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STRATEGY OF THE FORMATION AND DEVELOPMENT OF AN INNOVATIVE AGROINDUSTRIAL CLUSTER OF THE REGION IN A CONTEXT OF DECENTRALIZATION OF THE AUTHORITATIVE POWERS

Abstract. A research method of determining the clustering potential of the industrial complex of the region is proposed within the article. The main objective of the research is the development of a strategy of the formation and development of an innovative agroindustrial cluster of the region in the setting of decentralization of authoritative powers. In modern economic conditions, the search and application of new, adequate approaches to innovative development of agroindustrial enterprises is reasonably required. It is proved that the most significant form of the implementation of the agroindustrial enterprise potential is innovative clusters, which should be considered as economic subjects concentrated and technologically related on the geographical grounds and technologically new ones, which form territorial production complexes on a specific territory.

It is substantiated that the policy of decentralization of authoritative powers is a significant catalyst for the cluster development, especially the agroindustrial production and economic recovery of many rural areas.

This article studies the objective of intensification of the formation processed of innovative agroindustrial clusters in the regions of Ukraine. The block diagram showing the result estimation of clustering development of innovative agroindustrial enterprises of the region is proposed. A conceptual model of formation and development of innovative agroindustrial cluster of the region, which is based on structural modernization of economic space, solution of economic, social and ecological problems due to effective use of available areal resources, is developed.

***Keywords*:** cluster, innovation, agroindustrial enterprises, agroindustrial cluster of agroindustrial complex, decentralization, production core, innovative core.

JEL Classification R00, R11

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СТРАТЕГІЯ ФОРМУВАННЯ І РОЗВИТКУ ІННОВАЦІЙНОГО АГРОПРОМИСЛОВОГО КЛАСТЕРА РЕГІОНУ В УМОВАХ ДЕЦЕНТРАЛІЗАЦІЇ ВЛАДНИХ ПОВНОВАЖЕНЬ

Анотація. Досліджено основні процеси, які супроводжують функціонування інноваційних кластерних структур у сучасних умовах. Основною метою проведеного дослідження є розроблення стратегії формування та розвитку інноваційного агропромислового кластеру регіону в умовах децентралізації владних повноважень. У сучасних умовах господарювання об'єктивно необхідним виступають пошук і застосування нових, адекватних підходів до інноваційного розвитку агропромислових підприємств. Доведено, що найбільш вагомою формою реалізації потенціалу агропромислових підприємств є інноваційні кластери, які слід розглядати як сконцентровані за географічною ознакою й технологічно пов'язані географічною ознакою і технологічно нові суб'єкти господарювання, які формують на конкретній території територіально-виробничі комплекси.

Обгрунтовано, що саме політика децентралізації владних повноважень є вагомим каталізатором кластерного розвитку, особливо агропромислового виробництва й економічної реанімації багатьох сільських територій.

Досліджено завдання активізації процесів формування інноваційних агропромислових кластерів у регіонах України на національному і регіональному рівнях. Запропоновано блок-схему оцінки результатів кластеризаційного розвитку інноваційних агропромислових підприємств регіону. Розроблено концептуальну модель формування і розвитку інноваційного агропромислового кластеру регіону, яка базується на структурній модернізації економічного простору, розв'язанні економічних, соціальних та екологічних проблеми завдяки ефективному використанню наявних просторових ресурсів.

***Ключові слова*:** кластер, інновації, агропромислові підприємства, агропромисловий кластер агропромислового комплексу, децентралізація, виробниче ядро, інноваційне ядро.

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Introduction. The reformation process of Ukrainian economy in the setting of modernization of market relations determines the need for choosing the strategy of its management

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not only in general, at the national level, but also in certain regional segments. In fact, with the strengthening of international competition, the development of Ukrainian economy becomes increasingly dependent on the ability of each region to demonstrate its advantages successfully. Modern trends and forms of the transformation of regional agroindustrial enterprises significantly influence characteristics of the territorial labor market, the level and structure of household incomes, financial support of territorial economic systems.

