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ENERGY EFFICIENCY OF TECHNOLOGICAL MANAGEMENT OF AGRICULTURAL ENTERPRISES IN THE CONDITIONS OF REALIZATION OF SECURITY POTENTIAL

ЕНЕРГЕТИЧНА ЕФЕКТИВНІСТЬ ТЕХНОЛОГІЧНОГО МЕНЕДЖМЕНТУ АГРАРНИХ ПІДПРИЄМСТВ В УМОВАХ РЕАЛІЗАЦІЇ БЕЗПЕКОВОГО ПОТЕНЦІАЛУ

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Енергетична ефективність технологічного менеджменту аграрних підприємств в умовах реалізації безпекового потенціалу.
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The organization of the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the security potential is significantly updated in the period of war, shortage of investments, and energy raw materials and resources. The purpose of the study was to study the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential. It is substantiated that the objective assessment of the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential should be carried out taking into account the following principles: ensuring the comparability of the analyzed and planned energy efficiency indicators based on the use of the necessary set of its characteristics; identification of the impact on energy efficiency indicators of factors that change its value but do not affect the level of use of energy carriers. This principle is implemented based on fundamental energy efficiency analysis; the purpose of energy efficiency assessment determines the choice of the comparison base. Such a base can be a normative or average statistical level of advanced countries. The progressivity of the comparison base plays a specific vital role in improving energy saving; the reliability of the information based on which energy efficiency indicators are calculated; determination of the deviation of the analyzed planned energy efficiency indicators and comparison of these deviations with the requirements of the criterion. At the same time, the indicator's value and the direction and pace of its change are considered using the calculated dynamics of the arrow or the starting level. It is proved that the problem of optimization of energy consumption can be solved based on determining the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential, which has a subordinate value about economic efficiency. In inflation conditions, the natural method of determining energy efficiency becomes quite relevant thanks to objectivity.

Keywords: energy efficiency, technological management, agricultural enterprises, security, enterprise potential.

Організація енергетичної ефективності технологічного менеджменту аграрних підприємств в умовах реалізації безпекового потенціалу суттєво актуалізується в період війни, дефіциту інвестицій та енергетичної сировини й

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ресурсів. Метою дослідження стало вивчення енергетичної ефективності технологічного менеджменту аграрних підприємств в умовах реалізації безпекового потенціалу. Обґрунтовано, що об'єктивне оцінювання енергетичної ефективності технологічного менеджменту аграрних підприємств в умовах реалізації безпекового потенціалу слід здійснювати, ураховуючи такі принципи: забезпечення порівнянності аналізованих і планових показників енергетичної ефективності на основі використання необхідного набору її ознак; виявлення впливу на показники енергетичної ефективності чинників, що змінюють її значення, але фактично не впливають на рівень використання енергоносіїв. Цей принцип реалізується на основі фактичного аналізу енергетичної ефективності; мета оцінювання енергетичної ефективності визначає вибір бази порівняння. Такою базою може бути нормативний чи середньостатистичний рівень, рівень передових країн. Прогресивність бази порівняння відіграє певну стимулювальну роль у покращенні енергозбереження; достовірність інформації, на підставі якої підраховуються показники енергетичної ефективності; визначення відхилення аналізованих планових показників енергетичної ефективності та порівняння цих відхилень з вимогами критерію. Водночас розглядаються величина показника, напрям і темп його зміни, використовуючи розрахункову динаміку показника чи стартовий рівень. Доведено, що проблема оптимізації енергоспоживання може бути вирішена на основі визначення енергетичної ефективності технологічного менеджменту аграрних підприємств в умовах реалізації безпекового потенціалу, яка має залежне стосовно економічної ефективності значення. В умовах інфляції завдяки об'єктивності натуральний метод визначення енергетичної ефективності стає достатньо актуальним.

Ключові слова: енергетична ефективність, технологічний менеджмент, аграрні підприємства, безпека, потенціал підприємства.

Statement of the problem in a general form

There are two concepts for determining the economic efficiency of agricultural production - resource-based and cost-based. The first is based on assessing the efficiency of use in the reproduction process of a set of production resources, and the second considers the share of resources consumed in the production process. The disadvantage of these concepts is that partial indicators of economic efficiency are determined by the ratio of the overall effect and the value of individual types of production resources, abstracting from the influence of other resources that participate in forming the overall result. This is illegal because the overall result is a consequence of the cumulative effect of production resources. Considering this the example of certain spheres and branches of the economy is especially relevant. The organization of the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the security potential is significantly updated in the period of war, shortage of investments, and energy raw materials and resources.

