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Ukrainian agricultural production profitability issues

Ermir Shahini*

Lecturer, Associate Professor
Aleksandër Moisiu University of Durrës
2001, 14 Currila Str., Durres, Albania
<https://orcid.org/0000-0002-0083-1029>

Nataliia Korzhenivska

Head of Department, Professor
Podillia State University
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine
<https://orcid.org/0000-0002-4665-6676>

Yuliia Haibura

Associate Professor
Podillia State University
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine
<https://orcid.org/0000-0002-2267-4968>

Olena Niskhodovska

Associate Professor
Podillia State University
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine
<https://orcid.org/0000-0002-5403-878X>

Inna Balla

Assistant
Podillia State University
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine
<https://orcid.org/0000-0001-5041-9801>

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Abstract. The research relevance is predefined by the need to find ways to increase the profitability of agricultural production in the difficult economic conditions of Ukraine. The research aims to analyse the profitability of agricultural production, influencing factors and determination of directions for its improvement. The methodological approach is based on the analysis of statistical data on changes in production profitability; method of average values – to obtain the average value of indicators; comparison method – to compare data on profitability and productivity between types of products; graphic method – to display the results; method of generalization – for summarizing information about agricultural production. The main results that were obtained within the scope of this study should cover the analysis of the profitability of agricultural production by its types and crop yield and regions of the country in the conditions of the impact of negative



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*Corresponding author

factors on the agricultural sector during the period of martial law (in particular, the reduction of land suitable for agriculture, blocking many ways to sell products, complicating the supply of mineral fertilizers and other goods necessary for the functioning of the agrarian sector) and highlight directions for increasing profitability, namely increasing the yield of certain types of crops; reduction of feed costs for feeding animals by growing feed and electricity production efficiency through the use of renewable energy sources (sun, wind, biomass energy); development of pig meat production by increasing their population and quality of nutrition; creation of added value from products obtained by the producer on his own land, which will contribute to increased profitability and successful development of agriculture. Analysis of the supply and demand balance of grain and leguminous crops showed that their production exceeds the need for consumption of all types of grain. The results and conclusions have practical significance for agricultural producers in business management, as well as for the government in developing areas of support for the agricultural sector

Keywords: profitability; productivity; influencing factors; supply and demand balance; export volumes; creation of added value

INTRODUCTION

Ukraine is one of the leading countries whose agricultural products are necessary to ensure food security in the world. The high fertility of the land and the favourable climate in Ukraine allows for the successful development of crop and animal husbandry. However, since 2012, the development trends in this area indicate a low level of profitability and many negative factors that prevent manufacturers of products from obtaining sufficient profit. With the beginning of hostilities on the territory of Ukraine in 2014, and then their intensification in February 2022, agriculture suffered large losses and a decrease in the profitability of production due to the loss of a large land area, markets, the complication of the supply of fertilizers and other products necessary for agricultural development. Despite these events, Ukraine remains among the top five world leaders in the export of wheat, corn, sunflower oil, and barley (Negrei & Trofimtseva, 2022). To support the agricultural sector in difficult times for the state, it has become necessary to study the profitability of agriculture to determine the efficiency of investing monetary resources and the rationality of their use, as well as to develop proposals for increasing the profitability of production.

Ukrainian, English, Polish and other scientists studied the question of the profitability of agricultural production. The role of the agricultural sector of Ukraine in the world food market was considered by the Ukrainian scientist M. Negrei and O.V. Trofimtseva (2022), who studied the prospects for the development of the agricultural sector in the post-war period and determined that the key factor in this direction is human capital, the creation of reliable sales markets, increasing the competitiveness of products, environmental sustainability of agriculture, informatization and digitization of the agricultural sector.

As B. Khahula (2022) emphasizes, the condition for accelerating scientific and technical progress in the agricultural sector is the mastering of innovative technologies by producers, which creates a certain effect that is manifested in the production of additional products and obtaining additional income.

I. Kryukova (2022) also defined the key strategic guidelines for the development of the agricultural sector, which outlined the main elements of the structure of such development, considering world and national priorities and strategic tasks of rural regions.

V. Yuryev (2020) considered the impact of the diversification of the activities of agricultural enterprises on the current state of the agro-industrial complex. Among the directions of diversification, the author identified the formation of various industries for the processing of agricultural products, the organization of new types of production (growing new crops, improving the environmental friendliness of products), and expanding the range of products as necessary key elements.

The importance of the organization of procurement logistics as one of the tools for ensuring the competitiveness of agricultural enterprises was considered by O. Varchenko *et al.* (2022). The scientist proved that among the main tasks of logistics in this case are quality improvement, optimization of the composition and structure of material resources used in production activities, and strengthening of competitive advantages in target market segments.

The main problems of the Ukrainian agrarian sector development during martial law were considered by T. Dobrunik and O. Kuznetsova (2022), who noted the need to transform the current model of the agrarian sector of Ukraine, considering the priority of small business development.

A study on the relationship between environmental sustainability and prices for agricultural products was conducted by the English scientists Y. Vittis *et al.* (2021), the results of which showed that food prices will continue to decrease under conditions of strict environmental policies.

However, despite the significant contribution of scientists to the study of this issue, the issue of increasing the profitability of agricultural production remains debatable and requires a more detailed study. The research aims to analyse the factors affecting the profitability of

agricultural production, the state of productivity by types of crop production and regions, the level of costs by their types in the field of crop production and livestock production, the determination of promising directions for the development of livestock production, the balance of demand and supply for certain types of products, and as well as the development of proposals for increasing the profitability of agricultural activity in Ukraine.

MATERIALS AND METHODS

The basis of the methodological approach is a combination of statistical data analysis methods, the method of average values, the comparison method, the graphic method, and the generalization method. The research involves the analysis of the profitability of agricultural production and the identification of directions for its increase in the conditions of the negative influence of external factors during the period of martial law and requirements for increasing competitiveness.