It is generally accepted that the dominant development sector of the vast majority of regional economic systems, hence the national economy of Ukraine, is the agroindustrial complex, since it accounts for more than 40 % of gross domestic product and a higher share of foreign exchange revenues [1].

Under these circumstances, in the conditions of decentralization of authoritative powers, it is agricultural production, food industry and infrastructure objects of agrarian market should become a powerful locomotive of significant technological and social growth of territorial communities of rural areas and small towns and settlements of urban type. Guide is the agro-food complex of the EU, which, despite the recession of the European economy, generates 44 million jobs and is its fourth export engine.

Using this experience of reforming government relations in Ukraine should promote the effective use of spatial resources in order to solve accumulated economic, social and ecological problems, introduction of new forms of production organization based on the formation of territorial and production integration unions — innovative agroindustrial clusters.

Allocation of previously resolved parts of the overall problem. Despite the considerable volume groundwork of foreign and domestic scientists on clustering subjects, peculiarities of the formation and development between sectorial clusters, which would become catalysts of the innovation potential in the economy, did not have enough reflection in scientific researches.

Literature Review. During the research of Raisa Kozhukhivska, Nataliya Parubok, Nataliya Petrenko, Svitlana Podzihun and Irina Udovenko into the methods of estimating the efficiency of creating regional innovation clusters for dynamic development of economics, it was established that the application of an innovative cluster approach is one of the most efficient tools in the process of fulfilling the tasks of the enterprises modernization and ensuring the development of innovative sectors of economy [2].

The study of the Swiss scientist Christiane Gebhardt demonstrates the importance of a consideration of the organizational development in Triple Helix constellations and supports arguments in favor of good cluster governance in Triple Helix-based regional innovation systems [3].

Henry Etzkowitz from the USA notes that knowledge-infused clusters, including government and university, as well as firm actors, are the epitome of contemporary economic development strategy [4].

Authors of the paper O'Connor J., Gu X. examines the development of creative industry clusters in Shanghai. It looks at the cautious adoption of the creative industries' agenda by the Chinese government and how Shanghai was to adopt this more positively [5].

Jiang Lan, Wang Chengjun and Zhang Wei consider that continuous industrial development will inevitably form an agglomeration effect after reaching a certain level. When the industrial agglomeration effect appears, the growth of the industry will be stimulated, and it would cause further optimization and upgrading, thereby attracting the relevant industry chain to achieve the scale and efficiency, and finally, the phenomenon of industrial clusters will be achieved [6].

The paper of Italian scientists Tiberio Daddi, Maria Rosa De Giacomo and Francesco Testa aimed to describe a method adopted in an European project named IMAGINE applying to industrial clusters some innovative tools making them an effective and useful opportunity for Small and Medium Enterprises (SMEs hereinafter) and local communities to pursue sustainability objectives [7].

According to authors Arimoto Y., Nakajima K., Okazaki T., the agglomeration increases productivity of each factory through positive outer effects which shift distribution of the factory productivity to the right. The competition eliminates the least productive factories. The authors prove usefulness of the agglomeration effect which influences positively on less productive factories and can organize natural selection in a cluster. The authors define a cluster as a congestion of own industry in a certain territory [8].

The primary purpose of the study conducted by scientists Hilary Cheng, Ming-Shan Niu, Kuei-Hsien Niu (from Taiwan and USA) is to examine the relationships among an enterprise industrial cluster involvement, organizational learning and its ability to adapt successfully to the external environment [9].

The work of Hoffman V. E., Lopes, G. S. C., Medeiros J. J. shows how knowledge is shared among small businesses operating in industrial clusters and how this competitive resource circulates and accesses within the cluster [10].

Taking into consideration a large number of foreign and Ukrainian scientists' researches on this issue, they mainly touched the problems of the intensification of innovation development of certain territories or spheres of economic activity [11].

Having analyzed the available scientific heritage, a question has been raised before us, and is an acceptable algorithm for activating the production of innovative products in the priority spheres of the regional economic systems of Ukraine?

