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# **MANAGEMENT OF THE 21ST CENTURY: GLOBALIZATION CHALLENGES**

monograph

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## **ENERGY MANAGEMENT AND ENERGY EFFICIENCY IN THE AGRARIAN SECTOR OF THE NATIONAL ECONOMY**

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The urgent problems that have arisen in the agrarian sector of the economy of Ukraine and are directly related to the effective use of energy resources can be solved only through the energy management as an important direction of scientific and practical activity. Therefore, in this context the key role is played by the category of “energy efficiency”.

reflects the ratio between the volume of production of agricultural products corresponding to the current quality standards and the amount of aggregate energy costs, provided that the requirements for environmental protection are met.

An energy-efficient agricultural enterprise is considered to be the organization of agricultural production, which is based on energy and resource-saving, clean and environment friendly technologies with the use of energy-efficient technical means.

In general, the energy saving potential of an agricultural enterprise is a set of potential opportunities for this enterprise to save energy, resources and funds necessary to realize these opportunities, taking into account the level of specific energy consumption in agriculture production.

The energy saving mechanism is a set of structures, norms, methods and means of the energy-saving process management, which are based on the rational consumption of energy resources. At the same time, the process of rational use of energy should be considered within the framework of the energy management system of the existing agricultural enterprise (See Figure 1).

Energy management in the agrarian sector is a process aimed at identifying and realizing the optimal costs of energy resources and rational ways to achieve them. The goal of rationalization of energy consumption must meet the following requirements: certainty, clarity, attainability, compliance with the requirements of the objective laws of economic development, as well as the compliance with higher-order objectives [6, p. 163-164].

In turn, energy saving management is a management system that ensures the activity of an enterprise, in which only the amount of fuel and energy needed for production is consumed [2, p. 7].

Energy management is the managerial and technical activity of the personnel of the management object aimed at the rational use of energy taking into account social, technical, economic and environmental aspects [4, p. 7]. The main goal of energy management is to provide efficient ways to implement the energy saving strategy of the enterprise [3, p. 8].

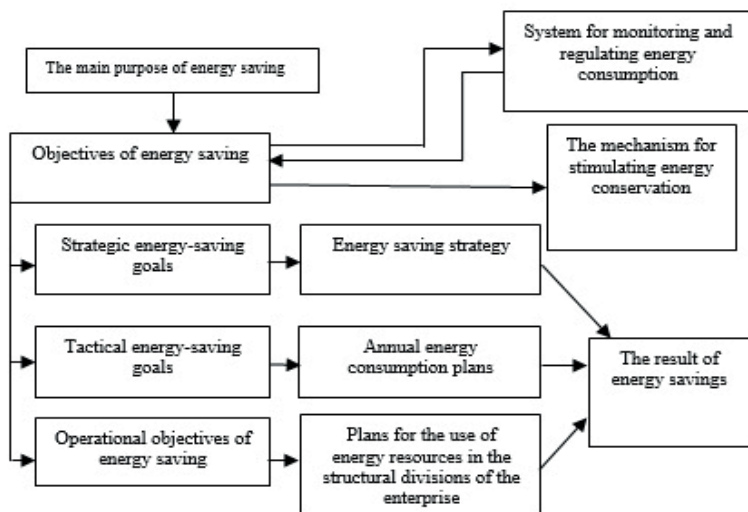


Fig. 1. Block diagram of energy management of the agricultural enterprise

*Source: developed by authors on the basis of the source: [6, c. 54]*

The energy management system is an integral part of the overall enterprise management system, which includes the organizational structure, management functions and responsibilities, procedures, processes and resources for the formation, implementation, and achieving of the energy conservation policy objectives and directions [2, p. 9]. From another point of view, the energy management system of an agricultural enterprise is a complex of organizational, technical tools and software that allow managing the production process in such a way that only the

minimum required amount of fuel and energy resources is consumed to produce a certain quantity of products or services [3, p. 13].

Energy management as a component of the organization's management should be interpreted as:

- the management actions aimed at ensuring the effective functioning of the energy system of the enterprise and the achievement of the goals set for it;
- the management of the processes of distribution and use of energy resources that are carried out within the framework of a particular organization and ensure the production of certain volumes of products or services;
- the adoption of management decisions and monitoring of their implementation, which ensure the effective use of energy resources.

Fundamental principles of management are the principles, which should serve as a guide to practical actions in this field, or a kind of hint for the top-management representatives of the enterprise about how to rationally influence the controlled system and what kind of reaction should be expected in response.

