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AGRO-INDUSTRIAL CLUSTERS: OPPORTUNITIES FOR INNOVATIVE DEVELOPMENT AND FINANCING

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Abstract

Attention to the models of agro-industrial clusters in the Russian Federation economy, their potential opportunities and innovative development prospects is drawn due to a number of exogenous and endogenous factors. Global financial instability, inadequate financial institutions, tools and mechanisms, a lack of effective system of public-private partnerships, and high geopolitical risks complement the existing totality of problems. In addition, business entities do not possess sufficient information regarding all financial

market products that reduces the efficiency of the Russian economy. To compensate for these negative trends, the authors suggest to use innovative features of cluster development in the agro-industrial complex, as well as to improve the financing system of business entities through the mezzanine financing mechanism.

Keywords: **Agro-Industrial Complex, Clusters, Agro-Clusters, Innovative Clusters, Innovative Development, Triple Helix Model, Mezzanine Financing, Mezzanine**

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INTRODUCTION

The Russian economy system has created basic conditions for the market relations development in the agricultural sector. Thus, there is private ownership of land as well as the necessary development and public support institutions. However, there is no systematic approach to the transformation of the agrarian economy, while the inconsistency in the implementing reforms has led to a range of negative consequences, such as the reduction of land dedicated to agricultural production by more than 40 million hectares, reduction in yielding capacity of major grain crops, rural depopulation, etc. Internal processes of financial instability, including unproven mechanisms of state support of Russian business entities, dramatize the existing host of problems: technology backwardness, shortage of staff, and instability of small business forms as compared to large high-tech agricultural holdings. State loan policy towards the agricultural producers also is characterized by paradoxical situation, where the interest rate on loans exceeds the level of profitability. Thus, the interest rates for the farmer vary within the range from 13 to 15% and higher, while the level of profitability along with the existing subsidies does not exceed 7-8% on average. Under such "game rules" the lender is doomed to debt bondage, while the chances for sustainable development and competitiveness of economic entities are reduced.

The imperfection of the existing financial institutions has led to the fact that, first, support mechanisms for agricultural producers, such as public-private partnership and project financing, are burdened by bureaucratic procedures. Obviously, this is a serious deterrent to the development of the agricultural sector of the Russian economy. Second, the agricultural businesses are not sufficiently informed about potential features of existing financial tools and mechanisms that at all other things being equal does not give them the opportunity to optimize the system of their funding. The need to find solutions to this problem is quite acute. This includes also the development of novel and innovative ways, mechanisms and financing instruments, as well as upgrading the existing ones and exploring the possibilities of their application to agro-clusters and the financing system of agro-industrial complex in general. It follows from the foregoing that one of the major ways out of this situation is seen by the authors in the development of efficient agro-industrial clusters based on the universal innovative capabilities of the cluster development model in general, as well as in improving the financing system of economic activity of agricultural business entities through the mezzanine financing

mechanism.

Method

In the preparation of this scientific article, which deals with the peculiarities of the innovative capabilities of the cluster development model in the agro-industrial complex of Russia and application of the mezzanine financing mechanism, the authors used the following research methods: abstract-logical approach, monographic method, analysis and synthesis, economics and statistics analysis, as well as formal logic and formal modeling methods. Information support of this study is based on the data of Federal State Statistics Service and Ministry of Agriculture of the Russian Federation, as well as Mezzanine Financing Fund. Given that the formation of agro-industrial clusters in Russian business practices is a fairly new phenomenon, the authors used in the course of study the empirical material related to the first successful practices of the cluster approach in the agricultural sector, analyzing the advantages and potential opportunities of the cluster innovation-driven development. When studying the opportunities of using the mezzanine financing capabilities to solve the problems of scarcity of financial resources for sustainable development of the agro-industrial complex, the authors applied the comparative analysis method, as well as dialectical method to adapt the existing common practices in the implementation of mezzanine financing and their forecast scenarios to the Russian economy under the conditions of general financial turbulence.

Theoretical and methodological approaches are based on the study of works of foreign and Russian scholars and analysts, including the methodology of institutional approach and cluster analysis. When writing the article, the authors used also official statistics from Russian and foreign information resources, the data of the official websites of research agencies, institutes and other organizations.