The theoretical basis of this research is based on the works of Ukrainian, American, Romanian, Australian, Polish, Czech, German and scientists from other countries, who considered the problem of the profitability of agricultural production and determined directions for its improvement.

Statistical information on the profitability of agricultural production, the productivity of crop production, volumes of dairy, meat products and eggs, production costs by product types, the cost structure of crop production and livestock production was researched based on the data of the State Statistics Service of Ukraine (The level of profitability..., 2022).

The application of the statistical data analysis method allowed to investigate the change in profitability indicators of the most common types of livestock and crop production in Ukraine, their volumes, and costs for the period 2012-2021, as well as the changes that occurred in these indicators in 2022. Data on the production and consumption of grain crops in the world for 2022, as well as the forecast for grain production and trade in the international market for 2023, were analysed based on information from the Food and Agriculture Organization (Food and Agriculture Organization) (hereinafter – FAO) (World Food Situation, 2022).

The analysis of data on the export of grain and legumes from Ukraine was carried out based on information published on the official website of the Ministry of Agrarian Policy and Food of Ukraine (Export of grain..., 2023). Information on crop and livestock products for 2022 was obtained from the website of the State Service of Ukraine on Food Safety and Consumer Protection (Information on the export..., 2023).

Using the average values method, the median value of productivity and costs for certain types of crop production was calculated. At the same time, the range of data was the values of productivity and costs per unit of production across the regions of Ukraine. The

comparison method made it possible to compare information on profitability by types of agriculture and productivity of products by regions of the country, as well as compare data on production and consumption of agricultural products and analyse the balance of supply and demand of grain and leguminous crops for 2021-2022.

Using the graphical method, the data obtained in the research process on the dynamics of the production of the main types of meat, milk, eggs, and wool for 2012-2021 are displayed in the form of a graph.

The application of the generalization method allowed to summarize the results obtained in the research process regarding the level of profitability of agricultural products in Ukraine and the factors affecting the profitability of its production; formulate conclusions that act as a final reflection of these results, namely: substantiate proposals for reducing production costs of plant and livestock production and increasing the profitability of production and determine further approaches to the study of the problems of the development of agricultural production in Ukraine in the conditions of the war period.

RESULTS

Agriculture is one of the most important branches of the national economy of Ukraine. Approximately 25% of the world's black soils, which have high fertility, are concentrated in Ukraine. Of the total land area of Ukraine, 71.9% belongs to agricultural land (World Food Situation, 2022).

The types of agricultural production in Ukraine are represented mainly by crop and animal husbandry. The main crops include wheat, sunflower, corn, barley, sugar beet, legumes, fruits, and vegetables. Ukraine holds a leading place among grain exporters in the world (about 25-35 million tons per year), including corn 14.4 million tons, wheat – 9.2 million tons, barley – 1.8 million tons and others (Export of grain..., 2023). The main types of livestock production are meat products from cows, pigs, goats and sheep, milk, eggs, and wool.

Changes in prices on the world market, the negative impact of hostilities that have taken place in Ukraine since 2014, the full-scale Russian invasion of the territory of Ukraine since February 2022, and other factors that affect the production and sale of agricultural products in Ukraine have proven the need assessment of the profitability to find ways to increase it in modern conditions.

Profitability refers to the ratio of profit received and costs incurred in the process of activity. The level of profitability of different enterprises or different types of activity allows to compare their efficiency and determine the expediency of activity and ways of development. To determine the priority types of agricultural activity in Ukraine, their profitability by type should be considered and analysed (Table 1) (The level of profitability..., 2022).

Table 1. The level of profitability of production of agricultural products in Ukraine for 2012-2021

Product name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Grain and leguminous crops – altogether	15.2	1.5	25.8	43.1	37.8	25.0	24.7	11.8	20.0	44
<i>Including</i>										
Wheat	11.8	2.4	28	36.4	31.7	26.8	24.6	7.3	21.5	40
Corn for grain	19.8	1.5	26.2	50.3	45.7	23.7	27.2	17.8	21.3	35
Barley	11.4	0.6	18.3	28.3	25.4	24.0	25.6	2.3	12.1	18
Rye	5.5	-15.3	-5.6	21.9	24.6	20.2	-2.2	9.9	14.4	16.1
Oat	9.9	-2.6	10.7	21.5	34.4	21.2	10.3	8.8	14.7	20
Buckwheat	24.5	-1.3	29.5	100	87.5	32.7	-17.2	6.6	54.7	63
Millet	-12.5	3	40.7	58.4	30.2	24.5	34.7	20.2	6.1	8
Dried legumes	9.3	-5	30.2	55.3	33.1	22.4	-5.4	-11.5	-0.1	2.1
Soybeans	23.4	15.8	34.5	38.6	52	28.8	21.0	13.3	30.2	40
Flax seeds	2.9	6.4	25.2	32.7	10.1	-10.8	18.6	8.6	78.0	80
Rapeseed and colza seeds	21.4	8.6	29.2	44.3	45	43.6	31.1	9.4	17.2	20
Sunflower seeds	45.8	28.5	36.5	80.5	63	41.3	32.5	23.5	39.4	52
Factory sugar beet	15.7	2.7	17.9	28.2	24.3	12.4	-11.4	-15.4	-13.5	10
Hop cones	-48	-11.6	-9.5	39.9	100.4	17.7	60.9	9.0	-	5
Potato	-21.5	23	9.2	24.2	-3.2	10.0	6.8	15.4	11.0	13
Vegetable crops in open soil	-6.8	7	16.7	47.5	19.7	15.6	16.7	7.0	8.3	8.5
Vegetable crops in closed soil	-0.1	3.7	12.4	14.1	7.7	1.7	8.5	-4.9	7.4	7.9
Grape	72.6	101.7	61	102.4	74.6	51.6	22.6	-7.2	-16.2	15
Fruit crops	8.8	154.7	68.2	52.6	12	27.3	3.4	0.2	12.4	8.9
Berry crops	5.1	13.6	11.2	86.2	104	85.9	19.5	19.8	54.1	18.6
Cattle raised for meat	-29.5	-43.3	-35.9	-17.9	-24.8	3.4	-17.7	-27.1	-24.2	12.7
Pigs raised for meat	2	0.2	5.6	12.7	-4.5	3.5	6.9	4.7	2.6	8.6
Sheep raised for meat	-39.7	-42.8	-52.1	-29.4	-35.1	-40.0	-16.7	-38.9	-38.6	17.3
Goats raised for meat	-70.5	-31	-79.7	-59.7	-43.4	-14.4	-13.8	-58.9	-62.7	16.1
Poultry raised for meat	-7.2	-10	-15.4	-6.1	5	7.0	5.7	-3.7	-0.2	3.1
Wool	-61	-72.7	-75.1	-61.9	-31.8	-69.8	-69.5	-71.1	-72.0	-73
Milk from farm animals of all kinds, raw	2.3	13.6	11	12.6	18.2	26.9	16.1	20.6	20.4	17.5
Poultry eggs in the shell, fresh (without eggs for incubation)	52.6	47.6	58.8	60.9	0.5	-9.0	5.4	-23.5	-19.2	15
Honey is natural	-29	-29.9	-30.6	-5.4	4.8	-16.4	-27.4	-32.2	-25	-10

