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**Organic and Conventional Agriculture- A Comparative  
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Scientific Article**

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**Abstract**

The main problem of agriculture is finding a compromise between (1) food security and (2) minimal negative impact on the environment. Currently, the first task is called upon to solve traditional agriculture, the second — organic. To identify the most sustainable type of agriculture, it is important to compare their economic aspects. When comparing, the analogy method was used. To assess the dynamics of demand for organic products and resources for their production, data from the Research Institute of Organic Agriculture (FiBL), the International Federation of Organic Agriculture Movements (IFOAM), the National Organic Union and the Union of Organic Farming were analyzed. The purpose of the study: to identify the benefits and opportunities of organic agriculture, the conditions for its long-term sustainability. The problem under

consideration: the choice of the most appropriate type of agriculture for solving the main problems of the industry. The study showed that the driver for the development of organic agriculture in developed countries is consumer demand and a number of positive externalities, while the limiting factors for the wide distribution of this type are the high price of products, the decrease in the level of food security of countries, the need to increase the cost of research and development of specific technologies. In the short term, traditional agriculture will continue to dominate due to higher productivity. Organic agriculture, with an increase in research costs and the introduction of innovations, can compete with traditional agriculture in the long term.

**Keywords:** *Organic Agriculture, Market, Sustainability, Externalities*

## 1.0 INTRODUCTION

According to the Research Institute of Organic Agriculture (FiBL), demand for organic products has increased over the last 20 years, with some developed countries reaching peak sales (Fig. 1).

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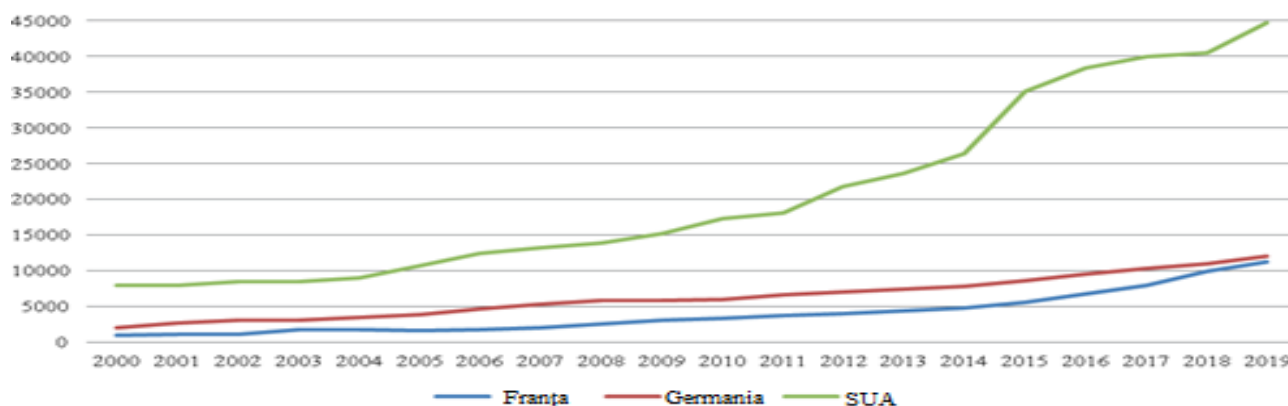


Figure 1: Volume of Retail Sales of Organic Products, Million Euro (Compiled According To FiBL)

Increasing consumer demand has become the main reason for the progressive development of the organic market, but initially the concept of organic farming emerged as a reaction to the intensification of the industry and the environmental problems it caused. It should be noted that many proponents of organic farming share the criticism of its low productivity and the implementation of innovations. At the same time, proponents of intensification agree that negative externalities have occurred.

Modern agriculture has to solve two problems simultaneously. On the one hand, ensuring food security, on the other, minimizing negative environmental impacts. This is possible by combining the advantages of organic and traditional agriculture, but there is a gap, to iron out their shortcomings. The study is dedicated to comparing traditional and organic farming, identifying their advantages, threats and opportunities. This is necessary in order to recognise the type of agriculture, which has great potential for solving the tasks set.

The main objective of the study is to identify the benefits and opportunities of organic farming, the conditions for its long-term sustainability.

## 2.0 METHODOLOGY

The research is mainly based on the synthesis of knowledge about organic farming. Synthesis means a comprehensive review of the scientific literature, identification of factors influencing the development of the sector in the short and long term.

