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Innovative-Oriented Cluster Systems as Performance Growing Points in Agroindustrial Complex of the Far East of Russia

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Abstract: It is proved that one of the factors on increasing agro-industrial complex performance in the Far East of Russia is its functioning within the framework of innovation-oriented cluster systems. Cluster organization provides for the concentration and specialization of production with the formation in the closed cycles of production, storage, processing and sale of products based on the principles of integration using mechanisms of corporatization and cooperation to obtain competitive products from the cluster subjects and to improve profitability. The possibilities of adapting the world experience of cluster's operation for the agro-industrial complex of the Far East of Russia are identified. The features of an agro-industrial regional cluster are specified. The innovative agro-industrial cluster model for the primorsky territory of the Far Eastern Federal District as a self-governing scientific and production association of manufacturers, enterprises engaged in receiving products and raw materials for storage and processing, manufacturers of technical facilities, equipment and other material and technological resources for production and processing of products as well as specialized research institutions that provide the transfer of innovation in production is elaborated. The defining vector of the innovation-oriented cluster system is to ensure the effective functioning and competitiveness of agro-industrial enterprises at three levels: micro, meso and macro. The indices of the cluster functioning efficiency estimation with taking account of the synergy effect are proposed. The advantages of clustering on the principles of public-private partnership for enterprises of primorsky territory are grounded.

Key words: Agro-industrial complex, cluster, innovation, system, public-private partnership, integration, concentration, specialization, efficiency, synergy effect, economies of scale

INTRODUCTION

In the conditions of imbalance of interbranch economic relations and the growing disparity of prices in the agroindustrial complex of Russia, the scientific substantiation and practical solution of the innovative development problem for the agro-industrial complex is a topical issue which involves the use of corporatization (property relations), cooperation and clustering (joint activities) mechanisms. Business relations within the industry between enterprises are the effect of realization of their interests and those interests should be compared and coordinated in the conditions of economic integration of enterprises. At the present stage, such economic relations show themselves in the agro-industrial system: relations of agricultural sector with the branches of its material and technical support and production and technical servicing the agricultural production spheres (harvesting, transportation, storage, processing and sale). At the same time, the system of economic relations between enterprises in the context of economic cooperation and agro-industrial integration is viewed not as a tie but as a set of organizational and economic measures that provide the necessary conditions for enterprises to effectively influence the economic mechanism through contractual relations for further coordinated development of economic relations. The consistency of their development must ensure not only the unity of their ultimate goal but also synchronism, proportionality, rhythm and optimal mode of operation of all links of the integrated production chain.

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MATERIALS AND METHODS

The following methods were used by the researchers for the study: abstract-logical, monographic, graphical, analysis and synthesis methods, deduction and induction, what made it possible to obtain scientifically substantiated and reliable results and to formulate on their basis conclusions and particular proposals.

RESULTS AND DISCUSSION

Economical integration of enterprises is the implementation of joint activities through the use of mechanisms of corporatization, cooperation or clustering. Today, large enterprises provide their own development using mechanisms of corporatization and medium and small enterprises use the mechanisms of cooperation and clustering. An important place in increasing the competitiveness of agricultural enterprises belongs to cluster formations. The use of the clustering mechanism makes it possible to carry out joint activities of all technologically related enterprises located on a certain territory due to their deep industrial specialization without loss of legal independence. Unlike other forms of integration formations, cluster structures are characterized by the following features:

- Territorial localization, geographical proximity of the bulk of economic entities participating in the cluster
- A high level of development of cooperation, specialization and concentration of industries
- Availability of a large leading organization which determines the long-term economic, investment, innovation and other strategies for all participants in the cluster
- Stability of economic ties of participants in the cluster system with the dominant significance of these ties for the majority of its participants
- Long-term coordination of interactions between cluster participants within the production programs of innovation processes, management systems, quality control
- Products common to all participants (goods, services, trade mark, brand), for example, grain, vegetables, milk, meat, eggs, poultry, fish, etc.
- Voluntariness and openness of membership in a cluster of independent enterprises, cooperation and trust based on parity exchange between participants in the food chain
- Close interaction between the cluster association and authorities
- Availability of an arbitration court

The mechanism for formation and functioning of clusters has a regional synergetic effect which is achieved through the pooling or joint use of resources (material, labor, financial, information, innovation), reducing transaction costs, joint entry into markets, regulating and balancing the interests of participants, forming an effective self-organization and management system.

