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The efficiency of organic crop production

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The purpose of the article is to analyze current trends in the world and domestic market of organic agricultural products, to conduct a comparative analysis of the production of traditional and organic products in an agricultural enterprise and to assess the efficiency of its production. *Methodology.* Methodological and theoretical principles are based on the results of research obtained by Ukrainian and foreign scientists in the field of agricultural organic production. To achieve this goal, the dialectical method of cognition and the method of system analysis, monographic and economic-statistical methods, methods of comparison and expert evaluation, methods of computer processing, analysis and display of information using Microsoft Excel were used. *Results.* It is revealed that the market of organic products is a promising segment of the modern agro-industrial world and domestic market, so the number of farms engaged in organic production is constantly increasing. It is established that the export of domestic organic products significantly exceeds the domestic consumer market due to the low solvency of the population of Ukraine, but given the growing popularity of products grown without chemicals, organic farming looks like an attractive industry for investment. The calculation and analysis of indicators of economic efficiency of organic production of winter rye in comparison with traditional. It has been found that a higher price for organic products compensates for the cost of uncollected gross fees due to low yields, and gross profit is higher due to lower costs for the purchase of ancillary products. *Practical meaning.* Strict adherence to the technology of organic production and the use of the necessary agricultural machinery allows obtaining high profits, and non-use of chemical pesticides and fertilizers allows producers of organic agricultural products to have lower total costs, which leads to increased profitability. *Prospects for further research.* Extremely relevant for producers who work in the organic market and for those who are just planning is to justify the offer price for this product. They need to know at what price level the produced organic products will provide them with the expected result and provide an opportunity to cover all the costs of production development and product

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certification.

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Ефективність виробництва органічної продукції рослинництва

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Мета статті полягає в аналізі сучасних тенденцій світового та вітчизняного ринку органічної сільськогосподарської продукції, проведенні порівняльного аналізу виробництва традиційної та органічної продукції у сільськогосподарському підприємстві та оцінці ефективності її виробництва. **Методологія.** Методологічні та теоретичні принципи базуються на результатах досліджень, отриманих українськими та зарубіжними вченими у галузі аграрного органічного виробництва. Для досягнення поставленої в роботі мети були використані діалектичний метод пізнання та метод системного аналізу, монографічний та економічно-статистичний методи, методи порівняння та експертних оцінок, методи комп'ютерної обробки, аналізу та відображення інформації за допомогою програми Microsoft Excel. **Результати.** Виявлено, що ринок органічних продуктів є перспективним сегментом сучасного агропромислового світового і вітчизняного ринку, тому постійно збільшується кількість господарств, які займаються органічним виробництвом. Встановлено, що експорт вітчизняної органічної продукції значно перевищує обсяги внутрішнього споживчого ринку внаслідок низької платоспроможності населення України, але з огляду на зростання популярності продуктів, вирощених без застосування хімічних препаратів, органічне землеробство виглядає привабливою галуззю для інвестування. Проведено розрахунок й аналіз показників економічної ефективності органічного виробництва озимого жита в порівнянні з традиційним. Встановлено, що більш висока ціна на органічну продукцію компенсує вартість недоотриманих валових зборів через низьку врожайність, а валовий прибуток вищий завдяки меншим витратам на придбання допоміжних продуктів. **Практичне значення.** Чітке дотримання технології органічного виробництва та використання необхідної сільськогосподарської техніки дозволяє отримувати високий прибуток, а невикористання хімічних пестицидів та добрив дозволяє виробникам органічної сільськогосподарської продукції мати менші загальні витрати, що й приводить до зростання прибутковості. **Перспективи подальших досліджень.** Надзвичайно актуальним для виробників, які працюють на органічному ринку, і для тих, хто тільки планує є обґрунтування ціни пропозиції на дану продукцію. Вони повинні знати, за якого рівня ціни вироблена органічна продукція забезпечить їм очікуваний результат та надасть можливість покрити всі витрати на розвиток

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виробництва та сертифікацію продукції.

Ключові слова: органічне виробництво, органічна сільськогосподарська продукція, економічна ефективність, витрати, ціна, прибуток

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1. Introduction.

