

Agro-based Clusters: A Tool for Effective Management of Regional Development in the ERA of Globalisation

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Abstract – The paper considers clustering as one of the most effective approaches to managing regional development. The analysis of conceptual approaches to the formation of clusters in the agricultural sector of the regions is presented. The authors propose an algorithm for creating and developing a regional agro-based cluster, which includes three stages: analysis and forecasting; organization of events; creating a system for monitoring the effectiveness of the cluster. The result of such analytical procedures and organizational measures is the formation of a management mechanism that ensures effective interaction between cluster members and the achievement of cluster development goals.

Keywords – agriculture, cluster, agro-industrial complex, agro-clusters, region, regional agro-cluster, development.

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1. Introduction

The modern economy of Ukraine faces new challenges and threats that require consolidated efforts from the state and society to systematically and purposefully modernize national production. The first sector that suffers from increased competition is the agro complex, as it is the main sector of the country's economy. It produces 96-98% of Ukrainian food, 50-55% of raw materials, and its share in national income is about 30% [2], [3]. This necessitates the use of new approaches and technologies of socio-economic development of territories, including the specific role of clustering tools that form the basis of long-term regional development programs.

An American scientist, professor at Harvard University, Porter M. introduced the concept of “cluster” in 1990 in relation to economic sectors, enterprises, organizations [9]. Porter M. came to the concept of “cluster” as follows: he divided the national economy of each state into sectors and compared which of them are the main ones in ensuring the competitiveness of each of the economies. The analysis showed that for the economy of each state there is a set of competitive industries (from three to six) that provide the bulk of exports. According to Porter M., in such industrial industry clusters the best conditions are created to increase competitiveness [10].

Martin R. and Sunley P. [7] referred to clusters in economic science as any group formation of economic entities, for example, industrial districts, territorial industrial complexes, technopolises, etc. Ukrainian leading agricultural scientists Sabluk P. and Kropivko M. – in a number of their works reveal the essence of the formation of a territorial-

production cluster and its influence on the strategic development of the region [3], [11].

Today, clusters are considered as the most important factor contributing to development through linkages they establish between the industrial world and the world of research and support services they can provide, especially small companies that otherwise would not have access to resources them, [5], [12].

The agribusiness cluster is widely discussed in the existing scientific literature, since its concept is closely linked to the development of the agro-food economy. Economic literature contains many definitions of what a cluster of agribusiness is, such as:

- geographical proximity and concentration of producers and institutions involved in the food and agriculture sectors, and which interact and create value networks, formally or informally, when solving common problems and promoting common opportunities [6];
- an organization that connects together key stakeholders, including farmers and local entrepreneurs (involved in the supply chain and channels), enterprises that indirectly serve agriculture or ecosystem services resulting from food production, as well as bankers (financial services), entities conducting research or business development services. the same region [1];
- an official or informal organization, consisting of a set of business entities from agricultural production (farm), branches related to agriculture (auxiliary industries) and other partners in agribusiness [8], [13].

The starting point in the range of considerations was the well-known assertion that well-managed clusters can shape the competitiveness of not only its members but also of the economy, and contribute to the strengthening of economic, social and territorial unity [4].

2. Materials and Methods

The basis of the research was the publication of domestic and foreign experts in the management of cluster development, individual issues of improving the efficiency of agro-based cluster. It was possible to isolate and classify cluster structures operating in the domestic economic environment and to investigate the main reasons that hinder their development, to assess the level of economic activity of enterprises in the agrarian sector of Ukraine. Methods for calculating structural indicators were used to develop methods for identifying cluster structures at the regional level. The information basis for the research was compiled by official data from the Ministry of Economic Development, the Ministry of Agrarian Policy and Food, data from the State Statistics Service of Ukraine, analytical reports of the European cluster observatory, information and analytical materials of individual companies. In our micro-study, we analyze the cluster potential of the most developed agricultural regions of Ukraine (Vinnytsia, Poltava, Kyiv, Kharkiv, Dnipropetrovsk, Cherkasy, Khmelnytsky, Kirovograd, Odessa, Kherson, Chernihiv, Sumy regions) in 2018.

