

## Improving the efficiency of economic management based on the development of agro-industrial clusters

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**Abstract.** The interaction of suppliers and manufacturers based on flexible links within cluster unions allows to achieve a synergistic effect, i.e. exceeding the sum of indicators of individual components of cluster-businesses. This effect is provided by the advantages of deep specialization of enterprises, their access to new technologies and ability to use highly qualified specialists (while savings on transaction costs). Therefore, at the beginning of the 21st century, the clustering process covered more than 50% of the economies of developed countries. Consequently, this article discusses the development models of various clusters, including ones existing in the agro-industrial sector. Based on the study of international experience, the article proposes a phased algorithm for the formation of a grain cluster in Russia. The purpose of the research is the development of a model for the interaction of participants and the rationale for creating a grain cluster in Russia, which contributes to improving the management of the economies of agricultural regions. The cluster model proposed in the article can be used in other countries with high agricultural potential.

**Keywords:** clusters, agroclusters, economic relations, grain, grain cluster

### 1. Introduction

According to the traditional definition of M. Porter, clusters are geographically concentrated and interact in a particular area of firms, companies, and institutions [1]. As a rule, the “triple helix” principle underlies all types of clusters, their formation and functioning [13-15]. This principle is the close interaction of business, science, and government. In recent decades, the formation of clusters has received an increased attention due to the impressive growth of regional economies from Denmark and Italy to Thailand and Japan [2].

The impact of knowledge-intensiveness and clustering on the competitiveness of economies of some countries of the world is given in Table 1. As can be seen, the world leader in the number of clusters (about 380) is the USA, it has the highest rating in competitiveness in the world (as of 2013) and a high rate of GNI (Gross National Income) per capita. As of today, the share of US GDP produced in clusters is more than 60%. Thus, the higher the country spends on science and education, the greater the number of clusters and the higher the efficiency and competitiveness of the country's economy.

**Table 1.** The impact of knowledge-intensiveness and clusterization on the competitiveness of economies of several countries of the world [6].

| Indicators<br>Country | Government spending on education and R&D, in % of GDP, 2005-2010 |                     |        | The share of countries in world R&D costs, 2009 | Number of clusters | World Competitiveness Rating, 2013 | The share of exports of agricultural products, 2010 | GNI per capita, \$ / 2010 rating |
|-----------------------|--|---------------------|--------|---|--------------------|------------------------------------|---|----------------------------------|
|                       | Total  | Including education | on R&D |   |                    |                                    |   |                                  |
| Denmark               | 11.7   | 8.7                 | 3.0    | 0.4   | 34                 |                                    |   | 59050/10                         |
| Finland               | 10.6   | 6.8                 | 3.8    | 0.8   | 9                  | 20                                 | 8.5   | 47720/16                         |
| USA                   | 8.2  | 5.4                 | 2.8    | 34.1  | 380                | 1                                  | 12.3  | 47390/17                         |
| Germany               | 7.4  | 4.6                 | 2.8    | 7.9   | 32                 | 9                                  | 6.0   | 43110/24                         |
| Russia                | 5.4  | 4.1                 | 1.3    | 1.4   | 25                 | 48                                 | 4.1   | 9900/67                          |
| China                 | 6.5  | 3.9                 | 1.5    | 4.4   | 66                 | 21                                 | 3.3   | 4270/107                         |
| India                 | 3.9  | 3.1                 | 0.8    | 0.9   | 106                | 40                                 | 10.5  | 1330/146                         |

## 2. Materials and Methods

The authors review literature on the development of clusters in the economies of various countries, including in the agricultural sector. Among all scientific literature on the topic, we additionally deeply reviewed a total of 12 sources.

In addition to scientific literature, the authors used the following research methods for a deeper study of the problem:

- The method of induction and deduction was used when formulating logical inferences by summarizing statistical data, as well as when drawing general conclusions when moving from the particular to the general and from the general to the particular;
- The method of a systematic approach was used when considering a cluster as a complex of interrelated elements;
- The method of a comparative analysis was used when comparing the level of clusterization in the economy of Russia and other countries of the world.

