Ecological Questions 34(2023)4 http://dx.doi.org/10.12775/EQ.2023.053

What are the organizational and economic principles of organic farming in the context of sustainable development? Case of Ukraine

Olena Dobrovolska[1], Tetiana Grabovska[2,3], Vitaliy Lavrov[2], Yuri Ternovyi[4], Marek Jelínek[5], Hynek Roubík[5,*]

[1]Department of Finance, Banking and Insurance, Dnipro State Agrarian and Economic University, Sergiy Yefremov st., 25, Dnipro, Ukraine
[2]Department of General Ecology and Ecotrophology, Faculty of Ecology, Bila Tserkva National Agrarian University, sq. Soborna, 8/1, Bila Tserkva, Ukraine
[3]Department of Agroecology and Environment, Agroscope, Reckenholz str. 191, CH-8046 Zurich, Switzerland
[4]Skvyra Research Station for Organic Production, National Academy of Sciences of Ukraine, Skvyra, Ukraine
[5]Department of Sustainable Technologies, Faculty of Tropical AgriSciences, Czech University of Life Sciences Prague, Czech Republic

*****Corresponding author e-mail: roubik@ftz.czu.cz

Received: 24 March 2023 / Accepted: 14 July 2023

Abstract. The development of organic agriculture is a long-term global trend; with different local factors that affect the development rate. Ukraine is one of the largest food suppliers in the world and this also applies to organic production. The evaluation of organic production at Skvyra Organic Research Station was conducted in 2015-2020 on 40 ha land; focusing on the economic performance of the enterprise and the specialization of production. The systematic approach and dialectical method of cognition were used to identify the key factors in the development of organic farming. The purpose of the study is an organizational and economic analysis of a state enterprise that is making a gradual transition from intensive to organic production, in order to determine the main principles that stimulate the development of organic production, and to overcome the challenges faced by the enterprise on the way to the introduction of organic production. The results indicate that the enterprise is profitable but does not operate up to its potential. The key issues were identified in the lack of focus on marketable crops, efficiency of labour, crop production, and management. The enterprise is negatively affected by the current legal framework and insufficient financial stability. The enterprises income consists of selling crops (i.e. cereals, legumes) and service-to-business (i.e. laboratory testing), with no state funding. Further results show the relation of the production and specialization with climatic, natural, biological and socio-economic factors. To improve the organisational and economic framework for the development of organic production, Ukrainian enterprises should focus on cost-effective products. Furthermore, competition between agricultural enterprises should support deeper specialization and production of competitive products, contributing to the profitability and economic stability of producers.

Keywords: organic farming, coefficient of specification, sustainable development, labour productivity, crop production, climate impacts, profitability, product competitiveness, management, state enterprise, economic indicators.

1.Introduction

Organic production plays an increasingly important role in world agriculture. Although the conventional way of agricultural production remains the major source of food products, the demand for organic products is constantly increasing. Organic farming methods combine traditional practices with current knowledge of ecology and modern technology. The basic requirements of organic production are the exclusion of genetically modified seeds and synthetic fertilizers and pesticides, which contribute to reducing the environmental impact of farming (Ti et al., 2020). Organic farming aims at sustainable food production, by minimising the negative impacts of water and nutrient depletion, soil degradation, and loss of biodiversity (Dobrovolska & Espejo, 2018; Seena Radhakrishnan et al., 2022). In Ukraine organic production is regulated by the law of Ukraine 'On general principles and standards of organic production, circulation and labelling of organic product' No. 2496-VIII dated 10 July 2018 and the decrees of the Cabinet of Ministers of Ukraine considering EU legislation: Regulations 834/2007, 889/2008 and other (Lavrov et al., 2019).

The economic aspect of organic production can be a limiting factor during the initial years of farming. After few years of organic farming, the soil condition is likely to improve, resulting in better crop yields, and with successive years, there will be less need for additional biofertilizers (Singh, 2018). However, in case of low economic performance, some farmers may be forced to switch back to conventional farming (Ti et al., 2020).

Currently, approximately 1-1.6% of the agricultural land in the world is used for organic farming (Dobrovolska & Espejo, 2018; FiBL, 2022), despite the growing interest in agricultural products. The choice may depend on education, landholding size, the age of farmers, experience, education level, per capita income, as well as a network of supply and delivery points, etc. (Sharma & Pudasaini, 2021; Liu et al., 2019; Home et al., 2019; Azam & Shaheen, 2019). Developing countries propose such an approach as agrotourism, as a local solution to the sustainability of organic farming (Abebe et al., 2022).

In Ukraine, the organic agriculture sector started to develop mainly in the late 1990s. The sector is under constant development, but remains a minor actor in comparison to countries as USA, Germany, France, or United Kingdom. According to the study by Vladlenov et al. (2020), the potential of Ukraine for organic agriculture is very great, namely due to the high fertility of Ukrainian lands. On the other hand, unsustainable conventional agricultural production does not preserve fertile land and decreases its quality.

Chygryn et al. (2017) state that future expansion of the organic sector will contribute to the preservation of the environment and soil fertility in Ukraine, as well as to the security of the healthy consumer market. This will require more advanced practices from the farmers, as well as better support from the government (i.e. in form of subsidies). According to Dobrovolska and Espejo (2018), the growth of the sector is limited by the lack of state support. This problem includes financial support, helping to maintain financial stability, but also raising awareness about the key issues the organic farming addresses, sustainable development, protection of the environment, and health.

This article aims to provide is an organizational and economic analysis of the Skvyra Organic Research Station, which implements organic farming and provides information on identifying the determining factors relevant for the successful development of organic agriculture as well as overcoming the challenges faced by the enterprise on the way to the introduction of organic production.

2. Materials and Methods

The Skvyra Organic Demonstration proving ground consists of fields belonging to two enterprises: Skvyra Research Station for Organic Production of the Institute of Agroecology and Nature Management of the National Academy of Agrarian Sciences of Ukraine (SRS IANM NAAS) (24 ha) and the State Enterprise "Experimental Farm "Skvyrske" IANM NAAS" (SE EF "Skvyrske") (16 ha).