Therefore, energy management should be based on the relevant principles, which are as follows:

- the correspondence between the intended purpose of the power system and the level of its provision by various resources, including energy ones;
- the strong conformity of efficiency of the energy system, energy intensity and production efficiency as a whole;
- conformity of the size of the agricultural enterprise to the energy efficiency requirements;
- conformity of specialization and concentration to the conditions for effective implementation of the available energy potential;
- compliance of the implementation of the energy potential with the current socio-economic requirements [5, p. 90-91].

The main functions of energy management are the following ones:

- energy consumption planning – this function is considered to be a process of cognition of objective cause-effect relationships between energy and other factors of production in agriculture by modeling them (design) for a certain period of time [6, p. 95];
- the organization of energy consumption, which is the process of dividing, grouping and coordinating activities and resources to achieve the set goals for energy consumption and energy conservation;
- motivation of the energy consumption, which is related to the combination of internal and external driving forces that not only induce a person to energy-saving activities and determine the behavior and forms of activity, but also give it a focus, aimed at achieving the organizational goals for effective energy consumption;
- energy control (energy audit), which is used to control activity at the enterprise in order to ensure qualitative analysis and energy assessment of the functioning of the energy system [6, p.

114].

The tasks that are solved in the energy management system include:

- the definition of specific goals of energy consumption of the agricultural enterprise;
- the identification of the priorities of energy consumption and energy efficiency goals and the sequence of their solutions;
- the development of the energy strategy of the agrarian enterprise, as well as certain economic tasks and ways to solve them;
- the development of a system of measures to solve the problems related to energy consumption, which are planned for different periods of time;
- the determination of the necessary resources and sources of their coverage for the implementation of the energy strategy;
- the establishment of control over the fulfillment of assigned tasks.

It is necessary to distinguish three basic levels of decision-making process about the introduction of energy-saving measures in the sphere of agricultural production. First of all, it is the macroeconomic (general) level at which questions about the structural reorganization of the national economy are being addressed, and state standards for energy consumption are being formed. Secondly, this is the sectoral and regional level, where decisions should be made on the placement of a government contract (order) for agricultural products, taking into account the energy efficiency of its production. Thirdly, this is the microeconomic level (or the level of agrarian enterprises), where the decisions made at the higher structural levels of management are made concrete, and the energy-saving measures are directly implemented [1, p. 133].

First of all, decisions are made about the advisability of managing energy conservation in a certain area by means of software analysis methods, since the energy use processes in agriculture are quite complex due to the dependence of the final result of the energy system's impact on many factors (i.e., weather and climate conditions, type of energy facilities and technology of production of agricultural products). The output result of the functioning of the energy system can not be unambiguously interpreted, since it is necessary to maximize the yield of products from a unit of land area and minimize the specific energy costs. The separation of the energy system as a subsystem of field cropping or animal husbandry is difficult, since energy use processes are exclusively the processes of production of agricultural products (technological processes and operations). Therefore, their energy analysis is inseparable from the analysis of these processes, that is, the energy system as a whole should be analyzed.

In general, the process of software analysis of energy consumption consists of several stages.

At the first stage specific problems should be formulated. The problem is difficult to formulate without defining the boundaries of the study. Thus, when studying the problem of providing agriculture with energy resources, it is necessary to find out



the state of oil, gas, coal production and processing in the state (region), electricity production and conjuncture in the world energy market. [1, p. 134].

At the second stage, the program objectives, indicators of its achievement and target groups of energy consumers are determined. The purpose of the energy saving program can be formulated as a result of energy consumption, which should be maximized (for example, achieving maximum energy output), or undesirable effect, the effect of which should be minimized (for instance, avoidance of cost overruns of energy resources). Entire programs should be formulated numerically, and implementation time should be specified. Indicators for the achievement of program objectives should provide a quantitative measurement of the goals.

An integral part of this stage is the study of the aggregate of energy consumers, their division into groups depending on sex, age, place of residence (work), social status, land use size and livestock, which ultimately contributes to improving the analysis and validity of management decisions.

At the third stage alternative energy conservation options should be considered. It is important to consider that a significant number of them make calculations and choice rather difficult, and a small number of energy saving options, on the contrary, reduces the validity of the choice.

The fourth stage is related to the definition of costs. In this case, all elements of alternatives are estimated in specific values, as well as the volume of capital investments and current costs for each of the alternatives are determined.

