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CONCEPTUAL PRINCIPLES OF ENERGY EFFICIENCY MANAGEMENT OF AGRICULTURAL ENTERPRISES IN THE CONTEXT OF ENSURING SUSTAINABLE DEVELOPMENT USING THE CLUSTER MODEL

The article defines the main conceptual principles of managing the level of energy efficiency, the instability of the market environment and the need to integrate sustainable development goals into the agriculture of the region, with the possibility of using the cluster management model. It is substantiated that the cluster regional system of integration of agricultural enterprises requires a comprehensive approach to resource management and adaptation to the economic challenges of wartime. The conceptual principles of energy efficiency management and reproduction of the production potential of agricultural enterprises are presented, which are key factors in ensuring their competitiveness and development in conditions of martial law and post-war recovery. It is substantiated that effective management of the potential of agricultural enterprises using the cluster mechanism involves balancing internal capabilities with the dynamics of the external market while ensuring sustainable recovery of resources. It is proven that the cluster development of enterprises is based on resource efficiency and quality management. The conclusion is drawn that the implementation of the outlined comprehensive principles will allow in the future to ensure stable sustainable development of agricultural enterprises and their competitiveness.

Keywords: *energy efficiency; renewal; innovation; innovative management; cluster; cluster development; modernization; technologies; resources; resource efficiency; sustainable development; agricultural enterprises; sustainable development goals.*

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КОНЦЕПТУАЛЬНІ ЗАСАДИ УПРАВЛІННЯ ЕНЕРГОЕФЕКТИВНІСТЮ СІЛЬСЬКОГОСПОДАРСЬКИХ ПІДПРИЄМСТВ В КОНТЕКСТІ ЗАБЕЗПЕЧЕННЯ СТАЛОГО РОЗВИТКУ З ВИКОРИСТАННЯМ КЛАСТЕРНОЇ МОДЕЛІ

В статті визначено основні концептуальні засади управління рівнем енергоефективності, нестабільності ринкового середовища та необхідності інтегрування цілей сталого розвитку у сільське господарство регіону, з можливістю використання кластерної моделі управління. Обгрунтовано, що кластерна регіональна система інтегрування сільськогосподарських підприємств потребує комплексного підходу до управління ресурсами та адаптації до економічних викликів воєнного часу. Наведено концептуальні засади управління енергоефективністю та відтворення виробничого потенціалу сільськогосподарських підприємств, що є ключовими чинниками забезпечення їхньої конкурентоспроможності та розвитку в умовах воєнного стану та післявоєнного відновлення. Обгрунтовано, що ефективне управління потенціалом сільськогосподарських підприємств, з використанням кластерного механізму передбачає збалансування внутрішніх можливостей із динамікою зовнішнього ринку при забезпеченні сталого відновлення ресурсів. Доведено, що кластерний розвиток підприємств базується на ресурсоефективності, якісному управлінні. Сформовано висновок, що реалізація окреслених комплексних засад дозволить у перспективі забезпечити стабільний сталий розвиток сільськогосподарських підприємств та їх конкурентоспроможність.

Ключові слова: *енергоефективність; відновлення; інновації; інноваційне управління; кластер; кластерний розвиток; модернізація; технології; ресурси; ресурсоефективність; сталий розвиток; сільськогосподарські підприємства; цілі сталого розвитку.*

Problem statement. Among the main tasks and areas of implementation of the Sustainable Development Strategy of Ukraine are the formation of an effective management system for energy-efficient development of enterprises, the creation of prerequisites for a radical reduction in the energy intensity of domestic products through the introduction of new technologies, standards, management and accounting at all stages of production, transportation and consumption of energy products, the development of market mechanisms for stimulating energy saving in all sectors of the economy, competitive relations in energy markets using integrated cluster interaction structures.

Unresolved parts of the problem. Considering that the problem of ensuring the sustainability of agricultural enterprises in market conditions is the main criterion for the economic feasibility. The conducted analysis leads to the conclusion that regional cluster policy is ineffective. Currently, mechanisms to promote cluster development are only just beginning to emerge at the regional level, primarily the creation of infrastructure organizations – Cluster Development Centers. However, a lack of practical experience in this area and a lack of trained specialists to work with clusters reduce the effectiveness of these initiatives.

A recommended measure to improve the effectiveness of cluster development centers is the unification of regional infrastructure organizations into collaborative networks.

The aim of the article is to study the energy efficiency management of enterprises in the context of ensuring sustainable development using a cluster model.

Analysis of literary sources by problem. Based on experience, two main approaches to cluster formation can be identified:

First, the classical liberal approach, proposed in the 1980s and 1990s by M. Porter, is based on the self-organization of economic agents within the framework of "free market" mechanisms.