It is one of the few state enterprises of Ukraine, which has fertile land, good climatic conditions and numerous scientific potential to create conditions for a gradual transition from intensive to organic production, understanding the compatibility of the organic system of agriculture and agricultural products to certain standards. In addition, it has the state support necessary to ensure the activity of organic cultivation of products during the transitional three-year period. The company under study maintains full-fledged financial reporting that meets the requirements of the legislation of Ukraine, and is open to scientists for conducting field research and analysis. All this made it possible to systematize economic indicators and conduct data analysis. The material was researched using the example of SRS IANM NAAS for the period 2015-2020.

Problems faced by the company:

- bureaucratic requirements and numerous paperwork for obtaining certificates of conformity,
- insufficient state funding and commercial funding,
- lack of organic fertilizers, which affects productivity,

- low motivation of labour activity of state enterprises,
- lack of new equipment and irrigation systems.

The station was established in 1919; since 2013 it works as organic (certified by Organic Standard LLC). The enterprise is based on the state property, activity – research and experimental developments in the field of natural and technical sciences. The station was established for the purpose of scientific support for organic production, development of the environment, energy saving technologies for cultivation, and the creation of new highly productive crops.

Weather during the study period 2015-2020 was characterized by high temperature and uneven rainfall. The 2020 year was generally atypical / abnormal for the right bank forest-Steppe in Ukraine due to the absence of snowfall and frost in winter.

We studied the dynamics of composition and structure, as well as revenue from sales of marketable products, labour resources, fixed and current assets, the main indicators of production and economic activity of the enterprise.

The dynamics of the composition and structure of marketable products of SRS IANM NAAS was described in accordance with the form State Standard of Ukraine 29, which is typical for all agricultural enterprises of Ukraine.

The coefficient of specialization is the concentration coefficient of commodity production, which is calculated in order to take into account the degree of development of all commodity branches of the enterprise. The efficiency of production in agricultural enterprises depends not only on the size of the industries that are leading in them, but also on how developed are other industries that are of a commodity nature. The more such industries there are in the economy, the smaller their size and the lower the concentration of production. This sometimes has a negative impact on the final results of business. Since our state-owned enterprise is engaged exclusively in crop production, we determined the coefficient of specialization based on the indicators of the structure of marketable products in its total volume. To calculate the coefficient of specialization, we used the formula (Andriychuk, 2013):

$$Ks = \frac{100}{(\Sigma p \times (2i - 1))}$$

where:

Ks = coefficient of specialization

P = p is the share of each industry or type of product in the total marketable products of the economy (in %);

i – the ordinal number of the type of marketable products in the series ranked according to their specific weight, starting from the highest.

Farms with a low level of specialization have a coefficient of Ks up to 0.20, with a medium – 0.20 to 0.40, and a high – from 0.41 to 0.60. Farms with a deep specialization have a coefficient greater than 0.60.

Data were statistically processed by analysis of variance at the level of 0.05.

The theoretical and methodological basis of the study was a systematic approach and a dialectical method of cognition, which were used to study problems of introduction of organic production and implementation of organizational and economic tools for the development of agricultural enterprises on the example of a state enterprise of Ukraine. In the work on writing the article, the authors used: the method of comparing statistical data (to identify the main problems and trends of the introduction of organic production at the enterprise), the graphic method (visual presentation of the obtained research results in the form of drawings, graphs and diagrams), methods of analysis and synthesis (for consideration and generalization of individual components of the research), economic and statistical analyses (to study the organizational and economic characteristics of the development of an agricultural enterprise), the survey method (to obtain information from the head of the enterprise regarding the definition and clarification of the enterprise's reporting indicators and the peculiarities of its activity). A survey of farmers was not conducted, as we focused on research on organic production in a state-owned enterprise. The data of the statistical and accounting reports of the agricultural enterprise served as the information base for writing the article for the period 2015-2020, results of the authors' own observations.

3. Results

SRS IANM NAAS makes a profit by growing crops, including cereals and legumes, corn, sunflower, soybeans, open ground vegetables, providing services in the field of crop production (testing of pesticides, fertilizers, stimulants, storage facilities), as well as other crops (crops grown for seed, mostly vegetables). In 2020, the crop industry there sold marketable products at 17639,57 euros 611 thousand UAH, which is 96.84 % more than in 2015 (Table 1). Furthermore, sales revenue was high in 2016 - 15410,16 euros. However, in 2018, the minimum for these years was 197 thousand UAH, which was affected by price fluctuations (in 2019, due to the depreciation of the euro, prices for agricultural products also decreased), crop yields (Table 2). Additionally, in 2015 and 2018, there were no orders from other businesses to test preparations, fertilizers, and other

services in crop production. Milk thistle (other spring crops) was grown in 2018-2019 and sold in 2020 (crop services).

Table 1. Dynamics of the Structure of Marketable Products SRS IANM NAAS.

Indicator	2015	2016	2017	2018	2019	2020	Deviation of 2020 from 2015	
	EURO	EURO	EURO	EURO	EURO	EURO	%	EURO, +/-
Cereals and legumes – total	5605.7	8830.93	4358.84	5670.21	7090.70	4272.76	76.22	-1332.94
Winter grain (winter wheat)	2402.44	2040.61	507.54	4695.08	3138.51	3839.71	159.83	1437.27
Spring cereals	3203.26	5664.46	2866.08	758.44	3952.19	433.05	13.52	-2770.21
- spring wheat			1283.76	0	154.99		0.00	0
- corn for grain		914.76		469.51		346.44	0.00	346.44
- buckwheat	2135.5	4257.14	1582.32				0.00	-2135.5
- spring oats	1067.75	492.56		0	3719.71		0.00	-1067.75
- spring barley	0			288.93	77.49	86.61	0.00	86.61
Legumes	0	1125.86	985.22	216.69			0.00	0
- pea	0		238.84	216.69			0.00	0
- other legumes	0	1125.86	746.38	0			0.00	0
Sunflower	0			288.93		86.61	0.00	86.61
Soybean	1716.03	1970.25	328.41	469.51	2324.82	3348.92	195.16	1632.89
Open ground vegetables	0	105.55		0	309.98	86.61	0.00	86.61
Other crop products	1639.76	809.21	149.26	686.20 1	116.24	664.01	40.49	-975.75
Crop products – total	8961.49	11715.94	4836.51	7114.85	9841.74	8458.91	94.39	-502.58
Crop services	0	3694.22	6120.28		2169.83	9180.66	0.00	9180.66
Agricultural products	8961.49	15410.16	10956.79	7114.85	12011.57	17639.57	196.84	8678.08

Table 2. Yields of agricultural products grown on SRS IANM NAAS after its purification, in t.

