

**Czech University of Life Sciences Prague
Faculty of Economics and Management
Department of Economics**



Master's Thesis

**Economic Evaluation of Organic Agriculture: The
Case of European Union Countries**

Tütay NACAĞ

2022 CZU Prague

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Tútay Nacak

Economics and Management
Economics and Management

Thesis title

Economic Evaluation of Organic Agriculture and Traditional Agriculture: The Case of European Union Countries

Objectives of thesis

The main purpose of this thesis is to determine the relationship between organic agriculture and the agricultural GDP of the countries. Within the scope of this purpose, the aims of the thesis are determined as follows.

- Examining the development of organic agriculture,
- To reveal the differences between organic agriculture and traditional agriculture,
- Determining the impact of Organic Agriculture on the agricultural GDPs of the countries.

Methodology

The thesis basically consists of three parts. In the first part, a conceptual framework for organic agriculture will be created and organic farming practices around the world will be examined, and a literature review on traditional agriculture and organic agriculture will be included.

The second part will be the practical part with empirical analysis. The analysis part of the study will be carried out using the data of the 27 European Union member countries for the period 2003-2020. As the dependent variable in the study, the agricultural GDP of the countries (in US Dollars with 2015 fixed prices); As the independent variable, the area (hectares) of organic farming and the number of producers engaged in organic farming will be used. The agricultural GDP data of the countries will be obtained from the World Bank, and the area allocated to organic agriculture and the number of producers will be obtained from the electronic databases of FIBL. The analysis on how the independent data affect the dependent variable will be made with the panel data analysis method.

The proposed extent of the thesis

60-80

Keywords

Organic farming

Recommended information sources

- Andrusenko N, Martynova L, Sharko V, Garbaziil, K, Hrych S, Vasylyshyna O. 2022. Changes in the organic products market as a result of the 2022 events in Eastern Europe. WSEAS Transactions on Environment and Development, 18: 918-929.
- FAO. 2021. United Food and Agriculture Organization. Available from <http://www.fao.org> (Accessed: September 2022)
- Francis CA, Youngberg G. 1990. Sustainable agriculture: An overview. Pages 1-16 in Francis CA, Flora CB, King LD, editors. Sustainable agriculture in temperate zones. John Wiley and Sons, New York.
- Geler B. 2007. IFOAM and the history of the international organic movement. Pages: 175-186 in Lockeretz W, editors. In organic farming: an international history, CABI, Cambridge, USA.
- Lockeretz W. 2007. What explains the rise of organic farming Pages: 1-9 in Lockeretz W, editors. In organic farming: an international history, CABI, Cambridge, USA.
- Rigby D, Cáceres D. 2001. Organic farming and the sustainability of agricultural systems. Agricultural systems, 68:21-40.
- Stoltze M, Piorr A, Häring A, Dabbert S. 2000. The environmental impacts of organic farming in Europe. Organic Farming in Europe: Economics and Policy, 6.
-

Expected date of thesis defence

2022/23 SS – FEM

The Diploma Thesis Supervisor

Ing. Karel Malec, Ph.D.

Supervising department

Department of Economics

Electronic approval: 24. 11. 2022

prof. Ing. Lukáš Čechura, Ph.D.

Head of department

Electronic approval: 25. 11. 2022

doc. Ing. Tomáš Šubrt, Ph.D.

Dean

Prague on 29. 11. 2022

Declaration

I declare that I have worked on my master's thesis titled " Economic Evaluation of Organic Agriculture: The Case of European Union Countries" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 30.11.2022

Tütay NACAК

Acknowledgement

I would like to thank Ing. Karel Malec, (Ph.D.) for his advice and support during my work on thesis. I am also grateful for my friends and colleagues who supported me through the time and kept me on track to achieve my goals.

Economic Evaluation of Organic Agriculture: The Case of European Union Countries

Abstract

Healthy food is of critical importance for human health. For this reason, agriculture has held a very important place for humanity for centuries. However, the rapid industrialization of the world and the increasing population in the last two centuries have led to the use of many dangerous substances for human health, such as the use of chemicals and artificial fertilizers, in order to meet the increasing demand in the field of agriculture. The nature has been damaged due to the machinery and chemicals used in agriculture, and unhealthy products have begun to be grown that threaten human health.

However, in recent years, both the increase in people's sensitivity to the environment and their healthy food needs have accelerated the orientation to organic agriculture. Organic farming means farming in completely organic ways without using harmful substances such as chemicals and artificial fertilizers.

In this thesis, the development of EU countries on organic agriculture has been examined. It has been observed that EU member countries have made rapid progress in organic agriculture, especially since 1990. On the other hand, in the thesis, the effect of the increase in the organic agriculture field and the number of organic agriculture producers between 2003-2021 on the agricultural GDP of 25 EU member countries was analyzed by panel data analysis method. As a result of analysis, it was determined that organic farming area had a positive effect on agricultural GDP, while the effect of the number of producers was found to be negative.

Keywords: Organic agriculture, panel data, European Union, Traditional Agriculture, Farming.

Ekonomické zhodnocení organického zemědělství ve vybraných zemích evropské unie

Abstrakt

Vyvážená strava má pro lidské zdraví zásadní význam a z tohoto důvodu zaujímá zemědělství po staletí velmi důležité místo. Rychlá industrializace světa a rostoucí populace v posledních dvou stoletích však vedly k používání mnoha nebezpečných látek, které mohou mít negativní vliv na lidské zdraví, jako je na příklad používání chemikálií a umělých hnojiv. To se děje především proto, aby bylo možné uspokojit rostoucí poptávku po zemědělských produktech. Nejen příroda je poškozována chemikáliemi a stroji používanými v zemědělství, ale také vypěstované produkty mohou negativně působit na lidské zdraví.

V posledních letech však došlo k zvýšení zájmu o ekologické zemědělství, které urychlil jak nárůst citlivosti lidí k životnímu prostředí, tak i orientace na zdravou výživu. Ekologické zemědělství znamená hospodaření zcela ekologickými způsoby, a to bez použití škodlivých látek jako jsou chemikálie a umělá hnojiva.

V této práci je zkoumán vývoj ekologického zemědělství v zemích EU. Bylo vypořádáno, že vybrané členské země EU dosáhly rychlého pokroku v oblasti ekologického zemědělství, zejména od roku 1990. Dále práce zkoumá, zda nárůst v oblasti ekologického zemědělství ovlivnil počet producentů ekologického zemědělství, a to v letech 2003-2021. Porovnávání bylo provedeno za pomoci metody panelové analýzy, kdy bylo analyzováno HDP (z oblasti zemědělství) u 25 členských zemí EU. Na základě analýzy bylo zjištěno, že odvětví ekologického zemědělství mělo pozitivní vliv na zemědělský HDP, zatímco vliv počtu výrobců byl shledán negativní.

Klíčová slova: Ekologické zemědělství, panelová data, Evropská unie, tradiční zemědělství, pěstování produktů.

Table of content

1.	Introduction.....	1
2.	Objectives and Methodology.....	4
2.1	Objectives.....	4
2.2	Methodology.....	4
2.2.1	Data Sampling.....	4
2.2.2	Data Collection.....	5
2.2.3	Data Analysis.....	5
2.2.3.1	Fixed Effect Models.....	6
2.2.3.2	Random Effect Models.....	6
3.	Literature Review.....	8
3.1	Organic Agriculture.....	8
3.1.1	Definition.....	8
3.1.2	Historical Development.....	11
3.1.3	Purpose and Principles.....	14
3.1.4	Advantages and Disadvantages.....	17
3.2	International Organizations Related to Organic Agriculture Organic Agriculture in the World.....	18
3.2.1	IFOAM (International Organic Agriculture Movements).....	18
3.2.2	FAO (United Nations Food and Agriculture Organization).....	19
3.3	Current Situation of Organic Agriculture in the World.....	20
3.4	Organic Agriculture in Europe.....	30
3.4.1	Change of European Agriculture Policies.....	32
3.4.2	The Organic Agriculture Statistics of Europe.....	39
4.	PRACTICAL PART.....	50
4.1	Data Set.....	50
4.2	Descriptive Statistics.....	51
4.3	Panel Unit Test Results.....	52
4.4	Panel Data Analyses Results.....	52
4.4.1	Hausman Test.....	52
5.	Results and Discussion.....	55
6.	Conclusion.....	57
7.	References.....	61

List of tables

Table 1. The Main Purposes of Organic Agriculture	16
Table 2. The Advantages and Disadvantages of Organic Agriculture.....	17
Table 3. Growth of Organic Agriculture Land (10 Years)	20
Table 4. Share of Total Organic Agriculture Land by Region.....	23
Table 5. Number of Organic Agriculture Procedurs in the World.....	27
Table 6. Number of Farmings in Europe (1966-2007)	36
Table 7. Percent of agricultural area, by farm size category (1990-2007).....	37
Table 8. Avreage Labor per Hectare (1990-2007).....	38
Table 9. Total organic area in Europe (2012-2020).....	39
Table 10. Organic Agriculture Holdings in Europe	45
Table 11. Standard Output (So) In Euro per Hectare of Utilised Agricultural Area (Uaa)	49
Table 12. Countries of EU in Data Set.....	50
Table 13. Description of Data Set.....	51
Table 14. Descriptive Statistics of Data Set.....	51
Table 15. Unit Root Test Results	52
Table 16. Hausman Test Results.....	53
Table 17. Random Effects Model Panel Data Estimation Results.....	53

List of figures

Figure 1. 1920’S Feeding The Plant and Soil Strategy	12
Figure 2. Growth of Organic Agriculture Land (2000-2020 Years).....	21
Figure 3. Organic Agriculture Land in the World (2020)	22
Figure 4. Distribution of Total Organic Agriculture Land by Region	23
Figure 5. The Top Ten Countries With The Largest Organic Agriculture Areas ...	24
Figure 6. Distribution of Organic Agriculture Shares of the World	25
Figure 7. Countries With An Organic Share Of The Total Agriculture Land Above 10%	25
Figure 8. Top Ten Countries with the Highest Increase of Organic Agriculture Land	26
Figure 9. The Ten Countries with The Most Organic Producers	27
Figure 10. Top Ten Countries with Largest Organic Market in the World	28
Figure 11. Distribution of Retail Sales By Country	29
Figure 12. Top Ten Countries with the Highest per capita Organic Food Consumption in the World	30
Figure 13. Area of Organic Agricultural Land in Europe (1995-2020)	32
Figure 14. Distribution of CAP Expenditure (1980-2022)	35
Figure 15. Distribution of EU Total Organic Area	40
Figure 16. Distribution of Organic Area in Utilised Area.....	41
Figure 17. Share of organic cereals production in total cereals production, 2020 ...	42
Figure 18. Share of Organic Fresh Vegetables Production in Total Fresh Vegetables Production, 2020 (%)	43
Figure 19. Organic Arable Land Crops, Permanent Grassland and Permanent Crops	43
Figure 20. Share of organic livestock in all livestock, by countries with the highest shares, 2020 (% of number of heads).....	44

Figure 21. Share of holdings with ONLY and SOME organic area, by country, (% of total holdings with organic area)	46
Figure 22. Ratio of standard output (SO) in Euro per Utilised Agricultural Area (Uaa) For Holdings with Only Organic Area and Non-Organic Area by Size Class	47
Figure 23. Ratio of Standard Output (So) In Euro per Annual Work Unit (Awu) For Holdings with Only Organic Area and Non-Organic Area, By Country.....	48

List of abbreviations

- FIBL : The Research Institute of Organic Agriculture (German: Forschungsinstitut für biologischen Landbau,
- FIAOM : International Organic Agriculture Movements
- FAO : United Nations Food and Agriculture Organisation
- UAA : Utilized Agriculture Ares
- EU : European Union
- EC : European Commission
- AWU : Annual Working Unit
- SO : Standard Output

1. Introduction

Food is as important as air and water for people to maintain their lives and lead a healthy life. The rapid increase in population with the industrial revolution has brought about great changes in the agricultural industry, which has been the main source of food for people for the last two centuries. With the increasing population, many different methods have been developed to increase productivity in agriculture. The limited world resources necessitated the acceleration of production in agriculture. For this reason, many different techniques such as mechanization, spraying, and hormones in agriculture have become indispensable elements for the agricultural industry (Sandhu et al., 2010).

However, although these techniques have provided the necessary efficiency for food supply, they have also brought many other problems. At the beginning of these problems are the emergence of negative situations in terms of people's health and the decrease in food quality. However, some environmental problems such as soil pollution and groundwater pollution are among these problems. Therefore, the solutions found to meet the food needs of the increasing population have also started to bring many negative consequences for people. These problems negatively affect the health of all plants and animals around the area where inorganic substances are used, as well as humans (Takatsuka et al., 2009).

Due to unhealthy food consumption, there has been an increase in cancer disease worldwide. This situation has mobilized many organizations, notably the United Nations, and some steps have been taken on food safety and healthy food production. Globally, some organizations such as the United Nations Food and Agriculture Organization (FAO), the International Federation of Ecological Agricultural Movements and the United Nations Development Program have taken many encouraging measures to end practices that contribute to the deterioration of ecological balance, especially human health, by developing appropriate techniques for healthy food production. have begun to put into effect (Reganold & Watchter, 2016).

Organic agriculture is at the forefront of the agricultural activities that have been promoted in terms of access to healthy food in recent years and that are trying to spread it around the world. Organic agriculture is a type of agriculture that expresses the production of food completely organically, in which none of the practices and inorganic substances harmful to human health are used. In this type of agriculture, it is aimed to avoid activities

that adversely affect human health at any stage of the cultivation process of an agricultural product. However, organic agriculture also has disadvantages for producers due to the fact that it is less efficient than traditional agriculture and it has competitive difficulties in terms of economic profitability (Goldewijk & Ramankutty, 2004).

The experiences of the long and difficult war period were influential in all the policies determined at the beginning of the European Economic Community, which was established thirteen years after the end of the Second World War. The most basic phenomenon that the war process evokes in the field of agriculture and food is “hunger”. In all of Europe, apart from a few countries, both at the front and behind the lines, outside of war and occupation, the worst memories of a generation in their lifetime were hunger, tangible and palpable, apart from the taken-for-granted brutality. Moreover, famine, rationing, and black market system had taken the social life captive in a short time, even in countries like Turkey that could stay out of the war (Ireland, Sweden, Switzerland, Portugal, and Spain). In this context, it is not surprising that the first common policy of the European Economic Community, led by Germany, France and Italy, the most ardent actors of the war, and completed with the Benelux countries, emerged in the field of agriculture. The "Six", who were not self-sufficient in the field of agriculture, were looking for a policy set that would provide food security for them in a short time and be adopted and implemented by the member states. Thus, for the first time, the supranational feature of European Law passes into a concrete application area in the field of agriculture; the common principles, aims and basic methods of the Common Agricultural Policy determined in Brussels were transferred to the member countries within the framework of the directly applicable legislation.

Keynesian economic policies, which dominated the capitalist world after the Second World War, became the main determinant in the field of agricultural policies, as in all policy areas. This means; It is the enactment of a project for the realization of the principles and objectives of the Common Agricultural Policy with the wide financial opportunities provided for many years to the European peasant-producer segment, whose access to resources is relatively limited compared to other social classes. In this context, the objectives of the Common Agricultural Policy set forth in the Treaty of Rome;

- Increasing agricultural productivity by transferring technical advances to the sector, ensuring the rational development of agricultural production and optimum use of production factors, especially labor force,

- Ensuring continuity in the supply of agricultural products, stabilizing agricultural markets,

- Providing a suitable living standard for the agricultural society, especially by increasing the individual income of those working in agriculture from the sector, and allowing consumers to access agricultural products at affordable prices while doing all these.

Although the harms of traditional agricultural practices have been on the agenda in the European Union member states since the 1970s, it is seen that the first concrete steps have been taken since the 1990s. Although it is not yet at a sufficient level in terms of environment, the leading countries in terms of organic agriculture around the world are still the European Union countries.

Worldwide, European Union countries are among the most active countries in organic agriculture, and with the incentives given in these countries, there is an increase in the amount of organic farming land and hand-held products every year (Andrusenka et al., 2022). In this study, it is aimed to make an economic comparison of organic agriculture with traditional agriculture based on European Union countries and to make some suggestions within the framework of the results obtained. In this context, in the second part of the study, the conceptual framework of organic agriculture will be drawn and the data on the economic situation of organic agriculture in the world will be examined. In the Practical Part, an economic evaluation of organic agriculture in Europe will be made. Finally, the findings will be compared with other studies in the literature and suggestions for the future will be presented within the framework of the results.

2. Objectives and Methodology

2.1 Objectives

The main purpose of this thesis is to determine the relationship between organic agriculture and the agricultural GDP of the countries. Within the scope of this purpose, the aims of the thesis are determined as follows.

- Examining the development of organic agriculture,
- To reveal the differences between organic agriculture and traditional agriculture,
- Determining the impact of Organic Agriculture on the agricultural GDPs of the countries.

2.2 Methodology

The thesis basically consists of three parts. In the first part, a conceptual framework for organic agriculture will be created and organic farming practices around the world will be examined, and a literature review on traditional agriculture and organic agriculture will be included.

The second part will be the practical part with empirical analysis. The analysis part of the study will be carried out using the data of the 25 European Union member countries for the period 2003-2020. As the dependent variable in the study, the agricultural GDP of the countries (in US Dollars with 2015 fixed prices); As the independent variable, the area (hectares) of organic farming and the number of producers engaged in organic farming will be used. The agricultural GDP data of the countries will be obtained from the World Bank, and the area allocated to organic agriculture and the number of producers will be obtained from the electronic databases of FIBL. The analysis on how the independent data affect the dependent variable will be made with the panel data analysis method.

2.2.1 Data Sampling

In the study, 25 European countries, whose data can be accessed between 2003 and 2020, were selected as a sample.

2.2.2 Data Collection

The data used as variables in the study, the organic agricultural areas and the number of producers, were obtained from the FIOAM database, and the agricultural GDP data was obtained from the World Bank databank.

2.2.3 Data Analysis

In the study, the analysis of the data was made by the panel data analysis method. In this section, information will be given about the panel analysis, which is the basis of the analysis.

It is possible to talk about two basic approaches used in regressions with panel data. These are: Fixed Effects Model (FEM) and Random Effects Model (REM). Before examining these models, It will be given information about panel data regression model in general. For this, take 'k' variables as a basis.

$$y_{it} = \beta_{1it} + \beta_{2it} + \dots + \beta_{kit} X_{kit} + \varepsilon_{it} \quad (1)$$

Here, $i=1,2,\dots,G$ is the cross section unit and $t=1,2,\dots,n$ is the time period.

