

## Sustainable development of agricultural enterprises: Economic dimension

S. Strapchuk\*

PhD in Economic Sciences, Associate Professor

<https://orcid.org/0000-0003-2809-6633>

Researcher ID AAF-4686-2020

Kharkiv National Agrarian University named after V.V. Dokuchayev

**Abstract.** The field of agriculture has a significant role in the context of providing the necessary amount of food resources for the population without causing degradation of natural sources. Sustainable agriculture aims to apply balanced food production systems and involve the most relevant agricultural practices that promote productivity and at the same time help sustain the ecosystem without affecting water and soil quality. During the study of the economic factor of sustainable development of agricultural enterprises, there is an urgent need to differentiate the dynamic characteristics of different levels, which reflect the processes of its transition to a new state. The relevance of the study is due to the need to study the progress of the economic component of the sustainable development of the agricultural sector. The purpose of the article is to analyze the available indicators at the country level that characterize the economic plane of sustainable development in the field of agriculture, as well as to analyze the efficiency and intensity of activity of industry enterprises of the Kharkiv region and Ukraine. Monitoring of indicators of relevant sustainable development goals in the national system of the Central Development System was carried out. The dynamics of indicators of efficiency and intensity in the sphere of agriculture of Ukraine over several years have been studied. The conducted research made it possible to identify a number of trends in the assessment of agricultural factors at the macro level. On the basis of individual enterprises of the Kharkiv region, the relationship between the efficiency and intensity of economic activity was analyzed and the highest indicator of profit per 1 ha of land was revealed in the group with a high efficiency indicator, which may be a consequence of the involvement of sustainable practices. The obtained results make it possible to identify actual problems, to determine the priority of solving the tasks of economic policy in the field of agriculture at different levels

**Keywords:** sustainable development, economic component, agricultural enterprises, production efficiency, gross added value

### INTRODUCTION

Agriculture plays an important role in providing enough food for nearly 10 billion people by 2050 without critical degradation of natural resources. Sustainable agriculture involves the use of balanced food production systems and the implementation of better agricultural practices that increase productivity, which at the same time can help support ecosystems without losing water and soil quality. There is no single

method for all regions or countries [1]. Each country must find its own way to achieve sustainable agriculture in the existing environmental, economic and social conditions. In the process of diagnosing the economic component of the sustainable development of agricultural enterprises, there is a need to distinguish dynamic characteristics of different levels that reflect the processes of its transition to a new state.

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Monitoring of indicators of sustainable development made it possible to establish a conditional division of the Sustainable Development Goals (SDGs) into economic, ecological and social components, proposed by J. Rokström and P. Sukhdev under the name “SDG wedding cake” [2]. This country-wide approach includes inclusion in the economic dimension of SDG 8 Decent Work and Economic Growth, SDG 9 Industry, Innovation and Infrastructure, SDG 10 Reducing Inequality and SDG 12 Responsible Consumption and Production. We believe that it is appropriate to include SDG 2 Overcoming hunger, development of agriculture in the list of economic goals, since this is the key purpose of existence for agricultural production. SDGs 9 and 10 in the context of the agricultural sector should be attributed to the social component.

One of the solutions to ensure sustainability is the development of organic farming systems. In the FAO reports, the division of indicators in this context involves the separation of the following components: production, environment, economy and social well-being. The economic dimension includes indicators of profitability, total costs and ecosystem services [3].

The division of indicators into agricultural, environmental and population welfare indicators was carried out by D. Kanter and co-authors in the process of evaluating trade-offs in agriculture during the period of sustainable development [4]. In our opinion, it is possible to correlate with the economic dimension agricultural indicators, which the authors include yield, yield gap, resource efficiency, personnel productivity, sowing intensity, fodder production, resource use intensity and stock level.

Worthy of attention is the study by L. Campagnolo and co-authors, which offers a comprehensive index of sustainable development assessment – FEEM SI for measuring general balance at the country level [5]. The indicator is divided into three sub-indices, including economic, ecological and social dimensions. The economic block includes indicators: GDP per person; R&D and investment in the industry; public debt and the relative balance of the trade balance.

