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**METHODICAL ASPECTS OF DETERMINING THE
EFFICIENCY OF GRAIN PRODUCTION IN MODERN
CONDITIONS**

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Introduction. The pace of development of the agro-food market of Ukraine is extremely volatile, due to the determinants of the external environment and internal factors. In the context of accelerated integration processes, the potential of free trade areas and regional trade associations have an impact on the structure of the internal market as a whole and the agro-food market in particular. Given the leading position of the agro-food sector in the national economy and the significant share of grain exports in total exports of Ukraine, the problem of ensuring the efficiency of grain production is of particular relevance for the domestic economy.

Aim and tasks. The purpose of this paper is to systematize the methodological bases for determining the efficiency of grain production in modern conditions. According to the stated purpose, the main objectives of the study are: to generalize the instrument of production efficiency estimation in the market of agro-food products and to identify the determinants of influence on efficiency of grain production in the conditions of increasing openness of national economies.

Results. The results of the study of theoretical foundations of problems of ensuring the efficiency of agricultural production from the standpoint of economic and socio-economic approach made it possible to identify the determinants of increasing the efficiency of grain farming in the context of natural and climatic conditions, biological and organizational and technological features of its production. Based on the generalization of indicators of economic efficiency of placement and specialization of grain production, it is determined that the efficiency of grain production can be calculated on the basis of indicators in the context of quantitative and qualitative indicators.

Conclusions. Given the prospect of maintaining its strategic importance not only in agriculture, but in the Ukrainian economy as a whole, grain will continue to remain dominant in the development of the agro-industrial complex, both in terms of the need to provide food security and in view of the potential for increasing export potential in Ukraine in this area. Forecasts of future world trade trends by major agricultural commodities are favorable for Ukraine in the medium term, given the potential of domestic grain exports. Prospects for further study of this issue are to identify the ways of strengthening the export orientation of Ukrainian enterprises in the grain market.

Keywords: agro-food sector, grain production, efficiency, export orientation.

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МЕТОДИЧНІ АСПЕКТИ ВИЗНАЧЕННЯ ЕФЕКТИВНОСТІ ВИРОБНИЦТВА ЗЕРНА В СУЧАСНИХ УМОВАХ

Вступ. Темпи розвитку агропродовольчого ринку України є вкрай волатильними, що обумовлено детермінантами зовнішньої кон'юнктури та внутрішніми факторами. В умовах прискорення інтеграційних процесів, потенціал зон вільної торгівлі та регіональних торговельних об'єднань зумовлюють вплив на структуру внутрішнього ринку в цілому і ринок агропродовольчої продукції зокрема. З огляду на провідне місце агропродовольчого сектору в національній економіці та значну питому вагу експорту зернової продукції в загальному експорті України, проблематика забезпечення ефективності зернового виробництва набуває особливої актуальності для вітчизняної економіки.

Мета і завдання. Метою статті є систематизація методичних засад визначення ефективності виробництва зерна в сучасних умовах. Відповідно до сформульованої мети, основними завданнями дослідження є: узагальнення інструментарію оцінювання ефективності виробництва на ринку агропродовольчої продукції та ідентифікація детермінант впливу на ефективність зернового виробництва.

Результати. Результати дослідження теоретичних засад проблематики забезпечення ефективності сільськогосподарського виробництва з позицій економічного та і соціально-економічного підходу дозволили ідентифікувати детермінанти посилення ефективності зернового господарства в контексті природно-кліматичних умов, біологічних та організаційно-технологічних особливостей його виробництва. На основі узагальнення показників економічної ефективності розміщення і спеціалізації зернового виробництва, визначено, що ефективність зернового виробництва може бути розрахована на основі показників у розрізі кількісних та якісних індикаторів.

