Modeling of export development of agricultural enterprises of the Kaluga region

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Abstract. In order to fulfill the set task of achieving GDP growth rates above the world level by 2021, an increase in investment of up to 25% of the country's GDP is required by 2024. At the same time, domestic demand for products of the agricultural sector is growing insignificantly. Overproduction in some items puts pressure on prices, so the need to develop exports is felt more and more acutely. The development of exports of agricultural products in Russia in recent years is one of the priority areas. The activities of enterprises to increase exports are supported by the state support measures, therefore the amount of products to be supplied for export is constantly growing. The article provides the results of the analysis of the current state of export activity of agricultural enterprises in the Kaluga region. The factors that hinder the development of export potential and the measures necessary to reduce their negative impact are identified. The promising areas for the development of export potential, such as development of cluster-network associations, digitization of processes for the production and sales of goods for export, application and diversification of production, etc., are shown.

1. Introduction

The President of the Russian Federation set the task in his message to the Federal Assembly for achieving GDP growth rates higher than the world level by 2021, for which it is necessary to launch a new investment cycle while increasing the amount of investments in the creation and renewal of jobs, infrastructure, etc. Investment growth should be at least 5%; their share in the country's GDP should grow from 21% to 25% by 2024.

Given the insignificant growth in domestic consumption of agricultural products, it is necessary to stimulate the development of exports. To this end, in 2016, the Ministry of Agriculture of Russia developed a priority project titled “Export of agricultural products” of the State Program for the Development of Agriculture and Regulation of the Markets of Agricultural Products, Raw Materials and Food (hereinafter referred to as the State Program). The implementation of the project led to an increase in the extent of products supplied: agricultural products and foodstuffs were supplied abroad for almost 26 billion US dollars in 2018, which is almost 20% higher than in 2017. Wholesale distribution centers are actively commissioned, eight among them were established in 2018, 14 more of them were planned by the end of 2022.

The sources for the study were the materials of the State program and the priority project titled “Export of agricultural products”, regulatory legal acts regulating the export of agricultural products, data from the Federal State Statistics Service of the Russian Federation, the Federal Customs Service of the Russian Federation, the Ministry of Agriculture of Russia and other federal and regional
authorities, as well as the results survey conducted by the authors. In the course of the study, methods of comprehensive and structural-dynamic analysis, mathematical modeling, expert assessments, extrapolation and other methods were used.

2. State-of-the-art
The analysis of the world scientific literature has shown that a large number of publications are devoted to the issues of stimulating the export of agricultural products and its role as a driving force of economic growth, many of them analyze the stimulation of exports of developing countries. For example, Abu H Ayob and Joan Freixanet examined the impact of government export promotion programs among small and medium-sized enterprises in Malaysia [1]. Anthony Q Aboagye and Kisan Gunjal examined the relationship between trade, trade liberalization and export diversification in developing countries and sub-Saharan Africa [1]. Narendra Raj Khanal et al. reviewed policy provisions, including legislative and institutional measures taken to develop agriculture in Nepal, identified gaps and constraints, and proposed mechanisms to close gaps and eliminate constraints [3].

Amid widespread claims that export diversification for a developing economy helps stabilize export earnings in the face of price volatility in international markets and acts as a driver of economic growth through the diffusion of technologies that benefit from other sectors, Elodie Mania and Arsène Rieber [4] argue that not all export baskets have the same potential for growth and economic development. The authors believe that the quality of export diversification should be assessed in accordance with the country's ability to develop its production structure.

Russia, according to the May 2017 presidential decree, must increase the amount of supplies to foreign markets up to 45 billion US dollars by 2024. To achieve this goal, the project titled “Export of agricultural products” is being implemented. Three hundred and fifty billion rubles will be allocated to perform a set of the project measures over six years. Of these, more than 290 billion rubles will be allocated to form a new commodity mass through preferential lending to enterprises, land reclamation and other measures. Special attention is paid to improving the quality of agricultural products and increasing the share of deep processing products. Over 30 billion rubles are planned to be spent on export-oriented agricultural logistics, including subsidizing the costs of transporting agricultural products and the construction of agricultural facilities. Eighteen billion rubles will be allocated for measures to eliminate foreign trade barriers. This money will be aimed at epizootic monitoring and ensuring epizootic safety, subsidizing the certification of agricultural products and food. In addition, almost 9 billion rubles will be allocated to create a system for promoting Russian products abroad, including subsidies to the Russian Export Center, which acts as a government agent for providing subsidies to exporters, creating and promoting brands and regional sub-brands, developing a network of agribusiness attachés and other areas [5].