Second, the modern European approach, called "poles of competitiveness," has been developing in France since 2006 and is based on a partnership between businesses and central and local governments. From this description alone, it is clear that a real cluster differs from an analytically defined conglomerate of geographically proximate enterprises and organizations. Such a conglomerate can become a real cluster under the following conditions:

- the presence of appropriate infrastructure;
- the presence of a formalized organizational and communication structure performing self-management functions and ensuring the formation of an innovative community as a subject of territorial development;
- the cluster's integration into the framework of industrial and regional policies

of the central authorities, adopted by the local innovative community;

- the use of new management technologies.

Presentation of the main material. Cluster management in energy efficiency processes at the level of agricultural enterprises is a synthesis of planning, production organization, motivation and control processes necessary for the formation and achievement of organizational goals.

In the conditions of quantitative and qualitative changes in the main indicators of the military economy, the problem of using production resources and energy potential of agricultural production, which is its cost part, is also acute. Each sustainable enterprise is characterized by a different ratio of components of production potential and in this regard, it is necessary to produce such types of products and services, the ratio of which will lead to the maximum effective final result, taking into account European or world trends.

In order to achieve sustainable development and achieve the planned efficiency of energy saving at the level of European standards, it is necessary to modernize management [1].

Diagnostics of the production activity of agricultural enterprises as an economic system makes it possible to substantiate the main goal, strategic goals and main characteristics of the directions of their development. Moreover, the strategic goal defined for development prospects—increasing production/profit volumes and achieving qualitatively new standards—depends significantly on the state of energy resources, their distribution, efficient use and restoration, and cluster management policies [7].

The initial goal of a regional cluster policy should not be the creation of specific clusters, but rather the creation of favorable conditions for voluntary interaction between companies, the establishment of collaborative networks, the implementation of cluster projects, and the support of related initiatives. It should be noted that isolated interactions will not lead to the creation of a cluster; a permanent system of information interaction is necessary.

Quantitative indicators of the effectiveness of cluster policy include the number of cluster projects and cluster initiatives implemented in the region, as well as the number of companies covered by such initiatives and projects. Based on the sources and literature reviewed, the following benefits of developing a cluster policy in a region can be identified:

- increase in taxpayers and the taxable base in the region;
- development of a convenient mechanism for interaction with businesses;
- manifestation of grounds for diversifying the economic development;
- improvement of the human resources infrastructure for business (this involves research and development infrastructure);
- cost reduction;
- opportunities for successful entry into international markets;
- creation of a network or complex in the region;
- minimization of innovation costs;
- envelopment effect;
- deepening the social division of labor;
- increased competition;
- organization of production without the need to purchase equipment.

The following are some of the challenges of a modern cluster economy:

- difficulties in creating a network of small enterprises;
- failure to fulfill contractual obligations;
- inability to predict product demand in advance;
- difficulty in determining cluster effectiveness due to a lack of statistics;

Theory lags behind practice. Among the undoubted advantages of cluster policy, it is also worth mentioning its disadvantages. Since clusters are one of the tools for increasing competition both nationally and internationally, competition with foreign producers increases the elasticity of demand for cluster personnel, thereby creating the possibility of increased unemployment or wage stagnation.

In the studied practices of industrial and innovation clusters, the interconnections often become too dense, which can lead to corruption in cluster policy oversight bodies implementing government regulation. Moreover, in some cases, the creation and maintenance of clusters can lead to conflicts of interest between ministries, departments, committees, and agencies. This legal impasse in public administration stems from the inconsistency of actions by various government agencies, which lack any hint of continuity, creating precedents in decisions, norms, and regulations that may contradict each other. Similarly, it makes sense to consider a situation in which individual

companies may be significantly more competitive than those in a cluster, thereby stagnating the development of these companies.

Furthermore, there is a risk of over-exaggerating the importance of a cluster, since its competitiveness is determined by its constituent organizations and the level of their management. Often, the "brand" of a cluster is perceived as inherently competitive, which is often not the case.

Other disadvantages of clusters include:

- excessive vulnerability due to the narrow specialization of a region, as well as possible sabotage of disruption of the technological cycle, which can directly impact the key advantages of the cluster and the region;
- local effects. Insufficient external connections, a focus on local contacts, and the resulting use of established practices and conservatism;
- lack of flexibility. The stability and rigidity of existing structures can impede radical change and delay restructuring mechanisms;
- reduction in competitive pressures.

Cooperation can lead to a reduction in competitive pressures and, consequently, in the driving forces of innovation:

- confidence in self-sufficiency. Relying on the foundation of past achievements, a cluster may be unable to follow market trends and grasp the directions of technological progress;
- internal decline. Since personnel are crucial for creating the foundation of cluster development, they can also put the social sphere of a cluster on the brink of decline, limiting its development potential by regressing to previous levels. Thus, it is clear that if cluster organizations become excessively closed at the level of internal relations, there is a risk of losing independence, and in the opposite case (being removed from the cluster), they will be left without potential economic counterparties.