Висновки. З огляду на перспективу збереження свого стратегічного значення не тільки в сільському господарстві, а й загалом в економіці України, зернове господарство у подальшому зберігатиме домінуюче місце в розвитку агропромислового комплексу як з позицій необхідності забезпечення продовольчої безпеки, так і з огляду на потенціал нарощення експортного потенціалу у цій сфері. Прогнози майбутніх тенденцій світової торгівлі основними видами сільськогосподарської продукції є сприятливими для України у середньостроковому періоді з огляду на потенціал експорту вітчизняного зерна. Перспективи подальшого дослідження даної проблематики полягають в визначенні шляхів посилення експортної орієнтованості вітчизняних підприємств на ринку зернової продукції.

Ключові слова: агропродовольчий сектор, зернове виробництво, ефективність, експортна орієнтованість.

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Introduction. Solving the food problem and improving the well-being of the Ukrainian population depend in a large extent on the development of agriculture and improving its efficiency. Production efficiency is characterized by its efficiency and is a complex economic category, which reflects the effect of objective economic laws. A market economy requires a clear accounting and comparison of all costs and outputs, since it is the economy of commercial transactions between equal and independent partners, that is, the economy of free enterprise. Recognition of the multifunctionality of agriculture is the result of the gradual awareness of the social and environmental threats to the world community that arises in the case of agriculture fulfilling exclusively production and commercial functions, focused on maximizing the economic benefits while ignoring its importance in solving employment problems: rural viability, food security issues etc. As a consequence, taking into account these non-economic aspects of agricultural development has a growing impact on the agrarian policies of governments of different countries. For Ukraine, which occupies leading positions in the export of agricultural products and grain products in particular, the problem of ensuring the efficiency of agricultural production is of particular relevance.

Analysis recent research and publications.

The research of the main factors that shape the market situation in the global agrarian markets is highlighted in the works of V. Andriychuk [1], V. Bazylevych [2], Yu. Bylik [3]. The problems of ensuring the efficiency of agricultural production are the subject of research of J. Giga [4]. Estimation of the determinants of increasing the efficiency of placement and specialization of grain production in the context of trade liberalization and the strengthening of factors of world prices and other components of the global environment on domestic agricultural markets are reflected in the works of M. Lobas [5], O. Popova et al. [6]. Issues of evaluation of the mechanism of state support in the agro-food market are reflected in the works of V. Pavchak [7], etc.

At the same time, the analysis of the publications showed that there is no single point of view regarding universal approaches to the evaluation of the efficiency of grain production in modern conditions

Aim and tasks. The purpose of the article is to systematize the methodological bases for determining the efficiency of grain production in modern conditions.

Results. Famous economists Robert S. Pindyck and Daniel L. Rubinfeld have made it clear that in order for the economy to be effective, it is necessary not only to produce goods at minimal cost, but also to produce goods in such combinations that meet the desire of people to pay for them [52].

The decline in domestic agricultural production has had a significant impact on the situation in both the domestic and foreign markets, with an expansion in the Ukrainian market of foreign producers, which is increasingly affecting the economic development of enterprises. Therefore, the formation of a market economy, which in its content meets such basic self-financing principles of management as interest, responsibility, profitability, economy mode, is a necessary condition for its functioning. These principles are directly related to the rational and efficient use of land, its transformation into an object of rational management and securing it to a specific interested owner, which is perhaps the most important problem of agrarian reform at the present stage, the solution of which will help to increase agricultural production, including grain production [11; 18].

The land legislation of Ukraine provides for the right to life inherited ownership, private property, and lease of land for the purpose of efficient management. In this case, such a method of management should be introduced, which presupposes the rational use of land, preservation and increase of soil fertility, which is a prerequisite for the introduction of modern technologies of cultivation of crops in order to obtain the maximum amount of production.

Land space is spatially limited, so it is important to ensure its efficient use. Land use efficiency is determined by comparing production results with the amount of resources expended (or other land value or value).

Land use efficiency is different from other resources. Land use is considered to be efficient, rational, if not only the output of a unit of area increases, its quality increases, the cost of production of a unit of production decreases, but also the soil fertility is preserved or increased, and environmental protection is ensured.

The problem of the efficiency of agricultural production has been studied by scientists for more than a decade, but in the economic literature different opinions are expressed about its essence and indicators of measurement.