The fifth stage is aimed to estimate the results of energy saving, which can be expressed both in monetary (for example, the cost of energy saved) and in physical (natural) units of measurement (for example, reducing the energy intensity of a certain type of agricultural products).

The sixth stage is comparing alternatives. For this, two main methods can be used: “cost-effectiveness” and “cost-benefit”. While the first method allows estimating programs in quantitative form (for example, increasing the amount of humus in the soil as a result of applying energy-saving technologies), the second one assumes that a conditional cost estimate that compares benefits and costs should be assigned to the results obtained [1, p. 135].

In a market economy, agricultural energy consumers must take into account the limited energy resources that can be available for use in production, as well as the existence of several alternative opportunities for the use of each type of energy resources. In spite of the fact that energy differs by its quality indicators, energy resources should be selected of such quality, which would correspond to the nature of energy consumption.

The use of certain energy resources in the production of agricultural products is the result of the choice between several options for energy consumption. The efficiency of choice can be determined by the profit from the most beneficial of all alternative ways of using energy resources, which follows from the law of interchangeable factors. This law determines the existence of several groups of

factors that mutually compensate each other. That is, in the case of a shortage of some types of energy carriers, they can be replaced by others. For example, in economically developed countries after the energy crisis of the 1970s, in some technological processes, fuel was replaced by electricity [2, p. 135].

The last stage is the presentation of the results of the analysis of energy consumption alternatives to the decision-maker and the adoption on the basis of the analysis of the decision to choose a specific option for the use of energy resources.

In addition to analyzing alternative energy consumption options, the energy management process should include the energy consumption planning and organization of its implementation.

In addition, it should be borne in mind that the process of production of agricultural products is determined by the specific features of the agrarian sphere of the national economy:

1. Bioclimatic conditions (solar radiation, entropy, land resources, water resources, climatic and weather conditions, biological processes of growth and development of agricultural crops and animals, biological properties of crops and animals, crop varieties and breeds of animals, seasonality of production, ecological production and so on).

2. The level of development of production technologies (technologies for the production of crop and livestock products, the use of organic and mineral fertilizers, a system for combating weeds, pests and diseases, a system of crop rotation, the part of the crop production, which enters the next production cycle, the way animals are kept and taken care of, the types of feeding of agricultural animals, the system of fodder production, the organization of reproduction and herd structure, a system for controlling diseases and pests of animals, the product storage system, etc.).

3. Technical support (i.e. system of machinery and equipment, technical condition of the means of production, material and technical support).

4. Organizational and economic factors (trends in the formation of production relations in the agrarian sector, the specifics of the organization of labor and territorial dispersal).

This reduces the uniformity and density of energy consumption, increases the extent of energy distribution systems and necessitates the creation in agriculture of significant reserves of energy resources to meet the needs for them during periods of peak load.

Thus, the energy management process is structurally composed of three phases: 1) analysis of alternative energy consumption options; 2) energy consumption planning and 3) implementation of such a plan. The choice between several options should be implemented taking into account the principle of interchangeability of energy resources. To increase energy consumption is expedient up to that limit, while the effect from the application of the last unit of energy resource can not be compared with the return. Energy consumption should be increased to the limit, until the effect of the last unit of energy usage can be compared with the return of

these resources.

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## INTERNATIONAL ASPECTS OF MANAGEMENT OF LAND RESOURCES FOR CONSUMERS' INTEREST

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Considering the external environment that affects the land management system of agricultural producers, we consider it expedient to single out such entities as consumers, other agrarian producers (competitors), and the state as a whole. Each of them exerts a certain direct and indirect influence on the existing land management system of specific agrarian producers and their groups and associations. In this case, there is always a reverse effect. These entities, as representatives of various interest groups (public and local communities, corporate and private interests), eventually create a mechanism for the land administration system that aims to achieve economic, social and environmental effects.

Concerning the realization of the interests of the consumers in the context of the rationalization of the agricultural land management system, it should be noted that they are of high priority because of their impact on national food security. Both market laws and the fact of the existence of the state structures indicate that first of all it is important to satisfy the needs of domestic consumers in the necessary food products with a wide range of high quality at reasonable prices. In the free market competition the state and competitors comprehensively contribute to this task, but in practice we are faced with the problem of imperfect competition in the agrarian market and in the market for land-use rights that is in a state close to transformation

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