It is also assumed that the mean of the nonprobabilistic error term ε is zero and has constant variance. That is, $E[\varepsilon_{it}] = 0$ and $\text{Var}[\varepsilon_{it}] = \sigma_{\varepsilon}^2$. The slope coefficients from β_{2it} to β_{kit} are unknown response coefficients. They may differ for different units and different time periods. However, while estimating the model, various assumptions are made about the model's constant term, slope coefficients and error term. Depending on the assumptions made about these, it is possible to predict five different models (Judge et al., 1985: 515). On these models:

- i. Both constant and slope coefficients do not change with respect to both units and time, and the error term can represent differences with respect to time and units.
- ii. While the slope coefficients are constant, the constant term varies in units but may remain constant over time.
- iii. While the slope coefficients are constant, the constant term can vary with units and time.
- iv. Both constant and slope coefficients can vary by units.
- v. All coefficients can vary both in time and in units.

As stated in Judge et al. (1985) and Gujarati (2003), it is possible to further classify models ii-iv depending on whether the varying coefficients are fixed or random.

2.2.3.1 Fixed Effect Models

One of the simplest models used to predict with panel data is the Fixed Effects Model (FEM). In FEM, the differences in the behavior of the units are tried to be revealed by the differences in the constant term. However, the slope coefficients are assumed to be constant. In this model, the constant term is called the group-specific constant term. As stated by Greene, the definition of constant here means that the coefficient may vary according to the units, but is constant according to time. Individual effects that cannot be observed in the FEM are considered to be related to the explanatory variables in the model (Greene, 2003: 285). Therefore, differences between units are modeled as parametric changes in the regression function. We can express the FEM as follows.

$$y_{it} = \beta + \sigma_i + \beta_{2it} X_{2it} + \dots + \beta_{kit} X_{kit} + \varepsilon_{it} \quad (2)$$

$$i=1,2,\dots,G \text{ and } t=1,2,\dots,n$$

$\beta_{1i} = \beta_{1i} + \alpha_{ii}$ th unit-specific constant term; β represents the mean constant term. α_i also represents the difference from the mean constant term for the i-th unit. The appropriate estimation method to be used in estimating equation (2) depends on whether α_i is constant or random. 'Dummy Variable Model' if α_i is constant; on the other hand, it is necessary to use an 'Error Component Model' if it is random (Judge et al., 1985: 519). If there is a relationship between the error term in equation (2) and the explanatory variables, FEM is considered as the appropriate model. Because in this case, the FEM estimators are unbiased. In addition, if the number of G is small and the number of observations (n) is large, FEM is still the preferable model.

2.2.3.2 Random Effect Models

Contrary to what is accepted in the FEM, if the explanatory variables in the model are not relevant, the unit-specific constant terms; it is more appropriate to assume that it is randomly distributed according to the units and to model accordingly (Greene, 2003: 293). Thus, the constant term β_{1i} in equation (2) will not be a constant, but β will be a random variable with the mean. In this case, the constant term value for each unit will be

$\beta_{1i} = \beta + \mu_i$. Here, too, μ_i is the random error term with zero mean and constant variance. REM would be as follows,

$$y_{it} = \beta + \beta_{2it} X_{2it} + \dots + \beta_{kit} X_{kit} + \varepsilon_{it} + \mu_i$$

or

$$y_{it} = \beta + \beta_{2it} X_{2it} + \dots + \beta_{kit} X_{kit} + u_i \text{ as follows.}$$

We can see the fundamental difference between FEM and REM by comparing equations (2) and (3). In FEM, each section unit has its own constant term; In REM, the constant term gives the mean constant term (β) for all cross-section units, and the error term (μ_i) represents the random deviation of the constant term of each cross-section unit from this mean constant term. The effective estimation method used to estimate REM is the Generalized Least Squares (GLS) method. If the number of cross-section units in the panel data is large and the time period (n) (G) is short, REM provides more efficient estimations than FEM. On the other hand, if n is large and G is small, little difference is expected between the two estimation results, and as we mentioned before, FEM is more preferred. However, if n is small and G is large, a significant difference is expected between the two forecast results. In this case, if it is believed that the cross-section units are randomly drawn from the large sample, REM is considered the more appropriate model, otherwise FEM (Gujarati, 2003: 650-651).

3. Literature Review

In this section, the organic agriculture will be discussed within the framework of related literature. First, the definition of organic agriculture, development of the culture of agriculture and factors affecting the techniques of agriculture will be discussed in this section. After the main concept and history of agriculture there will be the current situation of organic agriculture in the world.

3.1 Organic Agriculture

3.1.1 Definition

Today, it has begun to be discussed whether modern agricultural practices, or in other words, traditional agricultural practices and production systems are sustainable in the long run. Sustainability in agriculture constitutes an important part of the discussions on sustainable development.

Agriculture is a fundamental sector in the production of food, which is extremely necessary for human life. Despite this, as in many other sectors, the measures taken to increase productivity and reduce human labor over time have brought along many problems. While agriculture is being done, machines working with fossil fuels, chemical fertilizers and pesticides have begun to harm both the environment and human health, as well as all living things (Hodge, 1993). Sustainability has a Latin origin and means to survive, continue and preserve its existence for a long time. Sustainable agriculture, which is considered as a part of sustainable development, refers to the agricultural activities carried out in order to continue the production in agriculture and the consumption of the products produced by the society in the long term without harming the environment and consuming natural resources (Ikerd, 1993).

In the report titled “Our Common Future” published by the United Nations in 1987, it was stated that the development of countries without harming human health and without affecting people's quality of life could only be achieved with a sustainable agricultural policy.

The report emphasized that such a policy is sustainable when it is designed to enable future generations to use it while conserving the environment and resources. The concept of

“sustainability” emerged as a new expression of the balance desired to be established between economic activities and the environment at a time when it was believed that the destruction of the environment in the name of economic growth was justified. Sustainability is defined as “the ability of present generations to meet their own needs without compromising the ability of future generations to meet their own needs” (UN, 1987).

The concept of “sustainable agriculture”, on the other hand, is not only limited to the long-term protection of natural resources and ensuring their productivity, but also expresses an economically, socially and environmentally balanced agricultural system. Sustainable agricultural practices aim to provide agricultural production in sufficient quantity and quality, to be efficient in resource use, to be sensitive to the environment and to minimize all types of pollution. Sustainable agriculture, which should be evaluated in the context of modern agricultural technologies, expresses a structural transformation that will provide production with alternative energy sources in rural activities in order to eliminate the costs caused by traditional production methods (Karaca, 2013).

Although the concept of sustainable agriculture basically has a basic purpose that includes the agricultural activities necessary for a healthier nutrition of humanity, there are different approaches to fulfill this purpose. These approaches can be broadly listed as follows (Rigby & Caceres, 2001):

- Integrated pest management,
- Integrated product management,
- Low-input agriculture,
- Low-input sustainable agriculture,
- Sustainable agriculture with low external input,
- Agro ecology,
- Permaculture,
- Biodynamic agriculture,
- Organic farming.

Organic agriculture, which is one of the sustainable agricultural practices, is defined by the International Federation of Organic Agriculture Movements (IFOAM) as a production system method that provides continuity for soil, plants, animals, water, air, and in addition, for the health of people (IFOAM, 2021).

There are different definitions of organic agriculture in the literature. The lack of a generally accepted definition also causes some disagreements on organic agriculture. In the definition of organic agriculture by the USA Department of Agriculture (USDA), more technical features of organic agriculture are emphasized and organic agriculture is expressed as a production system that prohibits or largely avoids the use of synthetic fertilizers, pesticides, growth regulators and animal feed additives (USDA, 1980). . In another definition of organic agriculture, it is defined as an agricultural approach that aims to create an integrated agricultural system that is environmentally, socially and economically sustainable with more emphasis on sustainability (Lampkin, 1990). Lampkin stated that organic agriculture is a type of agriculture made by reducing chemical and organic-based inputs as much as possible. In many definitions of organic agriculture, as in Lampkin, it is seen that the theme of sustainability is at the forefront.

Similarly, Francis and Youngberg (1990) stated that organic agriculture is the agriculture made by considering the natural resources and product productivity in agriculture as long-term, while defining organic agriculture, based on the concept of sustainability, and by observing a certain economic, social and environmental balance.

- Even when looking at the definitions, it will be seen that the most important disagreements on organic agriculture are about which phase of agriculture is considered. While some researchers state that agriculture should be seen holistically as farmers, soil, plants, animals and all materials used, it is seen that it is an organic farming approach that is mostly expressed with prohibited and allowed inputs, both in terms of practice and from a legal point of view. It is seen that legal standards or certification processes are at the forefront, especially in the marketing of organic agricultural products (Lampkin, 1996). Approaches to organic farming are basically differentiated on four main elements. These elements can be listed as follows (Demiryurek & Ceyhan, 2008):

- Prohibiting or limiting as much as possible the use of chemical, soluble and inorganic substances such as drugs, fertilizers, growth regulators and animal hormones,
- Certain production techniques such as plant rotation, plant residues, animal manure and biological and mechanical pest, disease and weed control,

- Protecting consumer health, taking into account their preferences, protecting soil fertility, regulating the plant food chain between soil, plant, animal and farm systems,
- Controlling and certification of agricultural products by independent certification bodies during the production and marketing stages.

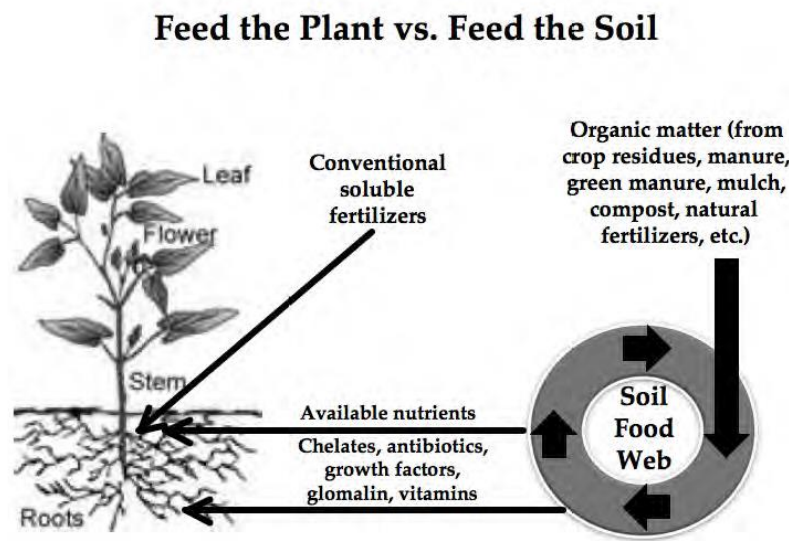
As a result, organic agriculture is neither "fertile and pesticide-free agriculture" nor "natural agriculture". Organic agriculture can be seen as an approach to sustainable farming systems, which has its own specific principles and practices in the process from growing organic products to selling their products (Demiryurek, 2004).

3.1.2 Historical Development

The first approaches to the concept of organic farming appear in Europe and the USA in the late 19th and early 20th centuries. The emergence of organic agriculture in western countries was based on biological-based agricultural science, life and food reform movements, and growing interest in the Far East agricultural system. The motivations of the advocates of organic agriculture of the period to switch to organic agriculture were generally caused by problems such as erosion and soil loss, decreased diversity, decreased quality of food and poverty in rural areas, and organic agriculture approaches were advocated as a solution to these problems (Kueper, 2010).

At the beginning of the 20th century, it is seen that humus farming is the main element of the organic farming approach. In this period, strategies were developed with the thought that humus is very important for the health and vitality of the soil and that humus both protects and revitalizes the soil. The practices carried out within the scope of organic agriculture, on the other hand, consist of practices such as the management of crop residues, the use of animal manure, rotational cultivation, the use of lime and natural rock salts to provide minerals. The main goal in humus farming is to feed the soil. Because in this understanding, the opinion that if the soil is fed, the food web of the whole soil will be fed as well. The soil's food web consists of bacteria, worms, insects, and other organisms found in the soil that provide nutrients to cultivated plants. The figure showing the soil feeding strategy of humus farming developed in the early 20th century is shown below (Kuepper, 2010).

Figure 1. 1920'S Feeding The Plant and Soil Strategy



Source: Kuepper, 2010.

After the First World War, economic and social problems arose in the field of agriculture and agricultural science, as in many different fields around the world, and besides these problems, ecological and soil-related problems were also experienced. Among these problems in the field of agriculture, the debates were mostly shaped on mineral fertilizers, pesticides and chemical techniques, and some circles considered them as a solution and some as a problem. During this period, many different areas of discussion in the field of agriculture emerged in European countries such as Germany, England, and in the USA. Among these discussions are the problems in agriculture, management problems and yield reduction due to the increase in the use of mineral fertilizers and the decrease in the use of organic fertilizers. The views expressed in this framework regarding mineral fertilization in Germany are listed below (Vogt, 2007):

- Excessive use of mineral fertilizers harms plants and disrupts their metabolism. It is easier for plants with weak metabolism to be attacked by pathogens and harmful insects.
- The use of fertilizers with high acidity reduces the growth of plant roots, and the soil structure is deteriorated as a result of the deterioration of the mineral balance of the soil.

- Organic fertilization and the use of machinery cause soil compaction and soil compaction reduces the water holding capacity of the soil. Droughts occur due to this situation.
- The reason for the decrease in soil fertility is soil fatigue. Soil fatigue cannot be explained by harmful organisms or nutrient deficiency alone. The main factor causing soil fatigue is harmful organic substances.
- One of the reasons for the decrease in yield is the use of the previous harvest as seeds. High nitrogen levels in the soil and plants prevent the seeds from fully maturing, and this prevents the development of the plants the following year.

The crises that emerged in the early 1920s and the discussions made allowed the emergence of scientific theories, and these theories emerged as successful agricultural systems in the 1930s and 40s. After humus farming, the concept of "organic agriculture" has been used for the first time since the 1940s. Organic farming was first used in the book "Look to the Land" published in 1940, and since that date, while the popularity of humus farming has decreased, organic farming has become more widespread. Organic farming is used in this book as a concept characterizing the agricultural techniques using humus, organic farming is used to mean the use of outdated old natural systems, not chemicals, in the nutrition of plants (Kuepper, 2010).

After the Second World War, very rapid technological developments emerged and the agricultural sector got its share from these technological developments. Especially with the agricultural techniques called "Green Revolution" initiated in the 1960s, increases of up to 100% have been achieved in products. This boom in production is considered one of the most important technological developments of the century. However, as these farming techniques cause the ecosystem to deteriorate very rapidly, it has come to the brink of an unsustainable development. Soil-water-air is polluted, food produced using various chemical pesticides and fertilizers has caused serious health problems in humans (Lockeretz, 2007).

In plant production made with these production techniques; The use of chemical fertilizers and pesticides, and the use of feed additives such as hormones and antibiotics in animal production have increased yields and reduced costs. However, some plant and animal products containing residues produced by these techniques have adversely affected human

health. In recent years, significant increases have been observed in health problems, especially cancer, in people who eat such unhealthy products (Lockeretz, 2007).

In the conventional agriculture system, as a result of intensive activities carried out in order to get higher yields from the unit area, adverse effects such as excessive exploitation of the soil, environmental pollution, deterioration of the natural balance and product quality, and residue formation in the product have emerged. Conscious producers and consumers came together and developed the concept of Ecological Agriculture for the elimination of these negativities and for the production and consumption of healthier products (Bayram et al., 2006).

While studies on organic agriculture on a national basis in different countries were carried out independently, these studies were gathered under the name of "International Federation of Organic Agriculture Movements" (IFOAM) after the 1970s. The main purpose of this organization, located in Germany, is to set standards for organic farming and to coordinate the flow of information about organic farming in the world. The first organic agriculture regulation in EU countries was published in 1991 for plant production. Organic agriculture regulation for livestock was published in 1999 and entered into force in 2000 (Bayram et al., 2006).

3.1.3 Purpose and Principles

Organic agriculture refers to one of the wide range of production techniques developed for the protection of the environment and human health. It is an agricultural ecosystem that includes certain formulas and standards in organic agriculture and aims sustainable agriculture. Minimizing the external resources used in organic farming techniques compared to traditional farming methods is one of the main goals. In order to achieve this goal, on-farm resources are used as much as possible. In this way, the use of both synthetic fertilizers and pesticides is avoided. In organic agriculture, it is aimed to minimize the damage to the environment by using agronomic, biological and mechanical techniques instead of synthetic materials and thus to reach the Sustainability targets (Ramesh et al., 2005).

Organic farming practices around the world are carried out according to IFOAM standards. The basic Organic farming standards set forth by IFOAM provide a framework for countries' local and regional practices. Organic farming activities are certified by regional

and local independent organizations within the framework of regulations, and these organizations have to act in accordance with current local and global legislation in certification processes. Regulations in organic agriculture by IFOAM include three basic levels. These levels (Stolze et al. 2000);

- Rules and practices that prohibit the use of certain substances determined for organic agriculture, and determine the requirements and restrictions of organic agriculture at a minimum level,
- General and more detailed rules, including preventive and restrictive rules, by the organizations that determine the general practices of organic agriculture and that issue certificates,
- Recommendations that include behaviors that need to be followed in order to comply with the general objectives of organic farming and the established rules.

The general principles of organic agriculture determined by IFOAM are as follows (Stolze et al. 2000);

- Increasing soil fertility and ensuring long-term sustainability of agriculture,
- Avoiding all synthetic nitrogen fertilizers, including chile nitrate,
- Not using synthetic pesticides,
- Determination of total and external stocking densities by authorized institutions,
- Making animal husbandry regulations in order to meet all the physiological needs of animals at the maximum level within the scope of animal husbandry,
- Not using hormones and drugs that support the growth of animals in animal husbandry

The main purposes of organic production determined by IFOAM (1998) are shown in Table 1.

Table 1. The Main Purposes of Organic Agriculture

1	To produce food of high quality in sufficient quantity.
2	To interact in a constructive and life-enhancing way with natural systems and cycles.
3	To consider the wider social and ecological impact of the organic production and processing system.
4	To encourage and enhance biological cycles within the farming system, involving microorganisms, soil flora and fauna, plants and animals.
5	To develop a valuable and sustainable aquatic ecosystem.
6	To maintain and increase long-term fertility of soils.
7	To maintain the genetic diversity of the production system and its surroundings, including the protection of plant and wildlife habitats.
8	To promote the healthy use and proper care of water, water resources and all life therein. To use, as far as possible, renewable resources in locally organized production systems.
9	To create a harmonious balance between crop production and animal husbandry.
10	To give all livestock conditions of life with due consideration for the basic aspects of their innate behavior.
11	To minimize all forms of pollution.
12	To process organic products using renewable resources.
13	To produce fully biodegradable organic products.
14	To produce textiles which are long lasting and of good quality.
15	To allow everyone involved in organic production and processing a quality of life which meets their basic needs and allows an adequate return and satisfaction from their work, including a safe working environment.
16	To progress toward an entire production, processing and distribution chain which is both socially just and ecologically responsible.

Source: IFOAM, 1998

3.1.4 Advantages and Disadvantages

Organic agriculture has advantages and disadvantages compared to other production methods. Increasing popularity day by day, organic agricultural products aim to highlight their existing advantages in order to meet increasing domestic and foreign demands. As in every production system, the disadvantages in organic agriculture are tried to be minimized. The advantages and disadvantages of organic agriculture in the general framework are categorized as follows.