The development of the overall cluster approach in economic science was heavily influenced by theory of regional development of Thunen, Launhardt, Weber, and Lesch, the theory of regional specialization of Smith, Ricardo, Heckscher and Ohlin, the doctrine of autarky of big spaces of Liszt, etc. Depending on the geographic agglomeration, economies of scale, and regional specialization, these studies justified agglomeration of certain economy sectors and in certain economy branches [1]. The contribution of the cluster theory of Marshall [2], who researched the specific features of the geographical regionalization and concentration of production, is generally accepted. In terms of essential characteristics, these were criteria, which later became reference ones in the cluster theory [2]. Interest in the results of Marshall's [2] study on the basic aspects of the cluster theory was revived in the 1980-ies by a group of Italian economists led by Becattini [1].

Currently, certain aspects of the cluster theory are the research subject of Nobel Prize winner in economics Krugman. In Russia, the cluster theory is studied in the works of Granberg, Kleiner, Mirolyubov. et al. For the agrarian sector of the national economy, these issues should not be considered as brand new. It should be noted that in Russia

in 1920, Yastremsky [3] in his work "The relationship between the elements of the peasant farms in 1917 and 1919" examined the clusters in terms of a statistical approach evidenced from economy management in agrarian sector of economy [3].

The development of the theory and methodology of the basic principles of regionalization and specialization (and, essentially, the basic principles of clusters formation) in the agricultural sector of the Russian economy was contributed in various years by Knipovich, Chayanov, Kondratyev, Skvortsov, Chelintsev etc. [4]. The cluster issues in their contemporary interpretation came under review in works of Russian economists relatively recently: for example, in recent years, different aspects of agro-industrial clusters development were studied in the publications of Ableeva, Demichev, Frolova [5], Gryadova and others. One of the recent monographs of researchers from Nikonov all-Russian Institute of Agrarian Problems and Informatics [6] is devoted to contemporary aspects of agricultural production location and specialization. Thus, we can state that the issues of agro-industrial complex clustering were studied in an indirect form simultaneously with the origin and development of the cluster theory in general.

RESULTS

Triple Helix Model of Innovative Clusters: The Nature and Features in the Present Context

Paramount importance for the formation of a mature cluster and its innovative effects has close interaction and cooperation between three institutional sectors – science, business and authorities. In the course of this cooperation they are involved in the process of co-evolution bringing together functional areas and providing cluster the ability of a dynamic self-development. Such a mechanism was developed in Silicon Valley and has been described as a triple helix model (the concept of "Triple Helix Model" of Itzkovich-Leudesdorf) [7], which is based on the fact that the intersection of the functional areas of three sectors generates a new mechanism for building consensus and represents a universal institutional matrix for innovation-based growth. Business category includes large, medium-sized and small enterprises. Power includes local, regional and state authorities. Scientific organizations are represented by universities, research institutes, and the research and development (R&D) commercialization centers. The authors of the model have highlighted a number of model advantages.

First, the "triple helix" dramatically reduces the level of uncertainty and the costs of economic agents, providing various types of external savings.

Second, the participants of the spiral can combine the assets and competencies in a variety of combinations that allows creating new goods and values, unrestrictedly expanding their diversity.

Third, the co-evolution process of the three sectors creates a collective innovations production model within the scale of the cluster, which is organized in accordance with the principles of intersection of three sets of relations, and each of the institutions provides knowledge production through the creation of hybrid institutional forms.

In the 2000-ies, the concept of "triple helix" has become the basis of innovation and cluster-based programs in many advanced countries. Today it is recognized as a classic collaboration model, which is used by the OECD and the EU countries, and is essential for emerging and transitional economies for their transition to innovative type of development [1].

Countries having plans of innovative clusters creation not always are focused on the development of those types of agglomerations that have organizational features of innovative ones. In some cases, the policy measures do not allow judging how closely they are associated with the stimulation of real collaboration mechanisms in clusters. In this regard, the definitions of clusters in national programs and realistic models of cluster structures, arising in the course of their implementation, are often different.

Economists distinguish three categories of network models based on the analysis of the global cluster policy.

First, these are protoclusters such as Italian industrial districts, where a high concentration of small firms creates the competitive alternative to large corporations, including those in export markets. They originated in the industrial era, are poorly structured and intended only for improving innovations. This is due to reliance on just informal relationships and rare local resources.