Indicator	2015	2016	2017	2018	2019	2020
Cereals and legumes – total	3.1	2.05	2.6	2.8	2.8	1.8
Winter grain (winter wheat)	3.3	2.8	4.2	5.4	3.8	1.9
Spring cereals	2.9	2.5	1.3	2.5	1.8	1.7
- spring wheat	–	–	1.8	–	1.0	–
- corn for grain		3.1	–	5.3	–	3.7
- buckwheat	1.2	2.2	0.8	–	–	0.4
- spring oats	4.6	2.2	–	–	3.0	
- spring barley	–	–	–	1.6	2.8	1.1
- other spring crops	–	–	–	0.6	0.5	–
Legumes	–	0.85	2.3	0.6	–	–
- pea	–	–	2.5	0.7	–	–
- other legumes	–	0.85	2.1	0.5	–	–
Sunflower	–	–	–	0.7	1.6	1.5
Soybean	1.6	2.2	0.8	0.7	1.5	1.3
Open ground vegetables	1.8	0.8	–	0.3	8.0	0.6
Total	2.2	1.7	1.7	1.1	3.5	1.3

The largest share in the structure of marketable products in this company is occupied by cereals and legumes. However, their share during the study period ranged from 79.7% (5670.21 euro) in 2018 (highest) to 24.2% (4272.76 euro) in 2020 (lowest) and averages 53.8% (Fig. 1). In 2019, 7090.70 euros were received for the sale of grains and legumes.

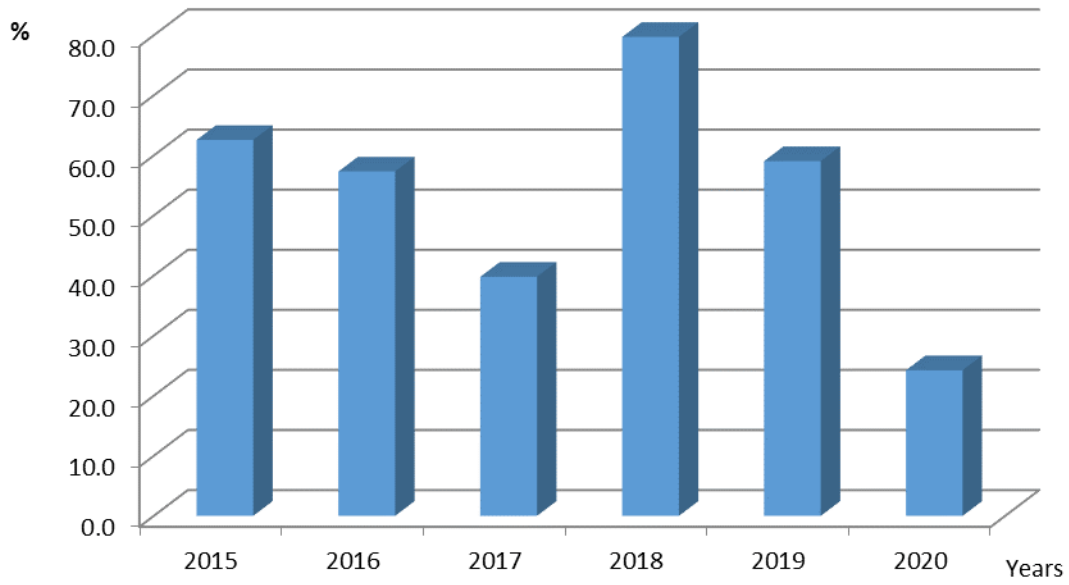

Figure 1. The share of annual revenue from the sale of grains and legumes in SRS IANM NAAS from the total number of agricultural products

The composition of grains and legumes by their structure over the years (Fig. 2) shows that in SRS IANM NAAS in 2015-2020 the sown areas for winter, spring grains, and legumes changed annually, the profit from the harvest of winter grains was 507.54 euro (2017) –4695.08 euro (2018), which is 4.6-66% of the total amount of profit, from spring cereals – 433.05 (2020) – 5664.46 euro (2016) (2.5-36.8%), from legumes – up to 1125.86 euro (2016) (0-9%). It is interesting that in 2019 the farm practically returned to the structure of marketable products in 2015. Winter/spring cereals in 2015 amounted to 26.8/35.7%, in 2019 – 26.1/32.9%. In 2020, the farm focused mainly on winter wheat (21.8%) among cereals and legumes and received for it on 70 thousand UAH more in 2020 compared to 2015.