Table 2. The Advantages and Disadvantages of Organic Agriculture

Advantages	Disadvantages
Producer income increases depending on the nature of the product.	The fluctuation in the supply of agricultural products poses a risk for the producer.
Savings are achieved from chemical fertilizers, pesticides and energy inputs, the prices of which are increasing rapidly.	The proximity of organic farming lands to modern production lands may cause them to be affected by the chemicals used in these areas.
With contract farming, there is a product purchase guarantee.	There is not enough information and trained labor force on organic agriculture.
Export prices of organic products are 10-20% higher than other products. This increases the profit rate.	Especially the uncertainty of demand in the domestic market poses a problem for marketing.
The export of organic products will create additional capacity in the production of agricultural products. Thus, the consumer base expands.	The fluctuation in the supply of agricultural products poses a risk for the producer.

Source: Durmaz, 2010

3.2 International Organizations Related to Organic Agriculture Organic Agriculture in the World

In the 20th century, many local and international organizations have emerged to attract the attention of farmers, researchers and all other agricultural sector stakeholders to organic agriculture and to encourage people. The main objectives of these organizations were to train farmers on organic farming and to increase the importance of organic farming. However, although these organizations were established for very great purposes, it cannot be said that the effect of organic agriculture is at the desired level. Lockeretz(2007) attributes the reason for this to the limited resources of the established organizations and to the fact that the existing resources are not used well enough as a result of reluctance to cooperate with other organizations. Lockeretz draws attention to the fact that the emergence of these organizations is not a reason for increasing interest in organic agriculture, but a result of increasing interest.

3.2.1 IFOAM (International Organic Agriculture Movements)

The increasing interest in organic agriculture since the 1940s began to become more systematic with the organic agriculture organizations established locally in many countries in the 1970s. Due to the lack of a globally centralized organization, the first structuring took place more locally. Globally, social sensitivities towards the environment necessitated the establishment of an international organization in the field of agriculture. Thus, IFOAM, the first international organization in the field of organic agriculture, was established in Germany in 1972 (Sligh & Cierpka, 2007).

The organic agriculture sector, which started to gain commercial value with the establishment of IFOAM, has started to become more global and regular. Since its establishment, IFAOM's objectives can be listed as follows (IFOAM, 2021);

- To gather the agricultural movements in all countries in one goal and to combine the services required in this regard on the basis of an international work,
- To guide the progress of organic agriculture in a regular way,
- To ensure the use of food production techniques that reduce the use of non-renewable energy resources worldwide, and prepare the necessary regulations in this context.

IFOAM aimed to create a network in the field of organic agriculture and to maximize the exchange of information between countries, and in this respect, it achieved a certain amount of success in a short time. In 1977, the first international conference was held in Switzerland and the theme of the first conference was Sustainable Agriculture. Later, these conferences started to be held every two years in order to raise social awareness and to emphasize the focal points of organic agriculture. Along with these conferences, IFAOM has started to organize conferences in some special fields such as tea, coffee, cotton and biodiversity since 1985. IFOAM has pioneered the establishment of fairs such as BioFACH, which allows people to come together and exchange information on a global level, and to establish fairs at lower levels in Rio de Janeiro, Washington, DC and Tokyo. Apart from these conferences and fairs, IFOAM also allows people to access important information and statistics on Organic Agriculture through journals and bulletins such as Ecology and Farming (Geier, 2007).

Founded in 1972 with the representation of only five countries, IFAOM had more than 100 members by the end of the 1990s. However, the organization, which held conferences only in Western Europe and North America until the 1980s, carried the countries it held conferences to Burkina Faso, Australia, Hungary and Brazil since 1980 (Lockeretz, 2007).

3.2.2 FAO (United Nations Food and Agriculture Organization)

The United Nations Food and Agriculture Organization was established in 1944 and leads international efforts for the eradication of hunger in the world and the development of rural areas, hosting poor and hungry people all over the world and serving all countries. Established as an organization, FAO acts as a source of information and advice (Demiryurek, 2004). FAO, which was founded with the participation of 42 countries when it was first established, has a total of 194 members today (Dalling, 1957).

The purpose of FAO is primarily to increase the quality of life of people and to improve the living conditions of people in rural areas. Other objectives of the organization are to increase the quality of food consumed by people and to contribute to the development of the world economy. In general terms, FAO aims to increase and support agricultural qualities, to ensure safety in the food sector and to maintain its sustainability in order to protect the natural resources of countries that are at the forefront and in an effort to develop (FAO, 2021).

There are representatives of member countries in FAO and it is held every two years, and in these meetings, the financial contributions of the member countries to the establishment and the two-year program are decided. FAO also provides technical support to member countries and leads the technical power existing in developed countries to contribute to less developed countries (Dalling, 1957).

For the development of organic agriculture, FAO has started to contribute to the development of standards through networking, market analysis, environmental impact assessments, development of technical knowledge, and responding to countries' requests for assistance since 1999 (FAO, 2021).

3.3 Current Situation of Organic Agriculture in the World

Although the history of organic agriculture in the world in general dates back to the 1940s, the establishment of the International Federation of Organic Agricultural Movements (IFOAM) in 1972 and the Organic Agriculture Institute in Switzerland in 1973, firstly, made progress in organic agriculture by taking concrete steps. In the last 10 years, there has been a great increase in organic farming areas around the world. While an increase of 2.97 million square meters was observed in 2019 alone, large increases are recorded in many countries every year. The changes in organic farming areas in 6 continents in the last 10 years and the increases in 2019-2020 are shown below.

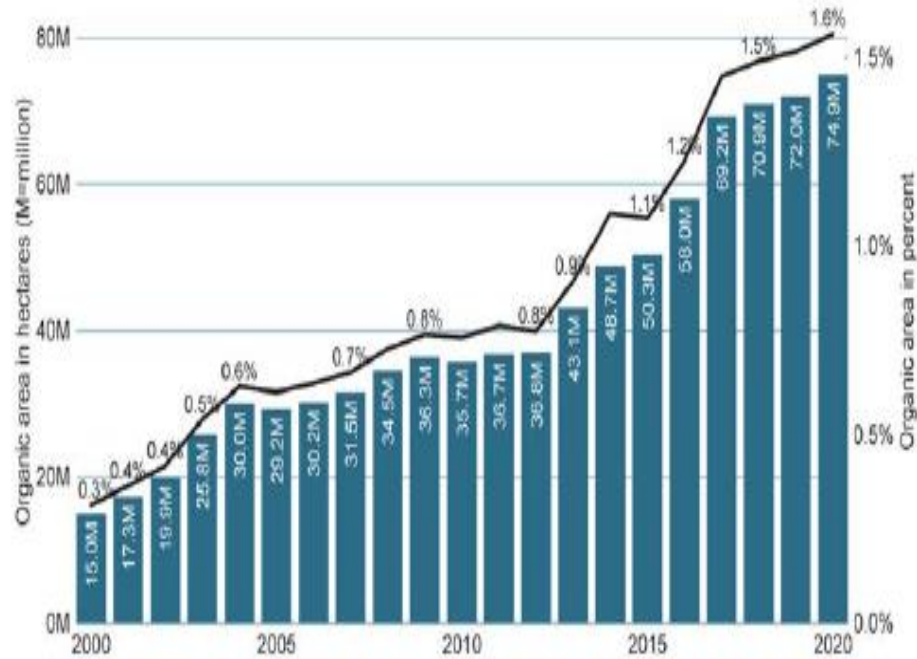
Table 3. Growth of Organic Agriculture Land (10 Years)

Region	Organic agri. land 2019 [ha]	Organic agri. land 2020 [ha]	1 year growth [ha]	1 year growth [%]	10 years growth [ha]	10 years growth [%]
Africa	1'937'873	2'086'859	148'986	7.7%	1'017'163	95.1%
Asia	5'713'875	6'146'235	432'360	7.6%	2'460'086	66.7%
Europe	16'494'912	17'098'134	603'222	3.7%	6'549'611	62.1%
Latin America	8'296'331	9'949'461	1'653'129	19.9%	2'983'312	42.8%
Northern America	3'647'623	3'744'163	96'539	2.6%	724'476	24.0%
Oceania	35'873'526	35'908'876	35'350	0.1%	24'525'183	215.4%
World*	71'957'852	74'926'006	2'968'154	4.1%	38'257'102	104.3%

Source: FIBL & IFOAM, 2022

The graph of the change in organic farming areas in the world in the last 20 years is shown below.

Figure 2. Growth of Organic Agriculture Land (2000-2020 Years)



Source: FIBL & IFOAM, 2022

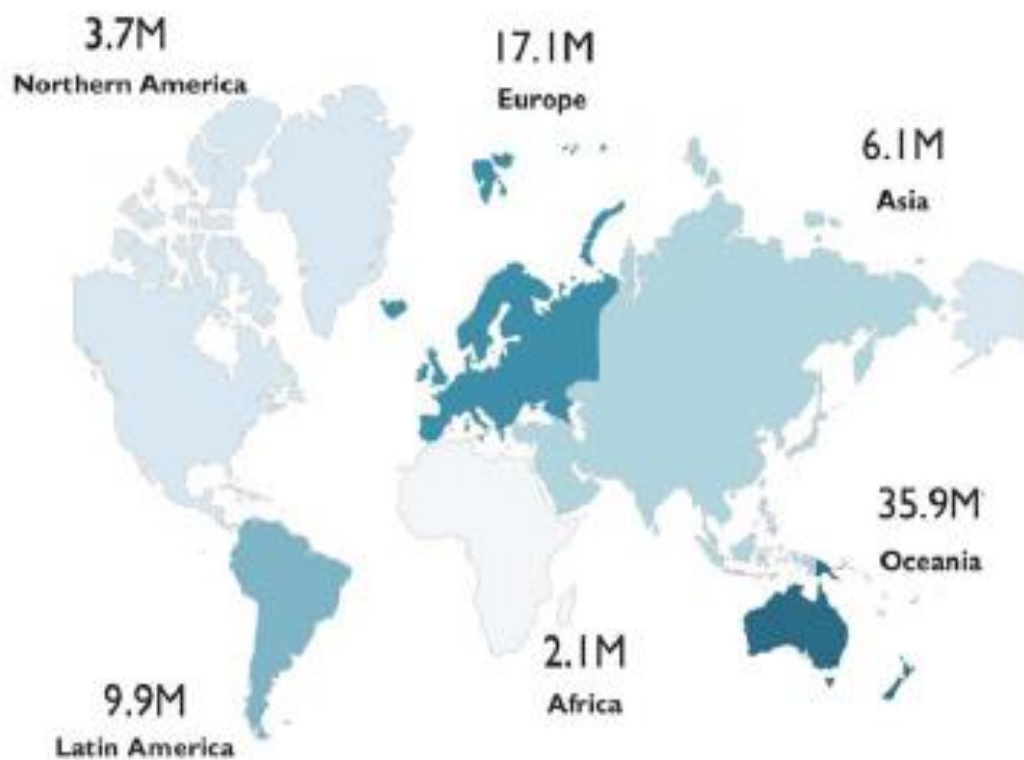
As can be seen in the graphic above, the area where organic farming is practiced worldwide in 2000 was 15 million hectares, this figure increased to 74.9 million square meters in 2020. This figure shows us an increase of nearly 5 times in the last 20 years.

According to the annual report of IFAOM, organic farming is carried out in approximately 74.9 million hectares of organic farming area in 190 countries in the world in 2020 (FIBL&IFOAM, 2022). The distribution of Organic Farming areas by continents is as follows.

- Oceania:35,9 million hectares
- Europe: 17,1 million hectares
- Latin America: 9,9 million hectares
- Asia: 6,1 million hectares
- Northern America: 3,7 million hectares

The distribution of organic farming areas in the world is shown below on the world map.

Figure 3. Organic Agriculture Land in the World (2020)



Source: FIBL & IFOAM, 2022

This agricultural area is 1.6% of the total agricultural land. Regionally, the highest organic farming areas in the world are 9.7% of the total agricultural areas in Australia, 3.4% in Europe (9.2% in EU countries).

The percentage distribution of Global Organic Agriculture areas is as follows:

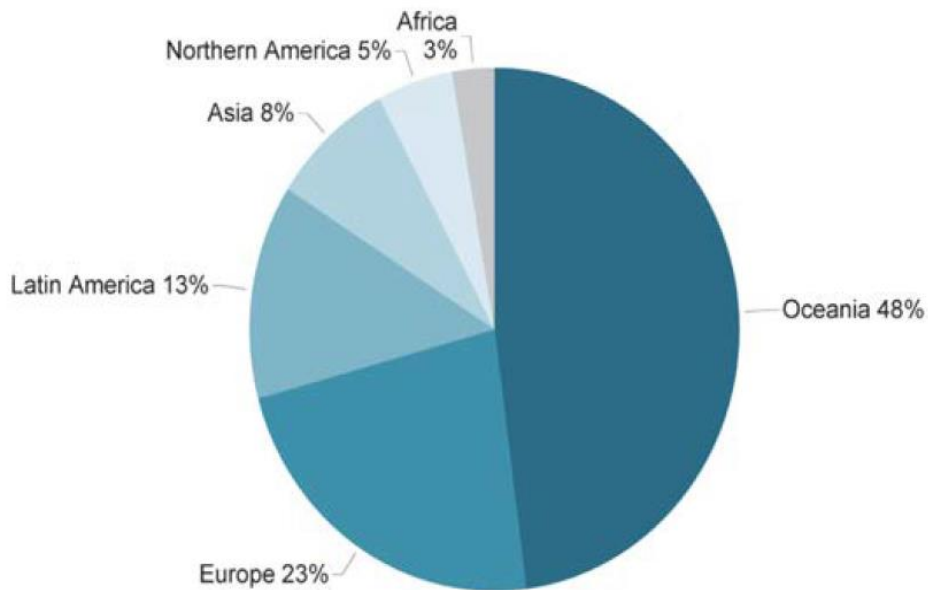
Table 4. Share of Total Organic Agriculture Land by Region

Region	Organic agri. land [ha]	Share of total agri. land
Africa	2'086'859	0.2%
Asia	6'146'235	0.4%
Europe	17'098'134	3.4%
Latin America	9'949'461	1.4%
Northern America	3'744'163	0.8%
Oceania	35'908'876	9.7%
World*	74'926'006	1.6%

Source: FIBL & IFOAM, 2022

The share of the continents in the total organic agriculture area in the world is shown below.

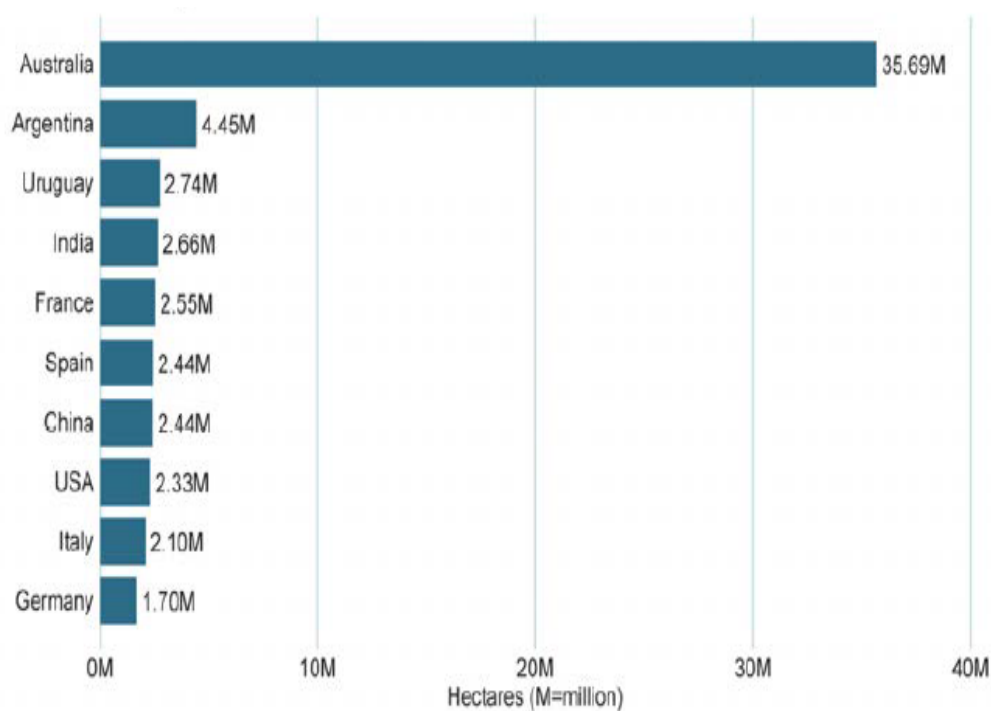
Figure 4. Distribution of Total Organic Agriculture Land by Region



Source: FIBL & IFOAM, 2022

When I look at the country basis, it is seen that the most organic agriculture area is in Australia. After Austria, Argentina ranks second with 4.45 million hectares. The top 10 countries according to the size of organic farming areas and their organic farming areas are shown below.

Figure 5. The Top Ten Countries With The Largest Organic Agriculture Areas

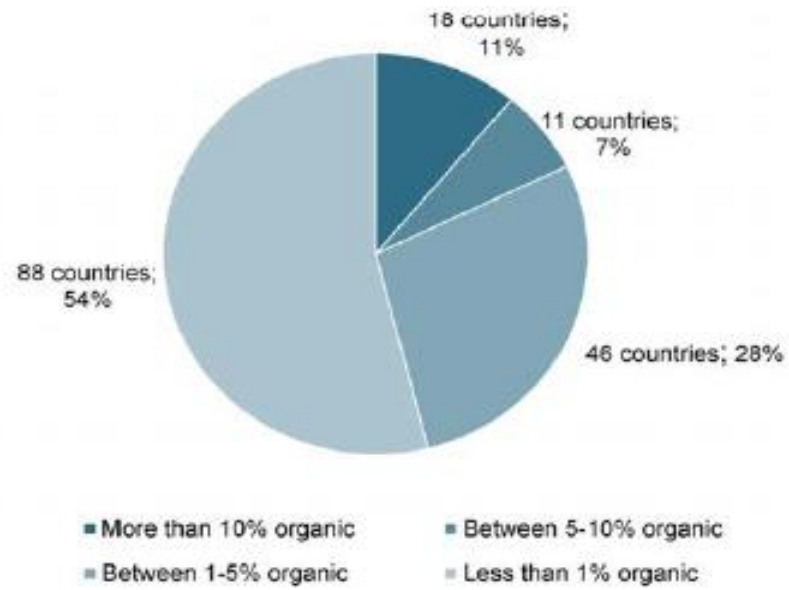


Source: FIBL & IFOAM, 2022

When we look at Figure 5, it is seen that four European countries are among the ten countries with the highest organic farming area in the world. Among these countries, it is seen that France has 2.55 million hectares, Spain has 2.44 million hectares, Italy has 2.10 and Germany has 1.70 million hectares of organic farming area.