Efficiency is understood as the degree of achievement of a number of goals. Costs relate not only to capital but also to all the resources that can be mobilized to achieve the desired level or degree of efficiency. That is "it is desirable to find such an option that would maximize the degree of achievement of the goal at the same cost, or at which the goal would be achieved at the least cost" [15, p. 361].

In some scientific works, the definition of efficiency is based on the principle: when using different means of production to effect the desired change, there is a different (in quantitative sense) relationship between input and output. According to this approach, when determining the ratio of efforts and results obtained, we have the degree of effectiveness of the former, which due to the energetic nature of change causes inevitable losses, and the level of losses will determine the final result – the effect.

Such results can be represented in the form of volumes of manufactured products in quantity or monetary value (at wholesale prices or at cost), and in terms of the market – profit.

It is important to distinguish the efficiency of production as both economic and socio-economic category. That is it characterizes the relationship between the number of factors of production and the number of products and services received [2, p. 98].

Socio-economic efficiency is the degree of satisfaction of the needs of the population at the expense of the product created. According to M. Kovalenko, the economic and social aspects of production efficiency should not be countered as they are in organic unity. Agricultural production efficiency is a complex economic category that reflects one of the important aspects of social production – productivity.

While characterizing the final result of production, it is necessary to distinguish the concept of effect and cost-effectiveness. The effect is the result of certain measures being implemented in agriculture by obtaining the maximum amount of production [9**Ошибка!** **Источник ссылки не найден.**, p. 380].

The economic efficiency criterion reflects the main purpose of production and can take on more specific forms of production for different sectors of the economy, taking into account its peculiarities and nature. There are different approaches to the criterion of production efficiency: the labor productivity indicator is used as the criterion of production efficiency [12, p. 12], return, gross income [4, p. 117].

The criterion of economic efficiency of agricultural production is to increase the mass of pure produce at the lowest cost of living and labor labor per unit [5].

Grain farming, as the basis of crop production, reflects the closest connection with the natural and climatic conditions, biological and organizational and technological features of the entire production. In this area, all the major factors that caused a significant decrease in the production of not only grain were reflected, for example: unsatisfactory condition of agricultural machinery and, as a consequence, failure to comply with intensive technologies of growing crops; reducing the supply of mineral fertilizers and pesticides and, as a result, the deterioration of plant resistance to adverse climatic conditions; insufficient fuel and energy base, fluctuations in grain prices, lack of a free market for agricultural products, formation of qualitatively new structures based on different forms of ownership, development of entrepreneurship and competition in the food market.

Most agricultural scientists consider that in agriculture, including grain production, the achievement of beneficial effects depends primarily on the rational use of land. Therefore, they consider the criterion of production efficiency to increase output per unit of land while increasing productivity. Because its indicators cannot characterize production efficiency to full extent, they also use a system of indicators that reflect the level of land use and live and manual labor [13].

The level of economic efficiency of grain production can be calculated on the basis of quantitative index of gross grain harvest to the cost of its production or yield to the cost per 1 ha. It should be noted that some cereals require different material and labor costs, which ultimately together with their yield determines the level of economic efficiency of production.

Entrepreneurial activity of agricultural production (including grain production) is almost always accompanied by investment, and the estimate is calculated by the coefficient of economic efficiency (profitability index) of real capital investments.

In assessing the efficiency of agricultural production, both natural and value indicators are used. Thus, yield is an indicator of the effectiveness of agriculture, which reflects the whole system of measures – economic, organizational and economic and directly affects the value of other indicators.

But the same level of productivity is achieved at different costs, or different performance indicators are obtained at equal production costs. Therefore, this is strong evidence that the natural indicators do not reflect the total cost of labor. The indicators of economic efficiency of grain production can be divided into the following groups: generalizations, indicators of efficiency of use of fixed assets and capital investment, labor and land. They allow to determine which resources are best used and what factors should be taken into account when improving production.

Absolute indicators (volume of gross, commodity production, etc.) do not characterize production efficiency but are used as a basis for calculations and analysis. A more accurate idea is given by the output of gross and commodity output per unit of land area.