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Scientific abstraction is applied in determining the most important aspects of organic farming development. The article outlines six blocks relating to threats and opportunities for the development of organic farming. The analogies method was applied to compare organic and traditional agriculture within each of the six blocks. The advantages and disadvantages of organic versus traditional agriculture were highlighted. Blocks 1-4 are important for understanding the conditions for the development of organic farming in the short term, blocks 4-6 - in the long term.

Block 4 is a transition block, which allows us to understand the process of transition from short-term to long-term.

The application of these methods and the chosen structure of the research results make it possible to identify the positive and negative aspects of the types of agriculture considered in relation to society, and to identify the conditions for the long-term sustainability of organic farming.

### 3.0 FINDINGS

#### The Concept of Organic Farming

Organic farming is based on the combination of ecological principles with productivity that has an impact on biodiversity, climate and human well-being. Organic products have to meet certain standards for sale in different countries, e.g. EU standards (Regulation 848/2018), US (USDA ORGANIC). Organic producers claim that their products are good for human health, leading to increasing demand from consumers in countries with higher per capita income (Fig. 2).

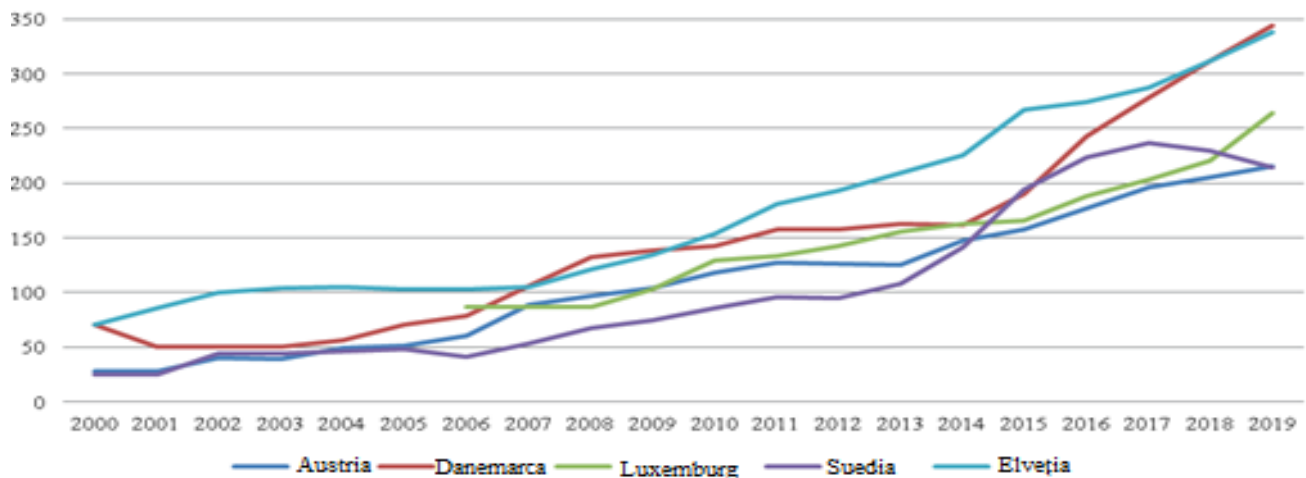


Figure 2: Consumption of Organic Products, Euro/Person (Compiled According to Fibl)

According to Fibl, the fastest growing markets for organic products are the US markets and EU countries. These countries are major importers of organic products (Fig. 3). A significant volume of imports can be associated with specific products from perennial fruit plantations as well as limited resources for organic food production.

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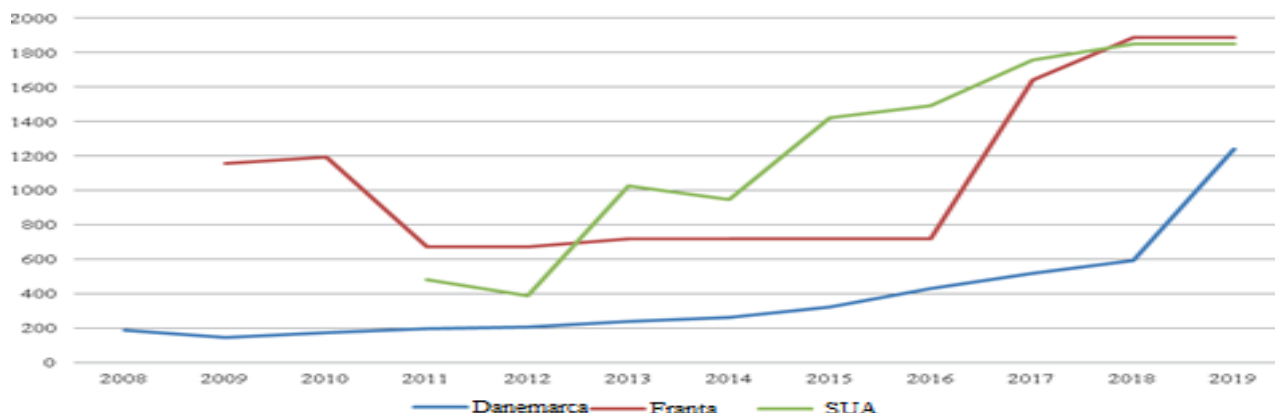