Thus, the main shortcomings of cluster policy have been identified, the elimination of which will facilitate the development of territorial clusters [8]:

- analysis as a method of studying economic activity in the entire set of processes occurring in them, as well as in each of them. Analysis of economic activity is the study and assessment of the use of all types of economic resources, including energy resources and the results of the work of enterprises and organizations in order to increase their efficiency. In the process of analyzing economic activity. The following have been defined: a monitoring tool (a logical-structural matrix, which defines the logical relationship of activities and provides a basis for allocating responsibilities for the management and implementation of each activity);

Monitoring areas (appropriateness and quality of the program structure, effectiveness, the role of results in achieving the program goal, the possibility of replicating the program idea, and the sustainability of the program) and monitoring indicators, defined using the Balanced Scorecard (BSC) methodology. Based on the BSC methodology, the following areas of cluster project effectiveness assessment and their evaluation indicators were defined:

- finances (growth of net profit at cluster enterprises; average level of return on total assets; volume of accounts payable of cluster enterprises; number of unprofitable enterprises in the cluster);
- internal processes (growth of production volume in the cluster; growth of labor productivity in the cluster; volume of cluster exports; volume of investments in fixed capital; number of established enterprises in the cluster);
- clients (cluster share of regional industrial production; growth of sales volume in the cluster; level of competitiveness of key products in the cluster; volume of work performed by research organizations for the cluster; number of people who have completed Targeted training at cluster educational institutions);

- innovation, training, and personnel development (number of people trained within cluster programs; number of innovation-active enterprises in the cluster; volume of innovative products in the cluster; share of innovative products at key cluster enterprises; number of innovative structures within the cluster).

Assessment: analysis of target performance; assessment of cluster competitiveness; proposals for corrective actions. Unlike existing planning methods, the project management and financing method offers several advantages: it enhances the scientific validity of the cluster strategy and comprehensive problem-solving by constructing a logical-structural matrix; ensures that projects are aligned with higher-level strategic goals by interlinking objectives and achieving project goals; expands funding sources through the joint use of resources from government, business, and international organizations; enables effective management of resources, deadlines, and budgets thanks to a developed monitoring and evaluation system.

All of this will enable regional government entities to develop and implement effective cluster programs. With the aim of increasing the competitiveness of clusters and regions. Cluster subsystems, formed through the harmonization of the economic and managerial aspects of its activities, directly influence the architecture of relationships between participants. To optimize and increase the efficiency of interaction between cluster participants, a mechanism can be proposed for coordinating the work of its key subsystems.

The central coordinating element in the cluster subsystem complex is the HR subsystem. This is due to the fact that its main task is the selection and placement of personnel in all subsystems, optimization of the organizational structure, distribution of responsibilities and authorities, and monitoring of personnel qualifications. The financial subsystem coordinates its work with the HR subsystem, the supply subsystem, the insurance subsystem, and the research and development subsystems. It distributes financial flows to ensure the functioning of these subsystems, namely:

- funding of research and development;
- distribution of wages;
- financing of procurement activities;
- supporting the insurance subsystem in the event of a crisis.

Supply subsystem Coordinates work with the production subsystem. This concerns providing production with raw materials, supplies, equipment, etc.

The production and research subsystems coordinate their work in matters of developing and applying advanced technologies, developing the production of new types of products, implementing modern production equipment, etc.

The production subsystem coordinates its work with the sales subsystem to organize the optimal release of products to the market.

The sales subsystem coordinates its work with the financial subsystem, since the financial subsystem receives funds as a result of product sales.

It is advisable to consider coordinating the work of the sales subsystem with the research and development subsystem. Since the sales subsystem also performs a marketing function, it researches the market for the need for a particular product and transmits this information to the research and development subsystem, so that it can develop new products that may be of interest and in demand on the market.

Coordination of the insurance subsystem with other subsystems becomes relevant only in the event of risky or crisis situations in the cluster's activities

Conclusions and development prospects. Thus, the primary task of agricultural enterprises is to use the cluster management model to overcome the resource-intensive nature of production implement saving technologies, increase the output of agricultural products with a high level of

added value. This situation has led to the fact that the developed concept of the Energy Strategy of Ukraine turned out to be partially out of sync with the conceptual principles of the Sustainable Development Strategy and regional strategies for the development of territorial communities, which reflect regional characteristics, and the latter, in turn, with the real state of economic development of the region and with the regulatory and legal framework, which should control the sphere of state interests in the processes of distribution of energy resources within the framework of enterprise management and technologies for their application in the implementation of certain types of economic activity.

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