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APPLICATION OF ECOLOGICAL AND ECONOMIC ANALYSIS TO THE EVALUATION OF PRODUCTION AND ECONOMIC ACTIVITY

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The article considers the need to use environmental and economic analysis to conduct a full and comprehensive assessment of economic activity of agricultural enterprises. It is noted that the tools of ecological and economic analysis play an important role in ensuring the efficient operation of farms on the basis of sustainable development. So activity is the basis of the process of greening production. In the context of the global environmental crisis, greening is the main requirement of our time. In the socio-economic aspect, the basis of greening should be considered the transition to such methods and principles of management that would ensure optimal resource use, and in the technical – to implement innovative eco-technologies of production and nature management.

On the example of the limited liability company “ADEPT-AGRO” a generalized assessment of the production activities of the farm.

It is determined that the cost of crop production is formed from different economic content of cost items that characterize its structure and depend on production specialization, level of equipment and features of production organization.

The necessity of finding reserves to reduce the cost of cultivated products with the optimal combination of cost reduction and quality improvement is proved.

It is substantiated that for the implementation of a full range of measures for the greening of production activities in “ADEPT-AGRO”, a prerequisite is the transition to a progressive system of biosphere-protective land use, as well as areas of storage and processing of agricultural products.

As a result of the analysis, it was found that the production activity of the object of study is maximally adapted for radical changes in the direction of greening of rural business for this agricultural enterprise.

A model of greening of the production system of the object of study is proposed.

Key words: ecological and economic analysis, production, efficiency, productivity, profitability.

Стратічук Н.В. Застосування еколого-економічного аналізу для оцінки виробничо-господарської діяльності

У статті розглянуто необхідність застосування еколого-економічного аналізу для проведення повноцінної та всебічної оцінки виробничої діяльності сільськогосподарських підприємств. Зазначено, що інструменти еколого-економічного аналізу відіграють важливу роль у забезпеченні ефективної діяльності господарств на засадах сталого розвитку. Так, діяльність є основою процесу екологізації виробництва. В умовах глобальної екологічної кризи екологізація є головною вимогою сучасності. У соціально-економічному аспекті базу екологізації слід уважати перехід до таких методів та засад господарювання, які б забезпечували оптимальне ресурсовикористання, а в технічному – упровадження інноваційних екологічних технологій виробництва і природокористування.

На прикладі товариства з обмеженою відповідальністю «АДЕПТ-АГРО» проведено узасильну оцінку виробничої діяльності фермерського господарства. Визначено, що собівартість продукції рослинництва формується з різних за економічним змістом статей витрат, які характеризують її структуру і залежать від виробничої спеціалізації, рівня устаткування й особливостей організації виробництва.

Доведено необхідність пошуку резервів зниження собівартості вирощуваної продукції за оптимального поєднання скорочення витрат і підвищення якості.

Обґрунтовано, що для здійснення повного комплексу заходів щодо екологізації виробничої діяльності в «АДЕПТ-АГРО» обов'язковою умовою є перехід до прогресивної системи біосферо-захисного землекористування, а також сфер зберігання та переробки одержаної сільськогосподарської продукції.

У результаті проведеного аналізу встановлено, що виробнича діяльність об'єкта дослідження максимально адаптована для докорінних змін у напрямі екологізації сільськогосподарського бізнесу для даного сільгосподарства.

Запропоновано модель екологізації виробничої системи об'єкта дослідження.

Ключові слова: еколого-економічний аналіз, виробництво, ефективність, урожайність, рентабельність.