Developed agricultural countries of the world, which have reached the limit level of chemicalization of agriculture, pursue an active scientific, technical and investment policy for the development of organic farming using alternative technologies, in particular, organic and biological. The result is the so-called organic products, which differ from the usual not only the presence of a certificate, but also environmental friendliness and safety, high quality and freshness, higher taste and shelf life (Willer et al., 2021). In addition, it is organic farming in the long run allows you to maintain and increase soil fertility; maintain and expand biological cycles in the system of management and processing; minimize environmental pollution; to protect water resources, etc. (Lioutas and Charatsari, 2018). As the market of organic products is a promising segment of the modern agro-industrial market, the number of farms that are now switching to organic crop and livestock is constantly increasing. Therefore, the creation and development of a behavioural economy that is able to respond effectively and in a timely manner to dynamic changes in the environment, the formation of corporate social responsibility and national health determine the undoubted relevance of uninterrupted food security on the basis of organic production.

2. Analysis of recent research and

publications.

Many scientists and specialists are engaged in research of problems and prospects of development of organic production in the agricultural sector. In particular, Madhusudhan L, Lioutas E D and Charatsari Ch emphasize the importance of expanding and comprehensively supporting this area in agricultural development (Lioutas and Charatsari, 2018; Madhusudhan, 2016). Ayuya O I draws attention to the impact of certification on the selling price of organic products (Ayuya, 2019). Czyżewski B, Matuszczak A and Miśkiewicz R note a wide range of prices for such products in the regional context (Czyżewski, Matuszczak and Miśkiewicz, 2019).

Domestic scientists, in particular V. Artysh, V. Granovska, T. Dudar, T. Zinchuk, V. Kaminsky, M. Martyniuk, V. Mesel-Veselyak, J. Ostafiychuk, I. Primak, P. Sabluk, O. Khodakivska, O. Skidan, O. Shkuratov, O. Shumeiko, in their works highlight the role and place of organic farming in the implementation of the basic provisions of sustainable development as a condition of European integration and food security of Ukraine (Dudar, 2019; Granovska, 2017; Artysh, 2010). Such issues are becoming increasingly important with the growing demand for organic products under the significant influence of COVID-19. Of course, today it is difficult to predict in the long run, but we can analyze trends for the development of the organic market.

However, this sphere of production, despite the significant potential, has not developed strongly in Ukraine, which necessitates the continuation of research.

3. Research methods.

A number of scientific methods were used in the research, in particular, the dialectical method of cognition and the method of system analysis, monographic and economic-statistical methods, and methods of comparison and expert evaluations. Methods of computer processing, analysis and display of information using Microsoft Excel were used to conduct a comprehensive analysis, defined by the purpose and objectives of the work.

4. Formulation of research objectives.

The purpose and task of the study is to analyze current trends in the global and domestic market of organic agricultural products, a comparative analysis of the production of traditional and organic products in an agricultural enterprise and assess the efficiency of its production.

5. Presentation of the main results and their substantiation.

Agricultural production and the food industry have been and will be the most stable sectors of the economy worldwide, as food is one of the basic social needs. Consumer preferences and priorities change, but basic needs do not. And no pandemics, lockdowns, border closures, changes in supply chains, etc. will be able to influence this.

One of the latest global trends in the global market for agricultural products, especially in the context of recent events, is the implantation of organic production. In addition, the world market of organic agro-food products is characterized by a

rapid increase in production and sales, diversification of species structure, an increase in the number of both producer and consumer countries, and is one of the most dynamic. Among the social masses, a noticeable trend of healthy eating is rapidly developing under the slogan "you are what you eat".

Organic crop production today is increasingly of interest to farms that have traditionally used mineral fertilizers and pesticides and engaged exclusively in "inorganic". The market of organic products is a promising segment of the agro-industrial market of developed countries, and the production of environmentally friendly products is characterized by systematic approaches to solving environmental, economic and social problems (Cvitko, 2018).

Modern sales of organic products in the world are more than 90 billion dollars for a year. Earlier, analysts predicted that in 2020 the volume of this market could reach 200-250 billion dollars. USA, but due to the well-known pandemic, many sectors of the economy of the vast majority of countries have stagnated. About 1.8 million producers from different countries are engaged in organic production on more than 72 million hectares of agricultural land. Their number is constantly growing.