M. Porter is considered the scientist who began to investigate clusters. He has come to the conclusion that, in the context of globalization, the sectoral approach to the organization of production and management loses its positions and the systems of cluster organization of the interrelationships of firms and organizations come to the fore. M. Porter believed that the more developed are clusters in a country, the higher in this country are the standard of living of the population and the competitiveness of companies.

D. Russell and R. Conne have also demonstrated a scientific interest in the theories of the emergence and development of clusters (Russell and Coin, 2013). Scientific understanding of the clusterization phenomenon can be traced in the works of many Russian researchers (Boush, 2013; Menshenina and Kapustina, 2008; Artamonova, 2017; Lebedinskaya, 2014; Mayakova *et al*., 2014).

Thus, the cluster organization for agro-industrial production development provides for the concentration and specialization of agro-industrial production with the formation of closed production, storage, processing and marketing of products cycles on the basis of integration using mechanisms of corporatization and cooperation to produce competitive products for participants of clusters and to improve profitability. The idea of cluster technologies is to create and support a competitive environment (Bortnik *et al*., 2015). The combination of competition, cooperation and integration in a geographically limited specialized area is the main feature of a cluster. Cooperation and integration are necessary to achieve territorial regional synergy effect. Therefore, one of the important directions for sustainable development of the agro-industrial complex both at the regional and national level is its clusterization and clusters should be considered as a promising form of organization of cooperation in the agro-industrial sector of the country's economy.

As the world practice (Smorodinskaya, 2015; Dezhina, 2013) shows clusters act as a form for adapting an economic mechanism of agro-industrial enterprise functioning to dynamic competition conditions for accelerating the development of agro-industrial production, increasing in the competitiveness of individual economic agents and products, ensuring the

effective organization of innovation processes with the purpose of expanding the volume of trade, efficient use of capital and resources. An innovative structure of a cluster helps to reduce the total costs of research and development of innovations due to the increase in the production structure effect what allows the cluster participants to stably carry out innovation activities for a long period of time. Thus, several basic functions are realized simultaneously in a cluster:

- Scientific and technical, organizational and economic innovations are spread from one enterprise to another, ensuring a constant increase in productivity in the cluster as a whole
- Costs are reduced including for research and development of innovations due to close proximity of related enterprises
- All participants of the cluster receive a synergistic additional effect due to the persistence of interrelations, reduction of costs and rational use of material, natural and labor resources
- Additional competitive advantages are obtained by all participants of the cluster under the influence of the combined influence of the scale effects of coverage and synergy

It is necessary to state the fact that the clustering of the economy predetermines and performs a decisive influence on the processes of strengthening competitiveness and accelerating innovation activity. This is a new economic phenomenon that allows resisting the global competition press and meets the requir ements of national and regional development (Gokhber and Shadrin, 2013). We analyzed the world experience on the functioning of clusters and identified the possibilities of adaptation for the agroindustrial complex of the Russian Far East (Table 1).

Since, a cluster is a "point of growth" as to social and economic development of territories, clusterization of agricultural production is one of the main factors for ensuring sustainable development of the agrarian sector. The agro-industrial cluster has a number of features.

The agro-industrial regional cluster is a voluntary association of enterprises engaged in agro-industrial production, institutions or other organizations of the region, one or several (adjacent to the agrarian) industries located geographically close enough (geographical localization of agricultural production) into a technological and financial structure. Competitive advantage is created not by individual subjects of entrepreneurial activity but by regional multi-level and multi-profile associations.