Modern researchers interpret the concept of economic efficiency as the best combination of the management of the company's primary resources and costs in the long term. This statement is based on various scientific approaches. In particular, efficiency is considered - how to do things correctly [9], as an economical category that reflects the relationship between the results obtained and the resources spent on their achievement, and when measuring efficiency, resources can be represented or in a certain amount at their initial cost, or part of their cost in the form of production costs [1-8, 10]. At the same time, there are several problems related to the determination of the energy efficiency of technological management, particularly agricultural enterprises, which in the conditions of realizing the safety potential, require further research.

The purpose of the study

The purpose of the study was to study the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential.

Presentation of the main research material

In solving the optimization problem of energy consumption, such an economical category as «energy efficiency», which reflects production relations regarding the rational use of energy resources to produce products, becomes essential.

The results of the use of energy resources by agricultural enterprises can be classified as follows: according to the results expressed by the energy or economic effect; by assessment; by a sign characterizing the direction of the consequences; by the term of manifestation; by the sphere of distribution of implications. However, some researchers believe that economic indicators and performance evaluations are rather rough tools for complex ratios of properties or characteristics of systems. An alternative to economic efficiency is functional (technical) efficiency, which is understood as the ability of the machine system to perform its primary purpose - functions. If the amount of profit evaluates economic efficiency, then technical efficiency is measured by calculating the input-output ratio in physical units [6].

From the point of view of management theory, the functioning of an energy resource as a management object is characterized by the presence of a controlled input flow of energy that is subject

to distribution, a perturbed influence of the environment, and two output flows of energy that are the result of the distribution. As a result, a certain amount of energy is received in a helpful form on one of the outputs, and the amount of wasted energy is obtained on the other. The production process is efficient if the energy equivalent of the useful result obtained during the distribution of energy flows exceeds the energy equivalent of the costs of carrying out the distribution processes.

The energy concept of the effectiveness of the technical management of agricultural enterprises in the conditions of realizing the security potential is based on references: to obtain resources of artificial origin, which are used in the reproduction process, reified energy is spent; it is possible to compare the result and energy costs. In the energy efficiency problem of technological management of agricultural enterprises in the conditions of realization of safety potential, it is essential to establish its criterion. The criterion of energy efficiency is the measure by which society approaches the determination of the degree of effectiveness of energy consumption for product production. The general criterion for the efficiency of using energy resources is the minimization of their costs in the final consumption per unit of production created in agricultural enterprises.

When calculating the energy efficiency criterion, it is also necessary to consider the conditions under which the labor process takes place, particularly those that do not directly belong to it. Still, with them, it is possible and can take place in an imperfect form [9]. Based on this, it can be considered that the most general criterion for energy consumption in agriculture is the replacement of living labor with embodied labor.

In its natural and tangible form, the criterion of energy consumption efficiency finds its expression in the reduction of the level of consumption of energy resources. Valuable and naturally embodied forms of energy consumption efficiency are mutually dependent. This is manifested in the fact that the reduction of the consumption of energy resources and their losses during transportation in the relevant energy networks leads to cost savings at all production, transportation, and use stages. Partial criteria for the efficiency of using energy resources to produce a specific product and implementing production processes follow the general criterion. At the same time, these criteria should be subordinated and consistent.

It is possible to highlight the potential and actual energy efficiency of the production of a specific type of product, industry, or agricultural enterprise. Potential energy efficiency can be measured by the ratio of likely volumes of product production and normative energy consumption and actual energy efficiency - of produced products and energy resource consumption.

It is appropriate to distinguish the levels of energy efficiency - minimum, average, and maximum. Minimum energy efficiency can be achieved in situations where the increase in energy costs ensures a comparatively minor increase in production. The average level of energy efficiency is calculated as the average value of energy consumption efficiency indicators. The maximum energy efficiency is the highest energy consumption efficiency that can be achieved at the full level of development of productive forces. Energy effect – positive results in the form of a reduction in the specific consumption of energy carriers to produce products. The indicated indicator at the level of the agro-food sector is characterized by the following features: the effect is determined by the average level of saving energy resources, which is found in all areas; energy costs are estimated as the sum of direct and indirect costs; the effect and energy consumption are taken into account not only within the current period but also for the entire period of use of the appropriate energy-saving equipment, the use of energy-saving technologies.