The answer is that the classic approach is unacceptable based on the fact that in our country there is a decline of industrial production, especially high-tech one, which, on the one hand, is the basis for the development of innovations, and on the other — lack of investments does not allow to intensify processes of technological renewal, establishment of production of new, needed products and services market.

Under these circumstances, the domestic agroindustrial complex, which in modern conditions is the dominant segment of the economy in most regions, can become an active participant of the innovative development, but only if the clustering approach. After all, agricultural production is focused on ensuring the food security of the country and the formation of raw materials and for processing, and food industry will be resource-limited in the producing of innovations. Solely by integrating the functioning of these areas of activity and assignment to the infrastructure environment, higher education institutions and civil society, it is possible to obtain a synergistic effect for the regional economy in terms of decentralization of powers.

Metholodology and Research Methods. In order to form the clustering potential of the region it is most advisable to apply an approach based on a comprehensive assessment, which is able not only to take into consideration not only the priorities of operating activities, but also their impact on the implementation of interests of all members of the integrated development.

Taking into consideration the volume of involved resources, the authors propose to use a system of stability indicators that characterize the degree of use of spatial possibilities. As part of this study, consider it advisable to introduce the concept of clustering potential of the region (CPR) in practice.

Under the clustering potential of the region (CPR), according to the authors, it is necessary to understand an integrated combination of the structure-forming spheres of economic activity with natural-resource, investment, innovative, infrastructural and intellectual capabilities to ensure sustainable development in the conditions of environmental changes.

It is important to define an aggregate integrated assessment, which would take into consideration on the one hand the opportunities, and on the other — restrictions and risks. That is, when evaluating the CPR combined with the strategy of local authorities on regional development priorities, it is necessary to consider:

Firstly, the situation of internal and external markets;

Secondly, aggregate possibilities of business entities to achieve the goals in different spheres of activity,

Thirdly, spatial, technological and cooperative relations between business entities,

Fourthly, the state of infrastructure development of territories that includes energy, transport, transit components;

Fifthly, environmental parameters and effects of clustering.

Thus, the comprehensive analysis of the spheres of economic activity will allow isolate those ones in which the priorities for creating the cluster.

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For objective conduct of the analysis, only indicators of regional statistics with partial characteristics are used. In particular, the structure of industrial production should include: sectorial specialization of the region; resource potential-assessment of mineral raw, natural and human resources; infrastructural potential — saturation of territory with objects of energy, transport, communication, logistics; innovation potential — indicators of innovation activity of business entities, volumes of production of new scientific and technical products; investment potential — investments in basic capital by structural areas; intellectual potential is the level of scientific development of the territory and creative activity status.

In order to assess the total level of the potentials, the rating assessment is the most often used in well-known methods of. At the same time under the ratings are the criteria of activities of enterprises of specialization and their parameters relative to other industries.

In this paper, the estimation of CPR industries is proposed by the method, which consists of several stages:

1. Selection of indicators that characterize different types of potentials from which the CPR is formed, on the basis of which the matrix of source data is shaped (x_j). The matrix is a table with terms I (i = 1, 2, 3... M — number of industries) and poles (j = 1.2, 3... n — number (characteristics) of indicators).

2. Standardization of indicators (characteristics) for obtaining a matrix of standardized values of characteristics (Xi, J), for this data source matrix standardized by the formula:

$$Z_{ij} = \frac{X_{ij} - \overline{X}_j}{S_j}, \quad (1)$$

where $\overline{X}_j = \frac{1}{m}\sum_{i=1}^{m} X_{ij}$ — the average value for the J-th indicator of the sphere of activities investigated;

$S_j = \sqrt{\frac{1}{m}\sum_{i=1}^{m}(X_{ij} - X_j)^2}$ — standard deviation of the j-th indicator of the sphere of activity.