Source: compiled based on data (The level of profitability..., 2022)

The data in Table 1 show that for the analysed period, the largest increase in profitability indicators was observed in 2015 (an increase compared to the previous year by 20.8%) and 2021 (an increase by 22.8%) (The level of profitability..., 2022). The highest profitability indicators during 2012-2021 were: grain and leguminous crops buckwheat, corn for grain, as well as sunflower, open-ground vegetables, and soybeans. Rye, sugar beet and hop cones were less profitable.

On the other hand, animal husbandry during 2012-2021 was unprofitable in almost all species (mainly

sheep and goats for meat (up to -79.7%), wool production (up to -75.1%). However, in 2021, the profitability of animal husbandry amounted to 12.7% for breeding cattle, dairy breeds increased by 14.6% (from 13.3% to 27.9%), and pigs – by 6.1% (from 2.5% to 8.6%) (The level of profitability..., 2022).

However, the continuation of the increase in the profitability of agricultural production, which was observed in 2021, became practically impossible in 2022 due to the start of hostilities (combat) in the entire territory of Ukraine in February 2022. The yield of

different types of products depends on the regions of the country where they are grown. To analyse the economic efficiency of the production of agricultural

products, it is necessary to compare productivity indicators with production costs (Table 2) (The level of profitability..., 2022).

Table 2. Yield and costs of individual crop production by regions of Ukraine in 2021

Name of the region	Wheat		Corn		Sugar beet		Vegetables of the open soil		Buckwheat	
	productivity, cwt from 1 ha	costs (per 1 cwt of products, hryvnias)	productivity, cwt from 1 ha	costs (per 1 cwt of products, hryvnias)	productivity, cwt from 1 ha	costs (per 1 cwt of products, hryvnias)	productivity, cwt from 1 ha	costs (per 1 cwt of products, hryvnias)	productivity, cwt from 1 ha	costs (per 1 cwt of products, hryvnias)
Vynnytsia region	56.8	392.2	100.2	400.7	456.3	91.6	219.0	2929.5	16.1	879.4
Volyn region	44.9	357.2	97.8	311.0	450.3	81.9	217.3	539.5	11.4	713.1
Dnipropetrovsk region	44.1	357.1	51.7	477.1	511.2	-	198.1	984.4	8.8	1025.5
Donetsk region	40.6	313.5	44.3	420.7	256.5	-	171.9	675.4	12.6	1515.9
Zhytomyr region	49.6	374.0	92.0	329.1	444.9	90.7	211.0	614.1	14.5	2188.5
Transcarpathian region	33.8	532.0	50.6	226.5	-	-	212.6	-	12.4	1139.7
Zaporizhzhia region	38.8	367.2	75.1	395.2	-	-	176.6	789.3	10.9	-
Ivano-Frankivsk region	51.6	423.1	84.3	324.9	553.7	-	172.2	655.2	11.8	-
Kyiv region	52.6	413.2	95.2	391.7	432.7	123.0	201.8	1159.9	16.8	745.2
Kirovohrad Region	49.8	386.5	70.0	508.7	460.3	119.0	152.3	622.1	13.6	874.1
Luhansk Region	39.2	320.5	29.1	352.5	-	-	277.8	-	7.1	1105.8
Lviv region	50.1	365.0	94.4	319.5	524.5	67.7	194.3	578.6	11.1	1403.1
Mykolaiv region	42.3	455.5	50.7	493.1	-	-	336.1	161.5	11.5	1424.4
Odesa region	40.5	749.6	62.7	569.5	-	-	156.4	380.8	10.0	2445.2
Poltava region	49.1	346.5	67.5	358.8	402.9	79.4	231.0	630.1	9.1	577.0
Rivne region	48.2	349.0	88.9	269.6	518.3	70.5	207.6	-	11.9	955.8
Sumy region	48.5	309.9	72.8	241.0	-	-	178.8	1895.0	12.0	830.3
Ternopil region	57.9	363.6	101.7	276.5	525.0	74.6	232.5	1777.9	12.2	634.9
Kharkiv region	48.6	293.0	52.8	304.6	407.0	92.4	160.7	1809.7	10.2	873.8
Kherson Region	42.5	386.4	90.7	333.4	-	-	283.2	183.1	6.9	974.8
Khmelnyskyi Region	62.2	364.0	110.7	275.9	497.3	87.8	210.5	520.2	18.2	895.5
Cherkasy region	55.8	437.7	90.1	539.3	465.1	113.1	170.2	690.3	14.3	845.9
Chernivtsi region	52.7	409.2	74.5	361.0	-	-	195.2	-	9.1	1201.2
Chernihiv region	51.6	328.8	95.2	264.4	411.6	146.6	167.0	-	5.8	-
Average value	48.0	391.4	76.8	364.4	457.4	95.3	206.6	926.1	11.6	1107.1