The energy effect at the level of agricultural enterprises is determined by comparison with the equipment and technologies that are being replaced and considers only that part of the total effect that concerns the given enterprise. Such an effect is local in time and space because its achievement in an agricultural enterprise does not characterize the energy consumption at the enterprise where the means of production are produced, which can overlap the effect of the consumer of these means.

The preliminary energy effect is determined if necessary to justify one or another measure. The expected energy effect can be determined in the process of choosing an option for the implementation of the energy-saving program. The output of the predicted energy effect is the potential energy effect, which is based on calculating the full performance of this or that type of energy-saving technique or technology. The actual energy effect makes it possible to evaluate the actual result of implementing the energy-saving program. The results of the actual energy effect calculations are used for the final assessment of the energy efficiency of the selected energy consumption options. The estimated energy effect is such an effect that it should be included in planning and reporting documents. Such calculations

can be used at various stages of the development and implementation of the energy-saving program. The planned energy effect is determined at the stage of implementation of measures of the energy-saving program in production.

The efficiency of energy saving can be defined as a measure of the achievement of the goal of energy saving, which is determined by the ratio of the value of the effect to the costs that caused it. The effectiveness of energy saving is a socio-economic category in its content. Because the socio-economic efficiency of energy consumption is the totality of the achieved final social result the improvement of the ecological situation. The criterion of efficiency of energy saving is a measure of evaluation of its effects and selection of the best possible options for the distribution of energy resources. The efficiency indicator is a quantitative meter, the maximum, minimum, or extreme value of which ensures the most excellent efficiency according to the energy criterion. Different bases can be considered when evaluating options for the use of energy resources. Still, the market economy corresponds to a single gauge - the highest global level of competitiveness of agricultural products. The effects of energy saving differ in content and level of economic interest. According to the content, the energy, economic, and ecological impact of energy saving are distinguished. The energy effect of energy saving consists of the ability to replace scarce energy resources, release them for the expansion of agricultural production, and attract energy resources that were not used before. An indicator of this effect is the saving of non-renewable energy resources and the attraction of alternative energy resources and secondary energy resources. The economic impact of energy saving is a consequence of using rational means of energy use, which consists of an increase in national income within the state. Two types of economic effects are distinguished: saving public labor and structural economic impact, which is caused by shifts in the distribution of energy resources between crop and animal husbandry and other areas of energy use. The ecological effect of energy saving is an improvement in the state of the environment due to a reduction in the consumption of energy carriers per unit of production. It is reducing their losses during transportation, refueling, etc. From the point of view of the organization of energy saving and depending on the stage, it is advisable to distinguish three types of energy saving effect: actual - from the actual application of energy saving measures; guaranteed - as a possible result of completed scientific and technical development because of its acceptance by the customer, expected - a possible result of research in the field of energy saving.

The proximity of the energy efficiency and energy optimum concepts does not mean their identity because only the highest energy efficiency can be optimal. According to the law of the optimum, the highest energy efficiency is achieved with an optimal combination of the values of the factors that determine it. When solving production tasks in agriculture, one should be guided not by one main criterion but by several. If the extreme values of different standards do not coincide, a compromise decision has to be made, when preference is given to the option appropriate for several criteria. Finding the extreme value of the new indicator, which would connect two or more bars, will provide a compromise solution.

The task of energy assessments is to help in choosing the best option, project, etc. Cost and energy assessments complement each other, remaining independent: cost criteria assess the object's economic connections and energy criteria - internal, and technological connections. Technological progress can always be brought to the fore by one of them, paying less attention to the others. Energy criteria should be considered in an inextricable connection with cost efficiency indicators. The method itself can be used in the economy concerning the first production reproduction stage only as an additional analytical technique.

From the point of view of the energy factor in agricultural production, energy efficiency appears first as a category of technological relations, which are determined by the technical properties of the means of production: power and productivity of energy means, specific consumption of energy resources, features of technologies for growing crops and keeping animals, etc. Considering this aspect, energy efficiency does not reflect the amount of labor costs to produce farm products. Economic efficiency as a saving in the prices of materialized and live labor per unit of production is characterized by the most general indicator - the level and rate of growth of labor productivity. But in this aspect, economic and energy efficiency dynamics do not coincide: to increase labor productivity, energy consumption should be increased by using machines more efficiently. And this means an increase in specific costs to produce agricultural products and a decrease in the energy efficiency of agriculture.