3. Results and Discussion

Modern practice has significant experience in the organization of large integrated socio-economic systems that includes many participants with different sectoral specialization and key parameters of efficiency. Such systems include the agro-based cluster. The process of creating integrated structures of this kind is associated with a number of problems of an organizational nature, as well as ensuring the interconnection of various flows - investment, financial, current (operational). Consequently. There is a need to develop a sequence (algorithm) for the formation of a regional agro-based cluster. The study indicated that the establishment of agro-based cluster in the production of consumer products is a phased process that includes three major stages (Fig. 1).

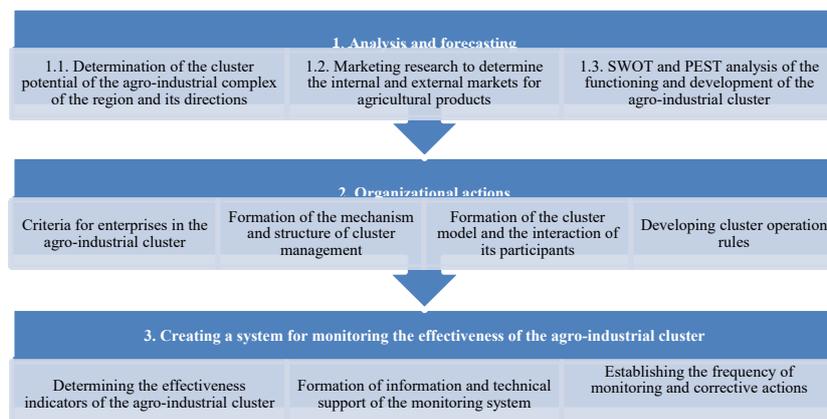


Figure 1. Algorithm for the creation and development of a regional agro-based cluster (Source: compiled by the authors)

Stage 1. Analysis and forecasting – is one of the key stages, on the quality and reliability of the activities carried out, on which the further performance. This stage includes the following steps (Fig. 2).

At the first stage of the algorithm for assessing the cluster potential of the agro complex, the indicators characterizing the integration processes in the regional agro-based cluster are calculated. These indicators include coefficients of localization, specialization and per capita production.