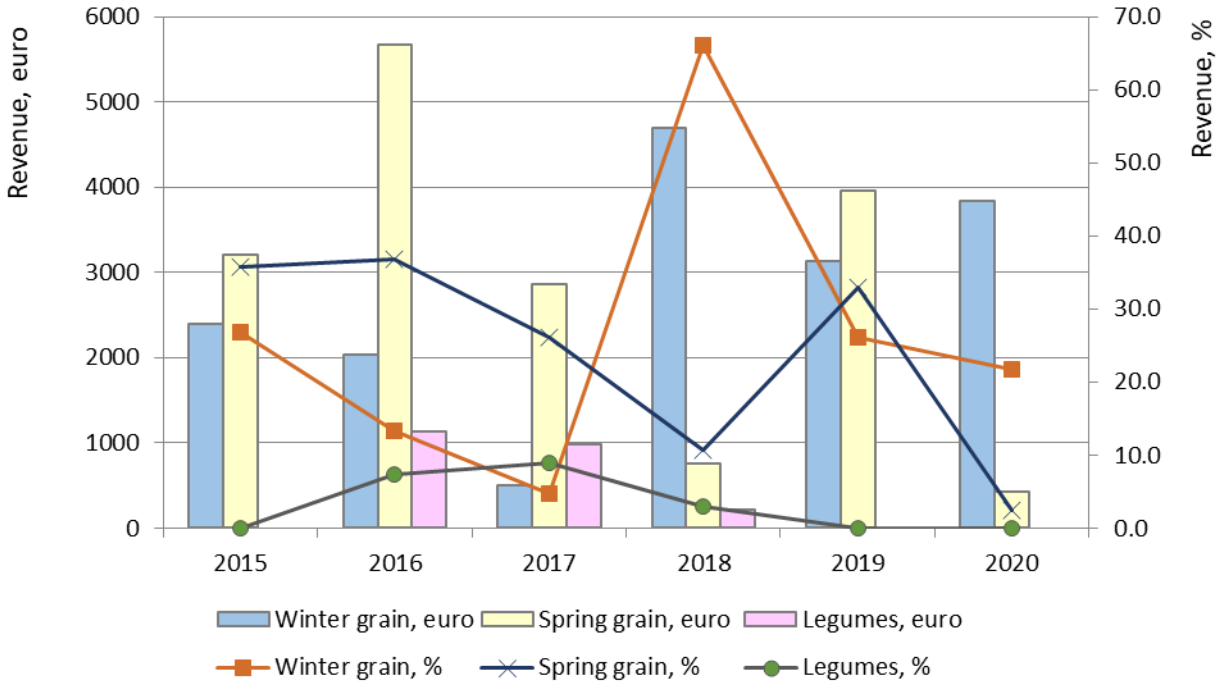

Figure 2. Dynamics of the amount of revenue from the sale of grains and legumes grown in SRS IANM NAAS, 2015-2020

It should be noted that corn for grain was grown in 2016 – 5.9%, in 2018 - 6.6%, and in 2020 – 2% in the structure of marketable products. Sunflowers were sown only in 2018 and 2020, 4.1 and 0.5% of total agricultural production. These crops were used for scientific research by the IANM NAAS laboratory to determine the effectiveness of pesticides and agrochemicals.

The company annually grows soybeans, which, in addition to providing nitrogen to the soil, are in great demand on the market. In terms of share of total revenue, soybean profit was almost the same in 2015, 2019 and 2020 (19.1; 19.4; 19.0%), but in 2015 the company received 1716.03 euros for soybeans, in 2019 2324.82, in 2020 -3348.92 euros. Therefore, we can say that further cultivation of soybeans in the enterprise is economically feasible. In 2017 and 2018, according to crop rotation, soybean was grown mainly in the fields of SE EF "Skvyrske", so in the accounts of the SRS IANM NAAS it was not covered.

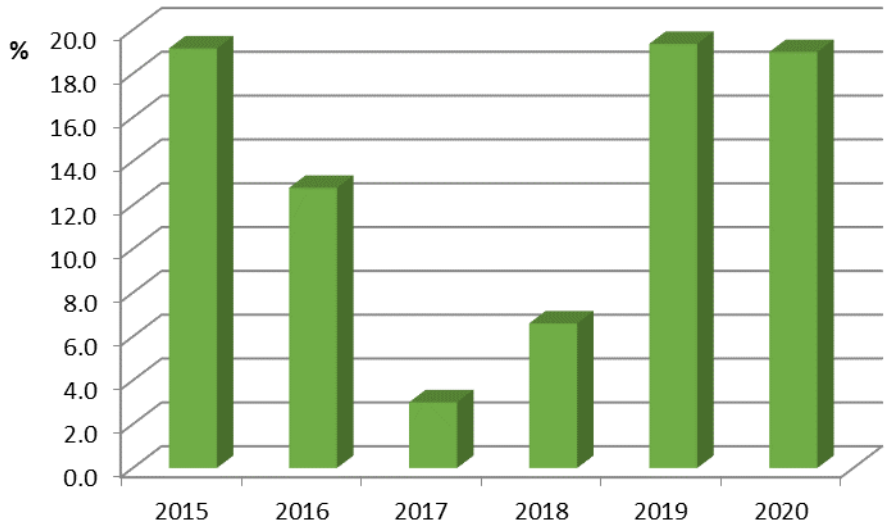

Figure 3. Dynamics of revenue from the sale of soybeans grown in 2015-2020 in SRS IANM NAAS

Compared to 2015, in 2020, in the marketable products of the SRS IANM NAAS company the most (52%) were services in crop production (conducting experiments to order, renting a tractor, storage of grain and seeds from other enterprises) (Fig. 4). Buckwheat, which was sown in 2020 in an area of 6.59 ha, due to low yields due to abiotic factors (heavy rainfall, cooling at the beginning of the growing season, and strong heat during flowering and grain filling) was left for sowing in 2021.

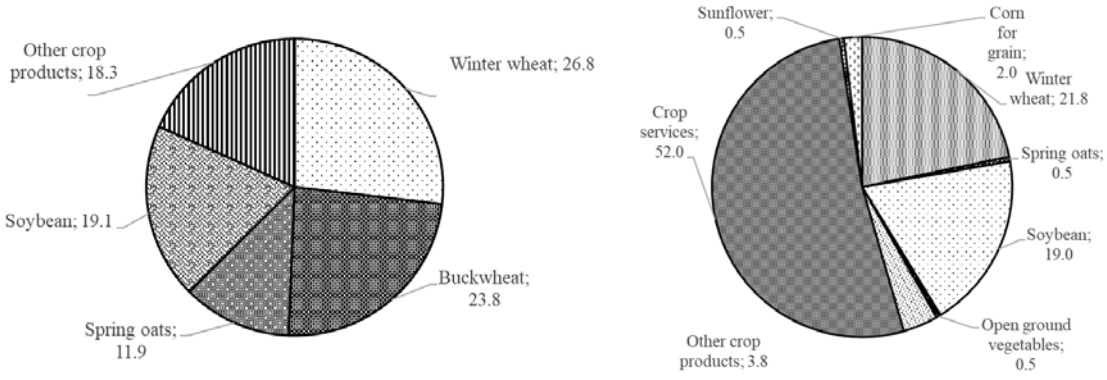

Figure 4. Structure of marketable products of SRS IANM NAAS, share (%) of the total number of agricultural products in 2015 (left) and 2020 (right)

The station also grows buckwheat, winter wheat, soybeans, oats, and corn. Its dynamics for

2015-2020 in the range of marketable products is shown in the table. 4. Organic corn was also grown in 2014. However, since 2017 the company abandoned this crop because it depletes the soil and requires a significant amount of organic fertilizers, which is economically impractical due to the lack of organic livestock at the station. Furthermore, corn requires significant costs in organic production and carries a number of risks in adverse weather conditions in the first half of the growing season. Growing this crop in small areas using organic technologies is economically unprofitable due to the problems of realization of its small volumes. Spelt (2016), spring wheat (2017), beans, cucumber (2018), and mustard (2019) were also grown in organic fields for only one year due to the lack of a stable market for these organic products. Lentils (2017-2018) and milk thistle (2018-2019) were grown on orders during this short period, although the production of organic milk thistle in large areas is promising for export. In 2016, peas were grown on a plot (1 ha) outside of crop rotation only for propagation, and in 2017 and 2018 in organic crop rotation fields.