The competition for consumer's preference is not led by a separate enterprise but the territorial complex of organizations is a cluster. Within the cluster, there is a concentration of resources, the use of which is aimed at achieving a common goal for all participants, creating a single economic and information space, opportunities for maneuvering the workforce, pooling intellectual capital, mutual support of financial resources. Cluster formations can jointly lobby the interests of cluster participants in government bodies:

- Cluster formations can create new jobs thus, providing a constant employment in conditions of reform and macrostructural destabilizing processes
- Cluster formations have a higher degree of competitiveness because they can
- Produce large volumes of products
- Create stable competitive advantages in comparison with independent enterprises
- Implement an effective marketing policy
- Hire highly qualified personnel
- Introduce innovative technologies
- Use progressive quality standards for the production of environmentally friendly and high-quality products
- Reduce the level of production costs and improve the quality of products through synergies including unification of approaches in quality management, logistics, engineering, information technology
- Increase their market shares for products through access to world markets of agrarian products and to agrarian exchanges
- Create an effective system of access and exchange of information on demand and supply in the market as well as competitors

The development of agrarian clusters is of great importance this will contribute to creation of high-tech and science-intensive associations with a closed production cycle and a high level of added value in the final product, creation of new jobs and the development of social and industrial infrastructure in rural areas (Kotilko and Farkov, 2014; Shelepa, 2013).

The economic factors of a merger of agro-industrial enterprises into a cluster are the prospects for increasing the volume of production for sale in the wholesale markets of agro-industrial products, introduction of a uniform price policy in the markets for a certain leveling of the disparity of prices for agricultural and industrial products; conducting joint marketing policy by participating companies to achieve sustainable competitive advantages in the market; opportunities for introducing innovations

Table 1: Adaptation of perspective directions of world clustering experience implementation for the agroindustrial complex of the Far East of the Russian Federation

Countries	Features of clustering	Adaptation of perspective directions of clusterization for agroindustrial complex
Great Britain and Northern ireland	Objective: to reduce the backlog in productivity and to level out significant disparities in productivity levels between different regions of the country Clustering activities: a practical guide for the development of clusters has been compiled reflecting the appropriateness, mechanism and features of cluster organization a steering group for the development of clusters has been formed which operates under the cabinet of ministers A book on competitiveness "our competitive future: building an economy based on knowledge" (1998). A clusters map was created, 154 clusters were allocated, from 8-18 in each region depending on the geographic location, development and specialization of each region	Initiate the process of clustering from the study of the specialization of the agroindustrial complex by regions, determining the main distribution conditions and create a map of Russia's clusters on this basis. Formation of the approach to increase competitiveness as one of the priorities in the conditions of a market economy, focusing on its importance and identifying opportunities for transformations on the way to leadership in the industry
Sweden	Objective: Stimulation of innovation activity and development of all regions. Clustering activities: whipduahi program (the world's best model for developing cluster-based innovation). Program: wizagsh (strengthening clusters regardless of their location which is based on the dissemination of knowledge and creating favorable conditions for clustering) regional cluster program (stimulation of clustering, export, marketing and cooperation initiatives with research institutions	To adopt and adapt programs for the development of innovations: the basis for structural changes, stimulation and motivation for the implementation of new initiatives within the clusters of agro-industrial business, development of marketing and logistics in them, defining exports as a promising area of cooperation
Japan	objective: to increase business activity and to increase competitiveness. Clustering activities: 20 programs to form the basis for the development of clustering. A regional office for economic, trade and industry (IZEDI) has been established which works with small and medium-sized businesses. Encouraging the expansion ofclusters in the direction of cooperation with universities, research institutes, the creation of new venture enterprises	To establish a bureau or other structure to attract small and medium-sized businesses to help them in adapting in new cooperative conditions, popularize clustering ideas among small producers as the basis for the formation of new regional clusters
Austria	Objective: to unite efforts in the economy for adaptation after gaining EU membership clustering activities: Strategic development program based on training, qualification preparation and marketing location of clusters providing special support to small and medium-sized enterprises. Programs to increase the motivation of cluster members to increase their skills	Create a program to increase the motivation of participants, their interest in clustering and in the future; training for the upgrading of the skills of workers in the agro-industrial complex in order to overcome the main problems in the industry
Norway	Objective: implementation of the innovative development program. Clustering activities: investing in the development of innovation centers at educational institutions and research centers as cluster placement centers, identifying problems and solving them (62 clusters). Placement of business parks abroad as a way to expand production and influence, explore new areas of investment Establishment of a cluster development department under the cabinet of ministers	Establish cooperation between agricultural enterprises with educational and research centers as sources of information and innovative support, include them in clusters, formalize cooperation with them
Portugal	Objective: increase the competitiveness of the national economy. Clustering activities: development of a national action Plan (analysis of existing clusters and regions, definition of their specialization for entrepreneurs); creation of cross-border clusters	Develop a Russian analogue of then national action plan for the agroindustrial complex which will contain a description of the each region's specialization and a development strategy for the future. Creation of transboundary clusters in the Asia-pacific region