Based on the findings, the authors determined the cluster initiative algorithm and developed a model for the interaction of the grain cluster participants and the stages of its formation in Russia.

## 3. Results

In general, several cluster development centers stand out in the global economy – North American, Western European, and Asian [3]. As of today, according to the European Cluster Observatory, about 3 thousand clusters are counted in EU countries, in which about 40% of the workforce is employed [4].

For example, the Scandinavian industry is almost completely “clustered.” Also, it should be noted that out of 31 European countries, 26 have national cluster programs (this is almost 84%) [5]. 12% of the total number of European clusters operate in the agro-industrial sector.

The clustering process is actively developing in China. Today, more than 60 special zones-clusters are formed here, in which about 30 thousand firms have a staff of 3.5 million. In addition, a sales level of approximately \$ 200 billion a year [7].

In the North American model of clusters, competition between firms is clearly pronounced, including for highly skilled and educated labor. The feature of clusters in the USA is their location in one region, which makes it possible to maximize the use of its geographical, climatic, resource, scientific, innovative, human, and integration potential. Thus, the creation of clusters on a geographical basis, in places where there is a high concentration of relevant enterprises both in terms

of products manufactured and in accordance with the principles of organization, allows to enhance the synergistic effect of enterprises [8].

A feature of the European cluster policy is the “Scottish model,” which presupposes the existence of a large enterprise as the core of a cluster, combining small enterprises and firms with a corresponding profile into a single streamlined mechanism. In Italy, clusters are considered as a factor ensuring flexible and equal cooperation between small and medium-sized enterprises and large businesses. The Finnish model is characterized by a high level of internationalization of business and innovation [9]. In the EU countries, over 2,100 clusters are functioning, and 11% of them operate in the agro-industrial complex.

In recent years, agroclusters have been developed in many countries, regardless of the level of agricultural development. So, if for economically developed countries (EU, USA), they became a natural stage of evolution, then for developing countries (China, Argentina), clusters are the main way to reach the world level. There are many examples: wine clusters in South Africa and Chile; Latin American fruit clusters; root crops processing cluster in Vietnam; coffee clusters in Kenya; grape clusters in India; livestock clusters in China.

An “agro-industrial cluster” is a system of geographically concentrated, interconnected, mutually complementary market entities of various industries (agricultural organizations, farmers, their cooperatives, research institutes and educational institutions, authorities, public organizations, etc.). This system has unique competitive advantages of location, application of science, innovations, causing the growth of efficiency and competitiveness of these market actors, as well as the development of rural areas [10].

Unlike agroholdings, as a rule, agroclusters do not have vertical subordination and a legal entity status. More than that, they can be created both on a sectoral and geographical basis. As experience shows, the most dynamic clusters are formed under the influence of objective factors of economic interest of participants.

The generalization of foreign experience in terms of the algorithm for forming and developing a cluster initiative and ensuring its investment support shows that at the initial stage of clustering, the potential of each cluster and the direction of its design and software content are determined and predicted; cluster’s mapping is carried out taking into account cluster capabilities for developing partnership opportunities and incentives.

#### **4. Discussion**

Recently, clusters have begun appearing in Russia. One of the main documents in this area is the Decree of the Government of the Russian Federation of March 6, 2013 No. 188. 19 industrial and 26 innovation-territorial clusters have been created in the country, but so far there has been none in the agrarian sector of the economy.

At the same time, in recent years, the Russian Federation has become one of the leading exporters of grain from the largest importer in the past. The global grain balance shows a steady growth in consumption by an average of 6% per year since the late 1990s. In the 2015/2016 season, the volume of the world market is estimated at 1.99 billion tons (excluding rice). The main factors affecting the increase in the grain market are the growth of the world's population, the increase in consumption from the countries of the Asia-Pacific region, Africa and China. Under these conditions, the Russian Federation has every chance to strengthen its role as one of the leading exporters of grain on the world market [11].