The specialization of agricultural enterprises is a complex and diverse process that requires the concentration of all resources to obtain quality products that would satisfy the purchasing power of consumers and would be profitable. To perfectly determine the level of specialization, we made a ranked raw (Table 3).

Table 3. Ranked raw of specific weight of certain types of organic products, %.

Year	1*	3	5	7	9	11	13	15	17
2015	26.81	23.83	19.15	18.30	11.91	0	0	0	0
2016	27.63	23.97	13.24	12.79	7.31	5.94	5.25	3.2	0.68
2017	55.86	14.44	11.72	8.99	6.81	4.63	3.00	2.18	1.36
2018	65.99	9.64	6.60	6.60	4.06	4.06	3.05	0	0
2019	30.97	26.13	19.35	18.06	2.58	1.29	0.97	0.65	0
2020	52.05	21.77	18.99	3.76	1.96	0.49	0.49	0.49	0

Note: * 1-17 – ordinal number of the type of commercially viable products in the raw ranked according to their specific weight.

In 2016 Ks was less than 0.20 (Fig. 5) which shows that the company has a low level of specialization in crop production (nine indicators). But it is clear that in 2015, 2017-2020, this figure

increased slightly and is in the range of the average level of specialization with fluctuations over the years.

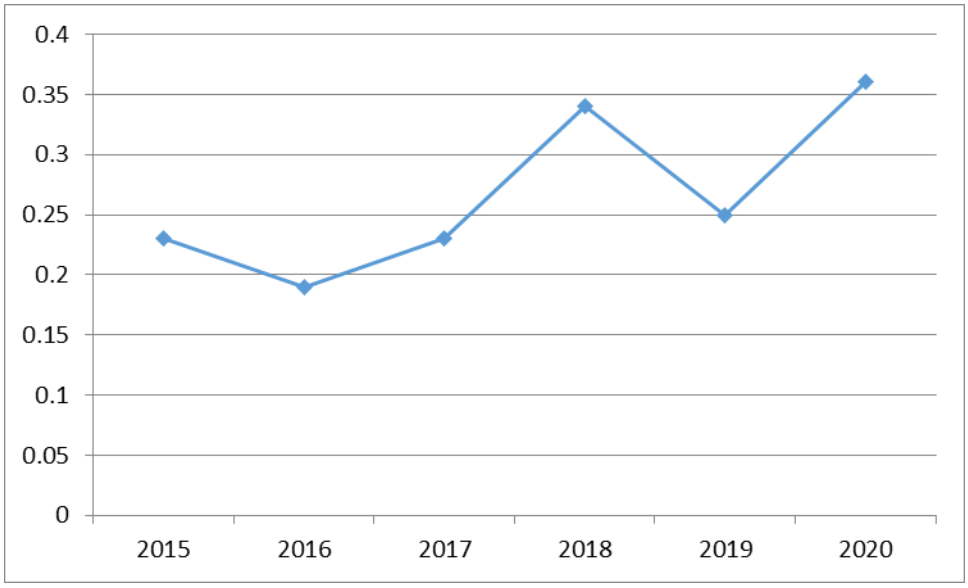

Figure 5. The level of specialization (Ks) of the SRS IANM NAAS enterprise

The sum of the value of gross output at comparable prices increased in 2020 compared to 2015 by 50.6%, which is 5.93 thousand euro (Table 4). The milk thistle, grown in 2018-2019, was sold in 2020. The average annual number of employees decreased by 9 people, or 45%, which was caused by a reduction in public funding and an increase in the minimum salary. Therefore, significant fluctuations in these indicators affected the production of gross agricultural production per average annual employee, an increase over the analysed period of 1.01 thousand euros (+171.2%) in 2020 compared to 2015.

Due to the annual decrease in the number of employees in the company and stable indicators of total land area, agricultural land, and arable land, we see a gradual increase in agricultural land and arable land per employee + 82%, respectively, in 2020 compared to 2015. In the 2020 report we have 3.18 ha of agricultural land and 3.09 ha of arable land per employee, which exceeds the corresponding indicators for 2015 by 1.43 and 1.39 ha.

Table 4. Dynamics of labour resources and efficiency of their use in SRS IANM NAAS.

Indicator	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**The ratio of 2020 to**

							2015	
							%	+/-
The cost of gross production at comparable prices in 2010, thousand euros	11.71	6.23	2.24	4.98	4.38	17.64	150.6	5.93
Average annual number of employees, persons	20	19	14	13	11	11	55.0	-9
Gross agricultural production per average annual employee, thousand euros	0.59	0.33	0.16	0.38	0.40	1.60	271.2	1.01
It is necessary for 1 employee, ha: - agricultural lands	1.75	1.84	2.5	2.69	3.18	3.18	181.7	1.43
- arable land	1.70	1.79	2.43	2.62	3.09	3.09	181.8	1.39

Taking into account the generalizing indicators that characterize the need and provision of the enterprise with fixed assets, the economic efficiency of working capital, the average annual value of fixed assets in 2020 amounted to 22.15 thousand euros, which is 26.24% lower than in 2015 (Table 5). During the 6 years studied, a slight decrease in the value of fixed assets occurred due to the annual write-off of their depreciation. No new equipment was purchased at the company. As a result, the capital adequacy rate per 1 ha of agricultural land also remained at approximately the same level, from 632.83 euros in 2020 to 858.02 euros in 2015.

The average annual value of the revolving fund of SRS IANM NAAS increased every year. Therefore, in 2020 it was 5.86 thousand euros, which is 2.9 times higher than in 2015. This increase was due to an increase in inventories, receivables, and cash balance in the company's cash register.