Second, these are industrial clusters, formed as a network edge around the "anchor center", which could be a large corporation, university or scientific laboratory (Japanese Sapporo Valley, many clusters in South Korea, Germany, and France). They actively interact with the global market and have highly formalized internal communications, though lack collaboration mechanisms, generating innovations just in a linear format. Each firm is tied "vertically" to an anchor centre. At that, to encourage collaboration with small businesses, this center is supported by the government (by money or benefits). Such networks can grow outwards, giving rise to numerous startups. But due to the low density of horizontal cross contacts, they do not reach the effect of sustainable self-development, being dependent on government assistance.

Third, these are innovative clusters of the post-industrial era, namely the economic systems of sustainable cross-linkages formed in the form of triple helices (clusters in Scandinavia, Switzerland, and USA). They are incorporated into the global chains, have coordinating network nodes, and generate innovations collectively. Such model reaches a dynamic self-development, successfully completing a functional task of the cluster - to become a growth pole for the region of deployment. Thus, in the Nordic countries, innovative are only those of the agglomerations, which have built "triple helix" [1].

By the beginning of the XXI century, leading economies of the world were clusterized halfway, and more than hundred countries had one or another variant of cluster policy. The governments of advanced countries are concentrating their efforts on supporting the existing clusters and the creation of new network structures. The state is not only the initiator of creating the clusters, but also an active participant in cluster formations.

Russia joined these countries in June 2012, forming "A list of pilot development programs for innovative territorial clusters", which included 25 cluster projects "with a high scientific and technical potential" selected on a competitive basis. At the same time we observe a process of agricultural clusters formation, whose number is currently about 10.

In the authors' opinion, the achievement of effective cluster policy in contemporary conditions is ensured by solving the following priority tasks.

First, when conducting cluster policy, the emphasis is made on the development of a competitive market. At that, state initiatives in cluster policy are focused primarily on the support of strong and creative companies and the creation of an enabling environment, in which, in turn, the weaker and more backward firms could raise their competitive capacity.

Second, cluster policy pays much attention to the analysis of local markets and companies on the basis of not inherited, but primarily produced factors of production. Microeconomic approach in cluster policy allows considering the development features and competitive advantages at the level of local areas, and to develop an effective targeted programs for accelerating the advancement and enhancing competitiveness of companies.

Third, cluster policy implementation is based on the organization of interaction between state institutions, businesses and educational institutions to coordinate efforts towards increasing the innovativeness of production, thereby increasing work efficiency.

Fourth, the implementation of cluster policy aims at stimulating development and increasing the innovative potential, primarily of small and medium-sized businesses.

Thus, cluster policy, in terms of its potential capabilities and the structure, can become exactly the package plan, which would contribute to the solution of tasks, such as improving the competitiveness of the Russian economy through the development of competitive markets, including agricultural markets; increasing the innovativeness of different sectors of the economy, including the agricultural industry, so important at the moment; accelerating the development of small and medium-sized businesses, including farming enterprises; optimizing the selection of sources, forms and mechanisms of financing of economic entities in the agro-industrial complex; forming an effective system of financing of agro-clusters, small and medium-sized businesses in agribusiness; promoting initiative at the local level and enhancing interaction between government, business and the scientific community.

Features of the Agro-Industrial Clusters in the Russian Federation Economy

In recent time great attention is paid to agro-industrial clusters as determinant for sustainable development of the agrarian sector of the national economy. Adapting the cluster theory for the agricultural sector in contemporary conditions, the priorities in the further transformation of the economy management forms is set in such a way as to create a territorial associations, which will produce those types of products that are most effective in a given region, promote investments and food security. Thus, the authors propose to consider the agro-industrial cluster as a geographically and climate-related association of enterprises, suppliers and sales companies, involved in the complete cycle of food production, staff training, and manufacturing of auxiliary products. An important condition for its functioning is a competitive basis.