In December 2019, the rules for granting subsidies from the federal budget to remunerate for part of the costs associated with certification of agricultural products for export were approved. The exporter will be able to receive a subsidy for the costs incurred for the previous year before the conclusion of an agreement between the Russian Export Center and the Russian Ministry of Agriculture. The size of the subsidy depends on the volume of export products. It will be 50% of the actually incurred and documented costs in the case of transportation of agricultural products in an amount exceeding at least five times the amount of the requested subsidy and 90%, if the amount of products exceeds at least 10 times the requested subsidy.

Decree No. 512 of the Government of the Russian Federation dated April 26, 2019 makes it possible to obtain preferential short-term and investment loans to organizations and individual entrepreneurs for the implementation of a competitiveness improvement program aimed at increasing the amount of agricultural products.

To achieve the goals of increasing exports, regional authorities have developed programs with appropriate funding and set targets. Thus, the project titled “Export of agricultural products” of the Saratov region sets the task of increasing the supply of regional agricultural products up to 773 million US dollars by 2024. A project for the development of exports in Udmurtia assumes an increase to 49.1 million US dollars. Kurgan region plans an increase up to 49 million US, Moscow region plans an
increase up to 1.7 billion US dollars, Stavropol Territory plans an increase up to 1.093 billion US dollars, and Bashkoria plans an increase up to 230 million US dollars, etc.

3. Main provisions of export activities

The export activity of the enterprise is based on economic and financial independence, self-sufficiency, its own monetary and financial, and inventory and logistical capabilities, and it is based on commercial calculation. The effective export activity development of agricultural enterprises is possible in the case of combining production, financial and credit, and foreign trade resources, as well as information, marketing and educational activities into a single organizational and economic mechanism. The main important motive for the development of export activities for agricultural enterprises remains the desire to increase profits and improve their image on foreign market [6].

In order to analyze the current state of affairs and factors that create favorable conditions for the implementation and dynamic development of export potential, a survey using personal, telephone and online interviews was conducted of about 1,300 agricultural enterprises engaged in export and other participants in this activity from more than 50 regions. Most of the respondents represented the central part of Russia: 17% from Kaluga region, 16% from Moscow region, 15% from Belgorod region, 13% from Voronezh region, 3% from Nizhny Novgorod region, and 2% from Vladimir region, as well as 2% from the Stavropol Territory.

Most of the surveyed exporters have some experience (more than two years) of export activities or numerous supplies, 14% of respondents have 1-2 years of experience or few shipments, and 7% of respondents are novice exporters or have separate single supplies.

A significant part of the supplies falls on the neighboring countries: 16% on Kazakhstan, 11% on Belarus, and 6% on Ukraine. The rest of the countries occupy a smaller share: 6% China, and 4% Germany.

Food products are in significant demand (13.1%): confectionery, including ice cream; frozen fish and fillets; milk and dairy products; flour; meat and offal.

The survey revealed the following main constraints on the development of export activities:
- long terms for passing customs procedures;
- insufficient level of modernity of existing technologies for production and processing of products and poor financing of modernization;
- shortage of qualified personnel with the necessary competencies for the development of export activities of agricultural enterprises, etc.

The lack of highly qualified personnel is one of the serious problems hindering the development of exports. Agricultural enterprises are experiencing difficulties in the preparation and implementation of foreign trade contracts for sale and purchase taking into account the rules and regulations of the WTO, in particular, customs and tariff formalities, risk assessment and management, additional requirements for paperwork, etc. [6, 7].

An important and problematic moment in the promotion of agricultural products to foreign markets is weak branding, which is traditionally characteristic of goods with high added value, such as meat processing products, fish delicacies, etc., and the organization of exhibition events in potential importing countries.

A significant factor hindering the development of export activities is the difficulty of product certification. For example, the lack of necessary certificates due to the shortage of certification specialists hinders the coordination and expansion of sales to China, which is a capacious potential market for almost all types of raw materials and food [8].