Therefore, the value of revolving funds per 1 ha of agricultural land from year to year increased under the condition of a constant indicator of the number of these lands.

Table 5. Dynamics of fixed and revolving assets/funds, the level of security, and efficiency of their use in SRS IANM NAAS, thousand UAH.

Indicator	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**The ratio of 2020 to 2015**	
							%	**+,-**
Average annual value of fixed assets, thousand euros	30.03	27.5	23.23	27.96	29.86	22.15	73.76	-7.88
Average annual value of revolving funds, thousand euros	2.04	2.60	1.87	3.93	4.95	5.86	286.96	3.82
Funding security per 1 ha of agricultural land, thousand euros	858.02	786.69	663.68	798.89	853.21	632.83	73.75	225.19
Labor assets per 1 average annual employee, thousand	1.50	1.45	1.66	2.15	2.71	2.01	134.00	0.51

euros								
Return on assets per 100 UAH of fixed assets, EURO	1.49	0.80	0.29	0.64	0.57	2.30	154.36	0.81
Capital intensity of UAH 100 gross output, EURO	9.78	15.56	30.97	20.26	26.43	3.63	37.12	-6.15
The cost of revolving funds per 1 ha of agricultural land, EURO	58.35	74.24	53.44	112.32	141.43	167.45	286.98	109.1

The return on assets varies significantly over the years. Therefore, in 2020 the return on assets is the highest 2.30 euros per 100 euros of fixed assets, 54.36 % higher than the value of this indicator in 2015. The lowest (euro 0.29) was the return on assets in 2017.

As during 2015-2019 there was a decrease in gross output with almost the same indicators of the average annual value of fixed assets, the dynamics of capital intensity is growing. In 2020 –3.63 euro per 100 euro of gross output, which is more than three times less than this indicator in 2015. The largest capital intensity indicator was observed in 2017 – at the level of 30.97 euros per 100 euros of gross output.

Taking into account the annual decrease in the average annual number of employees in the enterprise, the labour assets indicator shows a tendency to increase. In 2020 – 2.01 thousand euros of fixed assets per 1 employee, which is 34% more than in 2015.

In 2015-2019, gross production at comparable prices per 100 ha of agricultural land tends to decrease (Table 6). In 2020, this figure is 50.49 thousand euros, which is 51% more than in 2015. This was due to an increase in gross production in the company with a constant area of arable land.

Table 6. Dynamics of the main indicators of production and economic activity of the SRS IANM NAAS in 2015-2020.

Indicator	2015	2016	2017	2018	2019	2020	The ratio of 2020 to 2015	
							%	+,-
Gross production at comparable prices, thousand euros per 100 ha of agricultural land	33.44	17.80	6.39	14.23	12.52	50.49	151.0	17.05
Yields of grains and legumes, c/ha*	27.3	23.0	17.4	18.4	35.1	14.1	51.6	-13.2
• winter cereals (winter wheat)	32.5	28.1	42	54	38.6	19.1	58.8	-13.4
• spring cereals	19.8	21.7	12.1	6.8	23.0	11.0	55.6	-8.8
• legumes	-	8.5	24.4	5.8	-	-	-	-
• corn for grain	-	31.2	-	53	-	37.0	-	-
• soybeans	15.5	21.7	7.5	6.5	14.7	12.3	79.4	-3.2
Profitability level,%	187	58	3	8	7	52	27.8	-135

*Notes. c/ha – centners per hectares. Centner is a nonstandard metric unit of weight equal to 100 kilograms, commonly used as an agricultural measure in Eastern Europe countries.

There is a decrease in crop yields in 2020 compared to 2015, namely cereals and legumes by 13.2 c/ha, winter wheat by 13.4 c/ha, spring cereals by 8.8 c/ha, although in previous years the yield of these crops tended to increase. Soybean yields fluctuated significantly over the years and in 2020 they reached 12.3 c/ha, which is 3.2 c/ha lower than in 2015.

In general, the level of profitability of SRS IANM NAAS during the study period decreased. This happened most rapidly in 2015-2017, which were experimental; a field with green manure was included in crop rotation from which there was no profit. In 2018-2019, there was a gradual increase

in enterprise profitability to a level of 8-7%, and in 2020, the level reached 52%.

4. Discussion

SRS IANM NAAS has reserves for full-fledged and profitable agricultural activities aimed at achieving the best production and financial performance under market conditions.

The structure of the sown areas depends on many reasons. First, it is designed to carry out research planned by scientists of the Station and the Institute to which the Station is subordinated. Second, the station has two crop rotations: scientific and organic, which occupies 24 ha of arable land, that is, more than a third of the arable land of the station. The cultivation of legumes in organic crop rotation has certain difficulties that are associated with measures to control biotic factors. First, the control of pea pests (pea grain eaters, aphid) by biological methods does not provide products that would meet the requirements of the state standard of Ukraine. Second, some heat-loving legumes (beans, soybeans), which are sown in late spring due to unfavourable abiotic factors (heavy rainfall, cooling) are not able to compete with segetal vegetation and also lose marketability. The station grows the crops that are in demand in the region, as there are no suitable areas for the production of sufficient volumes of organic products for sale. Thus, the organic proving ground is a scientific project; it is not supported by the state. Therefore, only those products are grown that allow them to be sold in small quantities over a short distance and, at the same time, to conduct research in these areas.

A comprehensive analysis of marketable products produced in the SRS IANM NAAS in 2015-2020 shows that the economy has not focused on specific crops for their organic production and is currently searching for the optimal line of crops, including from the point of view of economic efficiency for the company. Until now, the structure of organic products has depended on the goals of scientific research.

The weather conditions in 2020 significantly affected the formation of the harvest of most crops in the Right Bank Forest-Steppe of Ukraine. The lack of precipitation and high temperatures during the grain filling period significantly reduced grain crop yield (reduced grain yield, weight of 1000 grains). Soybeans harvested in August, when the second period of high temperatures and no precipitation lasted, and part of 30% of the grain did not form at all.