In the grain economy, as in any other production of commodity items, its efficiency is determined by the mass of products sold. Therefore, the criterion of economic efficiency of the territorial organization of grain production is to increase the volume of production of high-quality products at the minimum cost of live and efficient labor.

To determine the economic efficiency of placement and specialization of grain production, a number of indicators are

proposed: crop yields; product quality; specific weight of this type of production in the structure of acreage; output of fodder units per 1 ha of sowing of cereals; production per capita, per hectare of agricultural land, per 1 UAH fixed and current assets, per one average annual employee; cost of production; profit for 1 UAH production costs, 1 ha of crops, level of profitability etc. [12, p. 204; 14, p. 14].

In general, agreeing with the acceptability of the above list of indicators, it is considered that some of them are contradictory or significant. In order to better characterize the effectiveness of the territorial location of a particular crop, it is advisable to use the aggregate placement efficiency score, which is defined as the ratio of the yield index to the cost index, or as the product of the indices of production and production in kind per unit of currency.

Indices are determined by the ratio of the cost or the yield of the object under study to the average level in the region or zone.

The efficiency of cultivation of crops, including cereals, depends on the use of a certain system of agriculture, as a complex of organizational-economic, technological, technical and social measures for more intensive use of agricultural land, manifested in obtaining the maximum amount of production per hectare of land at minimal cost material, labor and financial resources.

The system of agriculture as a complex concept consists of a large number of interrelated elements, the main of which are: rational structure of acreage, system of tillage, system of anti-erosion measures, system of fertilizers, system of land reclamation, system of varieties and hybrids, etc.

The assessment of the structure of acreage is carried out taking into account the soil-ecological, economic and social conditions of the economy according to the following economic indicators:

- output of gross and commodity products of basic crops in natural and value terms per hectare of arable land;
- the value of gross and net profit per unit of land area;
- the level of recoupage of material, monetary, energy and labor costs.

The economic efficiency of fertilizer application is determined by individual crops, crop rotation and in the whole economy by such indicators as the increase of the basic by-products from 1 hundredweight / ha of sowing and from the entire acreage; the cost of 1 hundredweight of feed supplement of feed protein or grain units received from fertilizer application, UAH / hundredweight; net income per hectare of sowing, per entire acreage, per unit of nutrients, UAH; profitability of additional costs, %. The yield increase from the application of fertilizers with 1 ha is calculated by the formula:

$$A_C = P_f * S_f \quad (1)$$

where A_C – yield increase when fertilizing, hundredweight / ha; P_f – actual productivity in the farm, hundredweight / ha; S_f – fertilizer specific gravity in yield, determined by average long-term data of field experiments with fertilizers, % [7, p. 54].

The economic efficiency of production of goods on reclaimed land is determined by a system of indicators, of which the main are yield, gross output in natural and value terms, labor productivity, the cost of 1 hundredweight of production, gross net income per hectare, per 1 UAH costs, level of profitability, recoupment of additional costs for reclamation, term of recoupment of investments in reclamation.

The criterion on the economic efficiency of new varieties of crops is the value of net income per unit area, resulting from increased yields and product quality.

Based on the above system of indicators, it is worth noting that the yield is one of the most important indicators of the economic efficiency of the agricultural system and the efficiency of land use, which reflects the whole system of economic and agricultural measures (level of mechanization, fertilization, economic organization) and directly affects the value of others. Cereals form the basis of the forage fund, so their yield ultimately leads to the possibility of developing livestock industries. However, yield reflects only one aspect of production efficiency. Product quality must also be taken into account.

Quality is the aggregate of product properties that determine its suitability to meet specific needs for its intended purpose. The quality of food depends to a large extent on the

means of production, harvesters and processors of agricultural products, transporters delivering it to the consumer. However, the main reserves of raising final products lie in agriculture. Confirmation of this is, for example, sowing seeds of the first class in comparison with the third class provides a yield increase of 10-20%. According to US experts, a 2% reduction in the share of marriage causes a 10% increase in labor productivity.