Determining the necessary list of indicators of the economic dimension of sustainable development of agricultural enterprises will allow to establish trends, compare them with established benchmarks and provide opportunities to identify the influence of factors on existing processes. In particular, the economic interest in conducting business in the industry, which is determined by high profitability, has the reverse side, which consists in increasing the anthropogenic load on land and water resources of agricultural territories. The author O. Nikishyna offers

a comprehensive assessment of the natural resource potential of Ukraine’s agriculture based on a system of complementary indicators of sustainable development, shifting the emphasis towards the ecological component. In particular, the dynamics of the water capacity of the gross added value of the agricultural sector, the indicators of waste generation in the industry and the amount of capital investments for the protection of the natural environment were analyzed [6]. In the work of A. Uzhva, the diagnosis of the economic component of the sustainable development of agricultural enterprises at the regional level was carried out by ranking regions according to increases in the volume of production of gross agricultural products and analyzing the level of profitability of production over a number of years [7].

The state and existing trends in the development of domestic agriculture are revealed in detail in O. Fryer’s research, which points to a violation of the optimal ratio of crops in crop rotations, an increase in the volume of monoculture, and obtaining the highest income from the sale of products by enterprises with the lowest level of diversification. To ensure the reorientation of management in the direction of its sustainability, the author proposes to strengthen agricultural diversification, which will contribute to the natural efficiency of management, increase the productivity of plants, their ability to resist diseases and pests, and expand employment due to the introduction of labor-intensive crops [8]. The purpose of writing the article is the analysis of the existing indicators at the country level that characterize the economic dimension of sustainable development in agriculture, as well as the analysis of the efficiency and intensity of the functioning of industry enterprises of Ukraine and the Kharkiv region.

## RESULTS AND DISCUSSION

Study of indicators of the economic dimension of sustainable development of agriculture in Ukraine

Based on the guidelines for the development of Ukraine until 2030, which were formed in the national report “Sustainable Development Goals: Ukraine”, the actual state of achieving the SDGs was analyzed in comparison with the planned indicators. The indicators established at the national level for SDG 2 Overcoming of hunger, agricultural development, SDG 8 Decent work and economic growth and SDG 12 Responsible consumption and production were selected based on the specifics of the agricultural sector and the economic dimension they allow to be assessed.

The set tasks are supported by a list of indicators and benchmarks for achievement in 2020, 2025 and 2030 (Table 1).

**Table 1.** Monitoring of indicators for Central Development Goals 2, 8 and 12 in the field of agriculture of Ukraine

Indicators/Years	Fact					Target values		
	2015	2016	2017	2018	2019	2020	2025	2030
<b>CDG 2 Overcoming hunger, development of agriculture</b>								
2.1.1. Meat consumption per person, kg/year	50.9	51.4	51.7	52.8	53.6	61.0	71.0	80.0
2.1.2. Consumption of milk and dairy products per person, kg/year	209.9	209.5	200.0	197.7	200.5	270.0	320.0	380.0
2.1.3. Fish consumption per person, kg/year	8.6	9.6	10.8	11.8	12.5	в/д	в/д	в/д
2.1.4. Consumption of vegetables per person, kg/year	160.8	163.7	159.7	163.9	164.7	в/д	в/д	в/д
2.2.1. Labor productivity in agriculture, thousands of US dollars per employed person	8.68	8.71	9.30	10.61	10.89	10.00	12.50	15.00
2.2.2. Index of agricultural products, %	95.2	106.3	97.8	108.1	101.4	102.0	102.0	102.0
2.3.1. Food production index, %	88.6	108.9	107.1	98.5	103.9	103.0	103.0	103.0
2.3.2. The share of products of the food industry and processing of agricultural raw materials in export, %	38.3	42.0	41.0	39.4	44.3	51.0	57.0	65.0
2.3.3. The share of agricultural land under organic production in the total area of agricultural land of Ukraine, %	1.0	0.89	0.67	0.72	1.1	1.10	1.30	1.70
2.4.1. Consumer price index for food products, %	144.4	108.5	113.4	111.5	108.3	105.0	105.0	105.0
<b>SDG 8 Decent work and economic growth</b>								
8.2.1. Rate of return on fixed assets	0.12	0.12	0.12	0.12	-	0.13	0.18	0.23
8.2.2. Labor productivity index, %	99.2	103.5	103.2	102.1	101.9	104	103.6	105.8
8.5.3 Share of workers employed in jobs with harmful working conditions, % (agriculture)	28.9	в/д	28.4	в/д	29.6	22	17	12
<b>SDG 12 Responsible consumption and production</b>								
12.2.1. The share of post-harvest losses in the total production of grain crops, %	2.3	2.0	1.8	1.8	1.8	1.8	1.0	0.5
12.2.2. The share of post-harvest losses in the total production of vegetables and melon crops, %	12.3	12.0	10.8	10.6	10	10	7.0	5.0