On the other hand, in the distribution of organic agricultural lands to total agricultural lands around the world, it is seen that only 18 countries have a ratio of over 10%. In 88 countries, this rate is even below 1%. Organic farming rates according to the number of countries are shown below.

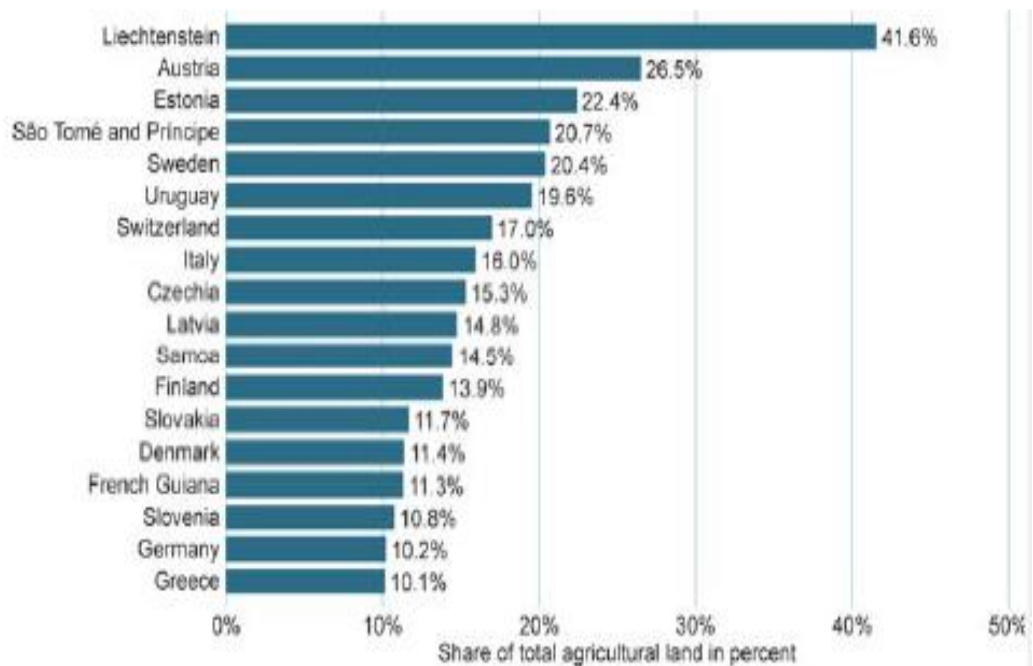
Figure 6. Distribution of Organic Agriculture Shares of the World



Source: FIBL & IFOAM, 2022

It is seen that the majority of the 18 countries with more than 10% organic agriculture area in the world are countries located in the European continent. The list of 18 countries and the ratio of organic agricultural areas to the total agricultural area are shown below.

Figure 7. Countries With An Organic Share Of The Total Agriculture Land Above 10%

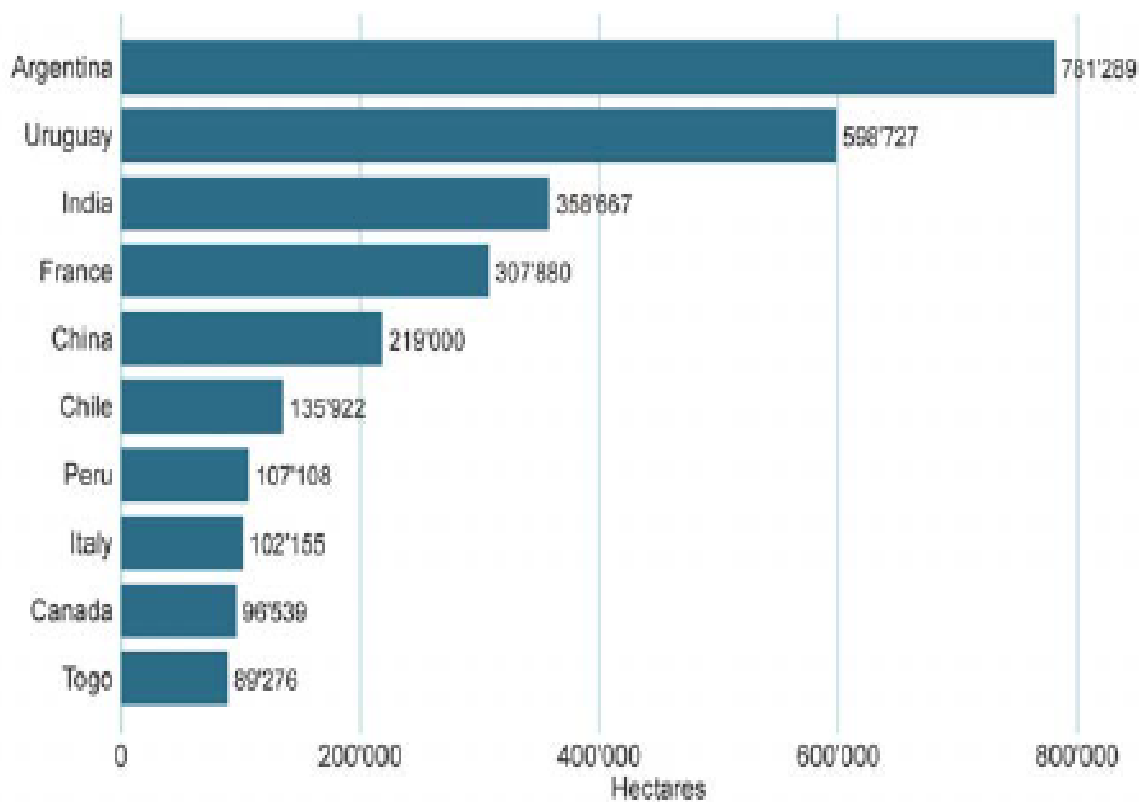


Source: FIBL & IFOAM, 2022

Considering the ratios of organic agricultural areas within the total agricultural areas of the countries, Liechtenstein ranks first with 41.6%, Austria ranks second with 26.5%, and Estonia with 22.4% in third place.

When a ranking is made based on the increase in organic farming areas in 2019, it is seen that the biggest increase in the world occurred in Argentina. In Argentina alone, the organic farming area increased by a total of 781,289 hectares in 2019. After Argentina, Uruguay comes second with an increase of 598,727 hectares. The top 10 countries with the highest increase in 2019 are shown below.

Figure 8. Top Ten Countries with the Highest Increase of Organic Agriculture Land



Source: FIBL & IFOAM, 2022

There are 3.4 million organic agriculture producers worldwide. While the largest organic agriculture producers in the world are in India, Ethiopia and Tanzania, 91% of the producers are located in Asia, Africa and Europe. The number of producers of the continents and the change by years are shown below.

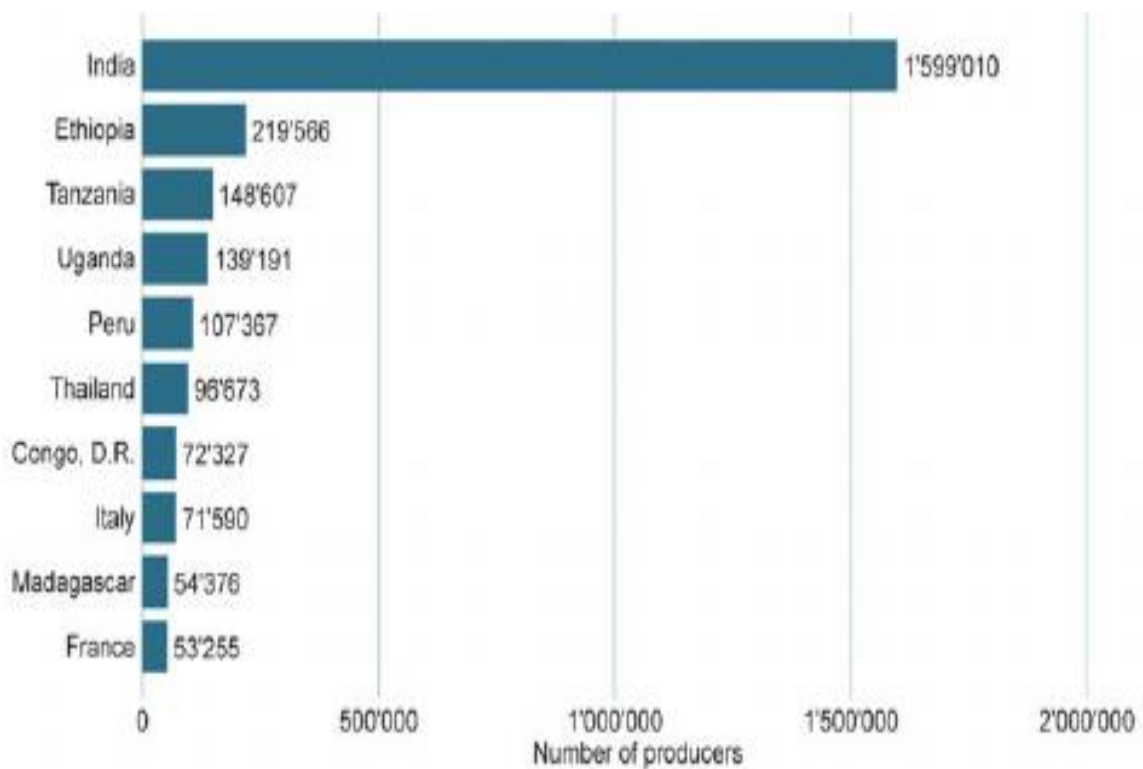
Table 5. Number of Organic Agriculture Producers in the World

Region	2019 [no.]	2020 [no.]	1 year growth [no.]	1 year growth [%]	10 years growth [no.]	10 years growth [%]
Africa	850'781	833'986	-16'795	-2.0%	306'073	58.0%
Asia	1'588'400	1'808'464	221'228	13.9%	1'197'342	195.9%
Europe	428'677	417'977	-10'700	-2.5%	128'349	44.3%
Latin America	224'388	270'472	46'084	20.5%	-37'075	-12.1%
Northern America	22'153	22'448	295	1.3%	5'850	35.2%
Oceania	16'117	15'930	-187	-1.2%	1'744	12.3%
World	3'129'893	3'368'254	238'360	7.6%	1'601'464	90.6%

Source: FIBL & IFOAM, 2022

Looking at the number of producers on a country basis, the producer numbers of the top 10 countries are shown below.

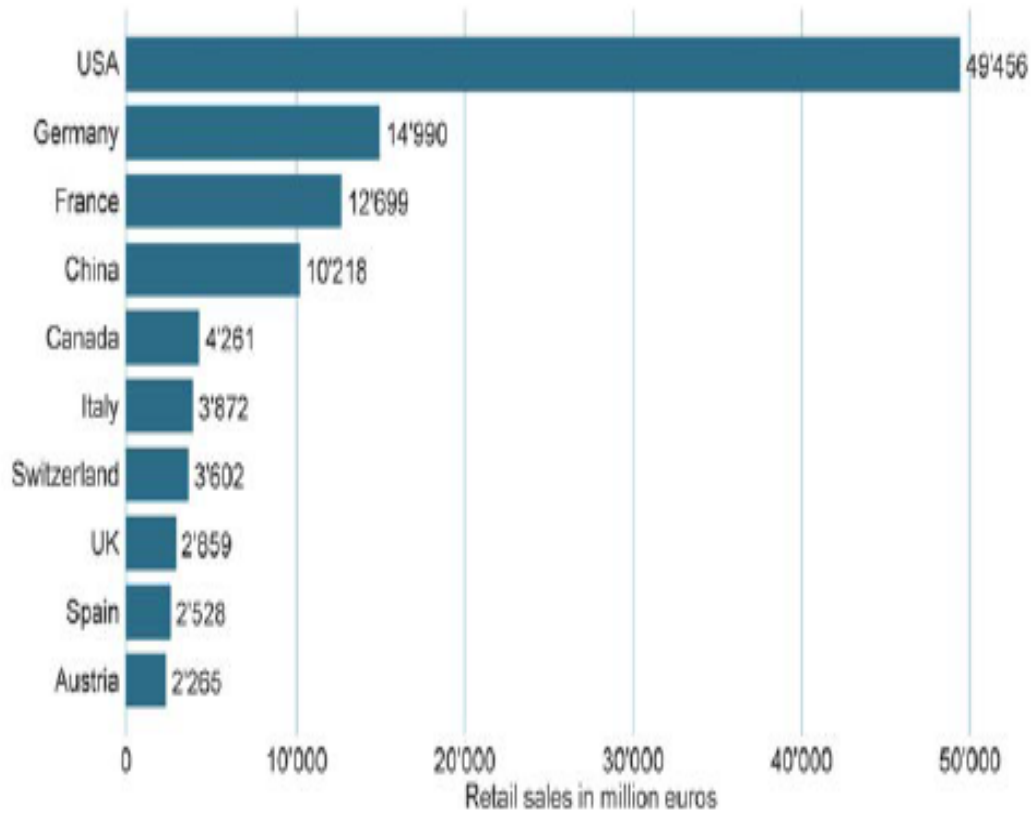
Figure 9. The Ten Countries with the Most Organic Producers



Source: FIBL & IFOAM, 2022

Looking at the commercial dimension of organic agriculture, it is seen that the world's largest organic food market is in the USA, followed by Germany. The top 10 leading organic food markets in the world are shown below.

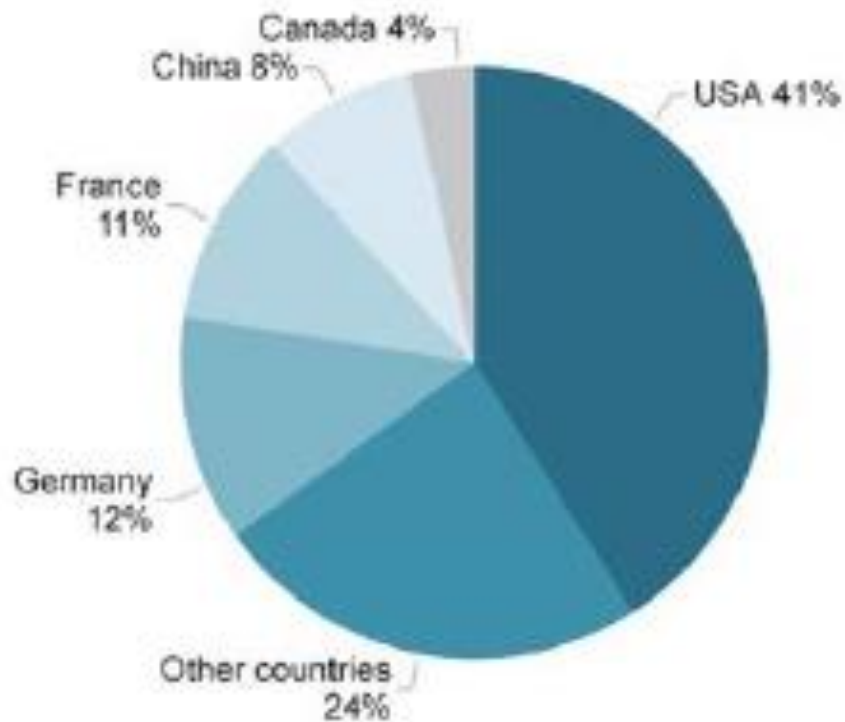
Figure 10. Top Ten Countries with Largest Organic Market in the World



Source: FIBL & IFOAM, 2022

In terms of retail sales of Organic Food, it is seen that the world's organic food market share is 41% in the USA and 12% in Germany. The distribution of retail organic food sales worldwide is shown below.

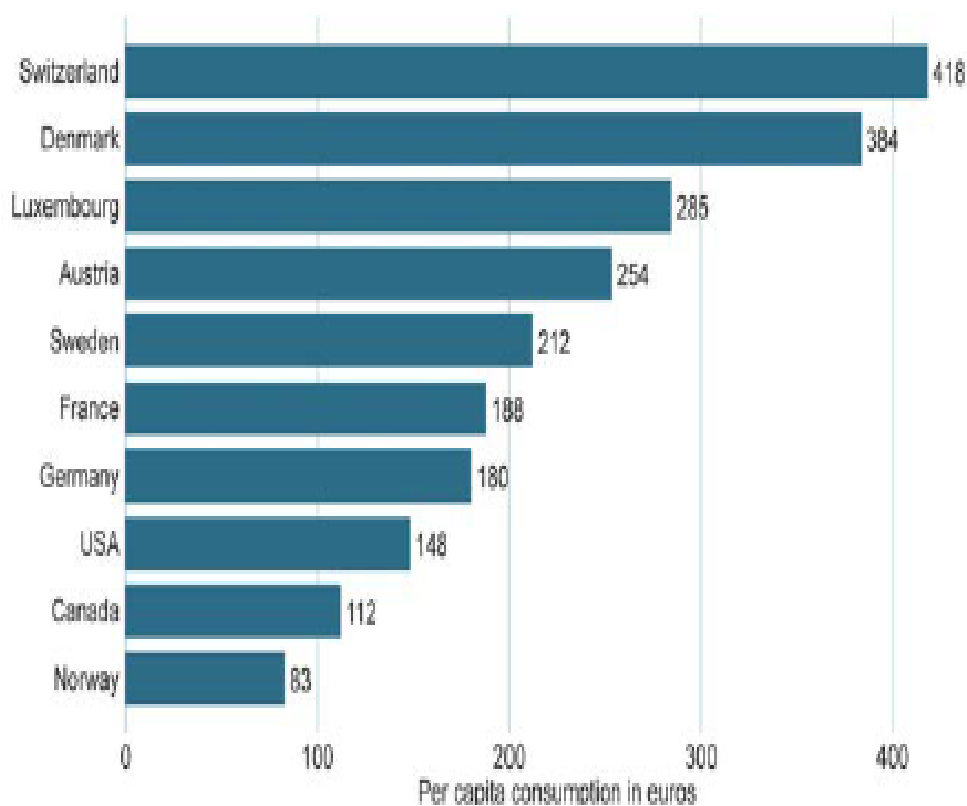
Figure 11. Distribution of Retail Sales By Country



Source: FIBL & IFOAM, 2022

In terms of consumption, it is seen that seven of the top 10 countries in the world in per capita organic food consumption are in Europe. The first three of these countries are Switzerland, Denmark and Luxemburg. The top ten countries with the highest consumption of organic food worldwide are shown below.

Figure 12. Top Ten Countries with the Highest per capita Organic Food Consumption in the World



Source: FIBL & IFOAM, 2022

3.4 Organic Agriculture in Europe

The history of organic farming in Europe dates back to the beginning of the 20th century. It first began in 1924 with a series of biological agriculture conferences given by Rudolf Steiner in response to the use of agrochemicals. Because at the beginning of the 20th century, it is seen that the first use of artificial fertilizers and chemicals in agriculture was started. Steiner opposed these techniques applied in agriculture and argued that plant and animal residues should be used as fertilizer. Organic agriculture, also called biodynamic agriculture, first appeared in Europe in this period. In this period, it is seen that Albert Howard also advocated organic farming methods in the Plant Industry Institute, which he founded with his wife. However, the widespread use of artificial fertilizers and chemicals, considering the need to increase productivity in agriculture during the Great Depression, which affected the whole world in 1929, destroyed the effects of these studies on organic agriculture. With the new agricultural techniques and practices that emerged after the Second

World War, the interest in organic farming decreased and there was a serious increase in the use of artificial fertilizers and chemicals (Holka et al., 2022).