The main areas of increasing the efficiency, and therefore profitability, of export activities of enterprises can be:
- increasing the efficiency of the enterprise itself through upgrading production and improving the quality and range of products;
- development of export activities of the enterprise and gradual integration of participants of foreign economic activity.

Sustainable algorithms for all processing chains starting from production through processing and formation of an assortment of goods with increased added value, logistics and customs-tariff measures
up to building sales chains subjected to digitalization can become a well-developed “export elevator” for mature streams of agricultural products, as well as a new assortment.

4. Export potential of agriculture of the Kaluga region

Currently, the agriculture of the Kaluga region is developing in accordance with the trends characteristic of the country and the task set for the industry to increase the export of products and food products. The region has achieved a high level of self-sufficiency in many food groups: up to 133.5% for milk, up to 111.7% for meat, and up to 106.1% for potatoes.

The region is one of the largest exporters of agricultural products in the Central Federal District. In the short and medium term, the main vectors of development will be a further focus on exports, the opening of new sales markets and the development of the national one, since this direction has become one of the priorities of state policy in the field of agriculture taking into account the growth in production amounts. A regional project titled “Export of agricultural products” is being implemented in the region within the framework of the national project titled “International cooperation and export”. The goal of the project is to triple the amount of exports of agricultural products in the region until 2025. The target indicator named “The amount of exports of agricultural products” for 2024 is planned in the amount of 72 million US dollars [9, 10].

The agribusiness of the Kaluga region is represented by 256 agricultural enterprises, of which more than 150 are involved in export activities. Among them are both exporters with proven sales channels and regular customers, such as Green Lines, Dial-K, Samaria Yammy, Russian Product, Partner-M, and novice exporters, such as PK Yablochko, Butch products, Voskhod Cooperative, and Kolos. They sold products worth more than 107 billion rubles in 2019. Industrial production index was 110.0% [11].

The total amount of funding for the activities of the regional export development project amounted to 9.33 million rubles in 2019, of which 8.96 million were allocated from the federal budget and 0.37 million were allocated from the regional budget.

An important result of the project implementation was the involvement of about 1,400 hectares of withdrawn agricultural land into turnover for the production of export-oriented agricultural products, of which about a thousand was involved in 2019.

The main indicator of the program implementation is the amount of sold export products in dollar terms (Table 1). The indicator exceeded 52.1 million US dollars (130.3% of the target) in 2019.

Table 1. Indicators of the implementation of the project titled “Export of agricultural products” of the Kaluga region

| Item                          | Export size [USD million] | Period [years] |
|-------------------------------|----------------------------|----------------|
|                               | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| 1 Agricultural products, including: | 23.9 | 38.4 | 40.0 | 42.0 | 45.0 | 50.0 | 59.0 | 72.0 |
| 1.1 Fat and oil industry       | 0.5  | 0.1  | 0.2  | 0.1  | 0.1  | 0.2  | 0.2  | 0.2  |
| 1.2 Grains                     | 0.0  | 0.3  | 0.4  | 0.3  | 0.3  | 0.5  | 0.8  | 1.5  |
| 1.3 Fish and seafood           | 1.1  | 1.3  | 1.0  | 1.4  | 1.5  | 1.6  | 1.8  | 2.0  |
| 1.4 Meat and dairy             | 0.8  | 0.9  | 0.4  | 0.9  | 1.0  | 1.7  | 5.6  | 12.7 |
| 1.5 Food and processing industry | 11.9 | 22.7 | 32.5 | 25.0 | 26.8 | 29.2 | 32.1 | 35.3 |
| 1.6 Other agricultural products | 9.6  | 13.1 | 17.6 | 14.3 | 15.3 | 16.8 | 18.5 | 20.3 |

The analysis showed that a decisive role in the dynamic development of export potential was played by:

− deepening of export specialization, as, for example, at Ptitsefabrika in Belousovo, which supplies about 350,000 metric tons of poultry meat to more than 30 countries;
− expansion of geography, currently, the following main strategic markets have been formed: the CIS countries, China, the countries of the Persian Gulf, North Africa and the Middle East, East and Southeast Asia, and the Pacific coast;
− an increase in the range of export products of agricultural enterprises, a growing demand for
buckwheat, meat offal, pigweed (*Epilobium angustifolium*), frozen semi-finished products, vegetables, fruits, berries and forest mushrooms; apples, fresh water, turkey meat are promising.