Source: compiled from [9]

According to expert assessments, indicators 2.1.2 and 2.3.3 are related to the level of consumption of dairy and meat products per capita and an increase in the share of land under organic production, are almost unattainable and are characterized by negative dynamics. All other indicators have a high probability of reaching or have already reached the level of the

established benchmark of 2020 [9]. The analysis of indicators at the regional level on the example of the Kharkiv region was carried out only according to indicators 2.1.1-2.1.5, which relate to the consumption of products by species per capita (Table 2). The rest of the indicators are developed only at the national level

**Table 2.** Dynamics of indicators of the Central Bank 2 Overcoming hunger, development of agriculture in the Kharkiv region

Indicators/Years	Fact				
	2015	2016	2017	2018	2019
2.1.1. Meat consumption per person. kg/year	52.8	51.2	52.0	52.1	52.0
2.1.2. Consumption of milk and dairy products per person. kg/year	228.3	239.9	220.9	208.7	203.9
2.1.3. Fish consumption per person. kg/year	6.9	8.0	8.7	9.2	9.2
2.1.4. Vegetable consumption per person. kg/year	173.4	179.2	171.1	168.8	172.8
2.1.5. Fish consumption per person. kg/year	52.2	52.1	55.3	55.7	55.6

Source: compiled from [9; 10]

Achieving the established benchmarks according to indicators 8.2.1 and 8.5.3, which relate to increasing the return on fixed assets and reducing the share of workers employed in harmful production in agriculture, according to experts, is unlikely and is characterized by negative dynamics [9]. Whereas the labor productivity index has a growing tendency, and the estimate of the probability of reaching the set level according to it is higher.

The task of reducing food losses in production and sales chains is planned to be implemented within the framework of achieving SDG 12 Responsible consumption and production, which is monitored only at the national level. In terms of SDG 12, only indicators related to post-harvest losses were selected.

Therefore, measures aimed at resource conservation, environmental protection, as well as the introduction into national legislation of the basic principles and provisions of European legislation in the field of waste management, made it possible to reduce the share of post-harvest losses in the total production of grain crops from 2.3% in 2015 to 1.8% in 2018 (1.8%

in 2019 – data from the Ministry of Economy), which corresponds to the target guideline until 2020 [9].

Taking into account the context of the economic dimension of sustainable development, in agriculture there is a need to distinguish indicators of the level of economic efficiency, the share of created added value and the level of intensity, which are mainly based on the level of profit. The profit obtained is one of the prerequisites for expanded reproduction of production and a general indicator of the effectiveness of economic activity.

Agriculture creates a relatively low added value, being the main branch of the national economy. Moreover, in the dynamics over the last five years, there has been a significant decrease in economic efficiency indicators, both in the industry as a whole, and in crop production and livestock production in particular. Thus, the added value of expenditures in the agricultural economy of Ukraine has halved over the past five years, or by 47%. The negative dynamics of the indicator of the level of operational profitability also shows an annual decrease on average in agriculture – 16.6%, including crop cultivation – 16.1%, and in stockbreeding – 20.6% (Table 3).