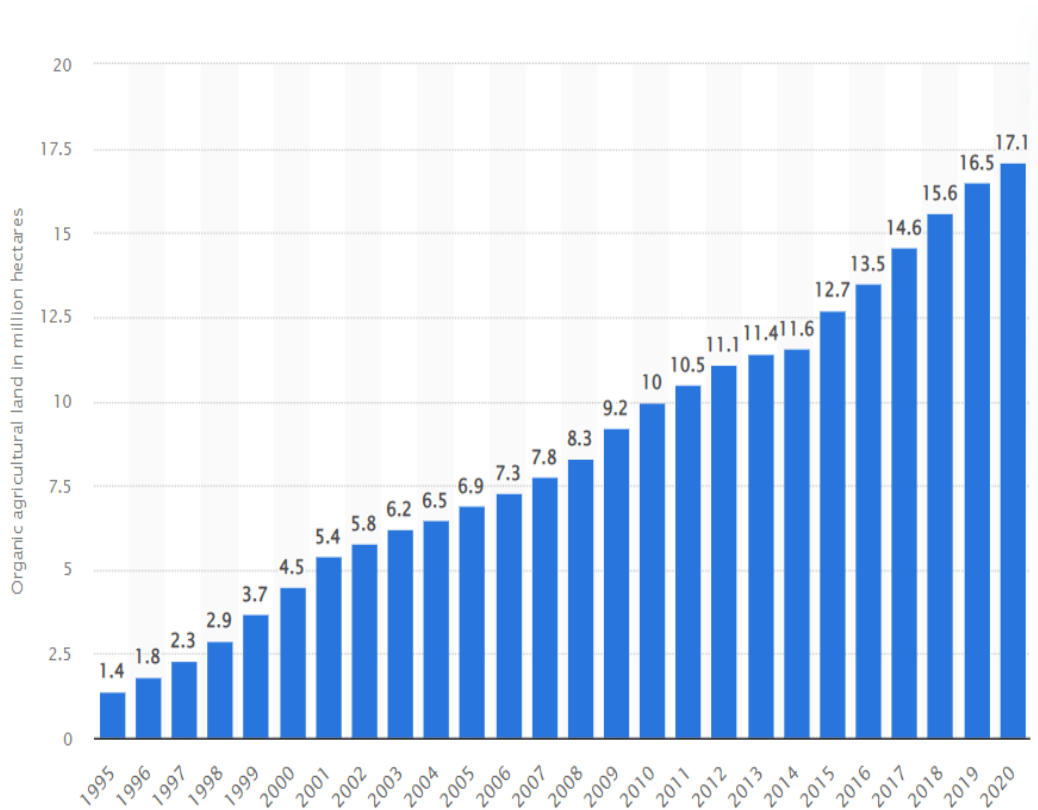
After the Second World War, with the support of institutions such as the World Bank and the Ford Foundation, industrial agriculture began to be seen as the only solution to produce enough food for the entire world population. However, although there were quite a lot of expectations for industrial agriculture, it was later seen that these expectations were not realized, especially for farmers. Not only the damage to nature and human health, but also the economic difficulties that farmers have begun to experience, have led to the production of alternatives to industrial agriculture. Because with industrial agriculture, the expected increase in the income of the farmers was not, and while the large agricultural enterprises were gaining, the farmers began to lose. There were many factors in this, especially the farmers' dependence on fossil fuels needed for the agricultural process, and the results were unreliable when artificial seeds were not provided under optimal conditions. The fluctuation in energy prices with industrial agriculture has also started to create great pressure on farmers who are dependent on fossil fuels (Konstantinidis, 2012).

However, public awareness of the harm caused by traditional agricultural methods to human health and nature in Europe started to increase since the 1970s, and as a result, IFOAM was established in 1972. Since then, IFOAM has played a major role in promoting organic farming. However, until the 1990s, it was not possible to enact a law on organic agriculture throughout the EU. European Union countries jointly took the first step in organic agriculture in 1991. This step was taken with the organic agriculture regulation issued on June 24, 1991. This regulation has been revised and continued to be implemented in different ways until today and is still the most important legal instrument of organic agriculture in the EU (Gurkan and Yasar, 2007).

With this regulation enacted in 1991, there has been a rapid change in the production and consumption of organic agricultural products in EU countries, and this situation has increasingly continued until today. From 2000 to 2020, the area of organic farming has increased nearly fourfold across the EU. Today, the total organic farming area in the EU constitutes 9.2% of the total agricultural area with an area of 75 million hectares. In the EU's total organic agricultural area structure, arable land is 46% (6.8 million hectares), followed by permanent grassland (grassland and pastures) and permanent crops (fruit trees and fruits, olive groves and vineyards) with a share of 42%. It has a 12% share. There is still room for

further expansion of organic farming. According to the EU's action plan, acquiring 25% of the EU's organic land will require tripling the organic land area between 2019-2030 (FIBL, 2022). In Figure 13, the change of organic farming areas in EU countries between 1995 and 2020 is shown.

Figure 13. Area of Organic Agricultural Land in Europe (1995-2020)



Source: Statista, 2022

3.4.1 Change of European Agriculture Policies

Since 1945, European Union countries have turned to some protectionist agricultural policies in order to reorganize their economies. After the war, France, Britain and Italy introduced packages of measures to make their agricultural industries more efficient and stabilize the markets, while the Netherlands and Belgium took these measures during the war. West Germany, on the other hand, wanted to increase productivity in agriculture and increase the income of farms with the agricultural law enacted in 1955. This law, enacted by West Germany, later formed the framework of the agricultural policies of the European Economic Community in the Treaty of Rome in 1957 (Hoggart et al., 2014).

The core of this agricultural policy of the EEC was to increase productivity in agricultural production, stabilize agricultural markets and ensure that consumers can access agricultural products at affordable prices. However, within this common policy (Common Agriculture Policy), there were also three basic principles such as common price, co-financing and common preference. The creation of such a common market across Europe has provided different benefits for countries (Ingersent and Rayner, 1999). With this agreement, incentives were provided for the products required to be qualified within the EEC, and different tariffs began to be applied for the products to be imported (Sampson and Yeats, 1977).

The first reform attempt under the CAP was made in 1968 by Mansholt, who was also the first agricultural Commissioner. Mansholt's goal was to turn agricultural farms into larger businesses by reducing agricultural employment. Because the farmers with low education levels and high average age did not participate in the incentives provided by the CAP, and the possibility that this idle situation in agriculture would put pressure on the economy over time prompted Mansholt to take a precaution in this regard. This reform package, known as the Mansholt plan, would transform farms into large enterprises and increase productivity. However, this plan of Mansholt did not succeed as desired. The reason for this is the opposition by farmer organizations to the retirement of many agricultural workers and the fact that many areas will be removed from agricultural areas. However, this situation was also found to be contrary to the small-scale family farm tradition, which is common in all European countries (Lynggaard, 2006, 87-89).

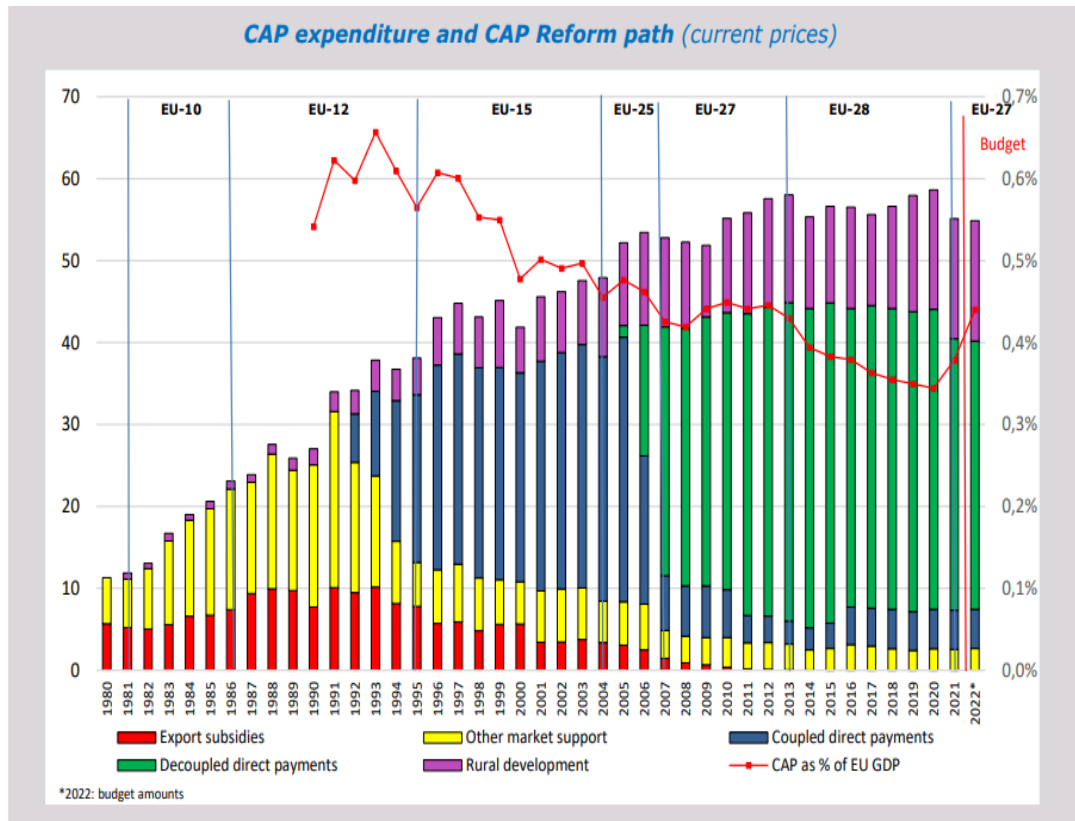
Since the 1970s, the "environment" has begun to enter the agenda of the European Economic Community. For the first time, some Environmental Action Plans were put forward by the Council in 1973. From this date on, an awareness has started to emerge about how much the techniques applied in agriculture harm the environment, and there has been talk about the harms of chemicals and artificial fertilizers.

It is seen that the first link on environmental pollution and common agricultural policies was officially established in 1980. In this period, a consensus was reached in the European Parliament that the basic principles of common agricultural policies were insufficient in terms of environmental concerns. By 1985, it was officially accepted that the agricultural practices applied in Europe directly damaged the environment and caused great damage to the ecosystem (Garzon, 2006).

Although the damage to the environment caused by the agricultural techniques used has been discussed since the 1970s, it was necessary to come to the 1990s for concrete steps to be taken in this regard. The organic agriculture regulation issued in 1991 and the agricultural reform introduced by MacSharry in 1992 were the first concrete steps taken. Along with these reforms and regulations, it has been requested that the member countries take measures on the environment, along with the support they give to agriculture (Garzon, 2006).

Although the damage to the environment caused by the agricultural techniques used has been discussed since the 1970s, it was necessary to come to the 1990s for concrete steps to be taken in this regard. The organic agriculture regulation issued in 1991 and the agricultural reform introduced by MacSharry in 1992 were the first concrete steps taken. Along with these reforms and regulations, it has been requested that the member countries take measures on the environment together with the support they give to agriculture. In addition, it is foreseen to give priority to agricultural development in the funding of the CAP in order to support young farmers and organic agriculture envisaged within the scope of the reform. Therefore, two titles were created in the funds of CAP as direct support and agricultural development (Garzon, 2006, 48). The distribution of CAP's funds between 1980-2022 is shown in Figure 14.

Figure 14. Distribution of CAP Expenditure (1980-2022)



Source: European Commission, 2022

When Figure 14 is examined, it is seen that the budget allocated to agricultural development has increased since the 2000s. However, despite this, it is seen that this budget, which determines the direction of agricultural development such as environmental measures and supporting young farmers, is still quite less compared to the traditional agricultural budget. Supporting organic agriculture in rural development has a central position. In addition, it includes projects such as small farmers, agricultural tourism and the protection of biodiversity. There are also economic measures, such as support in the marketing of local foods and handicrafts. However, as seen in Figure 14, although there has been a noticeable increase in the last 20 years, it cannot be said that it has reached a sufficient level yet.

The change in the number of farms in EU countries as a result of the reform made by Cap is shown in Table 6. In these data, which were shown from 1966 to 2007, it is seen that there is a decrease in the number of farms in almost all countries. Although the Mansholt plan could not be implemented as desired, it is seen that all countries except England and Greece have lost their farms since this date.

Table 6. Number of Farms in Europe (1966-2007)

	1966	1983	1990	1995	2003	2007
Austria				221,800	173,470	164,810
Belgium	214,800	102,600	85,040	71,000	54,930	48,010
Bulgaria					661,640	489,050
Cyprus					45,110	40,110
Czech Rep.					44,780	38,880
Denmark		98,700	81,200	68,800	48,390	44,350
Estonia					36,850	23,340
Finland				101,000	74,830	67,980
France	1,708,000	1,129,600	923,590	734,800	614,000	527,350
Germany	1,246,000	767,600	653,600	566,900	412,300	370,480
Greece		958,700	849,450	802,400	823,730	860,000
Hungary					769,260	626,070
Ireland			170,450	153,400	135,570	128,100
Italy	2,980,500	2,832,400	2,658,960	2,482,100	1,963,250	1,678,760
Latvia					126,610	107,690
Lithuania					272,110	230,270
Luxembourg	8,610	4,600	3,940	3,200	2,450	2,290
Malta					10,900	10,990
Netherlands	247,000	138,500	124,800	113,200	85,500	76,740
Poland					2,163,360	2,390,920
Portugal			598,740	450,600	359,250	275,080
Romania					4,464,950	3,923,150
Slovakia					71,730	68,980
Slovenia					77,140	75,330
Spain			1,577,020	1,277,600	1,127,970	1,036,210
Sweden				88,800	67,630	72,390
UK		261,900	242,570	234,500	250,400	255,320

Source: Konstantinidis, 2012.

The change in the size of the farms in terms of area in the same periods is given below.

Table 7. Percent of agricultural area, by farm size category (1990-2007)

	0 - 4.9 ha		5 - 9.9 ha		10 - 49.9 ha		50 - 99.9 ha		Over 100 ha	
	1990	2007	1990	2007	1990	2007	1990	2007	1990	2007
Austria		7.1		7.8		39.1		15.9		30.0
Belgium	4.9	2.1	7.0	3.3	60.2	40.2	19.9	33.6	8.0	20.9
Bulgaria		13.1		1.8		6.7		6.3		72.1
Cyprus		38.9		12.1		26.1		9.4		13.6
Czech Rep.		1.4		0.9		4.5		3.6		89.7
Denmark	0.3	0.3	3.4	2.8	46	17.7	28.5	18.2	21.9	60.9
Estonia		6.3		7.1		22.4		8.3		56.0
Finland		2.6		5.9		52.4		25.7		13.5
France	2.5	1.4	3.0	1.5	38.4	15.8	30.6	27.8	25.5	53.5
Germany		1.9		2.8		23.8		21.8		49.8
Greece	33.1	28.3	23.0	18.4	33.7	38.8	5.2	9.2	5.1	5.4
Hungary		9.7		3.1		11.4		7.5		68.3
Ireland	1.5	0.8	4.3	3.2	57.2	50.7	23.2	29.0	13.9	16.3
Italy	21.3	16.7	11.9	10.3	28.2	30.2	10.4	13.3	28.2	29.5
Latvia		9.7		13.3		36.9		10.9		29.3
Lithuania		16.1		12.9		27.8		9.9		33.3
Luxembourg	2.0	0.7	2.3	1.3	35.5	12.9	51.0	39.2	9.2	46.0
Malta		81.2		14.5		2.8		0		0
Netherlands	4.6	3.3	7.8	4.3	65.7	45.5	16.7	30.8	5.3	16.1
Poland		20.1		18.1		38.5		6.4		17.0
Portugal	24.8	15.4	10.8	7.9	19.1	18.8	6.4	8.1	38.9	50.0
Romania		35.0		14.0		9.8		2.4		38.9
Slovenia		26.9		31.3		35.5		2.4		3.9
Slovakia		2.0		0.7		2.8		2.0		92.5
Spain	9.8	5.6	7.1	4.3	23.6	19.1	12.7	12.9	46.8	58.0
Sweden		5.3		8.4		32.1		20.8		33.4
UK	0.6	1.4	1.4	1.4	15.6	12.4	18.2	15.3	64.2	69.5

Source: Konstantinidis, 2012.

When Table 7 is examined, it is seen that small farms were replaced by large farms in France, Germany, Denmark, Ireland, Benelux and Iberian countries. Only Sweden and Finland show a decrease in both the number of farms and their area. However, as an exception, an increase in all categories is observed in Greece.

Similarly, there has been a decrease in the number of people working on farms across Europe in the last 50 years. The graph showing the average number of labor per hectare is shown in Table 8.

Table 8. Average Labor per Hectare (1990-2007)

	1990	1993	1995	1997	2000	2003	2005	2007
Austria			0.05	0.05	0.05	0.05	0.05	0.05
Belgium	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.05
Bulgaria						0.27	0.23	0.16
Cyprus						0.21	0.19	0.18
Czech Rep.						0.05	0.04	0.04
Denmark	0.03	0.04	0.04	0.04	0.03	0.02	0.02	0.02
Estonia						0.05	0.04	0.04
Finland			0.06	0.06	0.05	0.04	0.04	0.03
France						0.03	0.03	0.03
Germany	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04
Greece	0.19	0.20	0.17	0.17	0.16	0.15	0.15	0.14
Hungary						0.12	0.11	0.10
Ireland	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.04
Italy	0.13	0.12	0.12	0.12	0.10	0.11	0.11	0.10
Latvia					0.10	0.09	0.08	0.06
Lithuania						0.09	0.08	0.07
Luxembourg	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03
Malta						0.42	0.40	0.41
Netherlands	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.09
Poland						0.15	0.15	0.15
Portugal	0.21	0.15	0.14	0.14	0.14	0.12	0.11	0.10
Romania						0.19	0.19	0.16
Slovakia					0.06	0.06	0.05	0.05
Slovenia					0.22	0.20	0.20	0.17
Spain	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sweden			0.03	0.03	0.02	0.02	0.02	0.02
UK	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02

Source: Konstantinidis, 2012.

Although it seems that there has been a great change in the agricultural policies of Europe since 1992, when the data are examined, a major structural break in the structure of the agricultural sector is not observed. Because, in the policies put forward since the 90s, it is aimed to support small-scale farms and to support smaller-scale environmentally friendly farms instead of industrial companies in agriculture. Despite this, when the data is examined, we see that the number of farms in European agriculture has decreased and the farm areas have grown, that is, small enterprises have been replaced by much larger enterprises.