For example, in Lebanon, growing organic tomatoes cost 10.4% more than conventional – 5504 against 4933 USD/0.1 ha (due to expenses on composting, organic seeds, water, labour and certification) (Abebe et al., 2022). In Pakistan, total expenses for organic wheat growing ranged

from 5816.96 to 12131.48 PKR/ha (1 PKR = 0.0044 euros) less than for conventional depending on the district (but also water and labour cost more). The estimated economic profit per hectare for organic and conventional wheat was 63805.74 and 76380.84 PKR respectively (Akram et al., 2019). The research of Finley et al. (2018) in Washington and California indicated that organic farms employed more workers per acre who worked more days.

The survey of 262 organic farms in Poland demonstrated benefits such as increased income, supported by subsidies (77.12%), increased profitability (63.4%) and high selling prices (54.2%). The most frustrating factor was decline in yields, 71% of farmers are not going to continue without government financial support (Łuczka & Kalinowski, 2020).

Organic certification is positively and significantly associated with a higher level of technical efficiency in Italian olive farms (around 10%) and wins in economic and environmental terms (Raimondo et al., 2021).

The cost-benefit ratio of organic rice production (2.2) was higher as compared to inorganic (1.9) which showed that the profitability in organic rice production was higher than in inorganic (Sapkota et al., 2021).

Comparing two models of organic agriculture in West Bengal, India showed the total cost of organic farming after conversion 33,275 INR/ha against 38,400 for nonorganic and 58,860 against 63,380 INR/ha (1 INR = 0.012 euros) based on the primary survey of 60 farmers (Koner & Laha, 2021).

Organic production in the Republic of Serbia showed that the total cost of production on organic farms is on average lower than that of conventional farms: variable costs are 30-40% lower; on the other hand, fixed costs are 45% higher than those of conventional production (Mirela et al., 2019).

Some cases in sub-Saharan Africa evidenced a greater increase in gross margins of more than 290% (Schader et al., 2021).

Polish organic farms are almost entirely dependent on public aid. Without taking this into account, the total net added value decreased from EUR 76,171 to EUR 20,143. However, it should be noticed that a similar phenomenon, yet on a smaller scale, also occurs on conventional farms, where the net added value is decreasing without subsidies and their importance is increasing. From 2016-2018, almost half of this group is publicly supported (Sadowski et al., 2021).

Recommendations

The following two key recommendations can be made to improve the organizational and economic framework for the introduction and development of organic production by public and private agricultural enterprises under conditions of financial instability in Ukraine.

1. Businesses, regions, and even countries focus on products that provide the maximum economic benefit or the minimum economic loss compared to other activities. The enterprise (region, country), producing the most cost-effective products, sells them, receives income, which will purchase the necessary goods of agricultural origin, which are less economically profitable to produce compared to the costs borne by the enterprise for their purchase. That is, the company (region, country) seeks to produce the most cost-effective products, the sale of which allows you to buy the necessary goods of agricultural origin, which to produce in itself is a more expensive process.

For small enterprises with a land bank of up to 50 hectares, it is necessary to clearly distinguish the specialization and concentration of production on those crops that correspond to crop rotation, are suitable for climatic conditions, enrich the quality of the land, were historically grown in this region and have consumer demand.

2. Competition between agricultural producers encourages the deepening of the specialization of enterprises (regions), which is significantly intensified under the conditions of the food-saturated market. Ultimately, each company concentrates on those types of products that are competitive and ensure its economic existence as a legal entity.

5. Conclusions

The peculiarities of the functioning of enterprises in Ukraine are due to new requirements in the conditions of financial instability in the state to the formation of an organizational and economic mechanism of the regulation of enterprise activity regulation; efficiency of its functioning should be provided under the influence of the improvement of the production, labor, and management organization.

The analysis of the activity of SRS IANM NAAS allows us to draw the following conclusions:

- the area of agricultural and arable land is unchanged due to the fact that the company has a state form of ownership and the statute does not provide for renting land;
- the level of specialization of the enterprise is low or average depending on a certain year. We consider it expedient to concentrate on 3-5 agricultural crops, the most acceptable for organic

production, taking into account the crop rotation plan. Therefore, in 2015, with a more defined crop line, the company had a sufficient level of profitability, higher than in 2020;

- the gradual decrease in yield for all crops indicates the absence or insufficient use of organic fertilizers and irrigation when growing these crops;
- the company does not have its own agricultural machinery, as evidenced by the almost constant rate of fixed assets. The capital adequacy ratio is increasing (+77.12%), but this is ensured by an annual decrease in the average annual number of employees at the enterprise due to reductions or voluntary dismissals due to low salaries;
- the profit of the enterprise is formed due to the cultivation and subsequent sale of plant products, in 2020, commercial products worth UAH 611,000 were sold, which is 160% more than in 2015. That is, the products are in demand and the price per ton is increasing. This serves as motivation for the further development of organic production of plant products;
- when the staff is reduced, the cost of gross production in comparable prices in 2020 compared to 2015 increases by 99%, which also motivates the continuation of the transition to organic cultivation.

The location and specialization of agricultural production are influenced by economic, biological, and social factors, but most of all natural and climatic. In particular, soil types, temperature regime, precipitation – in general, the distribution of natural areas most significantly affects the location of crops in space and the specialization of production. Territorial specialization largely determines the specialization of individual companies in activities that are crucial for this area.

An important factor in location and specialization is also the availability of markets for agricultural products. It is advantageous for enterprises to increase the production of those types for which there is constant demand and a reasonable price.

The shorter the distance to markets and the better the roads, the lower the transport costs, the higher the economic efficiency of production, and all other things being equal. In view of the above, it often becomes expedient for companies to develop the industry whose products are used as raw materials for companies that process goods located near the land use of it.

Businesses, often with good soil and climatic conditions and a market for labour-intensive products, as well as favourable economic conditions, cannot increase their production due to the lack of their own labour force (permanent employees) and the inability to solve this problem by hiring more.

The results presented in this document concern the functioning of the Skvyra Organic Research Station in 2015-2020, that is, in the period just before the rapid changes in the political and economic situation in Ukraine. These data will be able to constitute a unique historical reference point for further comparisons of the functioning of the examined economic facility in the period of disturbances and the return to normal conditions and stabilization of the economic situation.