in production what will increase the level of competitiveness of cluster participants in comparison with single commodity producers. Clustering of the agro-industrial complex is expedient to implement on the basis of rational regional specialization and concentration of production.

Therefore, it is advisable to include in the association of the cluster type all those which work to create a final product. Agrarian enterprises, suppliers of raw materials, machine-building enterprises (equipment suppliers), processing enterprises of the food industry, consumers of agricultural raw materials, agro-industrial integrated structures and complexes (agro-firms and corporations, consulting organizations, technology parks, trade organizations, transport organizations, packaging production companies, advertising companies, financial institutions, research institutes, educational institutions and authorities.

In our opinion, we shall mean clusterization by the concentration and specialization of agro-industrial production in a certain territory with the implementation of a sequence of actions: production-storage-processing sales of products, integration into global space, increasing the competitiveness of agroindustrial enterprises, satisfying consumer's needs for quality products and increasing incomes of cluster participants.

Important issues in the formation and development of clusters are ensuring their effective functioning through rational combination of internal resources and adaptation to environmental conditions (Reimer, 2013). Being integrated entities, economic clusters have certain features in the system of indicators and methods of determining effectiveness. The starting point for analyzing the effectiveness of a cluster is the definition of its essence as an economic association of diversified enterprises and organizations. On the basis of this, it can be argued that the efficiency of a cluster as a whole corresponds to the totality of the efficiency values of its participants:

$$E_c = \sum_{i=1}^{n} E_i \quad (1)$$

Where:

E_c = The efficiency of a cluster
E_i = Efficiency of the i-th enterprise of the cluster
N = the number of the enterprise

This approach allows us to use other indicators of the methodology for assessing the effectiveness of economic, financial and economic activities. However, the significant differentiation of economic activities within a cluster makes the process of summing up their effectiveness difficult, especially since, the efficiency in the servicing branches will have a smaller specific weight compared to the efficiency of production of profile products. Such a problem can be avoided by entering in the Eq. 1 the weighting coefficient of the branches which will be determined on the basis of expert estimation and have values from 0-1:

$$E_c = \sum_{i=1}^{n} (E_i \times v_j) \quad (2)$$

where, v_j is the weighting coefficient of the value for the j-th branch in the aggregate product of the cluster. The very essence of a cluster provides for the formation of a certain economic system that combining on the basis of economic and production ties will produce products or render services on the basis of joint efforts of the participants. At the same time, the sharing of resources and networks, integration of individual processes, etc. Will allow optimization of expenses and in some cases to avoid them. Thus, the coexistence of cluster elements takes place on the basis of a systematic approach that ensures the emergence of the synergy effect. This effect allows increasing the efficiency of the cluster operation by saving resources and optimizing costs in the conditions of joint activity as a result of which the overall efficiency of the cluster is adjusted upwards. Therefore, taking into account the synergy effect, Eq. 3 will have the following form:

$$E_c = \sum_{i=1}^{n} (E_i \times v_j) \times k \quad (3)$$

where, k is the synergy coefficient; it takes a value <1 and displays the integration degree of the production and economic systems of the cluster participants.

Primorsky territory is a unique constituent entity of the Russian Federation. The region combines a number of competitive advantages that determine its broad prospects for effective economic development. A strategically advantageous geographical position, proximity to the markets of the countries from the Asia-pacific region, a significant number of renewable natural resources and a high population are key prerequisites that distinguish primorsky territory from any other entity in the Far Eastern federal district. In addition, the region has a high scientific potential, expressed in a large number of educational institutions and research institutes. Over the past 5 years, the federal government has actively invested in the region what has resulted in the construction of important facilities for regional and international transport infrastructure.