The analysis of Nestle Russia, which includes more than 130 enterprises (manufacturers, logistics, consulting and other specialized companies), made it possible to identify the main obstacles to increase the efficiency of export activities, and to formulate tasks and options for their solution (Table 2).

**Table 2.** Key obstacles to efficiency gains and options to address them.

| Challenges | Solutions |
|------------|-----------|
| **Improving the efficiency of an agricultural enterprise** | **Solutions** |
| Reduction in the production costs | - Optimization of performance capabilities through industrial cooperation  
- Growth of personnel competencies and labor productivity due to increased specialization  
- Growth of financial potential due to access to financial resources of partners  
- Increasing the competitiveness of products due to its innovative renewal with the participation of partners performing research and development |
| Improving manageability | - Development and implementation of a joint strategy with partners  
- Centralization of a number of management functions through digitalization (information, accounting, marketing, foreign trade, etc. operations) |
| Improving export efficiency | - Cluster and network association of sales organizations  
- Organization of a sales network in foreign markets  
- Cooperation and concentration of sales processes within partnerships |
| Reducing risks | - In the production of raw materials, the purchase of raw materials, equipment, feed, etc.  
- When conducting sales operations in foreign markets |
| **Development of export activities of an agricultural enterprise** | **Solutions** |
| Increasing product competitiveness | - Establishing business relationships with organizations conducting research and development work  
- Organization of partnerships with innovative organizations  
- Attracting investments from partners of cluster and network integration |
| Production modernization | - Industrial cooperation  
- Involvement in the turnover of innovative developments of partners  
- Attraction of joint funding |
| Improvements in foreign trade activities | Creation of an extensive network for service and sales of products in foreign markets based on the optimization of the corresponding resources of partners |

One of the most optimal solutions can be a model of interaction of all participants interested in development based on the principle of cluster and network association, within which the entire list of designated challenges can be solved.

This form of merger has shown high efficiency, since it has been implemented in such successful organizations as Nestle Russia LLC, Green Lines LLC, Samaria Yammi LLC, Partner-M LLC, and SENTOS Central Logistics Rus LLC.

With a cluster-network association, the process of improvement of the management system of production and logistics processes through digitalization is inevitable (Marinchenko, 2016). The largest integrated associations of the country, such as Miratorg JSC, Rusagro Group, Agro-Belogorye Group, United Confectioners Holding, have passed this stage first: 19% in all of the total number of agricultural organizations that have costs for digitalization more than 100 million USD annually; 46% of them are at the “transformation stage” and 39% of them have not entered the stage of “necessity” of transformation and are not dealing with this issue (Voytyuk, 2019; Marinchenko, 2019).

According to the Ministry of Agriculture of the Kaluga Region, thanks to the use of modern IT solutions for 10 years by 2018, the average annual growth of gross output in comparable prices in the
region as a whole amounted to 5.1%, that in agricultural enterprises amounted to 10%, and 30% in farms. Labor productivity in agricultural enterprises of the Kaluga region increased by 26% over the previous four years and amounted to 2.4 million rubles per one average annual employee in 2018.

Using the example of Nestle Russia and Green Lines, a logical model for the functioning of the digital agribusiness platform is proposed in the Kaluga Region, which can ensure the implementation of all areas (Figure 1) [6, 12].

Thus, a digital platform is a set of software and hardware tools, rules and regulations for their use, as well as models of behavior and interaction of stakeholders, i.e. those who are actively involved in a project or business, those whose interests may be affected by the success or failure of the project, as well as those who can themselves influence the project by virtue of their position or authority.

One of the necessary organizational opportunities for the development of export activities of agricultural enterprises themselves is determined by the diversification of production with the expansion of the range and the reorientation of the focus to raw materials toward high-margin products, the deepening of sales markets and the development of new ones, the development of new types of production in order to increase production efficiency, obtain economic benefits, and prevent bankruptcy [13].