3.4.2 The Organic Agriculture Statistics of Europe

As of the end of 2020, the total organic farming area of the European continent is 17.1 million hectares. When we consider only EU countries, this number is 14.9 million hectares. The ratio of the organic agriculture area of the European continent to the whole agricultural area is 3.4%, while it is 9.2% for the EU countries. Among the EU countries, the countries with the most organic agriculture areas are France, Spain and Italy. Information on organic farming areas of the countries in the European continent and the rates of change since 2012 are presented below.

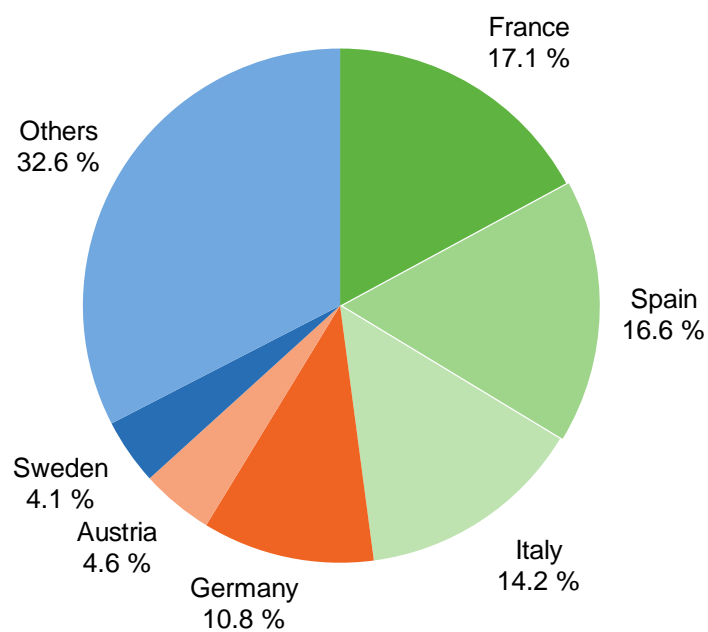
Table 9. Total organic area in Europe (2012-2020)

	Organic area (ha)		2012–20 (% change)
	2012	2020	
EU-27	9,457,886	14,719,036	55.6
Belgium	59,718	99,072	65.9
Bulgaria	39,138	116,253	197.0
Czechia	468,670	540,375	15.3
Denmark	194,706	299,998	54.1
Germany	959,832	1,590,962	65.8
Estonia	142,065	220,796	55.4
Ireland	52,793	74,666	41.4
Greece	462,618	534,629	15.6
Spain	1,756,548	2,437,891	38.8
France	1,030,881	2,517,478	144.2
Croatia	31,904	108,610	240.4
Italy	1,167,362	2,095,364	79.5
Cyprus	3,923	5,918	50.9
Latvia	195,658	291,150	48.8
Lithuania	156,539	235,471	50.4
Luxembourg	4,130	6,118	48.1
Hungary	130,607	301,430	130.8
Malta	37	67	81.1
Netherlands	48,038	71,607	49.1
Austria	533,230	671,703	26.0
Poland	655,499	509,286	-22.3
Portugal	200,833	319,540	59.1
Romania	288,261	468,887	62.7
Slovenia	35,101	52,078	48.4
Slovakia	164,360	222,896	35.6
Finland	197,751	316,248	59.9
Sweden	477,684	610,543	27.8
Norway	55,260	45,181	-18.2
Switzerland	121,213	176,337	45.5

Source: Eurostat, 2022

The proportional distribution of the total organic agriculture area between countries is shown below. Accordingly, 17.1% of organic agriculture area in Europe is in France, 16.6% in Spain and 14.2% in Italy.

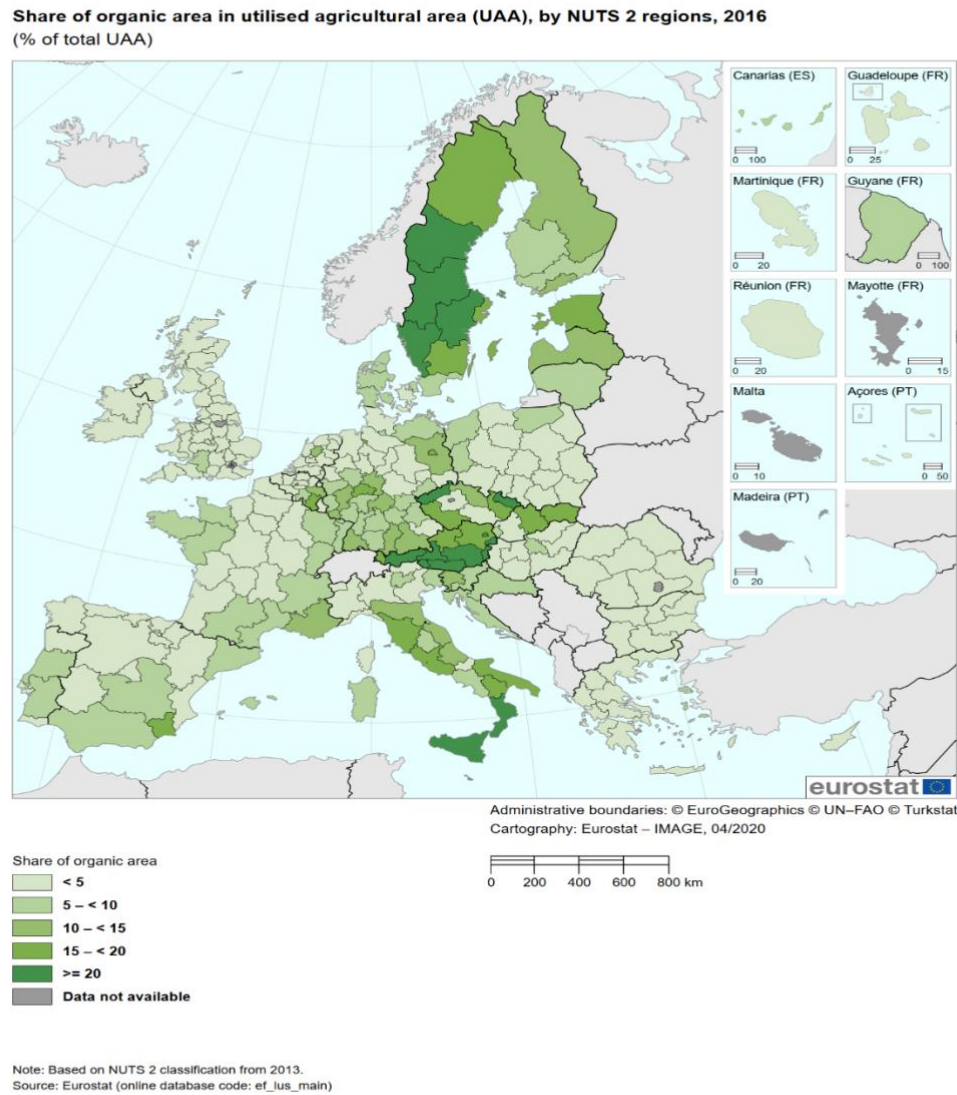
Figure 15. Distribution of EU Total Organic Area



Source: Eurostat,2022

After looking at the total organic agricultural areas of the European continent and the distribution of these agricultural areas within the countries, it is thought that it will be useful to look at the map in order to better understand the organic agricultural area distribution and the current situation of Europe in terms of organic farming area. For this reason, the organic farming area map of the European continent is shown below.

Figure 16. Distribution of Organic Area in Utilized Area

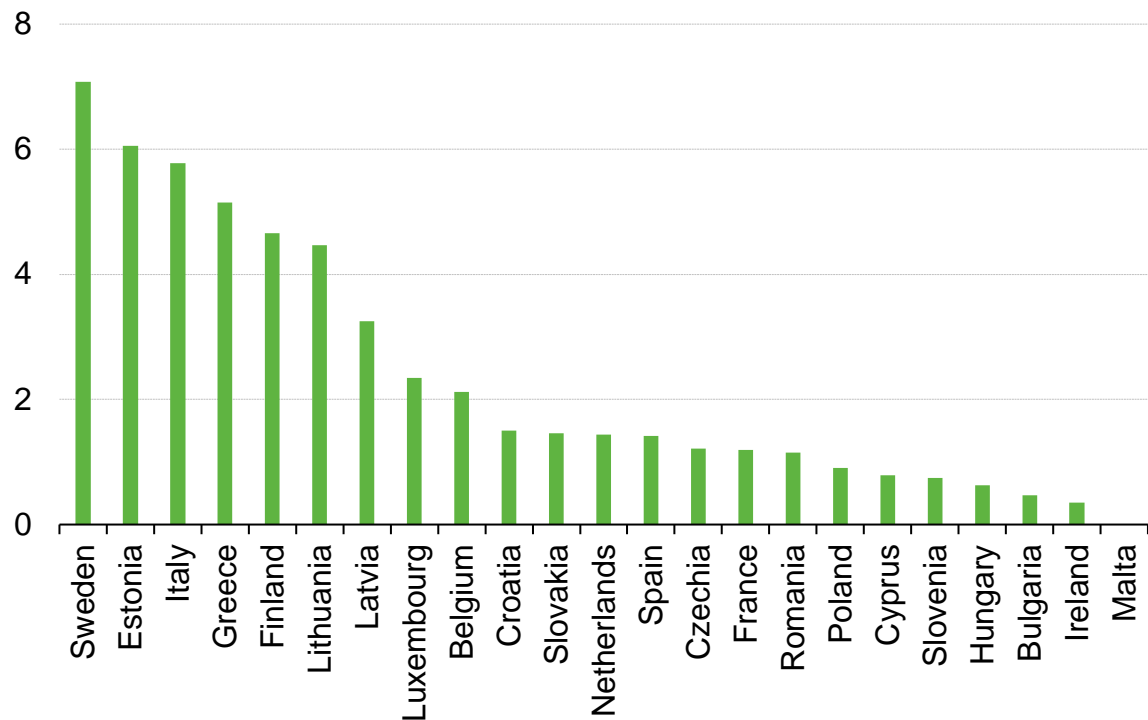


Source: Eurostat

When we look at the types of organic agriculture, it is seen that Sweden produces the most organic cereal proportionally in total cereal production in organic cereal production. After Sweden comes Estonia and Italy. The ratios and rankings of how much organic cereal the countries produce in the total cereal production are shown below.

Figure 17. Share of organic cereals production in total cereals production, 2020

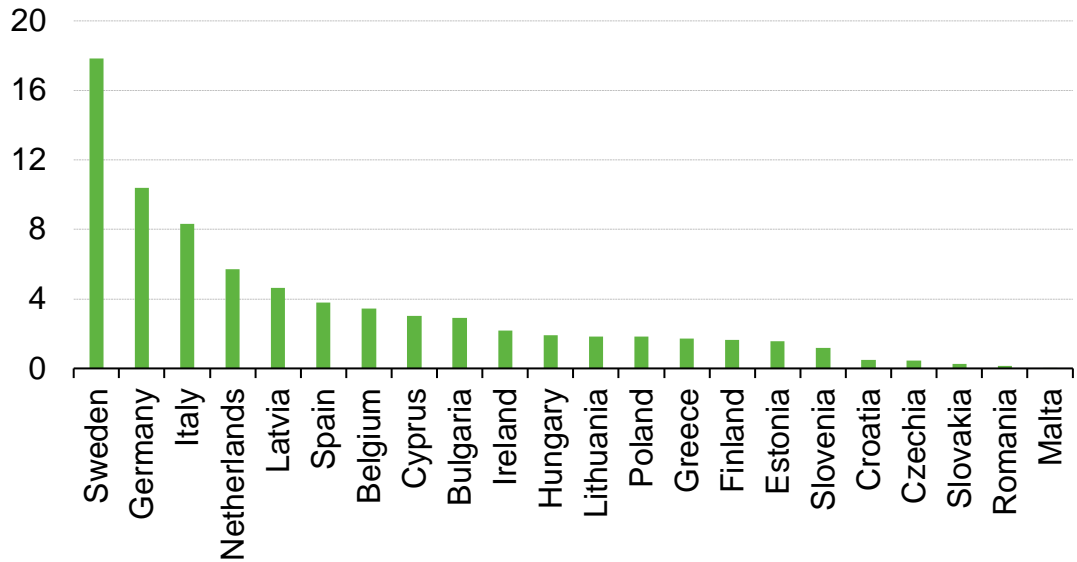
(%)



Source: Eurostat, 2022

Again, it is seen that Sweden has the highest share proportionally organic fresh vegetable production in total fresh vegetable production. The share of organic fresh vegetable production in Sweden's total fresh vegetable production is 17.84%. In Germany, which comes after Sweden, this rate is 10.38. The shares of organic fresh vegetable production in the total fresh vegetable production of all European countries are shown below.

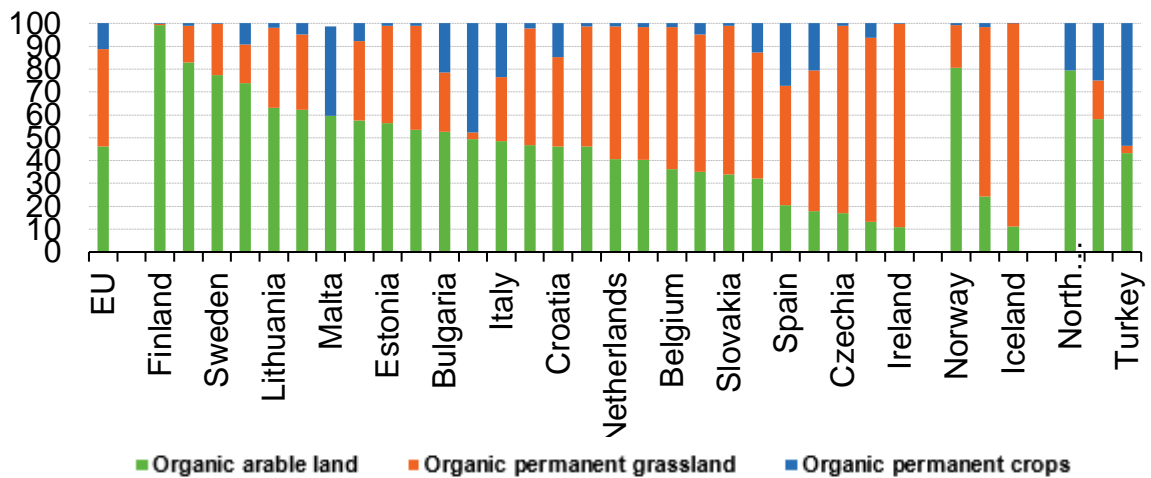
Figure 18. Share of Organic Fresh Vegetables Production in Total Fresh Vegetables Production, 2020 (%)



Source: Eurostat

Permanent grassland and permanent crops ratios in the organic areas of the countries are shown in the figure below.

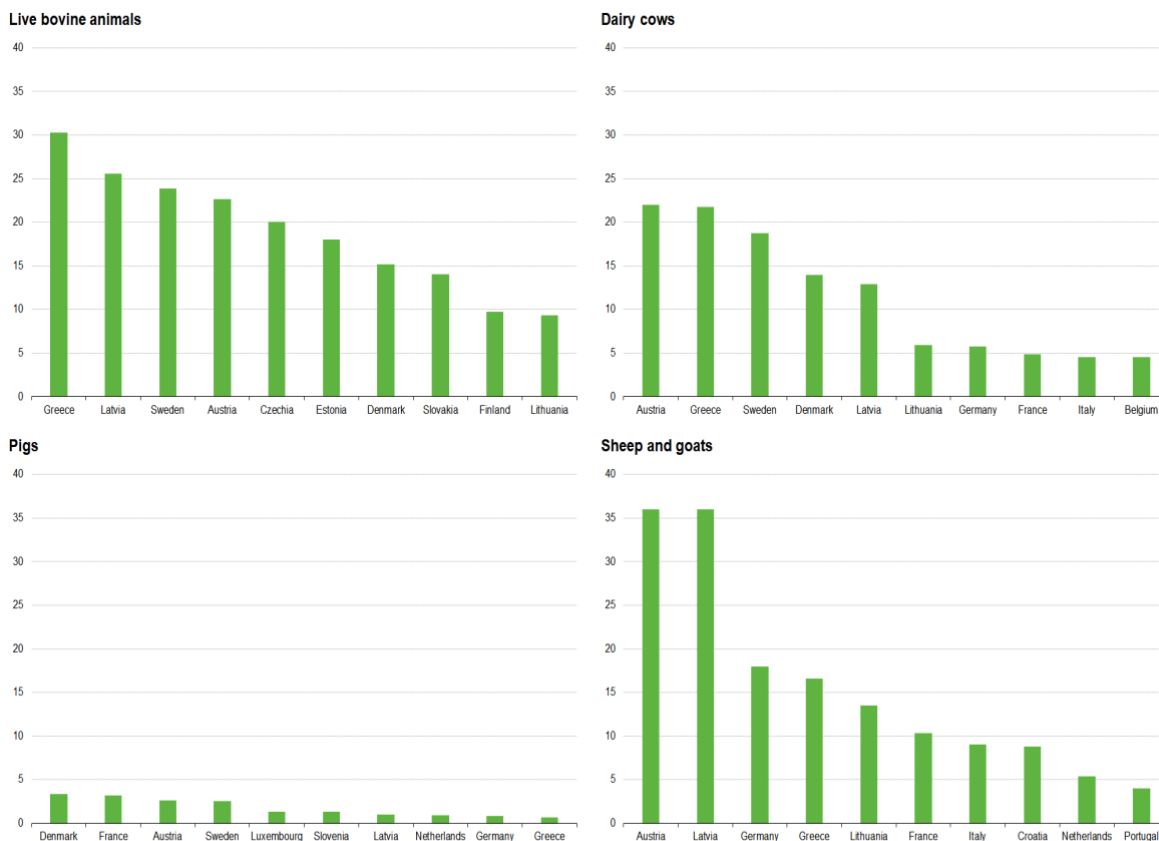
Figure 19. Organic Arable Land Crops, Permanent Grassland and Permanent Crops



Source: Eurostat, 2022

The ratios of organic livestock areas within the total livestock areas of the countries are shown below. Accordingly, it is seen that Greece in live bovine animals, Austria in dairy cows, Denmark in pigs, and Austria in sheep and goats are at the forefront among EU countries.

Figure 20. Share of organic livestock in all livestock, by countries with the highest shares, 2020 (% of number of heads)



Source: Eurostat, 2022

When we look at organic agriculture in terms of holdings, it is observed that the number of holdings dealing with organic agriculture is increasing day by day. While some of the agricultural holdings in the countries only do organic farming, some do partially organic farming and some do not. The numbers of holdings in EU countries engaged in only organic farming, some organic farming and non-organic farming are shown below.