Source: compiled based on data (The level of profitability..., 2022)

The data in Table 2 show that Vynnytsia, Khmelnytskyi and Ternopil regions have the highest wheat yields, and their costs per 1 centner of production are within the national average – UAH 391.4. The lowest costs for growing wheat in the northern regions

are Sumy, Kharkiv and Chernihiv. However, there are regions with lower productivity, for example, Zakarpattia (33.8 t) and Odesa regions (40.5 t), but their costs are almost twice as high as the average – UAH 532 and UAH 749.6, respectively (The level of profitability...,

2022). This means that wheat production is less profitable in these regions of the country.

The situation is similar with other crops by region: corn is more profitable to grow in Vinnytsia, Ternopil, and Khmelnytskyi regions, and less so in Dnipropetrovsk and Kirovohrad regions, buckwheat is more profitable in Vinnytsia, Kyiv, and Khmelnytskyi regions, and less profitable in Odesa, Mykolaiv, and Lviv regions.

Indicators of yield level and production costs play an important role in increasing the profitability of crop production. For example, the cultivation of sugar beet during 2018-2020 was unprofitable, and only in 2021, the production showed profitability. The analysis of

sugar beet productivity by region shows that in seven of them, this indicator is at a level below the average. It is possible to increase productivity by increasing the use of fertilizers to nourish the soil, which in turn will contribute to an increase in the production and export of sorghum, the world prices of which tend to increase. Thus, in 2022, according to the FAO, the average value of the sugar price index increased by 4.7% compared to 2021 and was the highest since 2012 (World Food Situation, 2022).

The dynamics of livestock production volumes can be analysed by species and periods (Fig. 1) (The level of profitability..., 2022).

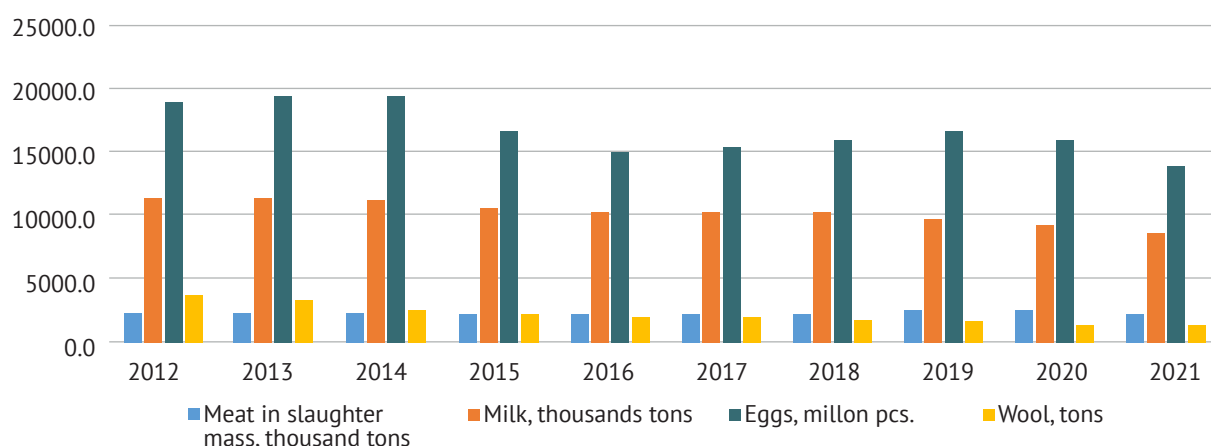


Figure 1. Production of the main types of animal husbandry products for 2012-2021

The data in Figure 1 shows that during 2012-2021, the production of livestock products had a gradual downward trend. Thus, the decline in milk production amounted to 23.4%, eggs – 26.4%, and wool – 59.8%. On the other hand, meat production increased by 10.4%

(The level of profitability..., 2022), which indicates the increased interest of agricultural producers in this type of product. Analysis of the production of livestock products by region will reveal which regions of Ukraine produce more or less of it (Table 3).

Table 3. Production volumes of livestock products by regions of Ukraine in 2021

Name of the region	Live weight of animals sold for slaughter, thousand tons	Gross volume of milk, thousand tons	Number of eggs from poultry, million pcs	Gross shearing of wool, t
Ukraine	3462.3	8728.8	14071.3	1497
Vinnytsia region	652.5	686.1	708.7	9
Volyn region	162.5	338	207.1	18
Dnipropetrovsk region	329.1	246	720.8	5
Donetsk region	120.4	144.2	602.1	43
Zhytomyr region	84.5	487.5	718.5	21
Transcarpathian region	83.3	312.3	377.4	158
Zaporizhzhia region	62.3	180.6	372.5	54
Ivano-Frankivsk region	135.2	393.3	275.8	20
Kyiv region	287.5	368.3	3323.2	5
Kirovohrad Region	71.7	269.4	468.8	1
Luhansk Region	14.2	102.1	78.4	27
Lviv region	180.2	425.3	598.8	14
Mykolaiv region	45.6	245.7	156.9	100