The contradiction between economic and energy efficiency should be eliminated as follows. In the case of choosing one of two options of equal economic efficiency, priority should be given to the

option with higher energy efficiency. Increasing the energy efficiency of agricultural production should prevent the deterioration of working conditions, complications of the ecological situation, and reduction of economic efficiency. The process of measuring energy efficiency is reduced to determining its absolute level, that is, the number of energy carriers required to produce a unit of products, and secondly, to determine the change in this level over a certain period. Energy efficiency accounting methods must meet the following requirements: compliance of the unit of measurement with accounting tasks, submission of the recorded volume of energy carriers and agricultural products with the fundamental importance of energy consumption and production, and unity of measurement methods. The energy efficiency indicator should be end-to-end, comparable, and have the following properties: a high degree of generalization, flexibility, and universality of application.

Due to its objectivity, the natural method of determining energy efficiency in inflationary conditions becomes the leading one. However, the use of the natural process has certain limitations. Consumer values created by specific labor and specific types of energy resources are qualitatively different from each other. Therefore, with the help of natural indicators, measuring the level and dynamics of energy efficiency only within the limits of certain agricultural products or specific works is possible. A relatively accurate and simple natural method only sometimes considers the product's quality because, to produce its higher quality, an additional amount of energy is spent both in a direct form and in an indirect form. The evaluation of products according to conventional natural indicators needs to reflect the level of resource consumption fully.

Meanwhile, when choosing an effective evaluation indicator, it is necessary to strive to free it as much as possible from the influence of production specialization and consider the resources used. That is, it is possible to ensure the objective comparability of different types of products only by considering the resource costs for their production. The natural method can be used to determine energy efficiency indicators at individual workplaces in production units and enterprises producing similar agricultural products.

The cost method is used to obtain generalized indicators of energy efficiency. For this purpose, various indicators of production volume estimation are used. Bringing multiple types of products to the value meter has several disadvantages and positive points. Thus, the indicator calculated based on gross output does not reflect actual costs and changes occurring in production. There are several reasons for this. First, the amount of awful work is significantly affected by the difference in the specific weight of the costs of embodied labor in connection with assortment shifts, which distort the level and dynamics of energy efficiency. Secondly, calculating the gross production of crops and livestock leads to double counting. Thirdly, when calculating the gross output, there is often a repetition of the account because the value of the products of the I and III spheres affects the agricultural enterprise's production or its division. In agriculture, the recalculation of labor items is 3-3.5 times higher than the value of the initial labor items involved in the production process. Fourthly, the volume of gross production depends on the level of prices for the sale of agricultural products, which also only sometimes reflects the proper relationship with energy costs. Fifth, both natural and cost methods of calculating the production volume do not fully consider the quality of products. Summarizing the shortcomings of the gross output indicator, we note that calculations of economic growth in labor productivity, efficiency, and other qualitative indicators on such a basis are distorted, as in a crooked mirror.

Conclusions and prospects for further investigations

Taking into account the above, an objective assessment of the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential should be carried out taking into account the following principles: ensuring comparability of the analyzed and planned indicators of energy efficiency based on the use of the necessary set of its characteristics; identification of the impact on energy efficiency indicators of factors that change its value, but do not affect the level of use of energy carriers. This principle is implemented based on a fundamental energy efficiency analysis; the purpose of energy efficiency assessment determines the choice of the comparison base. Such a base can be a normative or average statistical level of advanced countries. The progressivity of the comparison base plays a specific vital role in improving energy saving; the reliability of the information based on which energy efficiency indicators are calculated; determination of the deviation of the analyzed planned energy efficiency indicators and comparison of these deviations with the requirements of the criterion. At the same time, the indicator's value and the direction and pace of its change are considered using the calculated dynamics of the indicator or the

starting level. Therefore, the problem of optimizing energy consumption can be solved by determining the energy efficiency of the technological management of agricultural enterprises in the conditions of realizing the safety potential, which has a subordinate value in economic efficiency. In inflation conditions, thanks to objectivity, the natural method of determining energy efficiency becomes quite relevant.

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