However, cluster development in the province is still at the stage of birth (Zhupley, 2014). Therefore, the

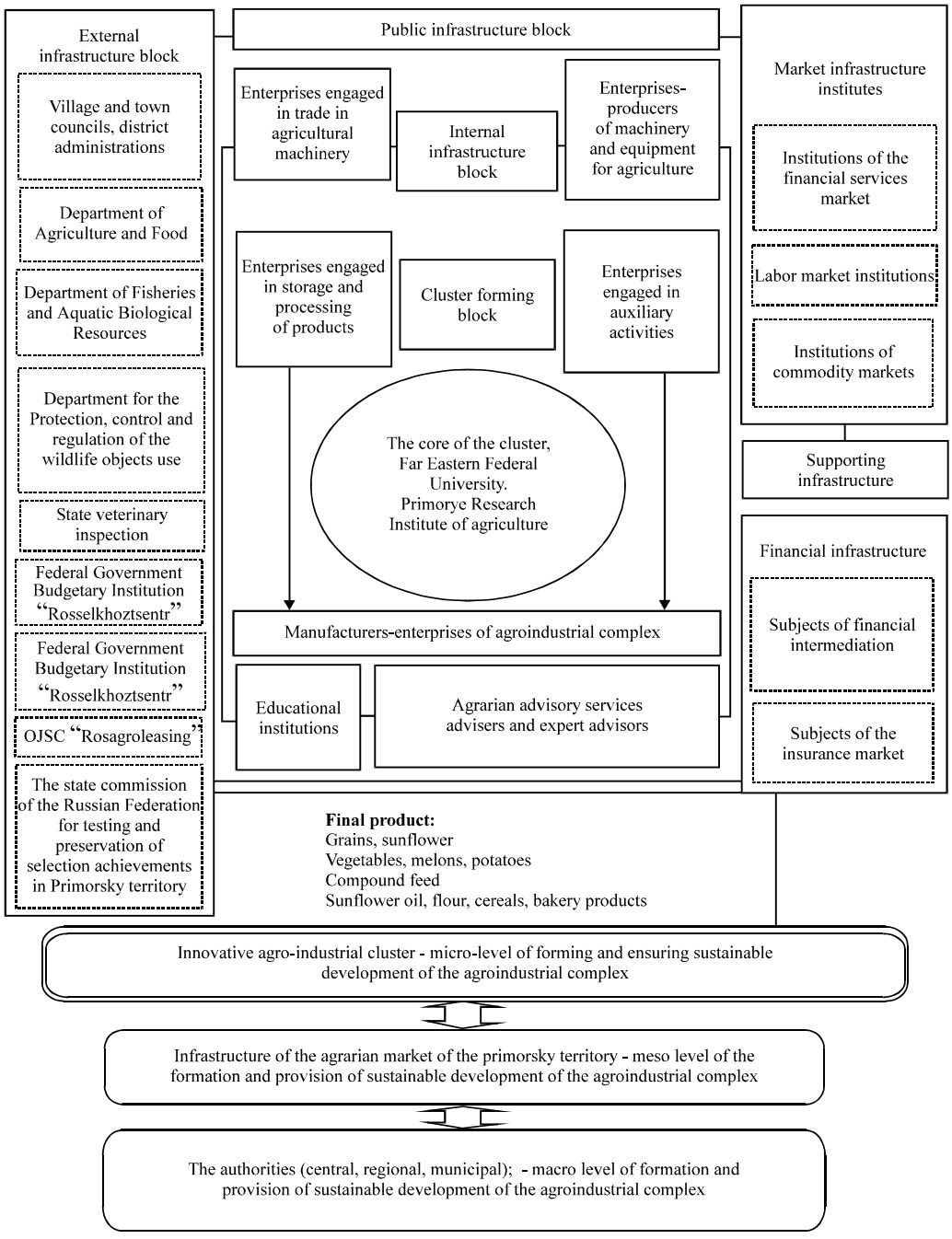

Fig. 1: The innovative agro-industrial cluster model for the primorsky territory of the Far East of the Russian Federation. Developed by the researchers

