha utilised agricultural area

<b>Indicators</b>	<b>2000</b>	<b>2010</b>	<b>2010 in relation to 2000, %</b>
Total livestock, LSU	0.93	0.78	84.27
Sole holders, persons	0.05	0.07	132.57
Total family labour force, persons	0.10	0.13	137.69
Regular non family labour force, persons	0.01	0.01	109.31
Regular labour force, persons	0.11	0.15	136.65
Sole holders, AWU	0.02	0.03	114.19
Non regular non family labour force, AWU	0.01	0.00	84.34
Labour force directly employed by the holding, AWU	0.05	0.06	114.01

Source: European Commission, Eurostat

As can be seen from this table, total livestock decreased by 15.73%, sole holders (in person) increased by 32.57%, total family labour force increased by 37.69%, regular non family labour force increased by 9.31%, regular labour force increased by 36.65%, sole holders



(in AWU) increased by 14.19%, non-regular non-family labour force decreased by 15.66%, labour force directly employed by the holding increased by 14.01%.

## **5 Results and discussion**

### **5.1 Recommendations for improving the system of indicators of all-Russian censuses of agriculture**

In the system of indicators of all-Russian agricultural censuses, there are no cost indicators. For example, in the European Union there is such an indicator as standard output of an agricultural production, which was already mentioned earlier. Based on this indicator, the classification of farms is made according to the type of farming and economic size.

Based on foreign experience, it is possible to put forward a proposal for the Russian Federation to include in its system also cost indicators that can characterize the economic efficiency of agricultural holdings, as well as assess their specialization of production.

To begin with, it can be proposed to introduce indicators such as revenue and costs for agricultural organizations and peasant (farmer) households and individual entrepreneurs.

In addition, in the system of indicators of agricultural censuses of the European Union, to characterize the labor force, in addition to the units of measurement in persons, the annual working unit (AWU) is also used.

An annual work unit is employment that is equivalent to full-time employment. In other words, it is the total number of hours worked divided by the average annual number of hours worked in full-time jobs in the country. One annual working unit corresponds to work performed by one person working in an agricultural holding on a full-time basis.

Minimum hours of work are required to determine that a job is full-time. They are defined in the national regulations that govern employment contracts. As the minimum value for the number of hours per year, 1800 hours should be taken, which are calculated on the assumption that there are 225 working days in a year with 8 hours each, unless a specific number of hours is specified in national regulations.

No person can represent more than one annual working unit, since agricultural labor is calculated on the basis of jobs. This restriction will be valid even if the worker engaged in agricultural production will carry out his work with more hours than is determined by full employment in a particular Member State of the European Union.

Based on foreign experience, it is possible to put forward a proposal for the Russian Federation to include this unit of labor force measurement in the all-Russian agricultural censuses, which will help to better characterize the labor force.

Also, taking into account the experience of agricultural censuses in the United States, proposals for the European Union to include in its system such indicators as: farm production expenses, market value of agricultural products sold, net cash farm income and value of agricultural products sold. These indicators can also be included in the All-Russian agricultural census.

## **5.2 Developing proposals for improving the presentation and analysis of the results of all-Russian censuses of agriculture**

In the Russian Federation, there are groupings that are a distribution series. For example, a grouping of agricultural organizations according to the size of the agricultural area. It displays the number of agricultural organizations, total land area, agricultural area and fertilized area. And in the European Union, groupings are carried out that allow to analyze and establish relationships between indicators.

Based on the study of foreign experience, it is proposed to introduce analytical groupings. The selected groups will have to be characterized by a wide range of census indicators, such as the number of livestock, the number of farm labour force, and the availability of agricultural machinery.

Provided that cost indicators are added to the indicator system of the Russian Federation, it will be possible to take as a model for the presentation of the results of the European Union census.

In the European Union, there are groupings based on standard output size classes. For example, number of holdings classified by farm size and economic size based on standard output size classes, farms growing cereals classified by economic size based on standard output size classes and area under cereals, farms with cattle classified by economic size based on standard output size classes and size of herd, number of family farms classified by economic size based on standard output size classes and characteristics of holder.

Standard output is the key variable for classifying agricultural holdings by types of farming and by economic size classes.

Now in the system of indicators of all-Russian agricultural censuses, there are no cost indicators and if they will be added, then in the future it is possible to propose to introduce groupings based on revenue and costs for agricultural organizations and peasant (farmer) households and individual entrepreneurs.

Subject to the expansion of the European Union census program, the following recommendation can be proposed: based on the US experience, include the groupings by value of sales, by selected farm production expenses, by farm net gains and net losses.

It is also possible to propose a recommendation to publish a wider set of groupings for the European Union as a whole, with the characteristics of groups with a full range of agricultural indicators.

## 6 Conclusion

Statistics have a big impact on the decision-making process. Therefore, it is necessary to improve the process of producing statistics, to increase its relevance and quality. It also needs to be promoted by providing timely and reliable statistics to improve government efficiency and public confidence.

Agricultural planning and policy making is evidence-based and highly dependent on the statistical system. An agricultural census can directly influence, for example, processes to encourage agricultural production and investment to stimulate economic growth, rural development, and crop diversification.

In addition to contributing to specific government policy objectives, the agricultural census provides essential data for research and assessment of the composition and distribution of the agricultural sector, as well as its growth in past and its future perspectives.

The agricultural census is also a valuable source of data for the private sector and the agricultural industry. For the private sector, the main focus is usually on data that can aid in business decision making.

In this thesis, the experience of the European Union in conducting agricultural censuses was analyzed. The methodological and legal foundations for conducting agricultural censuses in the European Union were studied, namely: the regulatory framework for conducting agricultural censuses, the agricultural census program, the organization of conducting agricultural censuses, the grouping and presentation of agricultural census data. An analysis of the results of agricultural censuses in the European Union was also carried out, namely: Analysis the distributions of farms based on groupings, Analysis of the types of farms in the European Union, Statistical analysis of the dynamics of agricultural development in the European Union based on census of agriculture data.

In addition, recommendations were developed to Recommendations for improving the system of indicators of all-Russian censuses of agriculture, as well as proposals for improving the presentation and analysis of the results of all-Russian censuses of agriculture.

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