Organic agriculture has great potential and is one of the tools to improve the economic, social and environmental condition of society.

In Ukraine, farmers began to consciously engage in organic production in the late 1990s. Today such public organizations and associations as the Federation of Organic Movement of Ukraine, the certification body "Organic Standard", the International Association of Organic Production "BIOLan Ukraine", the Union

of Organic Agriculture "Naturproduct", the All-Ukrainian Public Organization "Living Planet", All-Ukrainian public organization "Organic Agriculture Club", Trading House "Organic Era" and others. Actively developing the domestic market, our state from year to year is increasingly asserting itself in the international market of organic products. In Ukraine, the number of operators of such a market and the area of organic agricultural land is increasing to the level of world leaders, the range of products offered and the geography of supply is expanding.

According to the monitoring of the Ministry of Economy, in 2019 the total area of "organic" agricultural land and land in transition amounted to about 1.1% of the total area of agricultural land in Ukraine, or 468 thousand hectares. 617 organic market operators are officially registered, of which 470 are agricultural producers (Organic production in Ukraine).

Exports of domestic organic products significantly exceed the volume of the domestic consumer market. Analysis of statistical data of the Federation of Organic Movement of Ukraine revealed that the share of organic products sold on the domestic market in 2019 was only 1.54% due to low solvency of the population. Because the demand for organic products is directly proportional to the level of income of the population. Ukrainians consume much less organic products than in other developed countries, for example, in Ukraine this figure is 3 Euros per capita, and in the EU - 53.7 Euros (Ukrainians are lagging behind in the consumption of organic products). However, despite some negative factors, there is still a gradual development of the domestic market for organic products. The volume of the

consumer market of organic products in Ukraine in 2019 amounted to 36 million Euros (In 2019, Ukraine ranked 2nd out of 123 countries in terms of the volume of imported organic products in the EU). At the same time, in 2020 the number of operators of organic production increased by 17%, and the number of processors of organic products - by 33%. The problem that slows down the introduction of organic technologies in agriculture is the limited working capital of producers, because ensuring the environmental friendliness of production requires the introduction of various additional operations and strict compliance with agronomic requirements.

Most organic farms are located in Odessa, Kherson, Kyiv, Vinnitsa, Zakarpattia, Poltava, Lviv, Zhytomyr regions. Ukrainian certified organic farms are usually of various sizes - from a few hectares, as in most European countries, to several thousand hectares of agricultural land of large companies.

The introduction of high quality products is almost always associated with an increase in its cost over the life cycle and, consequently, the final price. The cost of organic products is usually higher than the cost of traditional products, although exceptions are possible - depending on the type of product, season and region (Ayuya, 2019). But despite higher prices, more and more middle-income Ukrainians are choosing organic products, realizing their health benefits and advantages over "inorganic". Therefore, given the growing popularity of products grown without the use of chemicals, organic farming looks like an attractive industry for investment.

The main types of organic crop products produced by Ukrainian farmers are wheat, barley, rye, oats, sunflower, corn, peas,

soybeans, etc., as the cultivation of arable crops is the least expensive.

The Kusto Agro Group defines crop production as a fundamental area of activity for long-term development. The key strategy in the field of crop production is to ensure high yields in the long run

with the use of modern technologies and adherence to agricultural culture, as well as the development of organic farming.

The main indicators of the use of production resources in general by the company and separately in organic production are presented in table 1.

Table 1. The main indicators of the use of production resources

Indicator	Inorganic production			Organic production		
	2016	2019	2019 to 2016, %	2016	2019	2019 to 2016, %
The cost of gross output, thousand UAH	245035,43	591974,95	241,59	11171,38	19574,00	175,22
Profit, thousand UAH	118791,74	215648,54	181,53	7022,58	7789,25	110,92
Area of agricultural land, ha	10975,40	21604,61	196,85	674,6	1136,22	168,43
It accounts for 1 hectare of agricultural land, UAH						
- gross output	22325,88	27400,40	122,73	16560,00	17227,30	104,03
- profit	10823,46	9981,60	92,22	10410,00	6855,41	65,85
The level of profitability, %	86,84	41,43	X	154,22	57,01	X

Table 1 shows a direct relationship between the value of gross output and agricultural land area and profit: with the company's GDP growth almost doubled and profit, by 81%, but per 1 hectare of agricultural land profit decreased due to a significant change in land structure possessions.