Table 3, Continued

Name of the region	Live weight of animals sold for slaughter, thousand tons	Gross volume of milk, thousand tons	Number of eggs from poultry, million pcs	Gross shearing of wool, t
Odesa region	54.5	291.4	137.4	705
Poltava region	90.9	690.7	630.4	32
Rivne region	77.1	298.5	634.2	21
Sumy region	66.0	354.6	349.3	21
Ternopil region	83.3	462.8	533	5
Kharkiv region	125.6	427.5	481.1	46
Kherson Region	59.9	237.5	657.7	72
Khmelnyskyi Region	90.6	653.8	725.4	5
Cherkasy region	468.1	435.9	753.4	1
Chernivtsi region	64.8	235.8	279.5	107
Chernihiv region	52.5	441.5	280.9	7
Average value	144.3	363.7	586.3	62.4

Source: compiled based on data (The level of profitability..., 2022)

The data in Table 3 show that the largest production of meat is in Vinnytsia and Cherkasy regions, milk – in Vinnytsia, Poltava and Khmelnytskyi regions, eggs – in Kyiv, Khmelnytsia and Cherkasy regions, and wool – in Odesa, Zakarpattia and Chernivtsi regions. The level

of profitability of agricultural products depends on the amount of production costs. An analysis of the cost structure in the field of plant and animal husbandry will allow identifying areas of cost that can be reduced (Table 4) (The level of profitability..., 2022).

Table 4. The structure of costs for the production of agricultural products by type in 2020

Types of expenses	Production costs			
	crop production		animal husbandry	
	million hryvnias	% to the amount	million hryvnias	% to the amount
Expenses of everything	278990.6	100.0	90323.0	100.0
Direct material costs	136622.4	49.0	68796.1	76.2
including				
seeds and planting material	27423.5	9.8	x	x
feeds	x	x	53333.1	59.0
of them are purchasable	x	x	21958.5	24.3
other agricultural products	2716.6	1.0	3498.7	3.9
mineral fertilizers	45878.4	16.4	x	x
fuel and lubricants	22230.4	8.0	1336.9	1.5
electricity	1793.0	0.6	1982.8	2.2
energy and fuel	1081.9	0.4	626.4	0.7
spare parts, construction materials for repair	14717.0	5.3	2514.9	2.8
labour costs	18147.2	6.5	7703.1	8.5
Other direct costs of all	77742.7	27.8	8064.4	8.9
Including				
deductions for social events	4000.9	1.4	1690.6	1.9
rent for:				
land shares	38510.0	13.8	x	x
property shares	619.9	0.2	3.5	0.0
amortization	24604.2	8.8	4958.0	5.5
Total expenditures	46478.3	16.7	5759.4	6.4

Source: compiled based on data (The level of profitability..., 2022)

From the data in Table 4, in the structure of costs to produce plant products, most of them belong to the costs of fuel and lubricants (16.4%) and seeds and planting material (9.8%), and animal husbandry – to the costs of purchasing fodder (59%) (The level of profitability..., 2022). Therefore, to increase the profitability of production, it is necessary to consider ways to reduce the specified cost areas.

A feature of plant and animal products is their rapid spoilage, which does not allow them to be stored for too long. Therefore, for the production to bring profits, and not losses in the form of crop loss, it is necessary to study the real demand for these products to form the appropriate volume of its supply. A comparison of the volumes of production and consumption of grain crops on the world market is necessary for correct conclusions regarding the volumes of products that will be exported and balancing the domestic market.

According to the FAO, the forecast of grain production and trade in the world for 2022 predicts the lowest volumes in the last three years, namely: 2.756 million tons, which is 2% (57 million tons) below the indicator of the previous period, which is mainly due

to the indicators of corn and wheat (World Food Situation, 2022).

The global volume of grain consumption in 2022-2023 is predicted the level 2.777 million tons, which is 0.7% (21 million tons) lower than the level of 2021-2022. This projected decrease is due mainly to a reduction in the consumption of feed – especially corn, as well as barley and sorghum – and the consumption of corn as an industrial raw material. Grain stocks in the world at the end of the 2023 season are expected to be 839 million tons, while they are 2.2% (18.5 million tons) lower than last season. The forecast volume of world grain trade in the 2022-2023 season is expected to be 472 million tons, which is 1.9% (9.2 million tons) below the record level of the 2021-2022 season (World Food Situation, 2022).

For Ukrainian grain, the main sales markets remain in four regions – the countries of Asia, the European Union, Africa, and the CIS, which account for about 97% of the value of agricultural exports. In 2022, an increase in exports was observed only to the European Union. An analysis of the supply and demand of grains and legumes allows us to estimate how much Ukrainian producers need to produce (Table 5) (Export of grain..., 2023).

Table 5. Balance of demand and supply of cereals and legumes in 2021-2022

Index	Cereals and legumes (thousand tons)								
	everything	wheat	barley	corn	oat	rye	buckwheat	millet	other cereals
1. Offer, including:	88788	33864	9876	42323	541	695	151	201	1137
production	83809	32102	9445	40000	481	602	103	182	894
2. The need, including:	84751	32312	9366	40623	491	625	136	161	1037
internal consumption	19292	7012	3881	6858	325	463	126	81	546
export	65459	25300	5485	33765	166	162	10	80	491
The difference between supply and consumption	4037	1552	510	1700	50	70	15	40	100

Source: compiled based on data (Export of grain..., 2023)

As shown in Table 5, in Ukraine in 2021-2022, the supply of grain crops exceeded the need for their consumption for all types of grain by 5-11%, and for millet – by almost 25% (Export of grain..., 2023).

