Food security parameters of the agro-industrial complex in Russia

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Abstract. The analysis of the development of the agro-industrial complex (AIC) in Russia is determined specified parameters in the current legislation that establishes the features of state programs intended for the agricultural system and standards for ensuring the food security of the Russian Federation in relations with the international economic community. The article suggests an analytical review of the results of state programs implemented to support the development of the Russian agro-industrial complex following the strategic directions of increasing the food security, reducing the import dependence of the national economy, and transition to the Industry 4.0 philosophy. The listed key aspects have been systematically pursued over several years in all regions of Russia with varying degrees of success. The article highlights main parameters of the AIC development according to the key criteria, such as crop production, animal husbandry, technological modernization, land reclamation, and resource support.

1. Introduction

The dynamics of the AIC development is determined by the State Program for the Development of Agriculture and Regulation of markets of agricultural produce, raw products and food, approved by the Decree of the Government of the Russian Federation of July 14, 2012 No. 717. Under this program, the measures were established for the period from 2013 to 2025. A number of necessary conditions and parameters for the AIC functioning in Russia are contained in the Doctrine of Food Security of the Russian Federation.

Within the framework of the envisaged measures for the AIC development, it is necessary to analyze the ratio between planned and actual indices of financing and economic state support.

Moreover, it is necessary to analyze the dynamics of some key AIC structural elements over five years, namely, from 2015 to 2019. In the system of planned measures of the State Program, two key directions that determine the most important aspects of increasing the productivity of the agro-industrial complex in Russia should be taken into account. These areas are “Development of the AIC branches” and “Providing conditions for the AIC development.” The first direction involves implementing a number of projects. They are:
1) creation of proper factors that ensure accelerated import substitution of the main agricultural products, raw materials, and food for the further development of AIC branches. The following should be defined as the given industries and implemented activities:

- a set of conditions for using cultivated areas for various agricultural crops in farms of all categories;
- structural elements of production of livestock and poultry for slaughter in terms of the live weight in farms of all categories;
- production indicators and functioning parameters of the beef cattle breeding system.

2) development of conditions for effective technical and technological AIC modernization.

3) building a modern system of farm performance, development of rural cooperation entities, and increasing the efficiency of technologies and natural and economic factors in order to further modernize various small forms of agricultural production.

In the structure of the second direction, one of the key projects related to the comprehensive support for the reclamation complex in Russia should also be indicated.

The food security doctrine of the Russian Federation also defines a number of parameters for creating and maintaining a system of food sovereignty as the level of provision due to the capacities and components of the Russian agro-industrial complex at the required level in comparison with agrarian relations abroad.

In accordance with the AIC parameters under the aforementioned State Program, it is necessary to show the nature of their implementation over five years. The analysis is based on the relevant National Reports that were prepared in the Ministry of Agriculture of the Russian Federation and approved by orders of the RF Government.

2. Assessment of the key parameters of the AIC development in Russia

The first key parameter of the AIC development in the Russian Federation is the sown area as a natural basis for the cultivation of various agricultural crops that constitute the food basis of the human life and fodder base for animal husbandry. The values of the cultivated areas should be analyzed in a generalized format for a five-year period; the dynamics is presented in table 1 [1].

| Crop                          | 2015  | 2016  | 2017  | 2018  | 2019  | Average value for the specified period |
|-------------------------------|-------|-------|-------|-------|-------|--------------------------------------|
| Total cropped land            | 78634.8 | 79311.9 | 80048.7 | 79633.7 | 79880.5 | 79501.9 |
| Cereals and legumes           | 46608.7 | 47099.8 | 47705.4 | 46339.4 | 46660.4 | 46822.7 |
| Sunflower for grain           | 7013.0 | 7606.8 | 7994.0 | 8160.1 | 8583.6 | 7871.5 |
| Soy                           | 2130.7 | 2237.2 | 2635.8 | 2949.2 | 3078.6 | 2606.3 |
| Rapeseed (winter and spring)  | 1021.6 | 979.6  | 1005.4 | 1576.3 | 1547.5 | 1226.1 |
| Sugar beet                    | 1020.7 | 1106.8 | 1198.1 | 1126.7 | 1144.9 | 1119.6 |
| Fiber flax                    | 52.6  | 48.5   | 47.5   | 44.8   | 49.7   | 48.6   |
| Potatoes                      | 1561.7 | 1441.3 | 1349.5 | 1324.6 | 1254.9 | 1386.4 |
| Vegetables                    | 563.1 | 551.1  | 534.6  | 525.9  | 517.6  | 538.5  |
| Fodder crops                  | 16992.8 | 16424.9 | 16342.3 | 16123.8 | 15417.0 | 16260.2 |

Table 1 contains various indicators of available acreage used for growing a number of these crops and shows a slight increase in cereals and legume crops, sunflower, and soybeans over five years and a
decrease in vegetables, potatoes, and especially forage crops. For the specified period, the average value was calculated for each of the specified parameters by summing each numerical indicator and dividing it by the number of years considered.

In addition, it was necessary to take into account and analyze functioning of various forms of agricultural organizations (AO) and individual (peasant) farms in terms of the used sown areas exemplified by two varieties of crops (table 2) [1].