Problem statement. In today's conditions, the creation and improvement of the economic mechanism of nature management is impossible without a comprehensive assessment of the situation in the interaction of economy and ecology, as well as the presentation of possible ways of ecological and economic development in the future. Each agricultural enterprise, each farm solves problems on a wide range of issues: determining the list of products; which market to enter with these products; what technologies to use for production; what resource structure is needed and how to allocate labor, material and financial resources [1]. Preliminary planning answers the question "what indicators must the company achieve over a period of time to remain profitable?". Growing concerns about the quality of the environment have focused the attention of agricultural enterprises on the possible environmental consequences of their activities. Farms should identify these effects and, if possible, completely eliminate their negative outcome [2]. To prevent negative consequences for the environment, each agricultural enterprise must conduct an environmental and economic analysis of its activities.

The main goal of sustainable development of Ukraine is to achieve and maintain regulatory indicators of quality of life and environment based on socio-economic development, balanced with the capabilities of the natural environment of the state, provided equal opportunities for present and future generations to use natural resources.

The problem of achieving the conditions of sustainable development requires for its solution appropriate mutually agreed actions of many subjects of production and economic activity. The environmental component should be considered as one of the determinants in solving the problems of achieving sustainable development and an acceptable level of economic security as individual entities, as well as individual regions and the state as a whole [3]. In recent decades, many scientific papers and representative conferences have been devoted to this area. This problem can be characterized by the variety of forms of manifestation of environmental impact, the composition and intensity of environmental impacts, the nature of social, economic, physiological and other consequences. A large number of indicators are used to quantify these effects. Each of the indicators usually covers individual manifestations of global environmental impact on the environment and recipients. Most indicators only partially characterize the relevant impacts and are not suitable for a comprehensive assessment of solutions aimed at radically improving the ecological state of the environment, the practical implementation of which takes place under many constraints, including resource [4].

Analysis of recent research. Such scientists as Melnyk L.G., Shapochka M.K., Kharichkov S.K., Khvesyk M.A., Tsarenko O.M., Pavlov V.I., Burkinisky B.V., Borshchevsky P.P., Veklych O.O. and other have been and continue to be engaged in the formation of fundamental theoretical principles of nature management, coverage of aspects of sustainable development and ecological and economic analysis in different years.

In his scientific works O.A. Veklych notes that the effectiveness and speed of the transition of the economy to an environmentally sound, sustainable path of development directly depends on the degree of development of environmental management processes at the microeconomic level of management [5]. In modern

economic conditions, the issue of application of ecological and economic analysis is important and relevant, as one of the main tools for assessing the ecological and economic development of individual enterprises, industries and regions.

Due to the diversity of environmental and economic indicators, due to the specifics of agriculture, it is necessary to analyze the indicators in accordance with their functional purpose, the place they occupy in the system of planning and regulation [6].

Task setting. The purpose of this article is to study the role of environmental and economic analysis to ensure the effective operation of farms on the basis of sustainable development, the use of a system of indicators to analyze the level of environmental friendliness of production in modern economic conditions.

Presentation of the main material of research. Kherson region is a powerful agro-industrial region with well-developed rural production, located in the south of Ukraine in the zone of risky agriculture, has a relatively high agricultural resource, which consists of agricultural land with an area of 1968,4 thousand hectares, including 1776,6 thousand hectares of arable land. The region has the highest rate of plowing of agricultural lands in Ukraine – 91.3%, which has led to the recent spread of erosion processes. Among the lands used in active cultivation, 437,1 thousand hectares are low-productive lands that do not provide a proper return on the material and energy resources invested in them.

Consider the application of environmental and economic analysis to assess the production and economic activity on the example of “ADEPT-AGRO” LLC, which is located in Skadovsk district, Kherson region. The farm is pursuing a course of intensification of crop production through the introduction of resource-saving technologies, the use of more productive varieties and hybrids of plants. Scientific support of agro-industrial production of the farm is provided by Spectrum-Agro LLC, which provides the latest technologies and qualified assistance to the farm.

To estimate the size of the farm, consider the area of agricultural land owned by ADEPT-AGRO LLC.