Figure 3: Imports of Organic Products, Million Euro (Compiled According to Fibl)

### Opportunity Costs of Producing Organic Products

The issue of economic choice is based on the concept of opportunity costs, which reflect the cost side of decision-making. The opportunity costs of organic farming are resources for producing conventional products. Published research results show that the overall difference in yield between organic and conventional crops is 20-25% in favour of the latter. Thus, all things being equal, the gross yield of organic crops will be 20-25% lower, i.e. the opportunity cost of producing 1 tonne of conventional crops is 3/4 tonne of organic crops. Given this, a natural question arises about food security. Lower productivity and lower gross yields of organic crops are the main reason to doubt the sustainability of the concept in the short term. It can be assumed that some countries are not interested in developing the concept of organic farming because of lower volumes of food production.

### The Price of Organic Products

The table shows the national retail sales data of organic and conventional products according to the US Department of Agriculture (ESMIS).

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Prices of organic and conventional products in the US, January 2022

Product	Price of conventional products, dollars	Price of organic products, dollars	Deviation in the price of organic products, %
Apples (Gala), lbs	1,71	1,87	+9,36
Salad (mix), 5-9 ounces	2,99	3,38	+13,04
Potato (simple), 5 lbs	1,99	2,98	+49,75
Beef (muscle), lbs	4,99	8,99	+80,16
Ice-cream, 48-64 ounces	3,99	5,99	+50,13

Compiled according to ESMIS.

As an example, available price data for certain types of products are selected. The smallest price deviation is observed for fruits of perennial crops, the largest - for processing of livestock products. Producing according to organic standards is attractive to consumers and they are willing to pay more for this benefit. The price difference may also be linked to higher production costs in organic farming. According to the US Organic Trade Association, the profitability of producing and selling organic products is higher than the similar profitability of conventional products. Thus, the commercial premium for organic products offsets much higher technological costs and is the main reason for growing organic products in the private sector. On the other hand, a significant proportion of food is socially important, so in the short term the state may not be interested in redistributing resources to support the development of organic farming, especially in the domestic market.

### **Spreading Organic Farming**

Although organic farming has been around for some time, in the modern world it is constantly interacting with the environment and its methods are constantly being improved, taking into account scientific knowledge, research results and inventions. Modern organic farming is therefore not a conservative concept. The main aim of this concept is sustainability (social, economic and ecological). In some research, organic farming is considered a social innovation, as it aims to change the relationship between producers and the environment, as well as changing consumer attitudes towards food. Producers who grow organic products are more cohesive and communicative, and in many countries producer communities have been created in the form of associations or cooperatives. Innovators are generally highly educated and better informed than others.

Organic producer unions consider that the main problem in organic farming is the insufficient growth rate of production volumes. If the current growth rate of 5% per year is maintained until 2050, the share of organic farming will remain insignificant and the problem of reducing the sector's negative environmental impact will not be solved. To address this problem, the European producer community has presented the main functions of the new development phase of organic farming "Organic 3.0":

- **Agroecology and sustainability:** Organic 3.0 focuses on integrating agroecological principles into organic farming practices to promote a more sustainable system. This involves optimising interactions between plants, animals, soil, water and natural habitat to create more resilient agricultural ecosystems.
- **Innovation and technology:** Organic 3.0 encourages the adoption and adaptation of innovative technologies in organic farming. These technologies may include advanced monitoring and control systems, efficient use of resources, application of science and research to improve production and reduce environmental impact.
- **Supply chain integration:** Organic 3.0 promotes a holistic approach to the organic supply chain, including producers, processors, distributors and consumers. This involves developing stronger partnerships between these stakeholders to ensure the quality and integrity of organic products throughout the supply chain.
- **Regeneration and conservation of natural resources:** Organic 3.0 places a strong emphasis on the regeneration and conservation of natural resources such as soil, water and biodiversity. Through sustainable agricultural practices, such as soil-conserving

agriculture, efficient water use and the promotion of biodiversity, the aim is to maintain and improve the health of agricultural ecosystems.