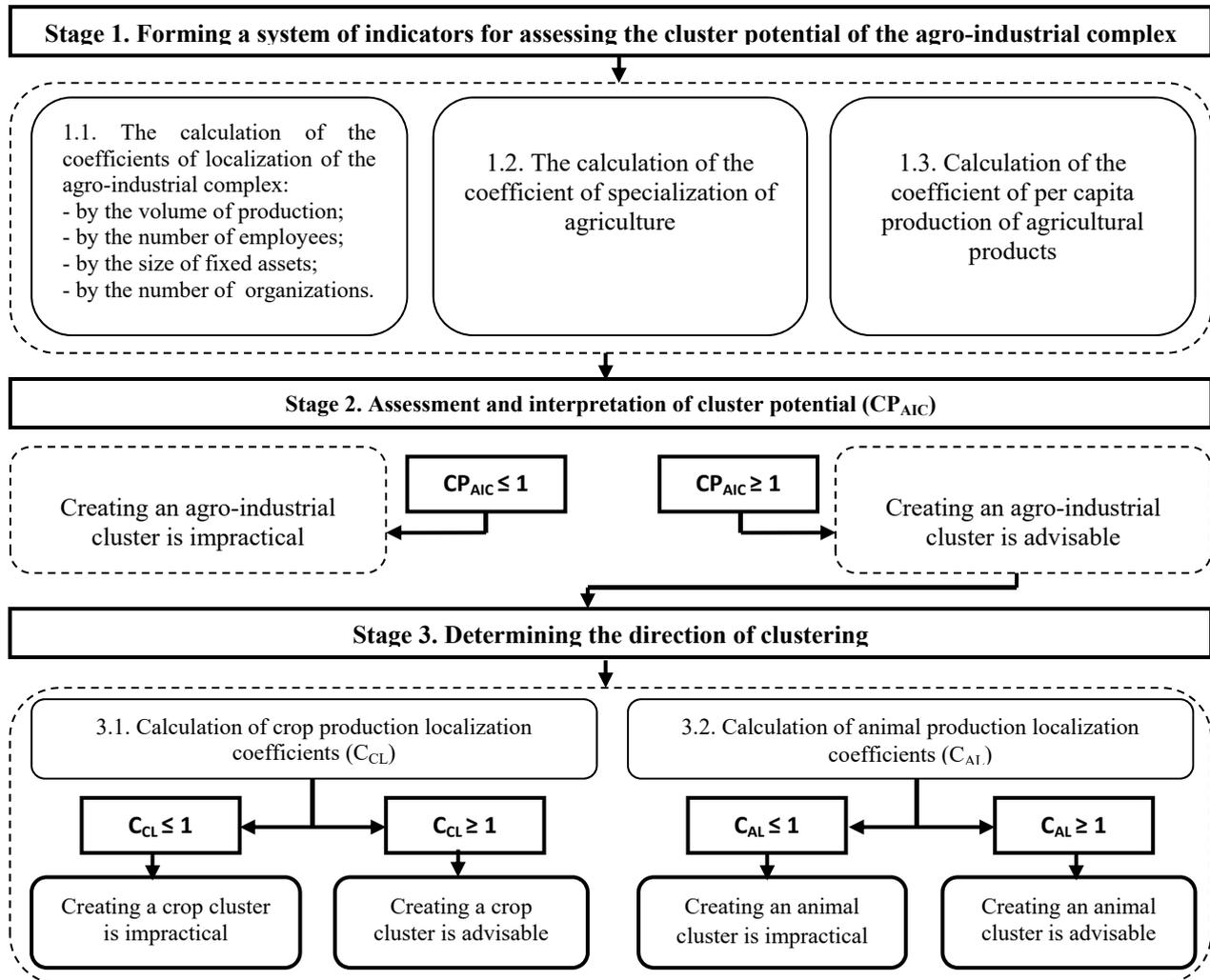


Figure 2. Algorithm for assessing the cluster potential of the agro complex (Source: compiled by the authors)

At the second stage, based on the calculation of private indicators, the integral indicator of the regional cluster potential (CP_{AIC}) is determined.

$$CP_{AIC} = (C_{L1} + C_{L2} + C_{L3} + C_{L4} + C_S + C_{PCP}) / 6 \quad (1)$$

C_{L1} – The coefficient of localization of the agro complex in terms of production;

C_{L2} – The coefficient of localization of the agro complex by the number of employees;

C_{L3} – The coefficient of localization of the agro complex by the size of fixed assets;

C_{L4} – The coefficient of localization of the agro complex by the number of organizations;

C_S – The coefficient of specialization of the agro complex;

C_{PCP} – The coefficient per capita production of products in the agro complex.

If the value of the indicator exceeds one, this indicates the feasibility of initiating cluster formation in the agro complex. If the coefficient is less than one, then the creation of a cluster is impractical. It is necessary to take into account the fact that if the value of cluster potential tends to unity in dynamics (0.8-1), then integration processes in the agro complex are possible, and their development can contribute both to economic growth and growth of the economy of the region as a whole.

At the third stage, the determination of the clusterization orientation of the regional agro complex is carried out. Thus, the proposed methodological approach to assessing the clustering potential of a regional agro complex will provide not only the determination of the prospects of cluster formations in the agrarian sphere, but also will make

it possible to clarify the direction of integration processes in the industry.

Marketing research aimed to determine: the total capacity of the internal and external markets; forecast of capacity of markets for the long-term period; current and forecast capacity for certain categories of agricultural products to determine the optimal regional range. The most important principles that must be taken into account subjects management of regional agro-based cluster in the formation prediction considering the potential development of individual segments of the agricultural market (structural prediction of its capacity) are as follows (Fig. 3).