Standards play an important role in improving the quality of agricultural products. They allow the use of land, material and labor resources, strengthen technological, industrial and labor discipline, make the search for internal reserves, constantly improve professional skills, improve knowledge, and implement the achievements of science and excellence, allow you to properly evaluate the labor contribution of each employee.

The main task of standardization in market conditions is to establish the optimal balance between the requirements of the consumer of agricultural products and the possibilities of production [16]. To evaluate grain quality, there are a number of indicators that can be grouped into specific groups:

- aesthetic taste (possibility of using grain and its products for the intended purpose);
- technological (state of grain, impurities, humidity, etc.) affecting processing;
- economic (output, protein content, gluten, etc.) [9].

Since vital food is made from grain, high demands are placed on it. It must be free from musty, sweet odor, harmful impurities and meet the culture standards set for each crop.

The leading food crop is wheat. For the grain of wheat, the content of the essential nutrients: proteins, carbohydrates, fats, vitamins, enzymes and minerals is important. By increasing the protein content of lysine, methionine and threonine, the nutritional value of wheat proteins approaches proteins of animal origin. In recent years, Ukraine has been harvesting wheat grains of III, IV and V grades with gluten content of 18-23% and below. The tendency to decrease the purchase of wheat of strong and firm varieties is clearly observed.

As a result, the Ukrainian market lacks high quality flour. Only high-class flour is in demand on domestic exchanges.

This is an indication that the quality control system in agriculture has not been established. Due to the lack of uniform methodological approaches, existing organizations are not able to carry out systematic work to improve grain quality. Agricultural specialists are eliminated from participating in settlements between farms and procurement organizations. The system of product quality management needs improvement, implementation of organizational and economic measures that would guarantee its impact on the increase of grain production with high protein content.

Considering the essence of this issue, it should be noted that the efficiency of grain production depends on the productivity of labor, and the latter – on the organization of it and the use of certain means of production. Natural labor productivity indicators: production volume per 1 person-hour; volume of output per average annual employee; labor costs per unit of output. The last indicator reflects the complexity of production. Cost indicators are calculated when determining the value of gross output produced per unit of working time and per average annual worker employed in agriculture.

Recently, due to the decrease in the volume of grain production, there is a decrease in labor productivity against the background of insufficient level of mechanization of technological processes, due to the aging of technical means, the absence of subsidies and credits, etc. In addition, there is a significant decrease in the material interest of employees and a weakening of technological and labor discipline, which also adversely affects the level of productivity in the industry.

One of the important synthetic indicators characterizing the level of grain production is the cost of production as a basis for justifying the level of prices, the feasibility of growing a certain crop, the level of profitability of the industry. The change in the value of the cost level is significantly influenced by the yield and production costs per hectare of sowing. In particular, sources of formation of production costs are the production resources used in the production process. These are natural and labor resources; capital and entrepreneurship. According to certain principles, the functioning of these resources causes the formation of appropriate production costs.

Thus, the functioning of natural resources is shaped by such indicators as rent, land payment, rent. Wage-related workforce capital determines costs such as depreciation, interest on capital, and borrowing. Entrepreneurial activity leads to regulatory profit, which is also a component of production costs.

Normative profit is the remuneration of an entrepreneur for his activities aimed at identifying an initiative in the production of a certain type of goods and services, making management decisions, introducing innovations in the production of new goods or services and applying new technologies, taking risks for production results. Consequently, normative profit is part of the production cost, which must be offset by the price of the products or services provided.

Profit is the main and determining indicator of the evaluation of grain production, which forces the production of products that are in demand from consumers and put it on the market at the price at which consumers can buy it.

In the market conditions, a generic indicator of economic and financial activity is profit, since its formation is influenced by the results of the enterprise, the sphere of activity, the branch of economy, the conditions of accounting of financial results, defined by law, inflation processes [17]. It is important to distinguish net income generated and realized. The generated net profit characterizes the whole value of the additional product, and realized – the difference between the sales revenue and the cost of production.