The grain market is the backbone of the food market in Russia, and grain production is the largest branch of agriculture. The development of the entire agro-industrial complex (AIC) largely depends on the level of development of the grain subcomplex as a result of multilateral relations with related sectors of agriculture and the food industry. In order to improve the efficiency of the agro-industrial complex, the shift of emphasis in the export-import policy from the export of grain to the export of products of its deep processing is necessary. In this regard, clusters for the deep processing of grain must be created to achieve sustainable economic development of the agrarian regions of Russia.

Planning and supporting the development of cluster initiatives is the process of forming a system of values characterizing the state and development of the economy, as well as the mechanisms for regulating the activities of cluster entities to ensure the achievement of target indicators [12]. This would allow to produce high-tech products, the demand for which is steadily growing both in the domestic and foreign markets: high-protein feed additives, gluten, starches, glucose-fructose syrups, sugar substitutes, organic and amino acids.

The implementation of cluster projects will give impetus to the development of industrial biotechnology and increased investment capitalization. According to a preliminary assessment of the Information and Analytical Department of the Russian Grain Union, a typical project of this level is estimated at around 200 million euros.

The assessment of the state of development of the system of promotion of agricultural raw materials to the finished product along the technological chain, the existing forms of interaction of enterprises, allowed to substantiate the stages of formation of the grain cluster (Table 2).

**Table 2.** Stages in the formation of a grain cluster [developed by authors].

| Preparatory stage  | Intermediate stage   | Final stage   |
|--|--|---|
| <ul style="list-style-type: none"> <li>– Substantiation of the necessity and feasibility of creating and further developing the grain cluster;</li> <li>– Analysis of the current state of the industry, grain sales markets, storage, processing, transportation infrastructure;</li> <li>– Identification of organizational and economic prerequisites for the creation and development of the grain cluster;</li> <li>– Determination of the competitive advantages of the grain industry in Russia.</li> </ul> | <ul style="list-style-type: none"> <li>– Identification of potential participants in the grain cluster (Russian and foreign companies);</li> <li>– Determination of the functional purpose of each participant and the model of their interaction within the grain cluster;</li> <li>– Determination of the possibility of state support for cluster development.</li> </ul> | <ul style="list-style-type: none"> <li>– Formation of an action plan and a program for the creation and functioning of the grain cluster;</li> <li>– Approval of the mechanism of interaction of the main participants in the grain cluster;</li> <li>– Development of intersectoral cooperation within the cluster.</li> </ul> |

## 5. Conclusion

In the process of formation and functioning of the grain cluster in the Russian Federation, various forms of economic interrelationships of the participating enterprises arise:

1. Economic interrelations within the cluster according to the technological stages “Production-Harvesting-Storage-Processing-Packaging-Movement-Realization”;
2. Economic relations within the cluster horizontally, with suppliers of the means of production, with supporting and related organizations;
3. Economic relations of the grain cluster with other sectoral clusters of related industries, such as livestock for the development of food supply;
4. Economic relations between grain enterprises of the constituent entities of the Russian Federation with the aim of combining efforts to develop effective mechanisms for the sale of finished products, develop market infrastructure, and increase export volumes.

In the context of the formation of a cluster system for the production, storage, processing and marketing of grain, the expected results include: increasing production of grain products; increasing exports of finished grain products; increasing competitiveness of cluster members; increasing the share of farms operating in agriculture using contemporary technologies; formation of a unified scheme of placement and specialization of the production of agricultural products and food products from grain.

Thus, as international experience shows, the creation of agrarian clusters in Russia would contribute to the implementation of strategies and programs to increase competitiveness of agro-industrial sectors not only in national but also in cross-border scales.

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