Table 1

Dynamics of agricultural lands “ADEPT-AGRO”

Years	2014	2015	2016	2017	2018	2019	2020
Area, ha	756	756	756	758	770	924	929

The object of our study practices the main stages of production that correspond to the cultivation of crops: the farm begins soil preparation immediately after the harvest of the predecessor. Peeling, plowing and cultivation are important pre-treatment measures. They make it possible to successfully combine the effective limitation of the number and spread of potentially dangerous species of weeds, pests and diseases with the preservation of moisture, the proper physical condition of the soil before the main cultivation.

On a farm of 929 hectares, 230 hectares are irrigated. Bringing the field to the sowing state takes place in a single technological cycle with the use of units equipped with loosening or trimming bodies, rollers or combined units.

Adept-Agro LLC is located in the steppe zone of the South, where saline soils are present. Peeling is carried out by disking in two directions to a depth of 6–8 cm to create a well-mulched topsoil. In the presence of only annual weeds and placement of wheat

after stubble predecessors, usually one high-quality peeling with disc cultivators to a depth of 6–8 cm.

Disking multiplies and stores the necessary microorganisms in the fertile topsoil. Reduces the degree of water and wind erosion, thereby increasing the biological activity of the soil. Allows you to get an environmentally friendly and safe harvest. Reduces labor costs during plant growing.

After the weeds have grown in the farm, the area is plowed with plows with plowshares in the unit with rollers. Depth of plowing depends on the need to plow post-harvest residues and manure. The main purpose of plowing is to saturate the soil with oxygen, improve the structure of the soil (it acquires a crumbly consistency, leveled), mix the components that make up the soil. Adept-Agro LLC does this for sowing spring crops in the spring.

For the period 2020–2021 of the sowing year, Adept-Agro LLC planned to sow winter wheat on the area of 280 hectares and 270 hectares of winter rape, 280 hectares of sunflower, 80 hectares of peas. Due to the dry autumn and late rains, the area under rapeseed was reduced to 180 hectares.

For sowing of winter wheat Adept-Agro LLC uses seeds which on a category correspond to 1–3 reproductions with germination for soft wheat not less than 92%, purity from seeds of weeds and other impurity not less than 98%, varietal purity not less than 98%, humidity not more than 15–15.5%.

The studied farm introduces intensive technologies of winter rape growing. Shrek rapeseed hybrid is used for sowing material. Of great importance is the quality of the seeds themselves: they use well-filled seeds, which have germination and germination energy close to 100%, as well as varietal purity, not less than 99%.

Much attention in the agricultural enterprise is paid to the application of fertilizers. Phosphorus-potassium fertilizers are applied to Adept-Agro LLC at the same time as sowing. But their dose should not exceed 10–15 kg / ha, etc., to prevent the suppression of plant seedlings.

When assessing the economic efficiency of agricultural production, it is necessary to take into account the specifics of the industry. Production in agriculture, as in any other industry, involves the use of natural potential. Therefore, all measures to develop agriculture and increase its efficiency should be aimed at preserving the environment.

The final indicator of agricultural activity of farms is the level of profitability. Its level indicates the efficiency of agricultural production.

During the study period in the company “ADEPT-AGRO» there is a profitability of growing all crops.

It should be noted that the bulk of the products grown on the farm are sold during the period of its harvest, when prices, which are formed under the influence of supply and demand, are at a fairly low level.

Most farmers do not have warehouses and other facilities for storing agricultural products. Therefore, to improve production efficiency, it is important to improve sales through marketing.

Estimated data indicate that the main types of products in the structure of cash receipts from sales are sunflower (58.08%), winter rape (21.32%) and winter wheat (9.35%). That is, the economy is highly specialized, and the production direction is sunflower. This is due to: the most favorable natural conditions for growing sunflower, which are inherent in this area; conditions of uncertainty under which a significant part of farmers are engaged in sunflower cultivation, as there is a stable demand for these products in the domestic market among the processing sector.