**Table 3.** Dynamics of the level of profitability of operational activity and added value by expenses of agricultural enterprises of Ukraine for 2015-2019

Indicators/Years	2015	2016	2017	2018	2019	Tendence
Profitability of operational activities in agriculture, %	43.0	33.6	23.2	18.9	19.8	$y = -6.11x + 46.03$ $R^2 = 0.8702$
cultivation of crops, %	47.2	38.4	24.6	20.6	21.9	$y = -6.84x + 51.06$ $R^2 = 0.8536$
stockbreeding, %	33.1	16.0	20.0	13.8	10.4	$y = -4.76x + 32.94$ $R^2 = 0.7327$
Total value added by production costs in agriculture, %	12.83	10.07	8.41	7.78	6.74	$y = -1.447x + 13.507$ $R^2 = 0.9256$
cultivation of crops, %	10.98	8.69	6.85	6.48	5.59	$y = -1.299x + 11.615$ $R^2 = 0.9171$
stockbreeding, %	1.38	0.98	1.00	0.86	0.81	$y = -0.126x + 1.384$ $R^2 = 0.7925$

Source: compiled from [11]

A detailed study of the reasons for the decline in the economic efficiency of activities in the agricultural sector requires consideration of the dynamics of indicators of the profitability of production of the main types

of products. Analysis of the annual growth rate of production profitability for each type of product allowed establishing a drop in efficiency at the level of 30% in crop production and 190% in livestock production (Table 4).

**Table 4.** Dynamics of the level of profitability of production of the main types of agricultural products at enterprises of Ukraine in 2015-2019

Indicators/Years	2015	2016	2017	2018	2019	Tendence
Profitability of production, %:	36.4	31.7	26.8	24.6	7.3	$y = -6.53x + 44.95$ $R^2 = 0.8686$
corn for grain	50.3	45.7	23.7	27.2	17.8	$y = -8.35x + 57.99$ $R^2 = 0.8589$
factory sugar beetraps and colza seeds	44.3	45	43.6	31.1	9.4	$y = -8.37x + 59.79$ $R^2 = 0.7529$

Table 4, Continued

Indicators/Years	2015	2016	2017	2018	2019	Tendence
sunflower seeds	80.5	63	41.3	32.5	23.5	$y = -14.45x + 91.51$ $R^2 = 0.9638$
pigs for meat factory sugar beet	28.2	24.3	12.4	-11.4	-15.4	$y = -12.29x + 44.49$ $R^2 = 0.9345$
cattle for meat	-17.9	-24.8	3.4	-17.7	-27.1	$y = -1.13x - 13.43$ $R^2 = 0.022$
pigs for meat	12.7	-4.5	3.5	6.9	4.7	$y = -0.46x + 6.04$ $R^2 = 0.0137$
poultry for meat	-6.1	5	7.0	5.7	-3.7	$y = -0.46x + 6.04$ $R^2 = 0.0137$
milk	12.6	18.2	26.9	16.1	20.6	$y = 1.39x + 14.7$ $R^2 = 0.1681$
poultry eggs	60.9	0.5	-9.0	5.4	-23.5	$y = -16.39x + 56.03$ $R^2 = 0.6495$

Source: compiled from [11]

A number of complex factors influence the formation and change of profit volumes: sales price, cost of production, the structure of changes in the product range and sales volumes. From the point of view of an individual enterprise, an inexhaustible reserve for

increasing profits (subject to other favorable factors) is an increase in the volume of sales of agricultural products. In the dynamics of sales volumes of the main types of products in physical terms for the analyzed period of 2015-2019, no single trend can be traced (Table 5)

Table 5. The dynamics of sales volumes in natural terms of the main types of agricultural products at enterprises of Ukraine in 2015-2019

Indicators / Years	2015	2016	2017	2018	2019	Tendence
<b>Scope of implementation:</b>						
wheat, thousand tons	17631	16921	16903	16110	17062	$y = -194.9x + 17510$ $R^2 = 0.3214$
corn for grain, thousand tons	23311	15739	17251	22058	27697	$y = 1509.1x + 16684$ $R^2 = 0.2454$
seeds of oil crops, thousand tons	14631	12242	13696	13685	16729	$y = 563.9x + 12505$ $R^2 = 0.2908$
factory sugar beet, thousand tons	5819	10879	12534	5015	4078	$y = -934.6x + 10469$ $R^2 = 0.1523$
agricultural animals (in live weight) thousand tons	1947	2176	2001	1009	1024	$y = -301.3x + 2535.3$ $R^2 = 0.7042$
milk, thousand tons	2538	2543	2690	2603	2551	$y = 8.6x + 2559.2$ $R^2 = 0.0449$
poultry eggs, thousand tons	8897	7141	7223	8051	8359	$y = -16.6x + 7984$ $R^2 = 0.0012$

Source: compiled from [11]

Thus, an increase in the volume of sales in natural units was recorded for corn for grain, oil crops and poultry eggs, while a decline occurred for other types. Particular attention should be paid to wheat, the sales volume of which increased in 2019 against the background of a constant decline in the previous period, but the level of profitability of its production was the lowest – 7.3%, with the average values of the indicator for previous years at 25%. The main reason for the decrease

in the level of profitability is the outpacing growth rates of activity costs compared to the volume of products sold. In addition, the orientation of domestic enterprises to foreign markets (if we consider export crops) makes Ukraine dependent on global price fluctuations.