Acknowledgements

The authors are thankful for the Czech government support provided by the Ministry of Foreign Affairs of the Czech Republic, which allowed this scientific cooperation to start within the project "AgriSciences Platform for Scientific Enhancement of HEIs in Ukraine".

References

Abebe G., Traboulsi A. & Aoun M., 2022, Performance of organic farming in developing countries: A case of organic tomato value chain in Lebanon. Renewable Agriculture and Food Systems 37(3): 217–226. doi:10.1017/S1742170521000478

Akram M.W., Akram N., Hongshu W. & Mehmood A., 2019, An Assessment of Economic Viability of Organic Farming in Pakistan. Custos e @gronegócio online. 15(1, Janeiro/Março): 141–169.

Andriychuk V.G., 2013, Economics of enterprises of the agro-industrial complex. K.: KNEU. 779 pp.

Azam M.S. & Shaheen M., 2019, Decisional factors driving farmers to adopt organic farming in India: a cross-sectional study, International Journal of Social Economics 46(4): 562–580. https://doi.org/10.1108/IJSE-05-2018-0282

Chygryn O., Treus A. & Isakov A., 2017, Organic Agriculture as a Perspective Branch of Ukrainian Economy. Mechanism of Economic Regulation N3: 16–35.

Dobrovolska O. & Espejo J.M.R., 2018, Ukrainian organic products market: State and prospects of development. Innovative Marketing 14(2): 41–49. https://doi.org/10.21511/im.14(2).2018.02

FiBL, 2022, The World of Organic Agriculture. Statistics & Emerging Trends 2022. https://www.organic-world.net/yearbook/yearbook-2022/yearbook-2022-key-data.html

Finley L., Chappell J.M., Thiers P. & Moore R.J., 2018, Does organic farming present greater opportunities for employment and community development than conventional farming? A survey-based investigation in California and Washington, Agroecology and Sustainable Food Systems 42(5): 552–572, https://doi.org/10.1080/21683565.2017.1394416

Home R., Indermuehle A., Tschanz A., Ries E. & Stolze M., 2019, Factors in the decision by Swiss farmers to convert to organic farming. Renewable Agriculture and Food Systems 34(6, December): 571–581. DOI: https://doi.org/10.1017/S1742170518000121

Koner N. & Laha A., 2021, Economics of alternative models of organic farming: empirical evidences from zero budget natural farming and scientific organic farming in West Bengal, India. International Journal of Agricultural Sustainability 19(3–4): 255–268, https://doi.org/10.1080/14735903.2021.1905346

Lavrov V., Grabovska T. & Ternowyi Yu., 2019, Methodology, mechanisms and tools for substantiation of socio-ecological and economic benefits from the implementation of organic

production. Monografia viacerých autorov: Geo-management in organic agriculture. Vydavateľ: Európsky inštitút ďalšieho vzdelávania, Podhajska, Slovensko, p. 125–149.
Liu X., Pattanaik N., Nelson M. & Ibrahim M., 2019, The Choice to Go Organic: Evidence from Small US Farms. Agricultural Sciences 10: 1566–1580. doi: 10.4236/as.2019.1012115
Łuczka W. & Kalinowski S., 2020, Barriers to the Development of Organic Farming: A Polish Case Study. Agriculture 10, 536. https://doi.org/10.3390/agriculture10110536
Mirela T.S., Danica G.T. & Marica P., 2019, Organska proizvodnja u Republici Srbiji – ekonomski aspekti. Ekonomija: teorija i praksa 12(3): 88–101. DOI: 10.5937/etp1903088T
Raimondo M., Caracciolo F., Nazzaro C. & Marotta G., 2021, Organic Farming Increases the Technical Efficiency of Olive Farms in Italy. Agriculture 11, 209. https://doi.org/10.3390/agriculture11030209
Sadowski A., Wojcieszak-Zbierska M. & Zmyślona J., 2021, Economic Situation of Organic Farms in Poland on the Background of the European Union. Problems of Agricultural Economics No 2(367): 101–118. https://ssrn.com/abstract=4047998
Sapkota B.K., Subedi A.P., Tripathi K.M. & Dhakal S.C., 2021, Economics of Organic vs Inorganic Rice Production: A Case of Chitwan District of Nepal. Journal of Nepal Agricultural Research Council 7(1): 109–121. https://doi.org/10.3126/jnarc.v7i1.36933
Schader C., Heidenreich A., Kadzere I., Egyir I., Muriuki A., Bandanaa J., Clottey J., Ndungu J., Grovermann C., Lazzarini G., Blockeel J., Borgemeister C., Muller A., Kabi F., Fiaboe K., Adamtey N., Huber B., Niggli U. & Stolze M., 2021, How is organic farming performing agronomically and economically in sub-Saharan Africa? Glob. Environ. Chang. 70, p. 102325. https://doi.org/10.1016/j.gloenvcha.2021.102325
Seena Radhakrishnan A.R., Suja G. & Sreekumar J., 2022, How sustainable is organic management in cassava? Evidences from yield, soil quality, energetics and economics in the humid tropics of South India. Scientia Horticulturae Vol. 293. https://doi.org/10.1016/j.scienta.2021.110723
Sharma M. & Pudasaini A., 2021, What motivates producers and consumers towards organic vegetables? A case of Nepal. Org. Agr. 11: 477–488. https://doi.org/10.1007/s13165-021-00354-2
Singh N., 2018, Economic and Environmental Aspects of Organic Farming: Evidence From India. Global Journal of Business Research 12(2): 83–90. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3241639%0Ahttp://www.theibfr2.com/RePEc/ibf/gjbres/gjbr-v12n2-2018/GJBR-V12N2-2018-8.pdf
Ti G.S., Uzei J.P., Fibl J.L., Miller D., Crea F.V., Ti J.C., Weisshaidinger R., Boku R.B., Boku A.M., Luke H., Isara E.G. & Isara P.F., 2020, Understanding & improving the sustainability of agro-ecological farming systems in the EU Deliverable Report 3. 4 : Report on Key Barriers of AEFS in Europe and Co-constructed Strategies to Address Them. 773901.
Vladlenov D., 2020, Theoretical and Scientific Approaches To the Problems of Modern Economy, [in:] Theoretical and Scientific Approaches to the Problems of Modern Economy. https://doi.org/10.46299/isg.2020.mono.econ.one