With the beginning of hostilities on the territory of Ukraine in February 2022, there was a deterioration and decline in all spheres of activity. The vulnerability of the agricultural sector was most evident in (Dobrunik & Kuznetsova, 2022): the impossibility of conducting fieldwork in the war zone; blocking sea routes for exporting products; destruction of the infrastructure intended for production, processing, and storage of products; deterioration of agricultural supply with fuel and lubricants, seeds, fodder and other material and technical means; the impossibility of uninterrupted operation due to periodic power outages.

However, Ukrainian agribusiness demonstrates its ability to withstand external threats. Since the beginning

of the 2022/2023 marketing year, the export of grain and grain crops amounted to 5291 thousand tons, including 3174 thousand tons of corn (60.4%), 1651 thousand tons of wheat (31.2%) and 447 thousand tons of barley (8.4%) (Information on the export..., 2023).

Regarding the export of livestock products, in 2022, the export of poultry meat brought in an income of 852.9 million dollars, which is 18.6% more than in 2021. However, the export of meat and edible poultry offal in 2022 amounted to 413.2 thousand tons, which is 10.3% less compared to the previous year. During the period of martial law, the number of producers that received the right to export products of animal origin to the countries of the European Union (hereinafter referred to as the EU) increased by 10% (from 385 to 418), of which: 11 more suppliers of dairy products, 6 more suppliers of fish products, and 5 – suppliers of snails (Information on the export..., 2023).

It should be noted that among animal husbandry products, the production of pig meat during 2012-2021 was unprofitable, and in some periods (2016) even unprofitable. However, this activity is underestimated in Ukraine, because it has prospects and conditions to develop and enter the world market. After all, pork consumption in the world is growing every year and, according to FAO forecasts, will increase by 33% by 2030 (from 11 to 16.5 million tons) (World Food Situation, 2022). About 45% of this volume falls on the EU countries, however, the concentration of pig farms in these countries has already reached a critical limit. If compare the number, Belgium keeps 6 million pigs on its territory, the Netherlands – 12 million pigs, as well as Denmark, whose area is approximately the same as the area of the two regions of Ukraine. On the other hand, there are only about 3 million pigs in Ukraine. In Europe, large amounts of money are spent on the purchase of fodder for pigs, and in Ukraine, significant volumes of grain are exported for sale instead of creating added value from raw materials obtained on the ground. More than 70% of grain and oil crops are exported as raw materials to other countries (In 2022, the export..., 2022). Importing countries process Ukrainian raw materials into high-value-added products, thereby earning a much higher profit than Ukrainian farmers who grew the products.

Regarding the measures that manufacturers should consider in reducing production costs, in modern conditions, one such measure is the transition to alternative energy sources renewable ones. Due to the destruction of critical infrastructure facilities during the martial law period, which led to permanent power outages, many enterprises use generators for power supply, which is much more expensive than power supply from the general power grid. This led to a significant increase in production costs and a forced increase in the prices of products by manufacturers. To improve the situation, manufacturers should transfer their production to alternative sources of energy supply, which will not be as expensive as, for example, diesel generators. Renewable energy sources include biomass, wind, and solar energy, which can be regenerated. The use of this type of energy allows you to obtain lighting, heating, and hot water, as well as reduce production costs and emissions of pollutants into the environment.

Summarizing the above, it is worth noting that the development of the agricultural sector is influenced by many factors, in particular climatic conditions, prices for agricultural products on the world market, wartime conditions in Ukraine, and others. To reduce the impact of these factors and increase the profitability of crop and livestock products for Ukrainian producers, it is necessary to increase the yield and quality of products to expand the assortment for export, which will allow for an increased profit from activities and competitiveness; reduce production costs, in particular by using

home-grown fodder for feeding animals that are raised for meat, which will reduce the cost of purchasing feed, as well as switching to alternative energy sources, which will reduce electricity costs; develop meat production, as one of the areas of positive development at the international level; create added value from raw materials obtained on land to increase the profitability of producers.

DISCUSSION

Analysis of the profitability of agricultural products in Ukraine allowed to determine that the profitability (unprofitability) of certain types of crop and livestock production depends on various conditions and factors. Modern challenges require agricultural producers to implement certain changes in their activities, the application of which will increase the profitability of products. The results obtained during the research show that the proposals provided during the research are aimed at improving the development of agriculture in Ukraine and increasing the profitability of its products.

According to the results of the study, it is emphasized the need to increase the productivity of crops to increase the profitability of their cultivation. A similar conclusion was reached by the Pakistani scientists T. Liliane and M. Charles (2020), who proved that the yield and mass of harvested plant products in a specific area are affected by several factors that can be grouped into three categories: technological (agricultural practices, management decisions), biological (diseases, pests) and environmental (climatic conditions, soil fertility, topography, water quality). These factors can explain the difference in productivity in different regions of the country.

The issue of government strategies that will increase agricultural productivity and improve the profitability of farmers was considered by the Indonesian scientists K. Heryanda and N. Yuliarini (2021). Such strategies are building infrastructure (roads, irrigation canals, markets for agricultural products), providing financial assistance through banks, using technologies that support agriculture, creating marketing networks, etc. These proposals are appropriate for use in Ukraine as they are a powerful tool for increasing the profitability of agriculture.

It should be noted that soil fertility is important for increasing productivity. A similar point of view is supported by the Ukrainian scientist A. Kucher (2020), who showed the influence of soil fertility and financial support of enterprises on the formation of their sustainable competitiveness. The author substantiated that the increase in financial support for agricultural production can help increase productivity.

To find ways to increase productivity, Australian scientists Z. Hochman *et al.* (2020) studied crop rotations (repeated sequences of crops) in Australia. The scientist studied the possibility of producers choosing crop rotations that have a lower income than optimal crop

rotations and found that for most of the region, crop rotation optimized agricultural profits.

To improve productivity and the probability of increasing production, the English scientists C. Panoutsou and E. Alexopoulou (2020) evaluated the production costs of fourteen crops and analysed how their profitability could be affected by increasing productivity and cultivation on low-quality land, because of which the existence of profitable options was proven at current market prices and types of land.