3. The set of signs — stimulators and destimulators for the construction of the reference sphere of activity is defined, thus the stimulator should be considered such indicators, which carry out positive influence, and destimulators — those, which have opposite influence. Then the set of stimulators is denoted as $I1$, and the set of destimulators as — $I2$. To determine the reference point of multidimensional space, which is a vector, we apply the following rule: among all the indicators-stimulators choose the maximum, among the indicators-disincentives — the minimum:

$$P_o = (Z_{o_1},...,Z_{ok},...,Z_{on}), \quad (2)$$

where P_o — reference point;

$P_o = Z_{ok}$ (max) — for the indicator-stimulator;

$P_o = Z_{ok}$ (min) — for the indicator of the destimulator;

4. A quantitative assessment of the level of CRC is as follows:

4.1. Calculate the distance between the points that characterize the elements of the study and the reference point (P_o)

$$C_{io} = \left[\sum_{k=1}^{n}(Z_{ik} - Z_{ok})^2\right]^{\frac{1}{2}}, \quad (3)$$

where C_{io} — the distance between the points that characterize the elements of the study;

4.2. Calculated average spacing between points by the formula:

$$\overline{C}_{io} = \frac{1}{m}\sum_{i=1}^{m} C_{io}, \quad (4)$$

where $\overline{C}_{io}$ — is the average value of the distance between the points;

4.3. Calculate the standard deviation of S_o:

$$S_O = \left[\frac{1}{m} \sum_{k=1}^{m} (C_{io} - \bar{C}_O)^2 \right]^{\frac{1}{2}}, \quad (5)$$

where S_O — standard deviation from the point P_O.

4.4. Determine C_O value with the following formula:

$$C_o = \bar{C}_{io} + 2 \cdot S_o, \quad (6)$$

where C_O — an indicator of the quality of the functioning of the sphere of activity under the study;

S_O — standard deviation from the point P_O.

4.5. D1 is calculated by the formula:

$$d_1 = 1 - \frac{C_{io}}{C_o}, \quad (7)$$

where d_1 is the overall indicator of the quantitative assessment of the CPR level.

5. Calculated figure D_1 for research objects is a quantitative estimate of the level of CPR.

The advantages of this method are as follows:

– has no restrictions on the number of indicators and areas of activity being compared;

– the technique is based on complex, multivariate approach;

– evaluation is based on the statistical indicators that reflect the real results of activity in the totality of comparable research objects;

– the algorithm is comparative, that is, its application allows comparing the activities of industries in dynamics;

– to deepen the evaluation, a set of indicators can be expanded by supplementing its data with other information sources;

– the influence of a number of factors that have different dimensions and methods of influence are taken into consideration;

– the evaluation of the integral indicator in most cases is formed in the defined range from 0 to the maximum value of 1.

Results. The authors came to the conclusion to offer this assessment for Chernihiv region, based on the fact that this region:

– has a long-term tendency to deteriorate the demographic situation and very low opportunities for reproduction of human potential;

– is characterized by the lowest population density in Ukraine, the second largest territory of the state;

– has no natural resources that would be the dominant factor of economic socialization;

– demonstrates a certain innovative inhibition in the development of material production;

– during the transformation period, high-tech industrial productions have practically disappeared and the region has an agroindustrial orientation.

At the same time, this does not mean that this methodology is focused exclusively on this region. It can be used to assess the clustering potential of any subnational formation, but the evaluation priority should be a guideline for developing ways to intensify innovation through the creation of technology parks, technopolises, logistics platforms, industrial parks and, especially, clusters.

Based on the proposed methodology of comprehensive assessment of the clustering potential of regional industrial development, the priority directions of industrial activity for Chernihiv region are determined. It is advisable to choose the creating and development of cluster structures in the region such areas: agroindustry; wood processing and production of wood products, except furniture; pulp and paper production; production of other non-metallic mineral products; production of food products, beverages and tobacco products (*Table*).

Given the fact that according to the results of calculations, agro-industry was the dominant priority, we consider it appropriate to base the development strategy of the region on agroindustrial clusters, taking into consideration the peculiarities of spatial development in terms of the decentralization of power.