Table 10. Organic Agriculture Holdings in Europe

	Holdings with ONLY organic area		Holdings with SOME organic area		Holdings with NON-organic area	
	Number of holdings	Utilized agricultural area (UAA) in ha	Number of holdings	Utilized agricultural area (UAA) in ha	Number of holdings	Utilized agricultural area (UAA) in ha
EU-27	166,370	6,555,780	77,530	5,274,870	10,037,780	144,768,790
Belgium	1,000	50,350	490	31,520	35,400	1,272,380
Bulgaria	2,160	42,500	2,150	352,920	196,970	4,096,440
Czechia	2,930	443,640	50	17,300	23,540	2,994,470
Denmark	1,420	89,160	1,150	115,680	32,480	2,409,760
Germany	19,800	1,136,560	490	35,480	255,830	15,543,290
Estonia	1,570	171,450	100	11,130	15,030	812,520
Ireland	200	5,420	1,380	65,860	136,320	4,753,260
Greece	4,580	39,860	8,080	166,480	672,280	4,347,490
Spain	14,550	394,100	13,610	1,208,900	916,870	21,626,750
France	21,620	1,136,130	6,630	511,820	428,270	26,166,210
Croatia	1,250	34,030	2,270	129,110	130,940	1,399,850
Italy	56,060	1,373,800	9,220	364,250	1,080,420	10,860,110
Cyprus	270	2,190	300	3,130	34,380	106,600
Latvia	420	21,540	3,250	294,280	66,260	1,615,050
Lithuania	890	76,530	1,580	166,630	147,850	2,681,440
Luxembourg	:c	:c	:c	:c	:c	:c
Hungary	780	55,580	1,730	318,450	427,490	4,296,520
Malta	:c	:c	:c	:c	:c	:c
Netherlands	970	39,890	400	20,600	54,310	1,735,780
Austria	21,990	556,960	520	24,190	110,000	2,088,600
Poland	2,130	45,370	17,500	727,460	1,391,080	13,632,820
Portugal	740	61,430	1,310	195,300	256,930	3,384,970
Romania	630	46,940	1,750	113,750	3,419,650	12,341,850
Slovenia	2,910	39,400	680	20,850	66,310	428,150
Slovakia	340	150,600	90	58,110	25,230	1,681,120
Finland	3,040	158,530	1,190	79,720	45,480	1,955,960
Sweden	4,040	379,450	1,610	241,780	57,280	2,400,120

Source: Eurostat, 2022

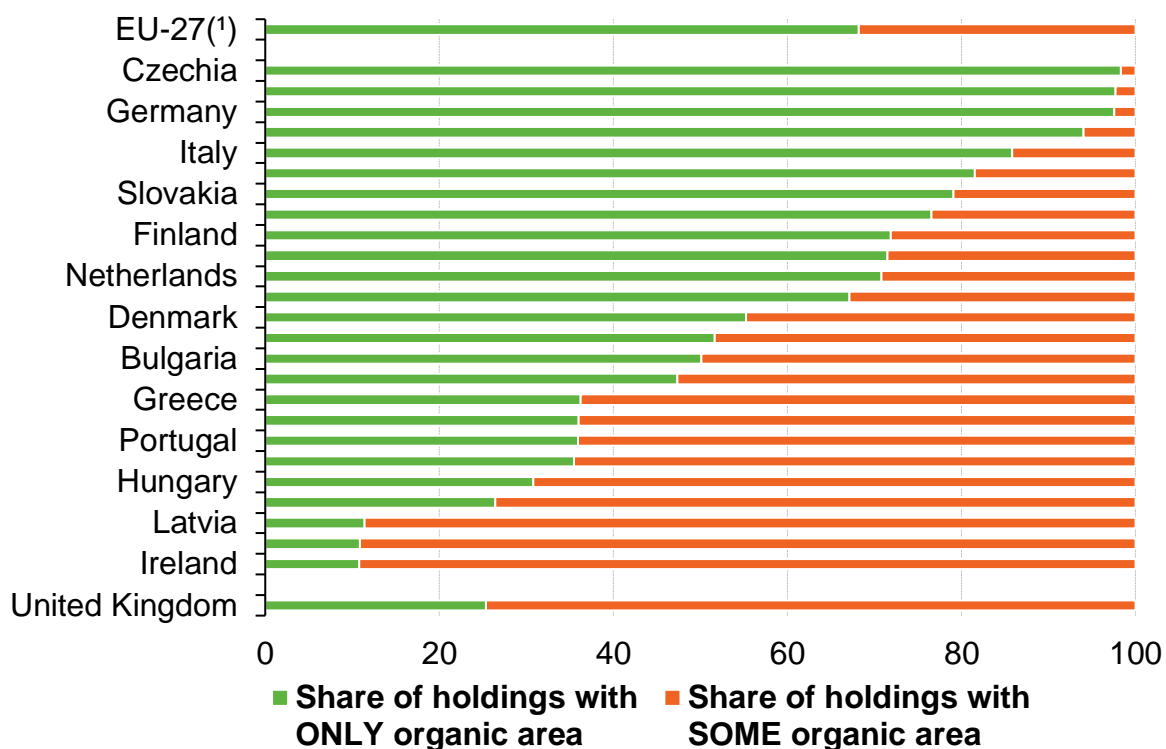
When the table given above is examined, it is seen that the total number of holdings in EU countries is 166,370. Among these countries, the country with the highest number of holdings is Italy with 56,060. After Italy comes France and Austria.

The proportional distribution of only organic farming holdings and some organic farming holdings in the countries is shown below.

When the figure above is examined, it is seen that Czechia, Germany and Italy have the most organic farming holdings among EU countries.

The proportional distribution of only organic farming holdings and some organic farming holdings in the countries is shown below.

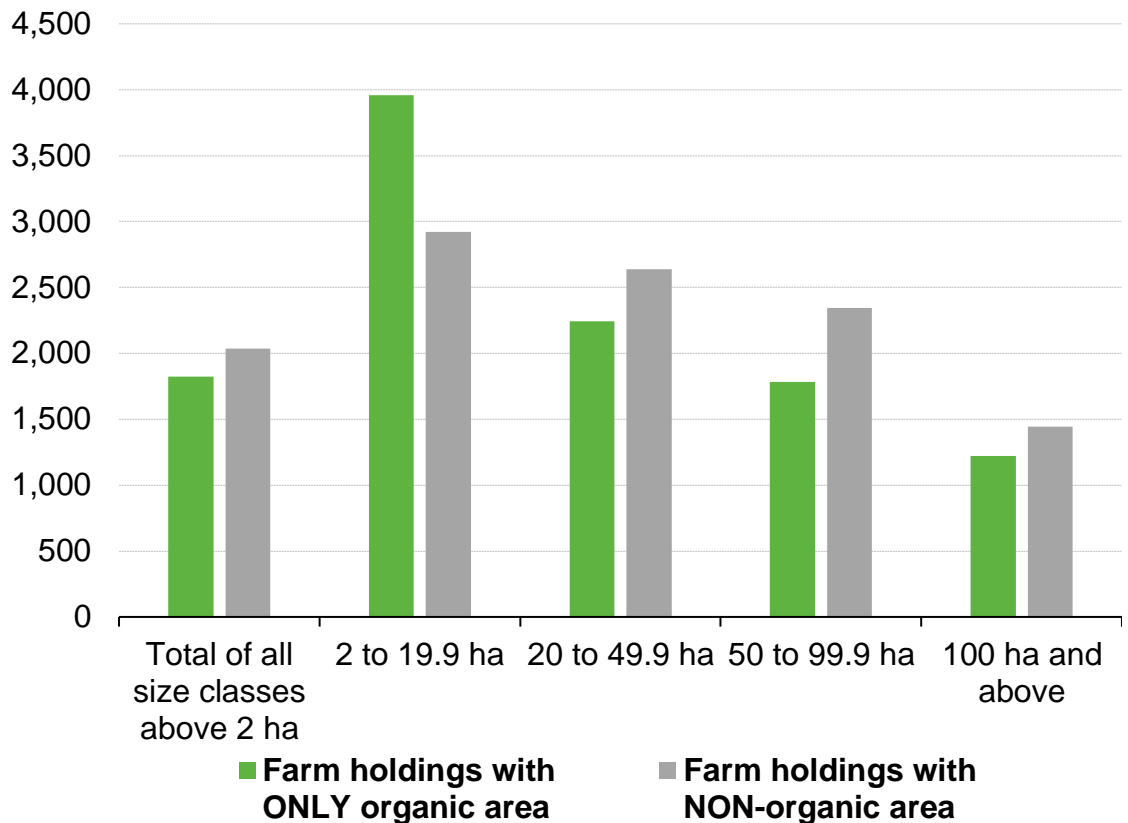
Figure 21. Share of holdings with ONLY and SOME organic area, by country, (% of total holdings with organic area)



Source: Eurostat, 2022

When the figure above is examined, it is seen that Czechia, Germany and Italy have the most organic farming holdings among EU countries. The standard output in Euro per UAA for holdings dealing with organic or non-organic agriculture of EU countries are shown below.

Figure 22. Ratio of standard output (SO) in Euro per Utilized Agricultural Area (UAA) For Holdings with Only Organic Area and Non-Organic Area by Size Class

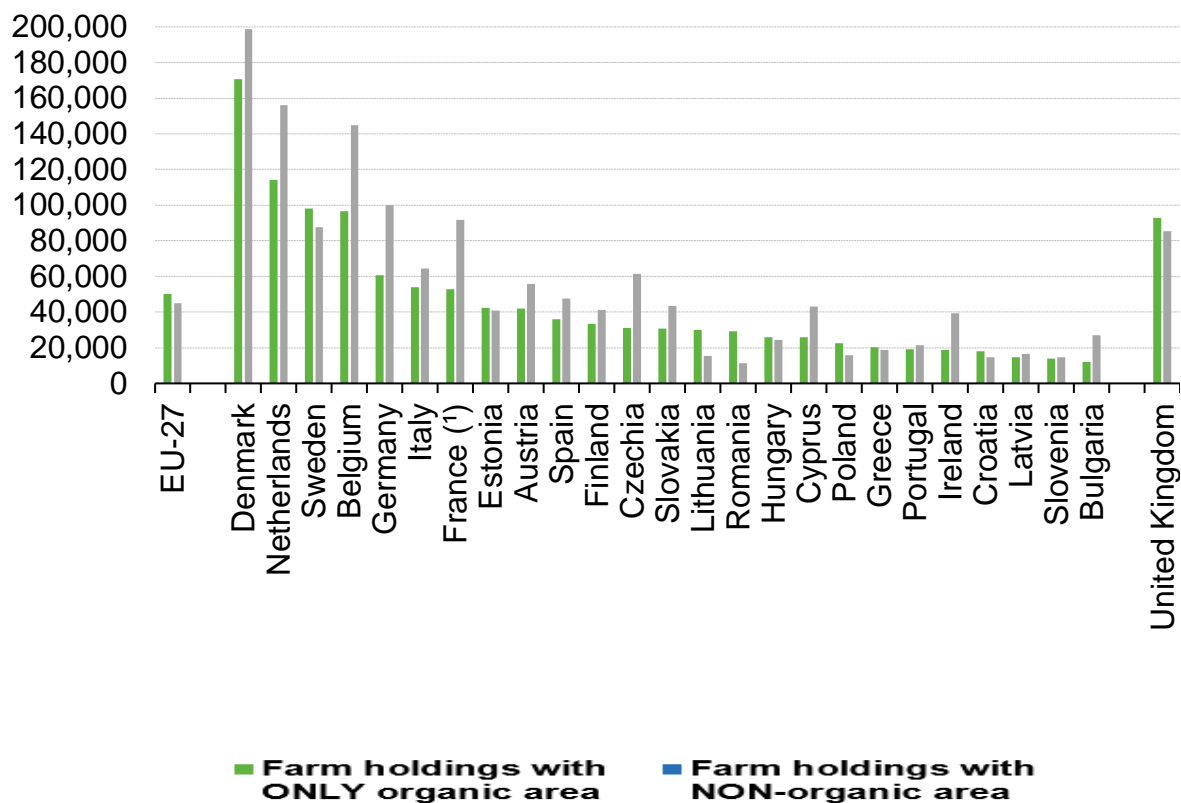


Source: Eurostat, 2022

When the above figure is examined, it is seen that organic agriculture producers achieve more standard output in euro than non-organic agriculture in the range of only 2-19.9 hectares.

The graph of the standard output in Euro obtained according to the annual unit working time for the countries is shown below. It is seen that organic agriculture is less than non-organic agriculture in the Ratio of standard output (SO) in Euro per annual work unit (AWU) in all countries except the United Kingdom, which left the EU with Brexit.

**Figure 23. Ratio of Standard Output (So) In Euro per Annual Work Unit (AWU)
For Holdings with Only Organic Area and Non-Organic Area, By Country**



Source: Eurostat,2022

Standard output (SO) in Euro per hectare of utilized agricultural area (UAA) across the EU is 1,823 Euros in organic farming areas and 2,036 Euros in non-organic agricultural areas. Based on countries, these rates are highest in the Netherlands, followed by Denmark and Belgium.

Table 11. Standard Output (So) In Euro per Hectare of Utilized Agricultural Area (UAA)

	Standard output (SO) in Euro per hectare of utilized agricultural area (UAA)	
	Farm holdings with ONLY organic area	Farm holdings with NON-organic area
EU-27	1,825.3	2,036.7
Netherlands	7,796.8	11,495.2
Denmark	2,946.9	3,458.0
Belgium	2,899.5	5,701.9
Italy	2,792.6	4,181.7
Greece	2,394.2	1,376.2
Cyprus	2,142.7	4,380.2
France	1,961.2	2,088.1
Germany	1,835.4	2,836.9
Austria	1,670.1	2,373.6
Sweden	1,558.2	1,626.8
Slovenia	1,432.6	2,325.1
Spain	1,385.3	1,397.5
Poland	1,114.4	1,666.7
Finland	1,051.9	1,494.0
Bulgaria	997.5	719.8
Hungary	819.9	1,204.6
Croatia	819.4	1,191.6
Portugal	717.9	1,291.1
Ireland	714.4	1,290.9
Romania	700.4	794.5
Czechia	562.6	1,812.2
Lithuania	523.1	737.1
Slovakia	509.0	998.0
Latvia	472.3	644.1
Estonia	447.7	801.0

Source: Eurostat, 2022

4. PRACTICAL PART

4.1 Data Set

In the study, 25 countries in the European Union, where all organic agriculture data between 2000 and 2020 can be accessed, were used as data set. The EU countries with all data available between these dates are presented below.

Table 12. Countries of EU in Data Set

Austria	France	Netherlands
Belgium	Germany	Poland
Bulgaria	Greece	Portugal
Croatia	Hungary	Slovakia
Republic of Cyprus	Ireland	Slovenia
Czech Republic	Italy	Spain
Denmark	Latvia	Sweden.
Estonia	Lithuania	
Finland	Luxembourg	

Source: European Union, 2022

In the study, the agricultural GDP of the countries was used as the dependent variable, while the independent variables were the agricultural areas used by the countries in organic agriculture and the number of producers. Information on the variables used in the analysis is shown below.

Table 13. Description of Data Set

Variable Name	Description	Source
AREA	Area Used For Organic Agriculture	FIBL
PRODUCERS	Organic Farm Producers	FIBL
AGR GDP	Agricultural GDP	World Bank

Source: Own Processing Using Eviews 10

4.2 Descriptive Statistics

In the analysis, the variables were used by taking their logarithms, and the descriptive statistics of the variables are shown below.

Table 14. Descriptive Statistics of Data Set

	LN_GDP	LN_ORGAREA	LN_ORGPROD
Mean	21.88324	11.48582	7.909026
Median	21.96037	11.91879	7.891517
Maximum	24.39104	14.75108	11.17871
Minimum	17.95937	2.564949	1.791759
Observations	420	420	420

Source: Own Processing Using Eviews 10

4.3 Panel Unit Test Results

Since the data we have chosen to perform the econometric analysis is stationary, it will give healthier results (to prevent the problem of false regression), so the stationarity tests of the variables used in the model have been performed. In this study, the stationarity of the series was tested with the Levin, Lin & Chu unit root test. In the light of these data, the results of the unit root test applied to the variables are shown in Table 15.

Table 15. Unit Root Test Results

Variable	At level statistics	Prob.
lnagrgdp	2.10919	0.0175
lnproducers	-3.34001	0.0004
lnarea	15.4981	0.0000

Source: Own Processing Using Eviews 10

As a result of the Unit Root Tests of the variables, it was seen that all variables were stationary at the level.

4.4 Panel Data Analyses Results

4.4.1 Hausman Test

For Panel Analysis, it is necessary to choose one of the random or fixed effect models first. Therefore, the Hausman test should be applied. The Hausmann Test result applied on random effects is shown in Table 16.

Table 16. Hausman Test Results

Correlated Random Effects - Hausman Test			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.318663	20.1154	

Source: Own Processing Using Eviews 10

In the Hausman test, the null hypothesis is "random effects model" and the alternative hypothesis is "fixed effects model". According to the Hausman test, the results of which can be seen in Table 16, the rejection of H1, that is, the panel analysis should be done by using the random effects

Table 17. Random Effects Model Panel Data Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNAREA	0.050947	0.014243	3.576865	0.0004
LNPRODUCERS	-0.047811	0.015186	-3.148437	0.0017
C	21.69725	0.062090	349.4460	0.0000
R-squared	0.996362	Mean dependent var		33.67754
Adjusted R-squared	0.996172	S.D. dependent var		23.06653
S.E. of regression	0.151896	Sum squared resid		11.49009
F-statistic	5245.828	Durbin-Watson stat		0.852225
Prob(F-statistic)	0.000000			

Source: Own Processing Using Eviews 10

According to these results, the significance level of the test (R_Squared) was 99%. Both independent variables were found to be significant ($p < 0.005$). When we look at the probability value of the F statistic, it is seen that both variables are statistically significant collectively. When we look at the coefficient signs, it is seen that the coefficient of the number of producers is negative, and the coefficient of the area variable is positive. This has shown us that the number of producers has a negative effect on agricultural GDP, not a positive one, while the increase in organic farming areas has a positive effect on GDP. According to the result of the analysis, when the organic farming area increases by 1%, agricultural GDP increases by 0.04%, and when the number of producers increases by 1%, a decrease of 0.04% in agricultural GDP is observed.

5. Results and Discussion

In recent years, it is seen that people's awareness of environmental pollution and healthy living has increased throughout the world. This awareness has created a social pressure on both the country's governments and companies, and while the legal regulations on this issue are stretched, companies have had to be more sensitive about acting environmentally friendly. One of the most important results of this awareness has been in the field of agriculture. It has been realized that the harm caused by the traditional methods used in agricultural activities to the environment has been realized and steps have been taken in this regard. For this reason, an increase is observed worldwide in organic farming activities that are sensitive to the environment and human health.

Organic agriculture is entering our lives more and more every day, with the increase in environmental and health awareness. 20 years ago, organic products, which were only sold in neighborhood markets, have turned into a sector where giant retail chains exist with their own brands. In the past, when organic food was mentioned, only vegetables and fruits came to mind, but today we encounter organic products in a wide product group from honey to milk, from bread to meat. The sale of organic products is not only limited to market products, but organic products have been added to the menus of many restaurants.