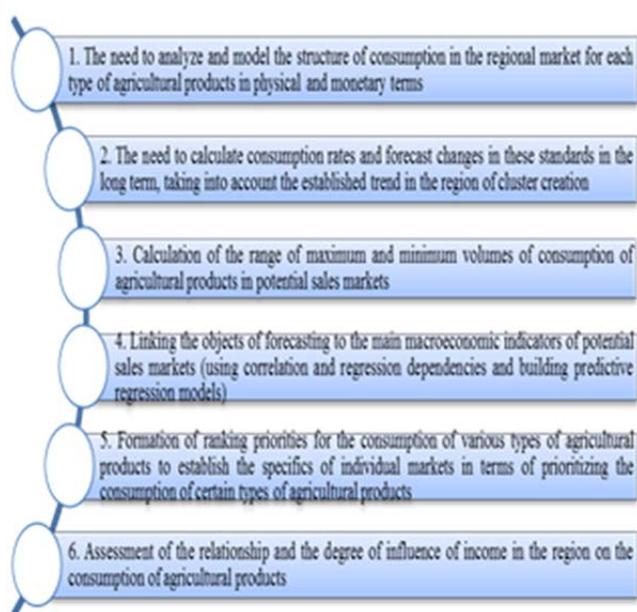


Figure 3. Principles of forecasting the development of a regional agro-based cluster (Source: compiled by the authors)

The next analytical measure of the first stage of the cluster implementation algorithm is to obtain qualitative results. In addition, the measure allows assessing the strategic prospects of influencing the situation in a number of factors that determine the strengths and weaknesses, opportunities and threats of the project for the development of the agro-based cluster; as well as the influence of political, social, economic and technological factors on the development of the cluster. The approach may be implemented using SWOT and PEST techniques.

Stage 2. Organizational actions

The stage involves the implementation of the following major steps: 1. establishment of criteria for the entry of agricultural enterprises into the cluster; 2. determination of the mechanism and structure of the cluster management; 3. formation of cluster model and system of interconnections between its participants; 4. development of the rules of operation

of the cluster in accordance with the functions of each participant.

One of the most important aspects of implementing organizational actions for the creation of an agro-based cluster is the process of establishing criteria for the selection of participating enterprises. Such selection should be based on the results of expert opinions, as well as objective data on the functioning of enterprises. The criterion selection of cluster participants involves the analysis and evaluation of the following aspects of the operation of enterprises: 1. the development of industrial infrastructure provision (the state of fixed assets, the level of innovation of the entire technological chain of production, the absence of problems with the legal status of agricultural land, etc.); 2. financial stability and investment attractiveness (indicators of the effectiveness of financial and economic activity, the possibility of using borrowed resources, the possibility of obtaining additional sources of investment, etc.); 3. the quality and availability of labor resources (experience and competence of the management of enterprises, level of productivity, availability of training programs, etc.); 4. indicators of efficiency of organization of business processes.

Stage 3

- Creation of a system for monitoring the effectiveness of the cluster

The stage includes: 1. determining the performance indicators of the cluster; 2. formation of information and technical support for the functioning of the monitoring system; 3. establishment of frequency of monitoring and its implementation.

The study calculated the indicators characterizing the integration processes in the agro complex of 12 agro regions of Ukraine in 2018 (Table 1).

The analysis of the localization coefficients of the agro of the regions of Ukraine in terms of production (C_{L1}) proves that the geographical location and climatic conditions of the regions in question are an important factor in the localization of agricultural production. Thus, the maximum values of the localization coefficients of the agrol complex in terms of production are demonstrated by the Vinnytsia, Kyiv, and Kharkiv regions. The values of indicators for these subjects range from 4 to 4.7.