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Table

Ranking of economic activity by a general indicator

Indicator / Types of economic activity	d_1	Rank	d_2	Rank	d_3	Rank	d_4	Rank	d_5	Rank	Amount d	Rank
Extractive industry	0,229	7	0,993	8	0,767	4	0,989	3	0,999	4	3,976	**8**
Production of food products, beverages and tobacco products	0,167	10	0,995	2	0,997	1	0,993	1	0,998	5	4,150	**5**
Light industry	0,182	8	0,994	4	0,742	6	0,985	10	0,999	3	3,903	**11**
Agriculture	**0,630**	**1**	**0,993**	**9**	**0,732**	**9**	**0,988**	**4**	**0,998**	**7**	**4,342**	**1**
Pulp and paper production; publishing activity	0,440	4	0,993	11	0,778	3	0,986	8	0,998	9	4,195	**4**
Chemical and petrochemical Industry	0,384	6	0,994	3	0,736	7	0,988	6	1,000	1	4,103	**7**
Production of other non-metallic mineral products	0,571	3	0,994	5	0,734	8	0,986	7	0,998	10	4,283	**3**
Metallurgical production and manufacture of finished metal products	0,418	5	0,993	7	0,732	10	0,989	2	0,998	6	4,130	**6**
Engineering	0,178	9	0,997	1	0,760	5	0,985	9	0,999	2	3,920	**10**
Wood processing and manufacture of wood products, except furniture	0,602	2	0,993	10	0,731	11	0,984	11	0,998	10	4,309	**2**
Production and distribution of electricity, gas and water	0,142	11	0,994	6	0,826	2	0,988	5	0,998	8	3,946	**9**

In modern setting of economic management, characterized by the manifestation of globalist tendencies on the background of limited resources and lack of motivational mechanisms, the search and application of new, adequate approaches to innovative development of agroindustrial enterprises is reasonably required.

The introduction of the cluster approach promotes the activation of business activity of agroindustrial enterprises and related business structures, because the core of the cluster is the innovation center, which will be the engine of improving the investment climate in the region, development of social, economic, information and integration ties; give impetus to more intensive development of the entrepreneurship and increase the economic potential of the territories.

A modern agroindustrial cluster should be understood as a network of technologically integrated business environment of the agricultural sector of the economy, a network of processing enterprises, if it has an innovative core, which in specific spatial boundaries produce competitive goods and services with higher value added, using internal resources of territorial formations. different taxonomic level [1].

In our profound belief, the policy of decentralization of the authoritative powers is a considerable catalyst for cluster development, especially for agroindustrial production and economic recovery of many rural areas. After all, the emphasis on the development of a small-scale agricultural production and domination of agroholdings, the increasing depopulation of rural territories induce local government bodies and executive authorities to integrate their efforts with business, institutes of civil society, and socio-humanistic environment to search the ways of intensification of economic development of territorial communities with innovative vector and engagement of opportunities of private-municipal partnership.

Decentralization gives huge possibilities for cluster development of domestic agroindustrial complex, as such form of production organization allows to ensure formation of social-oriented economy, alignment of inherited asymmetry, provision of comprehensive development, creation of proper working conditions and standard of living in rural areas.

The agroindustrial complex of the EU is a good example, which in the framework of the joint agrarian policy of the third millennium convincingly proves that land management means much more than food security and export growth, as it is impossible to fulfil without a simultaneous stable development of rural areas.

The EU focuses its commodity producers on a comprehensive system of agrarian innovations, localization of the food market, and stimulation of employment. The focus is on the fact that basic income support of the farms depends exclusively on the number of workplaces created.

In view of this, the Ukraine's agricultural policy should be reoriented to the European model instead of manipulating the forms of lobbying the interests of individual agricultural formations, to move to overcoming depopulation and revival of rural areas.

When implementing the cluster model in the agroindustrial sphere of the region, it is necessary to take into consideration all positive aspects of the localization of economic development of the territory. This applies to both the components of cluster structures and the components of the regional environment, in particular, business, market environment, as well as information space, scientific and educational areas, which in turn have a positive impact on sustainable development of the region (*Fig. 1*).