Turkish scientists E. Ertürk and H. Ağır (2022) researched the determination of productivity, quality characteristics, comparison of production costs and profitability of summer and winter varieties of sugar beet and winter sugar beet in Turkey. Fully supporting the opinion of the scientist who showed the differences in variable costs, and net and relative profit between summer and winter varieties of sugar beet, it should be noted the need to plan winter production to ensure constant income in both periods. Polish scientist Z. Krzysiak (2021) also carried out a comprehensive analysis of the costs of growing sugar beets in individual peasant farms in Poland, who proved that growing sugar beets is characterized by a high cost, which absorbs 82.5% of the total income.

The productivity and profitability of sugar beet cultivation in Germany were evaluated by German scientists S. Wimmer and J. Sauer (2020). It is worth supporting the scientist's point of view that the increase in overall production productivity partially compensates for the losses. The results of the analysis of the profitability of buckwheat cultivation in Serbia, conducted by the Serbian scientists Z. Sredojevic *et al.* (2020), showed that the production of buckwheat is economically justified from the point of view of the producer, but organic production achieves better effects compared to traditional production. In the process of research, it is emphasized that animal husbandry is unprofitable for most species and requires measures to increase this indicator. Scientists who studied the profitability of milk and egg production agree.

Thus, the American scientists Y. Walsh *et al.* (2020), who studied the influence of factors on the profitability of organic farms in the United States, noted that these are: feed management, farm size, milk price and resource costs. In turn, the Turkish scientists D. Sarica *et al.* (2022) emphasized that among the costs, the largest share in the total cost of production is the cost of feed (72.86%) and labour (7.12%). At the same time, with an increase in the size of the farm, the production costs per animal unit decreased, and the net profit increased. This conclusion is also confirmed in the research of the Romanian scientists R. Chetroiu *et al.* (2022), who substantiated that the size of farms and the level and cost of milk production are in direct correlation with profitability, and the unit cost of production is inversely correlated. Nigerian scientists S. Johnson *et al.*

(2020) identified the following as key factors affecting the profitability of poultry egg production in south-western Nigeria: the age of the farmer, the size of the farm, the price per box of eggs, the cost of drugs, and the location of the farm. In turn, an assessment of the profitability of meat production and ways to maximize profits among small farmers was carried out by the Tajik scientists F. Jobirov *et al.* (2022), who rightly emphasized that the potential for increasing profitability is significant if available resources are effectively coordinated, and production costs, in particular costs for feed and medical care, are reduced to a minimum.

At the same time, it is worth agreeing with the Chinese scientists A. Memon *et al.* (2020) that sufficient financial resources significantly contribute to innovation and environmental efficiency. It is proved in the work that the costs of fodder occupy a significant part of their total amount. The scientific community is actively discussing the issue of reducing feed costs and finding alternatives to expensive feed. Thus, the African scientists A. Ouédraogo *et al.* (2022) note that the production of improved fodder is a viable alternative to expensive ones. The study of the Ukrainian scientists V. Petrychenko *et al.* (2021) is devoted to the formation of a market for high-protein fodder for farm animals in Ukraine in the context of European integration processes, as well as to the justification of the use of such fodder by Ukrainian producers.

Among the areas of agricultural expenses that need to be reduced, there are also expenses for electricity, for which it is proposed to use renewable energy sources. A similar proposal is supported in the study of the Ukrainian scientists I. Ivashkiv *et al.* (2020). One such source is the biomass of highly productive bioenergy crops, as well as the commissioning of new capacities of renewable energy facilities, the use of which will make it possible to gradually replace traditional types of fuel with renewable energy sources. Prospects for growing energy plants in Ukraine were considered by the Ukrainian scientists O. Triboy *et al.* (2021), who noted that unused agricultural land can be used for this purpose.

Regarding the need to deploy sustainable renewable technologies in agriculture, the Iranian scientists S. Gorjian *et al.* (2022) and the Mexican scientists Y. Acosta-Silva *et al.* (2019), who proved the advantages of using solar and wind renewable energy in agriculture, note. Completely agree with the author, it is expedient to emphasize that the use of a wind-solar-renewable energy system to manage the greenhouse environment reduces fuel consumption.

Determining promising directions for the development of animal husbandry, the work emphasizes the feasibility of finding ways to increase the profitability of pig meat production. At the same time, other scientists also note the importance of studying the factors affecting this indicator. So, for example, the African researchers S. Fakudze *et al.* (2021) emphasize the need for farmers to improve their qualifications by attending

training seminars to keep abreast of new developments in this field. African scientists J. Nabiky and D. Kugonza (2016) emphasize that the production of pork meat can be made more profitable if groups of farmers are created, with the help of which they can save money and create capital for further investment. At the same time, Brazilian scientists L. Alves *et al.* (2022) proposed a mathematical model to estimate the costs of pig meat production, which facilitates the interpretation of the results and the economic evaluation of the system. It should be agreed that such a model can be used in the process of decision-making and cost control.

To increase profitability in agriculture, it is proposed to focus on creating added value from raw materials obtained on land, as an important tool for increasing profitability (Shahini *et al.*, 2022a; 2022b; 2022c). Carrying out research in the same direction, the American scientists J. Clark *et al.* (2020) determined the characteristics of the agricultural sector with added value: (1) consumers make purchases that simultaneously provide utility and a price premium; (2) the common principles of the firms' activities and their mutual relations support the distribution of values; (3) supply chain participants demonstrate commitment to the community.

The importance of the profitability of agriculture in Ukraine to ensure food security both in the country and in the world is considered by the Romanian scientist V. Câmpeanu (2022), who analyzed the impact of risk factors from the hostilities that began on the territory of Ukraine in February 2022, which may cause global food crisis.