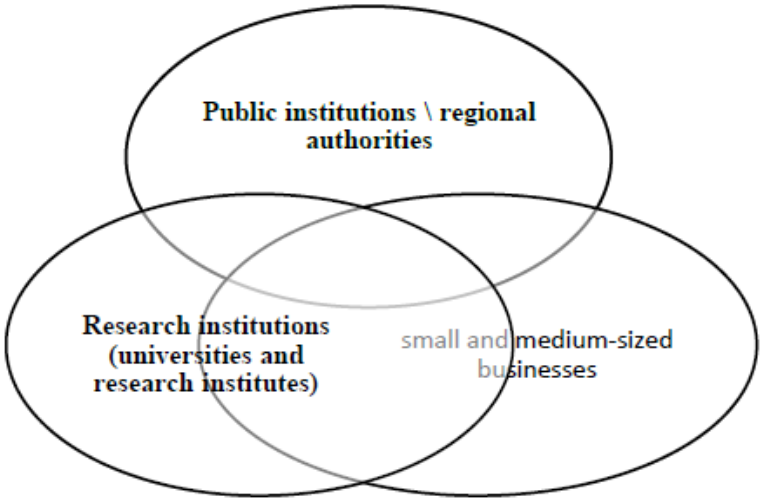
The most obvious features of agro-industrial clusters are observed currently at the meso-level of individual regions. For example, an agro-industrial cluster in the Tomsk Region is considered currently as one of the most "mature" clusters, which combines the integration of certain types of agricultural differentiation in combination with the implementation of advanced technologies. The agro-industrial clusters in Novgorod, Kemerovo, Tula and other regions are under development. The cluster model in the Tomsk Region is considered by the regional state institutions as an option of advanced features for integration of different agricultural activities and different forms of economy management. Thus, a cluster of renewable natural resources has been formed within the concept of "INO Tomsk" territorial innovation center. In 2015, this cluster included 38 business entities. Moreover, a dairy cluster is formed in the framework of the socio-economic development strategy of the region. In particular, the agreement has been initiated between the administration of the Tomsk Region and the Sino-Russian agricultural company. In the framework of this agreement the investor intends to build up a large dairy livestock breeding complex for the period up to 2030. Features of the cluster model formation in this region include attempts to create the local network of interactions on a practical level: public institutions (regional authorities) – business (small and medium-sized businesses) – research institutions (universities and research institutes) (Figure 1).

It should be noted in particular that the model, which underlies the formation and development of agro-industrial cluster in the Tomsk Region, coincides with the above "triple helix" concept of formation of innovation clusters.

In the Omsk Region, while creating "Bio complex" territorial agro-industrial cluster, the main activity is focused on three to four fold increase in the cost of grain due to the diversification of production and grain processing. Today there are 20 cluster members, while by 2020 it is planned to increase business entities involved in the cluster to 110 based on the potential capabilities of the region in this business segment. At that, the set tasks include increasing the proportion of innovative products manufacture with the highest number of conversions, the involvement of small farms in modern high-tech business processes, the implementation of non-waste and recycling technologies,

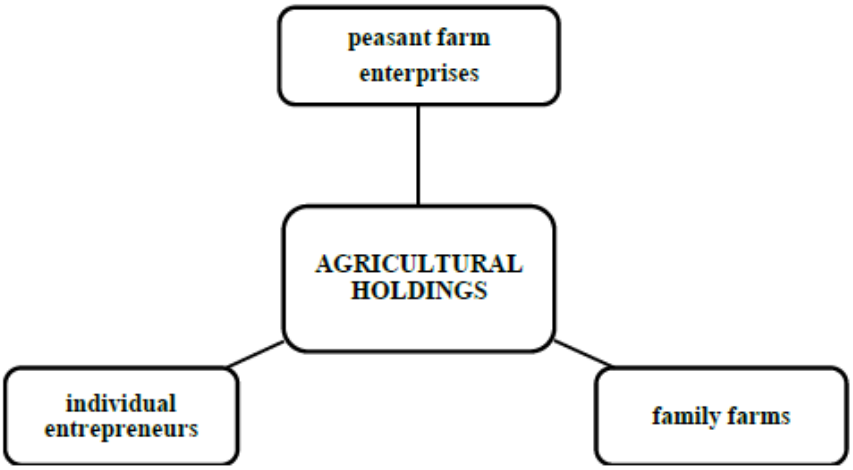
environmental challenges, creating new highly productive jobs and modern infrastructure within the cluster, commercialization of scientific developments and the increased inflow of investment to the region.

Figure 1: The model of the agro-industrial cluster structure. Source: compiled by the authors.



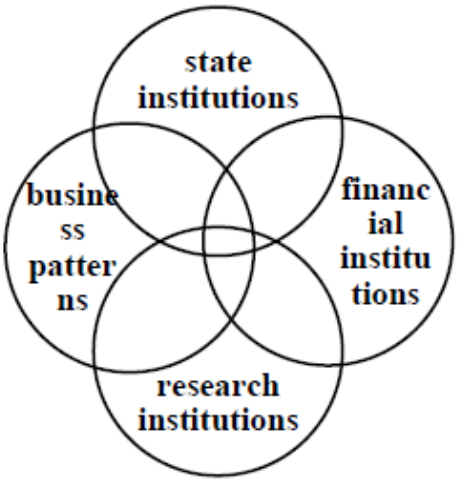
As a synergistic effect of the combination of small and medium-sized farms with large agricultural holdings, it is logical to propose organizational and structural model based on the development of the vertical contractual relations between large agricultural holdings, as growth points, and small and medium-sized businesses. In terms of horizontal relations in the field of economic activities of small and medium farms, the effect of "coupling" and survival can ensure the development of cooperative relations and the improvement of existing options of cooperation (Figure 2).