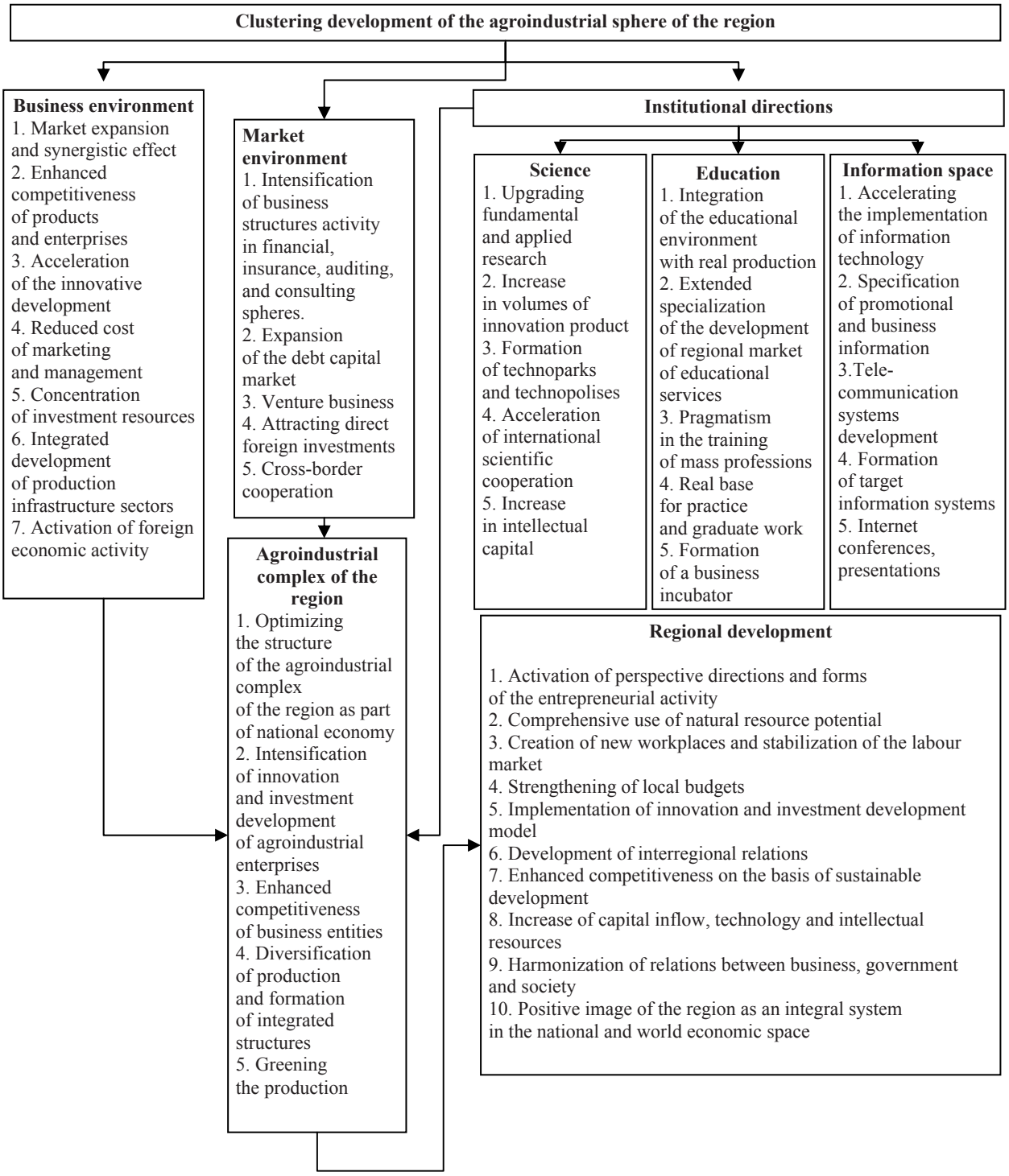

Fig. 1. **Block diagram of the results evaluation of the clustering development of the agroindustrial sphere of the region**

Source: developed by the authors.