Supporting the point of view of the Czech scientist Ľ. Kryszak (2021), should be noted that the increase in production relative to the farm's capital plays a decisive role in the growth of profitability, which is especially important for small enterprises. Analyzing the demand and supply for agricultural products, French scientists M. Desquilbet *et al.* (2017) assessed how intensive and extensive farming systems affect land use under market equilibrium. The scientist proved the advantages of implementing "active" land conservation through zoning and emphasized that the main effect of higher prices associated with extensive agriculture is a reduction in animal feed production, which has a higher price elasticity of demand. One should agree with the point of view of the Ukrainian scientists O. Osaulenko and N. Reznikova (2020), who claimed that the competitiveness of agriculture is transformed under the influence of the challenges of sustainable development, which is reflected in the strategies of international economic security.

As such, the analysis of the results of scientists' research on the issue of the profitability of agricultural

production in Ukraine confirms the conclusions and proposals made in this work on increasing profitability and determining the directions of agricultural development. The proposed measures to reduce certain areas of expenditure of agricultural enterprises, increase productivity in the crop sector, and create added value for products will allow to maximize the profitability of agricultural producers and increase their resistance to negative factors that affect agribusiness during the state of war in the country.

CONCLUSIONS

The conducted research shows that the profitability of agricultural products of Ukrainian producers is an important tool for maintaining food security, both in the country and in the world.

The goal set in this study and the analysis of the main problems that affect the profitability of agricultural production allowed to formulate the following proposals. It has been proven that one of the ways to improve the profitability of crop production is to increase the yield of sugar beet, which will allow to increase its profitability and the profitability for the economy of Ukraine from the sale of sugar on the world market. Measures are proposed to reduce the cost of purchasing fodder for feeding animals, which can be achieved if producers use products of their cultivation, as well as the transfer of production to the use of renewable energy sources, which will reduce electricity costs and contribute to increasing the profitability of production. The proposal to expand the business of growing pigs for meat in Ukraine, the demand for which in the world market during 2020-2022 is constantly increasing, is substantiated. To increase the profitability of this production, it is necessary to increase the number of animals and improve the quality of their nutrition using grain crops grown in Ukraine. It was revealed that one of the sources of increasing the profitability of Ukrainian agriculture is the creation of added value from raw materials grown on the lands of agricultural producers through their processing and obtaining additional profit.

The main directions of further research in this direction will be the study of methods of increasing the profitability of agricultural production in the conditions of climatic changes, as well as the resistance of grain crops to natural disasters.

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CONFLICT OF INTEREST

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Проблеми рентабельності сільськогосподарського виробництва в Україні

Ермір Шахіні

Викладач, доцент
Університет Александра Моїсці
2001, вул. Курілла, 14, м. Дуррес, Албанія
<https://orcid.org/0000-0002-0083-1029>

Наталія Леонідівна Корженівська

Завідувач кафедри, Професор
Подільський державний університет
32316, вул. Шевченка, 13, м. Кам'янець-Подільський, Україна
<https://orcid.org/0000-0002-4665-6676>

Юлія Анатоліївна Гайбура

Доцент
Подільський державний університет
32316, вул. Шевченка, 13, м. Кам'янець-Подільський, Україна
<https://orcid.org/0000-0002-2267-4968>

Олена Юріївна Нісходовська

Доцент
Подільський державний університет
32316, вул. Шевченка, 13, м. Кам'янець-Подільський, Україна
<https://orcid.org/0000-0002-5403-878X>

Інна Володимирівна Балла

Асистент
Подільський державний університет
32316, вул. Шевченка, 13, м. Кам'янець-Подільський, Україна
<https://orcid.org/0000-0001-5041-9801>

Анотація. Актуальність дослідження зумовлена необхідністю пошуку шляхів підвищення рентабельності сільськогосподарського виробництва в складних економічних умовах України. Метою роботи є аналіз рентабельності сільськогосподарського виробництва, факторів впливу та визначення напрямів її підвищення. Основу методологічного підходу складає: аналіз статистичних даних щодо зміни рентабельності виробництва; метод середніх величин – для отримання середнього значення показників; метод порівняння – для співставлення даних про рентабельність та урожайність між видами продукції; графічний метод – для відображення результатів; метод узагальнення – для зведення інформації про сільськогосподарське виробництво. Головними результатами, які були отримані в межах цієї праці, слід вважати аналіз рентабельності сільськогосподарського виробництва за його видами та урожайності рослинних культур та регіонами країни в умовах впливу негативних факторів на аграрний сектор в період воєнного стану (зокрема, зменшення земель, придатних для ведення сільського господарства, перекриття багатьох шляхів для збуту продукції, ускладнення постачання мінеральних добрив та інших товарів, необхідних для функціонування аграрного сектору) та виокремлення напрямів підвищення прибутковості, а саме: підвищення урожайності окремих видів культур; зменшення витрат на корми для годівлі тварин шляхом вирощування власних кормів та витрат на електроенергію через застосування відновлювальних джерел енергії (енергію сонця, вітру, біомаси); розвиток виробництва м'яса свиней шляхом підвищення їх поголів'я та якості харчування; створення доданої вартості із продукції, отриманої виробником на власній землі, що сприятиме підвищенню прибутковості та успішному розвитку сільського господарства. Аналіз балансу попиту та пропозиції зернових та зернобобових культур показав, що їх виробництво перевищує потребу у споживанні по всім видам зернових. Результати та висновки мають практичну значимість для сільськогосподарських виробників при управлінні бізнесом, а також уряду – при розробці напрямів підтримки аграрного сектору

Ключові слова: прибутковість; урожайність; фактори впливу; баланс попиту та пропозиції; обсяги експорту; створення доданої вартості