In this study, the development of European Union countries on organic agriculture has been examined. In the study, primarily organic agriculture statistics in both European Union countries and the world were examined. Then, the effect of organic farming areas and the number of producers in EU countries on agricultural GDP was analyzed by panel data analysis method. As a result of the analysis, it was concluded that although organic farming areas have a positive effect on agricultural GDP, the increase in the number of producers also has a negative effect. According to the result of the analysis, when the organic farming area increases by 1%, agricultural GDP increases by 0.04%, and when the number of producers increases by 1%, a decrease of 0.04% in agricultural GDP is observed. Ates(2020), who conducted a similar study, used the data between 2003-2018 in his study, and concluded that there is an increase in agricultural GDP when there is an increase in the number of organic agricultural areas and producers.

Acs et al. (2007) states in his study that although traditional agriculture brings less income to farmers than organic agriculture, many compelling factors are effective for

transformation. The authors state that these factors include the need for more labor, the risk and uncertainty of prices, the farmer's learning process, the pressures of banks and landlords, and community pressure.

As the demand for organic products, especially vegetables and fruits, increases, more and more farm owners direct their land to organic agriculture. Statistics published by FIBL and IFAOM also confirm that there is an increase in both the field of organic agriculture and the number of producers. Organic farming area, which was 9.5 million hectares in EU countries in 2012, reached 14.7 million hectares in 2020 with an increase of 55%. Especially after the mad cow disease, there has been a noticeable increase in the interest of European consumers in organic products. The disease significantly changed the eating habits of Europeans. During this period, there was an increase in vegetable consumption, and people began to be more sensitive about the vegetables they eat. According to a study conducted by GKF, 90 percent of German citizens took at least 1 organic product to their homes in 2006. Another study revealed that 39 percent of Swiss consumers purchase organic food products at least once a week (Gurkan and Yasar, 2007).

On the axis of the findings, it is possible to say that organic agriculture has spread rapidly in the European Union countries since the 1990s. When an evaluation is made in terms of European Union countries, about 17% of the total agricultural lands are produced by France and 16% by Spain. The number of organic businesses is highest in Italy. France ranks first in terms of the area where organic agriculture is applied, followed by Spain and Italy, respectively. Germany ranks first in terms of organic market share.

Andrusenko et al. (2022) examined eastern European countries in their study. Similar to this study, the authors pointed to positive developments in organic farming trends. In the study, he stated that Czechia and Poland came to the forefront in terms of retail sales and organic consumption among Eastern European countries.

6. Conclusion

In the new world order that emerged after the industrial revolution, income began to come to the fore in all sectors, and companies began to ignore all other factors for high productivity. The increase in the world population and the development in the industry have also increased the appetite of companies to generate more income. However, it is seen that the academic studies of the period, especially in the field of economics, mostly focused on how companies could make more profit. In the field of agriculture, as in all other fields, the priority of the agricultural sector has been to increase productivity in order to meet the needs of the increasing population and to earn more profits. New techniques have been developed to increase efficiency. Among these techniques, there are many different techniques that are harmful to nature and human health, such as chemicals and artificial fertilizers. The use of fossil fuels due to the machines and vehicles used with these techniques has also increased the damage to nature in the field of agriculture day by day.

However, over time, studies on human health and environmental damage due to agricultural activities, primarily by academic circles, began to increase, and then the awareness of both society and governments on this issue began to increase. One of the biggest reasons for this awareness has been the concept of Sustainability. The concept of sustainability refers to both long-term protection of natural resources in agriculture and a balanced production in agriculture in terms of economic, social and environmental aspects. Although there are many different approaches under the concept of sustainable agriculture, the most important of them is organic agriculture, which is also the subject of this thesis.

In this study, firstly, the definition and historical development of organic agriculture is given in the framework of the literature. It has been seen that there are different approaches in the literature on the definitions of organic agriculture. It has been seen that these differences in approaches are generally related to the aspect of organic agriculture. In some definitions, it is discussed that the farmer, soil, plants and animals should be handled holistically, while in some definitions only the parts related to legal and certification procedures are discussed. However, in all definitions, in order to prevent human health and environmental pollution in general, providing a control in all aspects in the field of agriculture and using sustainable methods to ensure that agricultural products can be consumed by future generations in a healthy way come to the fore.

Looking at the historical development of organic agriculture, it was seen that the first studies on this subject were in the late 19th century and early 20th century. In the studies carried out at the beginning of the 20th century, humus farms come to the fore as organic agriculture. There are also soil and ecological problems among the problems that emerged after the First World War. Since these dates, it is seen that there has been an increase in studies in the field of agriculture, especially in the USA and Germany. However, it is noteworthy that there are still disagreements about whether mineral fertilizers, pesticides and chemical techniques are the solution or the main problem in this period.

It has been seen that the word organic agriculture was first used in 1940 and since that date, studies have focused on organic agriculture instead of humus farm. However, although academic studies focus on organic agriculture, it is seen that the new agricultural techniques and technological developments that emerged after the Second World War, the harm of chemical techniques in agriculture, human health and nature began to increase much more. In this period, which is also called the "green revolution", the ecosystem began to deteriorate rapidly, and the pollution of soil, water and air began to increase gradually.

In plant production made with these production techniques; the use of chemical fertilizers and pesticides, and the use of feed additives such as hormones and antibiotics in animal production have increased yields and reduced costs. However, some plant and animal products containing residues produced by these techniques have adversely affected human health. Significant increases in health problems, especially cancer, have been observed in people who eat such unhealthy products. However, the visible damage to the environment and human health caused by these systems, which are called conventional farming techniques, has begun to raise awareness in all agricultural stakeholders and the society, and the concept of organic agriculture or ecological agriculture has been intensively discussed since these dates, especially since the 70s. has begun. The "International Federation of Organic Agriculture Movements" (IFOAM), which was established in 1970, is the biggest indicator of this.

In the thesis, after examining organic agriculture and its historical development, it has been examined to what extent organic agriculture has moved to world agriculture. Statistical information is given in the light of FIBL and IFOAM data, and in this context, the progress made in the application part of organic agriculture has been evaluated. It has been observed that there has been an improvement in organic farming areas and the number of

producers in the world, especially since the 1990s. Considering the increase in organic agriculture areas around the world, it has been seen that the increase in organic agriculture in the last 10 years is 104.3%. When considered on a continent basis, it has been observed that the largest increase in organic farming area in the last 10 years has been in Oceania with 215.4%. Looking at the data of the last 20 years, it is seen that the organic agriculture area, which was 15 million square meters in 2000, reached 74 million square meters by 2020. These figures show that there has been a 5-fold increase in organic farming areas in the world in the last 20 years. The largest organic agricultural areas in the world are in Oceania with 35.9 million hectares, and Europe with 17.1 million hectares. The continent with the least organic agricultural area is North America with 3.7 million hectares. On a country basis, Australia is the first country with 35.69 million hectares and Argentina is the second country with the largest organic agricultural area with 4.45 million hectares.

In the thesis, after examining organic agriculture statistics in the world, organic agriculture data of EU member countries and legal development of organic agriculture in EU were examined. When we look at the development of organic agriculture in EU member countries, it is seen that the second world war was an important breaking point in parallel with the world. However, it is seen that studies on organic agriculture have been carried out country by country since these years. However, with the establishment of the EEC and the entry into force of the Common Agriculture Policy (CAP), joint breakthroughs have been made in organic agriculture. It is seen that the EEC started to follow an active policy on environmental measures since the 1970s, and the Environmental Action Plan was put into effect for the first time in 1973. However, it is seen that there have been concrete developments in organic agriculture since the 1990s, and since this date, there has been a noticeable increase in both organic farming areas and the number of producers across the EU. As a matter of fact, when we look at the statistics, it is seen that the increase in organic agriculture in EU countries was 55.6% from 2012 to 2020. Among EU countries, the largest organic farming area is in France with 2.5 million hectares. As of 2020, 17.1% of organic farming areas in the EU are in France, 16.6% in Spain and 14.2% in Italy. In terms of the number of producers, it is seen that the largest organic agriculture holding is in Italy with 56,060 holdings.

In this thesis, organic agriculture in EU countries has been examined. Within the scope of the thesis, organic agriculture data of EU countries from FIBL, IFOAM and EUROSTAT data were examined in detail, and the historical process of organic agriculture was discussed within the framework of the literature. In the practical part of the study, the effect of organic farming areas and the number of organic farming producers on agricultural GDP was analyzed by panel data analysis. The data of EU countries between 2003 and 2020 were used in the analysis, and 25 EU member countries with full data between these dates were included in the analysis.

In the study, it has been seen that the statistical data of EU members have increased the organic agricultural areas, trade, number of producers and consumption in the last 20 years. In the analysis study, it was seen that the number of producers had a negative effect on agricultural GDP, but the increase in organic farming areas had a positive effect on agricultural GDP. It is considered that the negative effect of the number of producers is due to the fact that generating income from organic farming activities requires both experience and long-term work. Therefore, it is thought that a longer-term date range is needed for the increase in the number of producers to turn into a positive effect on agricultural GDP. However, since organic farming data do not have a sufficient historical range yet, the results are based on short-term observation. It is thought that studies to be conducted in the coming years may reveal different results on this subject.

The return of organic agriculture is longer than traditional agriculture and it needs more labor. However, there are many barriers for farmers to put into practice in terms of economy and education. For this reason, it is thought that it is important for political decision makers to take more guiding measures to increase organic agriculture in the future so that it can progress more than traditional farming methods.

As a result, it is seen that the increase in the awareness of the society is generally met by governments and businesses. However, as in all other environmental pollution factors around the world, it can be said that agriculture is still far from the desired levels. Protecting the environment and therefore human health requires a very comprehensive approach. At the beginning of this is the development of new techniques by analyzing economic and environmental factors with scientific methods. For this reason, it is considered that it will be beneficial to analyze the contributions of environmentally friendly approaches such as organic agriculture on the economy by conducting more studies in this manner.

7. References

ACS, S., BERENTSEN, P.B.M. and HUIRNE, R.B.M. Conversion to organic arable farming in The Netherlands: A dynamic linear programming analysis. *Agricultural Systems*, May 2007, Volume 94, Issue 2, pp. 405-415, ISSN 0308-521X.

ANDRUSENKO, N., MARTYNOVA, L. and SHARKO, V. Changes in the Organic Products Market as a Result of the 2022 Events in Eastern Europe. *WSEA Transactions on Environment and Development*, 2022, pp. 918-929, ISSN 2224-3496.

ATES, E. The Impact of Organic Agriculture on Agricultural GDP: Panel Data Analysis [online]. *Dokuz Eylul Universitesi Conference Proceedings*, 2020, pp. 1616-1626. Available at: <https://avesis.deu.edu.tr/yayin/8497b8a9-f42f-475b-8577-35477ed7c0e4/organik-tarim-ile-tarimsal-gsyih-iliskisi-bir-panel-veri-analizi>. Accessed 23 July 2022.

BAYRAM, B, YOLCU, H and AKSAKAL, V. Organic Farming in Turkey and its Problems. *Ataturk University Journal of Agriculture Department*, 2007, Volume 38, Issue 2 ,pp. 203-206, ISSN 1300-9036.

DALLING, T. The Food and Agriculture Organization of the United Nations. *Canadian Journal of Comparative Medicine and Veterinary Science* [online]. 1957, Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1614385/> Accessed 7 August 2022

DEMİRYÜREK, K. Organic Agriculture in the World and Turkey. *Harran University Journal of Agriculture Department*, 2004, Volume 8, Issue 3, pp.63-71.

DEMİRYÜREK, K and CEYHAN, V. Economics of organic and conventional hazelnut production in Turkey: Renewable Agriculture and Food Systems. *Renewable Agriculture and Food Systems*, 2008, Volume 23, Issue 3, pp. 217-227.

DURMAZ, D.H. Dimension of Organic Agriculture in Turkey and The World: Organic Agriculture in Adana Economy. *Master thesis, Anadolu University* [online], 2011. Available at:

<https://www.proquest.com/openview/aa283e86a055925390b6c7fad7feb9d9/1?pq-origsite=gscholar&cbl=2026366&diss=y> Accessed 08 August 2022

EUROPEAN COMISSION, 2022. Agriculture and Rural Development. Available at: https://agriculture.ec.europa.eu/data-and-analysis/financing/cap-expenditure_en Accessed: 17 September 2022

EUROPEAN UNION, 2022. Country Profiles. Available at: https://european-union.europa.eu/principles-countries-history/country-profiles_en Accessed 9 November 2022

EUROSTAT, 2022. Organic Farming Statistics. Available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Organic_farming_statistics Accessed 9 September 2022

FAO.2021. United Food and Agriculture Organization. Available at www.fao.org Accessed 8 September 2022

FRANCIS, C. A, BUTLER FLORA, C. and KING, L. D. *Sustainable Agriculture in Temperate Zones*, New York: Wiley, 1997. ISBN 978-0-471-62227-7.

GARZON, I. *Reforming the Common Agricultural Policy: History of a Paradigm Change*. New York: Palgrave Macmillan. 2006.

GEIER, B. IFOAM and the History of the International Organic Movement. In: *Organic Farming: an international history*. Wallingford: CABI, 2007.

GOLDEWIJK, K and RAMANKUTTY, N. Land cover change over the last three centuries due to human activities: The availability of new global data sets. *GeoJournal*, 2004, Volume 61, pp. 335–344.

GREENE, W. H. *Econometric Analysis. 5th Edition*. 2003, New Jersey: Prentice Hall. ISBN 0-13-066189-9.

GUJARATI, D. *Basic Econometrics: United States Military Academy. 4th edition*, 2003. ABD: Mcgraw Hill. ISBN : 978-0-07-233542-2.

GURKAN, E. and YASAR, S. Organic Agriculture Market in EU. *Doctoral dissertation, Bahcesehir University.* 2007.

HOGGART, K, BLACK, R. and BULLER, H. *Rural Europe: Identity and Change,* London: Arnold, 2014. ISBN 978-1-31-583256-2.

HOLKA, M, KOWALSKA, J. and JAKUBOWSKA M. Reducing Carbon Footprint of Agriculture: Can Organic Farming Help to Mitigate Climate Change?. *Agriculture* [online]. MDPI, 2022. ISSN 2077-0472. Available at: <https://www.mdpi.com/2077-0472/12/9/1383> Accessed 3 August 2022

IKERD, I.E. Two Related but Distinctly Different Concepts: Small Farm Today[online]. *University of Missouri-Coloumbia Food and Agriculture Organisation of the United Nations,* 1993, pp. 30–31. Available at: <https://agris.fao.org/agris-search/search.do?recordID=US9333204> Accessed 3 August 2022

JUDGE, G.G, GRIFFITHS, W.E, HILL, R.C, LUTKEPOHL, H. and T.C. LEE. *The Theory and Practice of Econometrics* [online]. 1985. ABD: Wiley: American Journal of Agricultural Economics. ISBN 978-0-471059387. Available at: https://www.academia.edu/11975688/The_Theory_and_Practice_of_Econometrics Accessed 23 July 2022

IFOAM - Organics International: International Federation of Organic Agriculture Movements [online]. 2021. Available at: <https://www.ifoam.bio/why-organic/organic-landmarks/definition-organic> Accessed 21 July 2022

INGERSENT, K and RAYNER, A. *Agricultural Policy in Western Europe and the United States,* Northampton: MA, 1999.

KARACA, C. Sustainable Agricultural Policies in Turkey: Assessment of Idle and Renewable Energy Resources at Agriculture Sector. *Turkish Journal of Agricultural Economics* [online]. 2013, Volume 19, Issue 1, pp. 1-11.

KONSTANTINIDIS, C. *Organic farming and rural transformations in the European Union: A political economy approach,* 2012, Amherst: University of Massachusetts.

KUEPPER, G. *A brief overview of the history and philosophy of organic agriculture: Kerr Center for Sustainable Agriculture*, Poteau. 2010.

LAMPKIN, N. *Organic Farming*. 1990. Farming Press. ISBN 978-0-85-236191-7.

LAMPKIN, N. *Impact of EC Regulation 2078/92 on the Development of Organic Farming in the European Union: Working Paper No.7* [online]. 1996. Aberystwyth: Welsh Institute of Rural Studies. Available at: <https://agris.fao.org/agris-search/search.do?recordID=US201300311001> Accessed 5 August 2022

LYNGGAARD, K. *The Common Agricultural Policy and Organic Farming: An Institutional Perspective on Continuity and Change*. 2006. Oxfordshire: CABI Publishing. ISBN 978-1-84-593114-8.

LOCKERETZ, W. What explains the rise of organic farming? In: *Organic farming: An international history*, UK: CABI, 2007, pp. 1-8.

RAMESH, P, SINGH, M and RAO A. Organic farming: Its relevance to the Indian context. *Current science*, 2005, Volume 88, issue 4, pp. 561-568.

REGANOLD, J.P. and WACHTER J.M. Organic agriculture in the twenty-first century. *Nature plants*, 2016, Volume 2, Issue 2, pp. 1-8.

RIGBY, D. and CÁCERES, C. Organic farming and the sustainability of agricultural systems. *Agricultural systems*, 2001, Volume 68, Issue 1, April 2001, pp. 21-40

SAMPSON, G. P. and YEATS, A. J. An evaluation of the Common Agricultural Policy as a barrier facing agricultural exports to the European Economic Community. *American Journal of Agricultural Economics*. 1977, Volume 59, pp. 99-106.

SANDHU, H.S, WRATTEN, S.D. and CULLEN, R. Organic agriculture and ecosystem services. *Environmental science & policy*, 2010, Volume 13, issue 1, pp. 1-7.

SLIGH, M. and CIERPKA, T. Organic values. In: *Organic farming: An international history*. Germany: Bonn, 2007, pp: 40-72.

STATISTA, 2022. Area of Organic Agricultural Land in Europe. Available at: <https://www.statista.com/statistics/641814/organic-agricultural-land-area-european-union-eu/> Accessed 10 November 2022

STOLTZE, M, PIORR, A, HÄRING, A and DABBERT S. The environmental impacts of organic farming in Europe: Organic Farming in Europe. *Economics and Policy* Germany: Karlsbad-Ittersbach, 2000. ISSN 1437-6512.

TAKATSUKA, Y, CULLEN, R, WILSON, M and WRATTEN, S. Using stated preference techniques to value four key ecosystem services on New Zealand arable land. *International Journal of Agricultural Sustainability*, 2009, Volume 7, issue 4, pp. 279-291.

UN. Centre for Social Development and Humanitarian Affairs: Social Development Newsletter, Special Issue, *Inter-Regional Consultation on Developmental Social Welfare Policies and Programmes*, Part II, 1987, Volume 2, Issue 26.

USDA. *Report and Recommendations on Organic Farming*. Washington, D.C.: USDA, 1980.

VOGT, G. The origins of organic farming. In: *Organic farming: An international history*, 2007, pp: 9-29.