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Based on the scientific heritage of domestic scientists, economists, having their own scientific school and carefully studied the possibilities of the agrarian sector of the research of Chernihiv region, we have proposed a model of a real agroindustrial cluster, where the core of such formation becomes the basic enterprises, which on an equal basis cooperate with the small business area and infrastructural environment.

In order to form an innovative core of the cluster, the National University «Chernihiv Polytechnic» entered into a structural unit such as the Information and Innovation Center, which performs the function of the integration of science and production through the intensification of activities of the business incubator and the implementation of the higher educational school in the actual production.

Moreover, the cluster has already included the enterprise on engagement of renewable energy sources; it is currently arranging for biogas production and its use for vegetable growing under cover, creation of a modern logistic-service center for the maintenance of technical means and systems.

The peculiarity of the cluster formation is that all production units are technologically interconnected, and are also prospective for further development in the sphere of extending raw materials processing and run-out production with high added value for the needs of internal and foreign markets.

After careful study of the legal field of the organization and functioning of clusters, we have concluded that the main disadvantage of the established institutional environment of our state is a total absence of motivational principles of intensifying the use of up-to-date forms of territorial households organization, implementation of innovation and investment model of productive forces modernization on meso- and microlevels, where creation of new high-competitive workplaces should be at core.

Instead, the members of the association have consolidated their efforts to form a centralized fund of innovative breakthrough, which is directed towards implementation of innovations in zero waste organic production, resource saving, extending the raw materials processing provided that the agricultural enterprise focuses solely on the implementation of the cutting edge technology and selection and breeding business, European and world experience in achieving high yields in plant-growing, high weight gain and milk yield in livestock farming, and shall guarantee the high quality production in compliance with environmental standards.

All other functions should be performed by existing or newly established companies that interact within the cluster (*Fig. 2*).