Figure 2: Organizational-structural model of the interrelations between large and small farms in the agricultural cluster. Source: compiled by the authors.



The development of financial institutions and the search for effective financial instruments is a certain "pressure point". From this point of view, the authors consider it important to supplement the formal “triple helix” model of the agricultural clusters by the fourth structural element: financial institutions (Figure 3). The study of potential opportunities of financial institutions is extremely important "in particular, in view of the fact that agrarian relations throughout the world originated earlier than financial relations" [8].

Figure 3: Formal development structure of the "triple helix model" for the agro-industrial cluster. Source: compiled by the authors.



According to the authors, the intersection sector of all four structural elements involves the "zone" generating innovative effects during operation of the agro-industrial cluster as a result of a seamless interaction and mutual complementarity of concerned structural elements.

Improving the System of Agribusiness Financing: Mezzanine Financing and Its Potential Capabilities

Supplementation of the "triple helix" model with a new element is explained by the fact that the Russian economy, coming out of a global financial crisis, faced with new problems of a geopolitical nature that caused the imbalance of the financial system. This affected all sectors of economy, including the financing system of economic entities. Innovative development of agro-industrial complex requires the expansion of financing forms and types. The authors suggest improving the financing system of business entities in the concerned economy sector through the implementation of a mezzanine financing mechanism.

Mezzanine financing (mezzanine) is an innovative mechanism of providing financial resources in the Russian market, including that in the agricultural sector. Mezzanine originated over 30 years ago [9], though for the Russian financial system, and especially for the agribusiness entities, it is definitely a new look for resources. Mezzanine involves relatively flexible terms and can be applied to a variety of transactions in agricultural sector. In 2011, New Russia Growth has created a mezzanine financing fund, the first in Russia, which amounted to $250 million. The fund provides investments to entities from Russia and the CIS for 3-5 years in the amount of 100-1000 mln rubles, while internal rate of return of the projects eligible for funding must be at least 30%. At the moment the financing of agriculture sector is not among the fund's priorities, though as the authors show further, a mezzanine financing can be a highly effective in agricultural sector.

Mezzanine financing refers to the so-called hybrid forms of financing that combines the characteristics of different forms of financing, and involves a combination of own and borrowed sources of funding, the synthesis of credit form of financing with equity financing, as well as the use of securities and/or derivative financial instruments in the implementation of the transactions. The mezzanine financing has a synergistic effect, which is achieved through a combination of debt and equity schemes that is extremely important for business entities as it potentially enhances the profitability of their activities, and not only due to the effect of financial leverage, but also due to the unique system of hedging.

The debt portion of a mezzanine can be represented by both secured and unsecured loan, revolving or non-revolving line of credit, and, often, by subordinated loan. There are also other forms of debt part, represented by the loans of third parties or even loans raised upon bonds (the convertible bonds). For innovative development of the Russian agro-industrial complex, of greatest interest is the debt part of the mezzanine in the form of a subordinated loan which, although having an interest rate higher than the average, due to the increased risks, allows on the other hand uncovering to the fullest extent the opportunities of the equity portion of the mezzanine, pushing the lender-investor or the issuer to exercise the option. Bond loans are not profitable to agro-cluster entities because of the complicated procedure of bonds issuance, rigidly regulated by the state.
Mezzanine financing involves mostly obtaining a secured loan. In this case, when using the mezzanine financing mechanism, collateral can be the assets of agricultural complex enterprises, such as real estate, machinery, machines, equipment, and much less – securities. Specific primary means of agricultural enterprises – livestock – would practically never be used as security because of their inherent extremely high risk, while the land, on the contrary, will be one of the assets most desirable by lenders to secure the repayment of borrowed resources.