Table 2
Sales of products in terms of major groups of goods in kind and in monetary terms

Types of products	Dynamics of product sales							
	2018 year		2019 year		Reporting period (September, 2020)		Similar period last year (September, 2019)	
	physical terms	thousand UAH	physical terms	thousand UAH	physical terms	thousand UAH	physical terms	thousand UAH
Yellow peas	–	–	–	–	184,78	962,42	–	–
Winter wheat	460,68	2909,5	306,2	1339,08	270,940	1313,42	–	–
Winter rape	759,38	8369,50	537,44	5269,75	610,6	6875,50	537,44	5269,75
Sunflower	460,80	4184,0	1085,14	9602,58	476,9	4428,33	782,82	7082,08
Corn	442,56	2048,9	–	–	–	–	–	–
Sunflower price adjustment	–	–	–	2239,83	–	–	–	2239,83
Total:	2123,42	17511,9	1928,78	18451,3	1543,22	13579,7	1320,26	14591,7

Table 3
The amount and structure of cash proceeds from the sale of products in “ADEPT-AGRO” LLC

Products	Cost, thousand UAH	Sales price, thousand UAH	Gross margin, %
Yellow peas	883,2	962,42	8,9
Winter wheat	1111,261	1313,42	18,9
Winter rape	5178,00	6875,50	32,8
Sunflower	3961,4	4428,33	11,8
The general level of markup on sold products	11133,9	13579,7	21,97

Systematic definition and analysis of the cost structure of the enterprise are very important primarily for managing costs in the economy in order to minimize them.

The largest amount of costs in agricultural enterprises falls on the implementation of the production process [7].

The cost structure allows the owner of the farm to identify the main reserves for their reduction and develop specific measures for their implementation in the enterprise.

One of the important indicators of the efficiency of agricultural enterprises is the cost of production. It shows how many resources have been used in the production of a particular type of product and how economically viable their use is.

On the example of ADEPT-AGRO LLC we observe the negative dynamics of growth of production cost of 1 quintal of the main types of crop products, on the cultivation of which the farm specializes. Thus, the production cost of growing winter wheat has increased significantly: by 76% in 2020 compared to 2018.

Table 4

The structure of the cost of goods sold, thousand UAH

The name of the cost item	Last reporting year 2019	Reporting period (September, 2020)	Similar period of the previous year (September, 2019)
Raw materials and components	8546,9	8135,9	6173,38
Electricity	-	-	-
Gas	-	-	-
Water	24,4	18,8	17,1
Fuel and lubricants	2452,3	1239,8	1806,9
Pay	299,9	212,1	209,9
Accrual on FOP			
Amortization	967,9	616,8	713,2
others (the share of which is less than 10% in the total cost structure)	1503,5	910,5	1107,82
Total cost	13794,9	11133,9	10028,30

The question of developing a set of measures that will increase yields while reducing production costs requires a comprehensive analysis. Factors that lead to increased yields can be considered as factors in reducing the cost of crop production. To determine the impact of factors on the change in cost, we will evaluate them by the index method for the main types of products grown by “Adept-Agro» LLC.

Determine the total change in unit cost:

$$iz = z_1 / z_0 = 0.753 \text{ or } 75.3\%; \Delta z = z_1 - z_0 = -138.58 \text{ UAH,}$$

where z_0, z_1 is the unit cost of production in the base and reporting years.

To determine the influence of factors on the change in unit cost of production, we define the following indices:

1) Cost index per hectare of sowing: $i_3 = z_1 y_1 / y_1 \div z_0 y_0 / y_1 = 0,811$ or 81,1%. Absolute change in cost due to the cost of funds per hectare: $\Delta_3 = z_1 - z_0 y_0 / y_1 = -98,45$ UAH, where y_0, y_1 – yield in the base and reporting years, respectively; $z_0 y_0, z_1 y_1$ – costs per hectare in the base and reporting periods, UAH