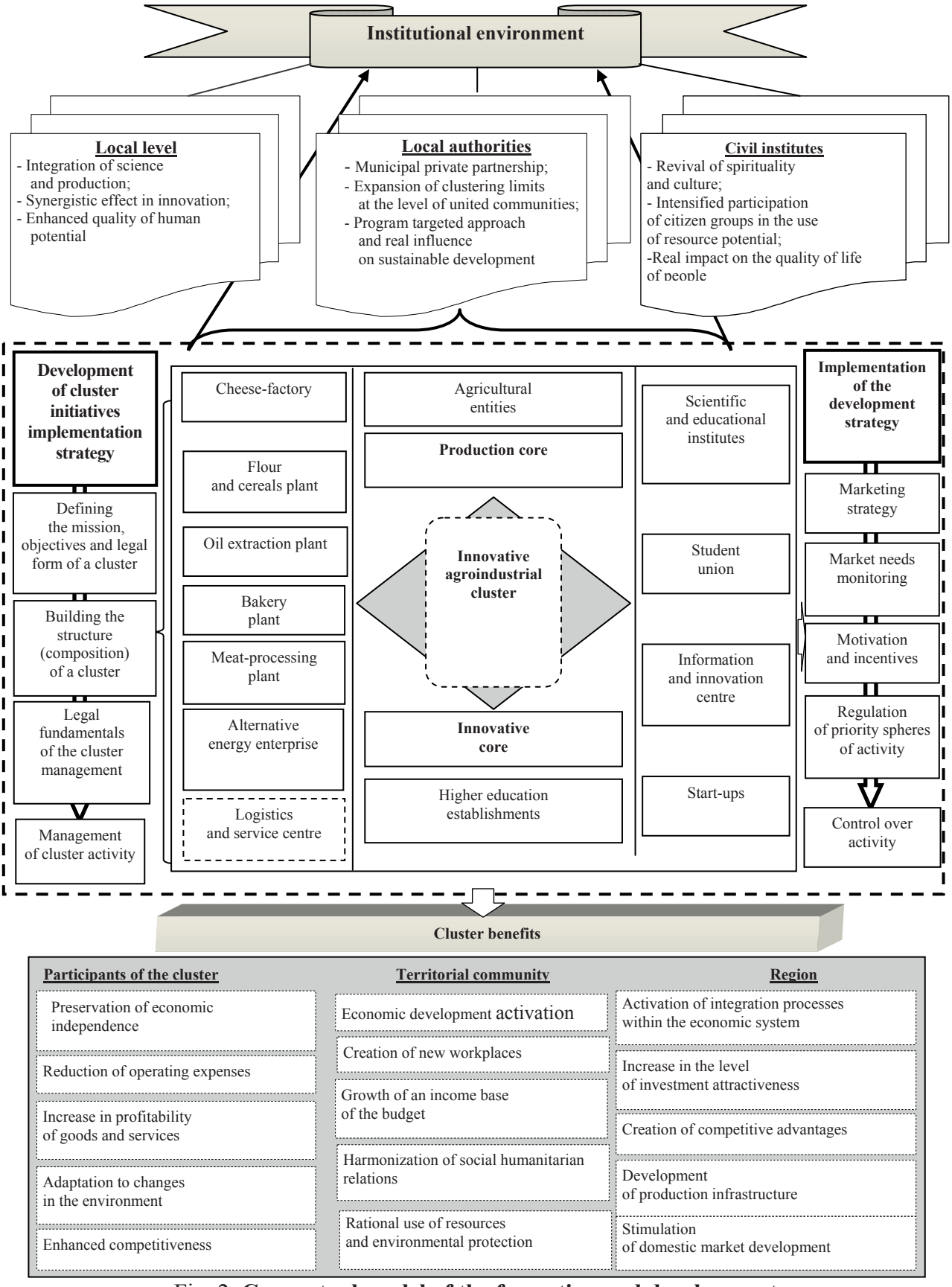

Fig. 2. **Conceptual model of the formation and development of the innovative agroindustrial cluster of the region**

Source: developed by the authors.

We believe that the proposed model of the agroindustrial cluster is exceptionally acceptable for large-scale diversified enterprises, or for a group of such enterprises within a district, but cannot

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be extended to agroholdings or small farm enterprises, because, within a separate territorial community, the technologically related production units do not function and there is no resource base for their creation.

Conclusions. Accelerating the innovative development of regional economic systems is an imperative to increase the level of their competitiveness, taking into consideration the challenges of globalization and the European integration strategy of the state [12].

In the context of the decentralization of power, the influence of territorial communities on the use of spatial resources of economic development changes significantly through the introduction of new forms of economic organization, among which the leading role is played by clusters.

Given the objective realities of the sectoral impact of the agroindustrial complex of Ukraine on the development of the national economy, it is the agroindustrial clusters that can become a catalyst for intensifying the innovative activities of territorial formations and most regions of Ukraine.

After all, these formations allow integrating the existing business environment as the production base of the cluster, forming an innovative core through the involvement of research institutions, higher education institutions, establishing processing of agricultural raw materials, and motivating local communities and civil society institutions to economic activity through new jobs and increased capacity of local budgets.

The strategic course of Ukraine on joining a high-tech competitive environment causes the need to form an innovative development model. Transition to such model requires the implementation of a continuous and targeted search process, preparation and introduction of innovations, which allow not only to increase the efficiency of agroindustrial complexes, but also to change fundamentally ways of the development.

In order to overcome the problems of inertia, revive the innovative climate and overall innovation orientation of the country, it is necessary to create new organizational structures that implement innovative processes. Thus, according to authors, the most significant form of the implementation of agroindustrial enterprise potential is clusters, which should be considered as economic subjects concentrated and technologically related on the geographical grounds and technologically new ones, which form territorial production complexes on a specific territory. It is feasible to engage educational institutions, especially universities, research centers, trade-logistic and other companies.

The article proves that clusters can become the peculiar centers of the accelerated innovation development. A conceptual model of the formation and development of innovative agroindustrial cluster of the region, which is directed towards structural modernization of economic space, solution of economic, social and ecological problems due to effective use of available areal resources, is developed.

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