Taking into account certain fluctuations in the volume of sales, the choice of the type of reproduction of production should be based on competitiveness and sustainability. Recently, a popular concept is constant

intensification, which is primarily associated with best practices and innovation.

Limiting the expansion of agricultural land at the national level requires the search and use by producers of agricultural products of intensive forms of extended reproduction, which provide for a constant increase in production volumes based on the use of more efficient means of production, improvement of technologies, rational placement and specialization, scientific organization of work, etc.

In this regard, the statement of researchers V.V. Vasyuta & V.B. Mormul, who consider the

intensification of agricultural production as the concentration of production resources on one and the same land area, which implies the qualitative improvement of the means of production and the use of advanced technologies [12]. The tasks of production intensification should be directly related to the introduction of progressive technologies, techniques and methods of labor organization in agriculture and animal husbandry [13].

Further analysis of the intensity of production involves determining the level of concentration of production costs per 1 ha of land and crop yield/animal productivity by individual species (Table 6).

**Table 6.** Dynamics of the level of production intensity of the main types of products of agricultural enterprises of Ukraine for 2015-2019

Indicators/Years	2015	2016	2017	2018	2019	Tendence
<b>Production costs</b>						
wheat, UAH/ha	4829.0	6384.7	7495.2	8476.7	9431.7	$y = 1129.7x + 3934.2$ $R^2 = 0.9888$
corn for grain, UAH/ha	7245.7	9274.9	10851.6	14398.8	14611.1	$y = 1985.5x + 5320$ $R^2 = 0.9544$
sunflower seeds, UAH/ha	5873.8	7193.1	8335.9	9498.8	10221.0	$y = 1100x + 4924.5$ $R^2 = 0.9909$
factory sugar beet, UAH/ha	22589.2	30800.1	29513.6	33965.4	33210.8	$y = 2440.9x + 22693$ $R^2 = 0.7281$
milk, UAH/ha	345.6	420.8	520.4	610.8	627.9	$y = 75.46x + 278.72$ $R^2 = 0.9646$
poultry eggs, UAH/ha	220.5	296.0	344.7	819.3	802.6	$y = 168.75x - 9.63$ $R^2 = 0.8442$
<b>Production/productivity of livestock and poultry</b>						
wheat, c/ha	38.9	42.1	42.6	38.4	43.4	$y = 0.53x + 39.49$ $R^2 = 0.1359$
Corn for grain, c/ha	61.1	66	59.5	87	77.7	$y = 5.42x + 54$ $R^2 = 0.5308$
Sunflower seeds, c/ha	21.6	22.4	21.3	24.1	27.0	$y = 5.42x + 54$ $R^2 = 0.5308$
factory sugar beet, c/ha	448	481.5	484.1	518.8	470.3	$y = 8.19x + 455.97$ $R^2 = 0.254$
milk, kg/cow	4691.5	4791.6	4874.8	4987.6	5034.5	$y = 88.2x + 4611.4$ $R^2 = 0.9879$
Poultry eggs/hen.	78.7	74.0	76.9	78.8	78.8	$y = 0.5x + 75.94$ $R^2 = 0.1436$

**Source:** compiled from [11]

We estimate the level of intensification using the indicator of production costs per 1 ha of land for the studied types of products, which shows steady growth. Yield of individual crops, animal productivity and production of individual species in natural measurements per 100 hectares of relevant land are effective indicators of intensity. The dynamics of the latter are characterized by significant fluctuations over the period, which requires the analysis of longer time intervals.

Analysis of the dependence between the intensity and efficiency of economic activity of individual enterprises of the Kharkiv region.