The results of the assessment of the localization of the agro complex of Ukraine in terms of employment (C_{L2}) suggest a significant concentration of labor resources in the agricultural sector in Vinnytsia, Kyiv, Kharkiv, Dnipropetrovsk, Odessa regions. The results of the study suggest that it is necessary to increase labor productivity and the efficiency of the agro complex that have indicator values greater than 1, which can be achieved by applying the cluster approach.

The concentration of fixed assets in the agricultural sector of the regions of Ukraine is also uneven, which is clearly demonstrated by the localization

coefficients of the agro complex in terms of fixed assets (C_{L3}). The maximum values are fixed in Kyiv, Vinnytsia, Poltava, Kharkiv, Dnipropetrovsk regions.

Table 1. The system of indicators of the clustering potential of the agro complex of Ukraine in 2018

Regions of Ukraine	Indicators characterizing the integration processes in the agro complex						
	C_{L1}	C_{L2}	C_{L3}	C_{L4}	C_S	C_{PCP}	CP_{AIC}
Vinnytsia region	4,04	2,01	5,59	2,05	4,04	4,05	3,63
Poltava region	3,44	1,19	4,65	1,51	3,44	1,71	2,66
Kyiv region	4,58	2,73	5,52	2,12	4,58	3,29	3,80
Kharkiv region	4,69	2,59	4,76	2,13	4,69	3,48	3,72
Dnipropetrovsk region	3,95	1,97	5,32	2,21	3,95	2,49	3,32
Cherkasy region	3,07	1,53	3,31	1,05	3,07	2,44	2,41
Khmelnysky region	1,41	0,72	1,79	1,43	1,41	1,05	1,30
Kirovograd region	1,82	1,14	1,58	2,08	1,82	1,07	1,59
Odessa region	2,78	1,87	2,89	1,87	2,78	2,49	2,45
Kherson region	2,02	1,15	2,24	1,68	2,16	1,38	1,40
Chernihiv region	1,19	1,12	1,79	1,95	1,19	1,03	1,38
Sumy region	1,48	0,75	1,96	1,87	1,48	0,71	1,38

Source: compiled by the authors

The coefficients of localization of the agro complex of Ukraine by the number of organizations (C_{L4}) in 2018 exceed one.

Another important criterion for assessing integration processes in a regional agrol complex is the specialization of the region in a specific type of activity (C_S), in this case in agricultural production. This fact indicates a significant specialization of the studied regions in agricultural production. Leading regions are Kyiv, Kharkiv, Vinnytsia, Poltava regions.

The coefficient of per capita production in the regions of Ukraine in the area of agriculture (C_{PCP}) is more informative. Analysis of the calculations suggests that the creation of agro-based cluster is not promising due to the low productivity of the agricultural industry in six regions (Khmelnysky, Kirovograd, Kherson, Chernihiv, Sumy regions). The maximum values of the index are recorded in the Vinnytsia region.

At the second stage, the integrated indicator of the clustering potential of the industrial complex of Ukraine for 2018 was calculated (CP_{AIC}). It has been established that Vinnytsia, Kyiv, Kharkiv, Dnipropetrovsk, Poltava, Odessa regions have the greatest clustering potential.

At the third stage, the determination of the clusterization orientation of the regional agro complex is carried out. So, the indicators for identifying the direction of clustering of the agro complex in the regions of Ukraine with a clustering potential in this area were calculated. For this purpose, the coefficients of localization of crop (C_{CL}) and animal production (C_{AL}) of regions of Ukraine in 2018 were additionally calculated (Tables 2).