Profitability is a common economic indicator of the economic efficiency of grain production [20-21]. Profitability is defined as the percentage of net profit to the cost of production. The cost of grain is formed during the year, with the means of production being accounted for at the time of purchase, and the grain being sold at prices prevailing at the time of sale, taking into account the inflation index.

Therefore, profitability must be considered throughout the scorecard, its increase may not be achieved not only by reducing cost and increasing output but also by increasing prices. Recently, in the economic literature have preferred the rate of return, which is determined by the percentage of profit to the value of fixed and current assets [13]:

$$R_R = R * C \quad (2)$$

where R_R – rate of return; R – amount of return; C – amount of capital.

Sharing the opinion of M. Lobas, it is worth noting that an important indicator is the index of return (profit) on invested capital [4]. The evaluation of the efficiency of grain production should be considered on the basis of a combinatorial approach, taking into account qualitative and quantitative indicators, which will allow to form an empirical basis for the

development of measures to improve production efficiency in this field in order to enhance its competitiveness in the domestic and foreign markets.

In future, the OECD experts predict that the development of the world grain market will grow to 788.8 million tons by 2020, while increasing the yield level. Production growth will be observed both in the context of economically developed and developing countries (Table 1).

Table 1. Forecast of the development of the world wheat market for 2019-2022

Indicator	2016-2018	2019	2020	2021	2022
World					
Production, Mt	752,2	766,4	772,9	781,0	788,8
Area, Mha	219,0	220,5	220,2	220,2	220,2
Yield, t/ha	3,43	3,48	3,51	3,55	3,58
Consumption, Mt	741,1	751,6	764,7	776,0	787,1
Feed use, Mt	146,3	147,8	150,9	153,1	155,4
Food use, Mt	503,4	512,5	518,4	525,5	531,5
Biofuel use, Mt	12,3	12,6	12,8	13,1	13,4
Exports, Mt	176,6	181,4	185,2	187,3	189,9
Developed countries					
Production, Mt	394,3	402,9	405,6	409,4	412,7
Consumption, Mt	273,6	271,3	273,3	275,3	277,7
Net trade, Mt	122,2	126,8	130,4	132,6	135,1
Developing countries					
Production, Mt	357,9	363,6	367,3	371,5	376,2
Consumption, Mt	467,5	480,2	491,4	500,7	509,3
Net trade, Mt	-120,5	-126,8	-130,4	-132,6	-135,1
Net trade, Mt	57,9	63,7	64,0	64,7	65,6

Source: conducted by the author on the basis of [8].

The need of increasing grain production is driven by the growing population of the world, and with it an increase in consumption of food and agricultural products; increasing demand for grain from the bioethanol industry (it is characteristic that countries that develop bioethanol production from grain are reducing their exports and increasing their grain imports to their countries).

Conclusions. In the future, the grain sector will remain of strategic importance not only in agriculture but in the Ukrainian economy as a whole. Grain economy is one of the main priorities for the development of agro-industrial complex, defines the state's strategy for its further development. State support for technological development and incentives to innovate contributes to increased product production, increased productivity through a mechanism for modernizing the industry, increased value added, expanded markets, and improved competitiveness of manufactured products. Ignoring the process of implementation of incentives for innovation in

this field poses a threat in the form of lagging behind the leading countries in the level of development of technology and technology. In such circumstances, the agrarian sector will be forced to either import foreign technologies or use outdated methods of economy, which causes additional costs and reduced competitiveness of products in the domestic and foreign markets.

Due to the difficult financial situation, most agricultural enterprises do not have the opportunity to purchase new equipment or introduce new technology at their own expense, so agricultural enterprises borrow the necessary funds from domestic or foreign lenders. To achieve these goals, a necessary prerequisite is the expansion of a business plan or the formation of a feasibility study. The development of such a document allows to predict the financial results by modeling the commercial and economic activities and thus to avoid the wrong decisions. Prospects for further study of this issue are to identify ways to strengthen the export orientation of domestic enterprises in the grain market.

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