Using the example of enterprises of the Kharkiv region, the indicators of intensification and efficiency of economic activity in wheat cultivation were determined and analyzed, followed by a search for the dependence between them according to the created groups (Table 7).

**Table 7.** The relationship between the efficiency of agricultural enterprises of the Kharkiv region and the level of intensity of wheat production in 2019

Indicators	Intervals according to the production cost per 1 ha					Average
	Group 1 below 10 thous UAN/ha	Group 2 10-12 thous UAN/ha	Group 3 13-15thous UAN/ha	Group 4 16-20 thous UAN/ha	Group 5 more 20 thous UAN/ha	
Number of enterprises	87	126	137	72	58	480
Production cost per 1 hectare, thousand UAH/he	7.909	11.550	14.405	17.648	28.608	16.024
Sown area, ha	482.1	815.4	742.1	892.9	691.9	724.9
Commodity products, centner	14355.0	27979.4	31712.8	39929.8	47065.6	32208.5
Yield, c/ha	29.2	33.1	39.4	46.1	70.1	43.6
Profit per hectare, thousand UAH/hectare	2.718	2.030	2.069	1.794	2.872	2.297
Profitability of sold products	41.8	20.5	15.5	13.4	13.7	20.9

**Source:** compiled from [14]

The selected groups show tendencies to change the level of profitability of implementation, profit, productivity depending on the increase in costs per 1 ha. The direct relationship between the cost of production and yield is explained by the comparison of the input and output of intensification, while there is an inverse relationship between costs and profitability or profit. It is interesting that the enterprises that are included in group 5 with significant expenses have the highest profit per 1 ha, which requires a more detailed study of economic entities that spend on wheat cultivation from 20 thousand UAH per 1 ha and above. If we compare the rate of growth between costs and productivity in the section of the selected groups, the latter indicator grows at a lower rate, and the gap is the smallest in the third and fourth groups.

## CONCLUSIONS

The study of the indicators of the economic dimension of the sustainable development of agriculture in Ukraine in the context of the Central Development Fund demonstrated the possibility of using indicators for analysis at the national level and certain difficulties at the level of enterprises and regions. The selection of indicators for the further formation of a complex index may differ depending on the tasks set, such as the assessment of the effectiveness of the country's national economic policy or the effectiveness of the implementation

of sustainable practices at the enterprise level. The conducted research made it possible to determine a number of trends in the assessment of indicators of agriculture at the macro level. The positive trends include a significant increase in crop productivity and animal productivity, due to an increase in the level of intensification of farming by increasing costs per 1 ha. The negative trends should include a decrease in the level of profitability of operational activities (by 23%), added value at the expense of agricultural enterprises (by 6%) against the background of an annual decrease in the profitability of the main types of crops; a permanent decrease in the volume of sales in real terms.

At the level of individual enterprises of the Kharkiv region, the dependence between the intensity and efficiency of economic activity was analyzed, and the group with a high level of efficiency showed the highest rate of profit per 1 ha of land, which may be the result of the implementation of sustainable practices. Adherence to the principles of balanced management will contribute to the achievement of the goals of sustainable development thanks to the effective use of natural mechanisms in combination with innovative principles of sustainable agricultural production in Ukraine. Prospects for further research consist in the identification of existing models of complex indicators of sustainable development, their approbation on the example of the agricultural sector at the macro level and the level of an individual enterprise.

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## Сталий розвиток сільськогосподарських підприємств: економічний вимір

С. І. Страпчук

Кандидат економічних наук, доцент  
<https://orcid.org/0000-0003-2809-6633>  
Researcher ID AAF-4686-2020

Харківський національний аграрний університет ім. В. В. Докучаєва

**Анотація.** Актуальність дослідження обумовлена необхідністю діагностики прогресу економічної складової сталого розвитку сільськогосподарського сектора. Здійснено моніторинг індикаторів відповідних цілей сталого розвитку в національній системі ЦСР. Досліджено динаміку показників ефективності та інтенсивності галузі сільського господарства України за декілька років. Отримані результати дозволяють виявляти актуальні проблеми, визначати пріоритетність вирішення завдань економічної політики в галузі сільського господарства на різних рівнях

**Ключові слова:** сталий розвиток, економічна складова, сільськогосподарські підприємства, ефективність виробництва, валова додана вартість