The equity portion of the mezzanine should be represented in a financial instrument that will give the holder the right to purchase shares of the agricultural company upon the occurrence of certain circumstances and/or at certain times (during certain time) at a predetermined price. Options and issuer options may be the most logical financial instruments for this purpose. This successfully fits into the concept of development in

Russia of innovative agro-clusters generating free cash flow based on the use in the production process of exclusive rights on intellectual property assets. Nevertheless, unfortunately, at the moment, the number of such enterprises is not large. Also, it is rational to exercise the option in an adverse situation, when borrower does not fulfill his obligations, and thus to try at least partially compensate for lost profits.

The average collection period is 5-7 years, while a grace period is often given at the beginning of the credit period that allows business entities of agro-clusters to invest into the expansion of their business. This is extremely important due to the specificity of agricultural business that requires serious investments not only in the fixed assets and current assets, but also substantial costs to conduct breeding work that fully corresponds to the concept of agro-clusters innovative development.

The return of mezzanine financing consists of several elements:

1. Credit (loan) interest. The interest rate can be both floating and fixed.
2. The payment of the principal amount of the debt. It can be paid gradually or in a form of "balloon payment" at the end of the credit (loan) reporting term.
3. Income received from equity participation in the capital of the organization. This income will be represented by dividend payouts and/or exchange rate difference between the sale price of the share and the price of its purchase" [10].

The advantages of using this financial mechanism to receive funds include the fact that the mezzanine will be particularly attractive to those agricultural enterprises, which do not want to become public joint stock companies, though would like to attract some resources from outside not only by increasing debt load. In the agricultural complex, especially among small farms, such opportunities will be in demand.

Thus, in contemporary conditions, the mechanism of mezzanine financing:

First, is another potential opportunity to address "chronic" problem of the state financial support of Russian agricultural producers of different business patterns and economy management profiles;

Second, may be interesting and applicable to economic entities of different levels and legal forms of organization, in particular, to agro-industrial clusters;

Third, contributes to the development of triple helix into the four elemental synergy systems, aimed at innovative development.

Mezzanine financing will allow expanding and improving the existing financing system in the agricultural sector, will facilitate vertical and horizontal integration of different business patterns, and can become one of the financial mechanisms of transformation of the triple helix into the four-element model.

DISCUSSION

“It is very important and right that the government is working in two directions: development of rural areas and agriculture” [11]. Despite the significant number of problems in the Russian agricultural sector, it is improving and gets on the path of innovative development, implementing new technologies, increasing productivity, updating the basic production assets, moving to domestic raw materials, and using albeit imperfect, but still virtual mechanism of public-private partnerships. However, the solution to the problems of optimization of financing schemes, selection of financing sources and forms are very critical. “The most effective measure to improve the development of crop and livestock production in the Russian Federation is in the first place the increase of financial support to farmers, growth of investment in agriculture, implementation of new technologies, development of transport infrastructure, and improving the quality of products” [12]. The authors of the present work proposed to use the mechanism of mezzanine financing for improvement of quality indicators of business entities. Certainly, this proposal requires further study, quantification and validation.

The proposed scheme to improve the triple helix model by adding financial institutions will allow economic agents to reduce production costs, manage risks more effectively, and create innovative products on the basis of exclusive rights on intellectual property assets. Given the diversity of financial institutions currently available, the proposed system of four elements of sustainable development of agro-industrial complex in Russia should be studied in more details that the authors plan to do in their further scientific studies.

CONCLUSION

The proposed algorithm for the analysis of the essential characteristics of cluster theory, as well as the potential innovative capabilities of modern clusters with regard to sectoral aspects, including the agricultural complex in the economy of Russia, enables the following:

- First, to consider the capabilities, available in the agricultural sector, toward improving the overall integration processes of different business patterns with synergistic effect, as well as to assess the impact of various institutions on agriculture for substantiation of the agro-industrial clusters formation in the economy of Russia as one of the options for the industry innovation cluster.
- Second, to justify the formal organizational structure of the agricultural cluster on the basis of a combination of the vertical contractual relations between large and small farms and horizontal cooperative relationships between small farms.
- Third, to develop dialectically a theory of clusters, including the rationale of the hypotheses about the importance of supplementing the "triple helix" model in relation to the Russian agro-industrial clusters with another structural element – the financial institutions, which become a critical factor in the successful operation of the integrated management system of agro-industrial cluster and its

innovative development.

- Fourth, to offer the mezzanine financing model, innovative for the agro-industrial complex of Russia, thus improving the mechanism for obtaining financial resources by the business entities.

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