2) Index, which characterizes the change in unit cost due to yield:

$$iy = z_0 y_0 / y_1 \div z_0 y_0 / y_0 = 0.929 \text{ or } 92.9\%. \text{ Absolute change in cost due to yield:}$$

$$\Delta y = z_0 y_0 y_1 - z_0 = -40,13 \text{ UAH.}$$

Relationship between indices and increments:

$$iz = i_3 \times iy; 0.753 = 0.811 \times 0.929;$$

$$\Delta z = \Delta_3 + \Delta y; -138.58 = -98.45 + (-40.13).$$

Analyzing the calculated indicators, we can conclude that the production cost of 1 quintal of sunflower farm “ADEPT-AGRO” LLC in 2020 compared to 2019 decreased by 24.7%, which in absolute terms amounted to 138.58 UAH. At the same time, due to the reduction of costs per hectare of sowing, the cost of production decreased by 18.2%, the absolute change – 98.45 UAH. Due to the increase in yield in 2019, the unit cost decreased by 7.1%, which in absolute terms amounted to UAH 40.13.

Therefore, assessing the impact of factors on the change in production cost per unit of output, it should be noted that the decrease in cost in the studied economy is mainly

due to reduced costs, which contributes only to a slight increase in productivity. At the same time, increasing yields, for example, winter wheat and sunflower, requires significant costs, which leads to an increase in cost almost twice. Therefore, there is a need to find reserves to reduce costs with the optimal combination of cost reduction and quality improvement.

Greening the production activities of the farm “Adept-Agro” is especially relevant in view of the deepening global environmental and food crisis.

It should be noted that the modern system of agriculture of “Adept-Agro” LLC does not fully meet the new environmental and technological requirements, as the need of plants for nutrients is not met by the ratio of mineral fertilizers, namely uncontrolled chemicals, high doses of fertilizers and pesticides, mainly nitrogen fertilizers are applied. At the same time, the vast majority of modern agriculture is forced to be carried out on small plots of land, which causes violations of crop rotations, non-compliance with the technology of growing crops and, consequently, worsened the care of forage lands.

Given the above, in order to stop soil degradation and, accordingly, their reproduction, increase economic efficiency, ensure the proper state of the environment as a whole, there is an urgent need to implement a full range of measures to green production activities in “ADEPT-AGRO” LLC, a prerequisite what is the evolutionary transition to a progressive system of biosphere-protective land use, storage and processing of agricultural products.

Conclusions. As a result of the analysis, it was found that the production activity of the object of study is maximally adapted for radical changes in the direction of greening of rural business for this agricultural enterprise.

According to the results of the forecast, it is expected that, on the one hand, during 2021–2022 there will be relatively insignificant changes in the factors, however, on the other hand – deviations in their values according to the optimistic and pessimistic scenarios will be weighty. In particular, the potential discrepancy between pessimistic and optimistic forecasts regarding the level of plowing is 2.03%; application of mineral fertilizers is 61%; fertilized areas – 30.26%; provision of labor resources – 2.4 times; technical security of enterprises – 40.04%; level of profitability – 2.3 times.

Undoubtedly, ensuring the systematic development of ecologically oriented economy in rural areas is possible by using the provisions of developed scientific approaches, based on the principles of mechanism formation, tools for regulation and implementation of which are provided through the interaction of economic, organizational and managerial components. attractiveness of the business environment, forecasting of indicators of economic expediency of ecologically safe activity.

Today, the priorities of ecologically oriented economy in rural areas are the development of environmental certification and intensification of organic production. With the transition of ADEPT-AGRO LLC to organic farming, it is expected to increase production efficiency, namely: increase the level of profitability of rape by 33%, sunflower seeds – by 29%, wheat – by 102%, corn for grain – 140%. We emphasize that the intensification of organic production is possible, first of all, by expanding the area of agricultural land suitable for organic farming; stimulating the economy to reorient to the ecological principles of management, reducing the risks of such activities; improvement of the system of certification of organic products.

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