Table 2. The indicators to identify the direction of clustering of the agro complex in the regions of Ukraine

Regions of Ukraine	Indicators of identifying the direction of clustering of the agro complex in the regions of Ukraine		
	CP_{AIC}	C_{CL}	C_{AL}
Vinnytsia region	3,63	0,76	1,42
Poltava region	2,66	0,64	1,27
Kyiv region	3,80	0,85	1,33
Kharkiv region	3,72	1,18	0,68
Dnipropetrovsk region	3,32	1,06	0,71
Cherkasy region	2,41	0,57	1,11
Khmelnysky region	1,30	1,07	0,62
Kirovograd region	1,59	1,24	0,81
Odessa region	2,45	1,25	0,66
Kherson region	1,40	1,10	0,72
Chernihiv region	1,38	1,14	0,84
Sumy region	1,38	1,12	0,79

Source: compiled by the authors

Based on the results of the calculations, the following conclusions can be made: 1. the creation of a crop cluster is most appropriate in the Kharkiv, Dnipropetrovsk, Khmelnysky, Kirovograd, Odessa, Kherson, Chernihiv, Sumy regions; 2. the creation of an animal cluster is most appropriate in the Vinnytsia, Poltava, Kyiv, Cherkasy regions.

It should be noted that the development of agrarian clusters in Ukraine is complicated by the following factors:

- the imperfection of the legislative framework for the functioning of clusters and, as a consequence, the lack of support for cluster initiatives of agricultural enterprises by the state;

- lack of trust between public authorities and business, as well as between individual companies;
- weakness of the existing agricultural clusters due to the low level of competition;
- the risk of losing the right to benefits and subsidies to the agricultural enterprise in case of any organizational or industrial changes;
- isolation of science and education from agricultural production;
- the lack of a unified, which prevents the creation in society of understanding the benefits of cluster associations, as well as a holistic picture of performance of existing agrarian clusters in Ukraine.

The implementation of the principles of the cluster approach in order to improve in the regions of Ukraine should, in the most general sense, solve the following problems:

1. The development of mechanisms for the interaction of cluster enterprises.
2. Formation of tools for effective management of business processes.
3. Stimulation of the processes of cluster cooperation based on common technological parameters.
4. Formation of a system of interaction between the scientific and educational sector with commercial and state structures.
5. Implementation of an effective system of strategic planning and controlling functioning.
6. Creation and launch of a cluster performance monitoring system.

Cluster policy makers seek to combine existing systems with new strategies, but the most common approaches are defined in marketing the region, attracting different types of businesses, highly educated professionals and professionals. In addition, it should be borne in mind that successful implementation of projects for the special promotion of industry clusters can only be in the presence of a regional strategy. It is inefficient to develop the cluster in isolation from the development of the region. When developing a regional strategy, it is important to consider what key growth points are in the region and what different interest groups can do to develop these key growth points. In today's context, there is not so much need for the development of a particular cluster that should be spelled out in a regional strategy, but rather that there should be consensus between the business and administrative elites of the region about the need for cluster development.

Thus, the creation of clusters is a promising direction of development of the agro complex of Ukraine. Its implementation will ensure stable

growth of the industry and, as a result, it will create additional conditions for the social and economic development of the regions as a whole.

4. Conclusion

Cluster approach is one of the most advanced industry management technologies. In a structured form, a cluster is a network of suppliers, manufacturers, consumers, elements of industrial infrastructure, research institutes, interconnected in the process of value creation. The key stages of organizing the initiation and creation of agro-based cluster were identified, and the parameters of selection of enterprises-participants in the agro-industrial cluster from the standpoint of analysis, and evaluation of such aspects of enterprises were ascertained: the development of industrial infrastructure maintenance; financial sustainability and investment attractiveness; quality and availability of labor resources; indicators of efficiency of organization of business processes. A study of the clustering potential of the agro-industrial complex in 12 regions of Ukraine (Vinnytsia, Poltava, Kyiv, Kharkiv, Dnipropetrovsk, Cherkasy, Khmelnytsky, Kirovograd, Odessa, Kherson, Chernihiv, Sumy regions) in 2018 was conducted. It was determined that the creation of agro-industrial clusters in Vinnytsia, Poltava, Kyiv, Kharkiv, Dnipropetrovsk, Cherkasy and Odessa regions is appropriate. In these regions, steady growth with maximum dynamics was revealed, both as a generalized indicator of the clustering potential and its components. The results of the study indicate increased integration processes in the agro-industrial sector due to the increased concentration of agricultural production, as well as their productivity.

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