- **Accessibility and equity:** Organic 3.0 aims to provide greater and fairer access to organic products for all categories of consumers. This may include developing innovative and sustainable business models that ensure affordable prices for organic products and encourage organic farming practices in local communities.

It is worth noting that spending on research into specific technologies for growing organic products accounts for less than 1% of private and public budgets. Innovations in organic farming are largely generated by the private sector of the economy. Given the minimal existing support for research and development, organic farming may have significant reserves for productivity growth in the future. Research priorities include:

- possibilities for improving soil fertility;
- crop rotation improvement;
- selection of agricultural crops targeted to the specific environment of organic farming systems and increasing pest resistance;
- prevention and treatment of animal diseases.

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### **Positive Externalities of Organic Farming**

Organic farming contributes to positive externalities to a greater extent than conventional farming. The types of agricultural production analyzed are compared both in economic terms and in terms of environmental impact.

### **Biodiversity**

It should be noted that ecosystem services are difficult to assess quantitatively. For example, traditional agriculture has an impact on pollinating insects and the precise assessment of this impact in quantitative terms is quite complex. Natural grasslands in an organic farm have high biodiversity and long-term resilience. Organic farming increases the biodiversity of farmland and adjacent areas by 30% compared to traditional farming. The greatest positive effect of organic farming is on wild plants and pollinating insects.

### **Impact of Organic Farming on the Environment**

The share of global agriculture in greenhouse gas emissions is 20-30%. In the region, total greenhouse gas emissions from agriculture are low compared to other sectors. The main sources of emissions are nitrous oxide from agricultural soils and methane from internal fermentation of farm animals. The main potential for climate change mitigation lies in the ability of agricultural soils to capture CO<sub>2</sub> through the creation of organic matter. In organic production, crop rotation and diversification are the most widely used means of pest and disease control. The limited use of pesticides and mineral fertilizers in organic farming encourages more varied crop rotations for nitrogen fixation. Greenhouse gas emissions per hectare in organic farming are lower than in conventional farming, but not always lower per unit of production due to the lower yield of the latter.

### **Impact of Organic Farming on Human Health**

The basic principle of organic farming is the health principle, according to which the health of an individual and society is linked to the state of the environment. Organic farming is designed to reduce the negative impact on human health of growth promoters, veterinary drugs, feed additives, mineral fertilizers and pesticides. Organic standards minimize the use of these substances. Organic producers claim that their products promote and maintain the health of society as a whole. Such products help to reduce population incidence and increase average life expectancy. The improved state of public health allows savings in the maintenance of medical institutions. At the same time, society itself maintains and strengthens the level of health without additional state intervention. Society also has a higher level of business activity and, consequently, higher labour productivity.

### **Adapting To the Impact of Climate Change**

Research shows that without climate change adaptation strategies, agriculture can suffer significant economic damage. At the moment, it is possible to compensate for the sector's losses through various adaptation measures: crop diversification and changes in the timing of technological operations (planting or crop rotations), institutional changes (government measures), technological developments. These directions are universal and can form the basis for adapting traditional and organic agriculture to climate change. However, adapting the industry to extreme weather events, such as drought, is possible by applying methods commonly found in organic farming. The key advantage of organic farming is the ability to form humus. Increased organic matter in the soil allows for increased fertility due to its water-holding capacity. This tool is the key to reducing operational risks associated with extreme weather events.

### **4.0 CONCLUSION AND RECOMMENDATIONS**

Considerable attention is being paid to organic farming from consumer demand. According to Fibl, in some EU countries (Denmark, France) organic products are replacing traditional ones and may become mainstream. In developing countries, organic farming is not yet perceived as a broad strategy for industry development. This is due to higher product prices and lower productivity. However, organic farming has positive externalities in contrast to conventional farming. The experience of developed countries shows that conventional and organic farming coexist, but the transition from conventional to organic production causes significant difficulties. For production, the conversion period presents two kinds of disadvantages: on the one hand, companies face higher labour intensity and lower yields, and on the other hand, they do not yet receive the commercial premium for organic products. Comparing these types of farming reflects the trade-off between affordable food production and positive environmental impact. At the same time, the development of organic farming in the short term depends to a large extent on purchasing power and government support. Comparing research and development costs in organic and conventional farming, we can assume that organic farming has the highest reserves for increasing productivity. Global experience shows that no activity can develop progressively without productivity growth, so the main conditions for ensuring the long-term sustainability of organic farming will be increasing research costs and implementing innovations.



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