development of an innovative agro-industrial cluster model is quite an urgent and timely task for the development of primorsky territory. Proceeding from the above, we have elaborated a model of an innovative agro-industrial cluster as a self-governing scientific and industrial agro-industrial association of producers, enterprises and organizations engaged in receiving and processing, manufacturers of technical equipment, equipment and other material and technological resources for grain production and processing as well as specialized scientific research and educational institutions that provide a transfer of innovation in this production (Fig.1).

The development of the clustering institution will create effective institutional conditions for involving all

resources in order to increase the competitiveness of agricultural enterprises. The creation of an innovative cluster with the establishment of direct cooperation with state partners will allow:

To regulate issues related to the transfer of individual engineering infrastructure objects from communal ownership to private partners to fulfill the terms of the concession contract concluded within the framework of public-private partnership and further expand the arable land by more full use of constructed but not used irrigation systems. Restore the objects of engineering infrastructure; maintain them in working order by performing repair and restoration works.

Continuously improve the ecological and agro-meliorative state of soils, avoiding the processes of waterlogging, secondary salinization and solonetzation of soils. Increase production due to the growth of sown areas and the use of new high-yield, high-quality grain varieties adapted to biotic and abiotic environmental factors. Improve information and analytical support for the development of the industry. Promote the protection of legitimate rights and interests of public and private partners.

Implementation of public-private partnership with an appropriate harmonization of the interests of public and private partners will make it possible to use the administrative resource of public authorities and local self-government bodies, taking into account the interests of the region and use the investment potential of private partners to improve the level of technical and economic indicators of the industry performance. The synergy effect should become a conceptual approach to the strategic management of the industry development as a complex controlled system.

In addition, the conditions for creation and operation of clusters can simultaneously be the conditions for investing in promising projects based on cluster technologies. After all, it is impossible to implement even the simplest project or attract any investments without an initiative. Only new, original and non-standard innovative ideas may be of interest to the investor; only integration of the efforts of government, business and institutions (scientific, educational, public organizations) can be a condition for successful attraction of investments to this territory (city, district, province and region). Without an exchange of information on the potential of a region, its priorities, investment attractiveness and development prospects it is impossible to obtain any investment proposal from potential investors and finally, only economic interest from the invested capital can be a guarantee of successful implementation of any real investment project. Thus, the advantages of clustering for enterprises of the primorsky territory can be the following: the possibility of sharing joint capital and accelerating innovation processes. Joint use of resources, savings on their acquisition, maintenance and logistical support. Definition of effective specialization of the enterprises in accordance with the territorial location of the region, the scale of activity and the peculiarities of the functioning of each individual enterprise in the agroindustrial complex. Split of the markets in accordance with the specialization and capacity of activities in order to avoid unfair competition.

Obtaining economies of scale from cooperation and eliminating shortcomings caused by small sizes of enterprises, eliminating or reducing costs. Reduction and distribution of risks what is achieved as a result of cooperation and synergy. Increase in the level of competitiveness of enterprises. Increasing the sustainability of individual enterprises and the network as a whole. Establishment of long-term relations within the reproduction chain including ties between the producer and the consumer.

CONCLUSION

As a result of the conducted research it was established that one of the factors of increasing the competitiveness of enterprises is their functioning within the boundaries of innovation-oriented cluster systems what involves the use of mechanisms of corporatization (property relations), cooperation and clustering (collaboration relations). The creation of innovative-oriented cluster systems as a self-governing scientific and industrial agro-industrial association of producers and enterprises that are business partners as well as specialized research institutions providing transfer of innovations to production on the principles of public-private partnership is proposed. The implementation of public-private partnership will allow regulating a transfer of engineering infrastructure facilities to a private partner for the design and construction of new elevators, irrigation systems, farms and also reconstruction, modernization and operation of existing ones as well as other functions for the purpose of concession agreement execution.

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