The great potential for export growth lies in increasing the range of new export products of agricultural enterprises of the Kaluga region, which requires resolving the issue of certification that includes a set of measures to assess the compliance of these products with the requirements of foreign markets, as well as compliance with the requirements of foreign trade contracts, including voluntary certification with the purpose of obtaining “halal” or “kosher” certificates: veterinary and sanitary and phytosanitary measures; transportation; storage; testing and disposal of test samples [14, 15].

This is a set of procedures that requires the qualifications of personnel. Currently, there is a shortage of personnel, as well as the efficiency of export activities of agricultural enterprises in many cases and largely depends on the skillful use of export marketing.

The scenario options for the development of export activities of agricultural enterprises in the Kaluga region have been developed using the results of research on the export activity of agricultural enterprises and surveys and taking into account the proposed model of cluster-network associations, (Table 3).
### Table 3. Basic scenarios for the development of export activities in the Kaluga region.

| Scenario assumptions          | Current situation                   | Forecast Realistic | Pessimistic | Optimistic                  |
|------------------------------|-------------------------------------|--------------------|-------------|-----------------------------|
| Availability of own financial resources | Availability is sufficient, trend of stability | Growth with dynamics of more than 14.5% annually | Stagnation, negative dynamics | Growth of resources over 14.5% to 25% annually |
| Availability of effective sales techniques | Ensures the retention of a permanent client base on mutually beneficial terms | Retention of the existing customer base | Does not ensure customer retention: irrelevant or ineffective; competitors’ methods are more relevant or effective | Always up-to-date techniques: expanding the client base, covering new markets, increasing the result of transactions; techniques are more effective than competitors |
| Availability of sufficient raw materials | Sufficient for efficient uninterrupted export | Sufficient for efficient uninterrupted export | Decreases due to downturn in investment or production | Growing steadily due to intensive investment and innovation activities, rising costs for research |

Applying a simplified version of the expert assessment method, we determined the likelihood of scenarios: the most probable is a realistic forecast, an optimistic forecast is unlikely, but according to some scenario assumptions, the probability increases.

### 5. Conclusion

With the transition to an export-oriented development model, export activities are defined by the government as a driver for the development of the agricultural sector. Its development is possible with the transition of production to an innovative basis, which will increase the competitiveness of products, their effective promotion in foreign markets. The focus on export activities allows enterprises to significantly increase production amounts, increase the number of jobs and replenish regional and federal budgets.

The study showed that state support measures both at the federal and regional levels do not solve all the problems of export activities. However, at the same time, manufacturers, while improving agricultural export activities, pay special attention to state support aimed at ensuring the effective implementation of the existing export potential, increasing it, developing the range and scale of production, as well as expanding the geography of exports.

The Kaluga region is one of the largest exporters of agricultural products to the Central Federal District, therefore, the analysis of the state, identification of obstacles to the development of export activities and modeling of ways to eliminate them were carried out using the example of regional enterprises. The main exporters of the region are large enterprises, such as Nestle Russia LLC, Green Lines LLC, Samaria Yammi LLC, which export more than 2/3 of the total agricultural export of the region.

According to the survey, the development of export activities of agricultural enterprises is facilitated by the active policy of the region, the deepening of the export specialization of many enterprises, the expansion of the geography of supplies and an increase in the range of new products.

As a result of the study, a model of cluster-network associations with the maximum digitalization of all technological, agrological, customs-tariff and other processes was proposed. Due to the combination of cluster and network properties, clusters specialize in production, high-tech processing of products and foreign trade activities while ensuring the implementation of a full cycle of marketing work and advertising of products in the foreign market.
Diversification of production, simplification of the procedure for standardization of agricultural products, implementation of effective marketing can play a large role in increasing the organizational capabilities of export activities of agricultural enterprises.

The planned indicators for the growth of exports of agricultural products in the Kaluga region are more than realistic. The existing production facilities of the industry have sufficient potential for the production of competitive products and their successful sale on the international market. The systematic technological modernization of agricultural enterprises, their high innovative activity in order to increase competitiveness, as well as state program support for the export of agricultural products will contribute to the growth of product exports. The formed trends with a pronounced synergistic effect, such as reforming the structure of the agribusiness and development of integrated structures with intra- and inter-sectoral integration of manufacturers, processors, marketing organizations, scientific and educational institutions, stimulate the process.

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