The gradual increase in gross output per 1 hectare of agricultural land from 2016 to 2019 by UAH 5,074.52 demonstrates the harmonious and rational use of the company's available resources. The farm successfully uses crop rotations and modern production technologies and achieves proportional growth on several important indicators.

The level of profitability over the analyzed years in the dynamics has almost halved, but the company managed to fix it at 41.43%. In contrast to the average profitability indicators in Ukraine, the company has a positive level of

profitability, especially against the background of recent global changes. The use of production resources in organic production somewhat repeats the trends of the company's overall performance, but has several significant differences. Thus, the profitability in 2016 was almost twice as high and amounted to 154.22%, but fell to 57% mainly due to a decrease in profits per 1 hectare of organic agricultural land by 3554.59 UAH. This is mainly due to increased competition in the organic market, which has led to balancing the market price to adequate values. Therefore, these changes should be considered more economically justified at the national level, which will bring qualitative and quantitative changes in the range of organic products in the markets of Ukraine.

The analyzed crop is winter rye, on the example of which the efficiency of organic production in comparison with

the traditional one is considered (Table 2).

Table 2. Economic efficiency of winter rye production

Indicator	Inorganic production	Organic production	Deviation
Area, ha	177,62	278,00	100,38
Yield, quintals/ha	45,00	27,00	-18
Gross harvest, quintals	7992,90	7506,00	-486,9
The total cost of 1 ton of grain, UAH	3011,92	2741,28	-270,64
Total costs per 1 ha, UAH	13553,82	7401,48	-6152,34
Sales price 1 ton, UAH without VAT	3214,17	3921,28	707,11
Profit per 1 ton, UAH	202,25	1180,00	977,75
Profit per 1 ha, UAH	910,13	3186,00	2275,87
The level of profitability, %	6,72	43,05	36,33

The disadvantage of organic technology is the lower crop yields. As can be seen from the table, for winter rye more than 1.5 times. This, of course, affects the reduction of gross collection.

Winter rye using various mineral fertilizers and pesticides is a crop with a high production cost compared to its low selling price. This explains the low profitability of crops grown by traditional technology, at 6.72%.

In contrast, organic winter rye with the use of phytobiopreparations has many advantages, namely: lower total cost of 1 ton of grain by 300-400 UAH, higher selling price by 400-700 UAH per ton, higher profit, 6-7 times higher profitability of the crop .

Strict adherence to the technology of organic production and the use of the necessary agricultural machinery allows to obtain high profits. A higher price for organic products compensates for the cost of uncollected gross fees due to low yields, and gross profit is higher due to lower costs for the purchase of ancillary products. That is, the non-use of chemical pesticides and fertilizers allows producers of organic agricultural products to have lower total costs, which leads to increased profitability.

Extremely relevant for producers who work in the organic market and for those

who are just planning is to justify the offer price for this product. They need to know at what price level the produced organic products will provide them with the expected result and will provide an opportunity to cover all costs for production development and product certification (Cherednichenko and Bal-Prylypko, 2019). For example, German processors pay 30% of the market price for organic rye and all 50% for soybeans. In this example, the selling price of 1 ton of organic products exceeds the selling price of 1 ton of inorganic by 22%.

6. Conclusions.

Demand for organic products in the consumer market is constantly growing, despite the low level of awareness of organic products among consumers and low purchasing power. And, despite the fact that organic production requires additional financial and organizational costs, the number of farms ready to engage in it is growing. Even with yields at the level of the average in intensive agriculture, organic production is profitable. And this example clearly shows the great potential for development in this area.

The Cabinet of Ministers of Ukraine also encourages the expansion of areas for organic production, introducing a new

direction of state support for farmers engaged in the production of organic products (The Federation of Organic Movement of Ukraine).

The expediency of using organic technologies in agriculture is conditioned by the need to develop rural areas and improve the living standards of the rural population; reproduction of soil fertility

and preservation of the environment; increasing the efficiency and profitability of agricultural production; strengthening the country's export potential; providing the consumer market with healthy quality products; improving the image as a producer and exporter of high quality organic products; ensuring food security of Ukraine.

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