**Table 2.** Sown areas under potatoes and vegetables in agricultural organizations and farms, thousand hectares.

| Plant culture | 2015    | 2016    | 2017    | 2018    | 2019    | Average value for the specified period |
|---------------|---------|---------|---------|---------|---------|--------------------------------------|
| Potato        | 360.6   | 344.6   | 300.2   | 310.7   | 305.3   | 324.3                                |
| Vegetables    | 187.2   | 187.8   | 182.5   | 180.7   | 188.8   | 185.4                                |

Table 2 reveals two trends that determine a slight increase in vegetables’ indices of various economic entities and a downward trend in potatoes when comparing indices for 2015 and 2019. Average values, reflecting the overall performance, were also calculated for the period analyzed.

The next parameter of the AIC development in the Russian Federation is the system for raising live stock and poultry for slaughter considered with respect to functioning of agricultural entities [2, 3]. In this regard, it was necessary to indicate values that reflect the economic activity of the population and individual farm entrepreneurship (table 3).

**Table 3.** Production of livestock and poultry for slaughter in terms of the live weight by categories of farms, thousand tons.

|                      | 2015    | 2016    | 2017    | 2018    | 2019    | Average value for the specified period |
|----------------------|---------|---------|---------|---------|---------|--------------------------------------|
| Farms of all categories | 13397.0 | 13896.0 | 14 513.4 | 14 880.2 | 15 163.9 | 14370.1                             |
| cattle               | 2820.1  | 2777.2  | 2738.1  | 2798.4  | 2821.2  | 2791.0                              |
| pigs                 | 3951.4  | 4329.1  | 4549.9  | 4797.1  | 5042.4  | 4534.0                              |
| sheep and goats      | 454.2   | 465.8   | 475.1   | 482.9   | 462.2   | 468.0                               |
| poultry              | 6039.2  | 6190.7  | 6618.3  | 6670.5  | 6707.5  | 6445.2                              |
| other types of livestock | 132.1  | 133.2   | 132.0   | 131.3   | 130.7   | 131.9                               |
| agricultural organizations, total | 9587.7  | 10162.4 | 10865.8 | 11288.0 | 11626.0 | 10705.9                            |
| Households           | 333.6   | 3246.2  | 3134.7  | 3050.1  | 2980.5  | 2549.0                              |
| Farms, incl. individual entrepreneurs | 473.3   | 487.4   | 512.9   | 542.1   | 557.4   | 417.1                               |

Table 3 demonstrates an increase in the overall performance of all farm categories, as well as in the activities of farmers and individual entrepreneurs. In terms of certain categories of livestock, a relative increase is observed in rearing pigs, with the general economic activity of the population being decreased...
over the past four years. The average values that are comparable with the achievements for 2017 and 2018 were determined for the specified period.

In the structure of animal husbandry, the beef cattle breeding deserves special attention. In this case, two main aspects are to be analyzed: 1) marketable livestock of beef cows as one of the key categories of cattle; and 2) beef cattle for slaughter (table 4) [4].

Table 4. Development of beef cattle breeding in the Russian Federation.

| Parameter | 2015 | 2016 | 2017 | 2018 | 2019 | Average value for the specified period |
|-----------|------|------|------|------|------|---------------------------------------|
| Marketable livestock of cows of specialized beef breeds, thousand head | 719.4 | 719.4 | 827.1 | 886.9 | 959.97 | 822.5 |
| Production for slaughter (in live weight) of beef and crossbred livestock, thousand tons | 327.7 | 327.7 | 339.0 | 359.7 | 411.57 | 353.1 |

The data in table 4 indicate a slight positive growth trend. In particular, the indices for 2019 were the highest in the last five years. The average values for the period under review correspond to the achievements for the period of 2017-2018.

To determine further directions of agricultural production, it is necessary to consider the issue of various forms of state support for peasant farms and small businesses in the agro-industrial complex and agricultural cooperation. The combination of methods and means of various forms of economic activity is conditioned by the technical base and qualitative and quantitative characteristics of various types of machines used in various branches of agricultural production.

These parameters are considered in a special subprogram that is implemented in the agro-industrial complex and determines its technical modernization (table 5) [4].

Table 5. Achieved targets of the subprogram “Technical modernization of the agro-industrial complex,” units.

| Indicators | 2015 | 2016 | 2017 | 2018 | 2019 | Average value for the specified period |
|------------|------|------|------|------|------|---------------------------------------|
| Units of new agricultural machinery sold by manufacturers to agricultural commodity producers | 6405.0 | 17483.0 | 26366.0 | 17639.0 | 24137.0 | 18406.0 |
| including: | | | | | | |
| combine harvesters | 2195.0 | 3120.0 | 6658.0 | 3428.0 | 3208.0 | 3721.8 |
| forage harvesters | 106.0 | 260.0 | 322.0 | 266.0 | 179.0 | 226.6 |
| tractors | 979.0 | 1092.0 | 1531.0 | 1225.0 | 1990.0 | 1363.4 |
| other types of equipment | 3125.0 | 13011.0 | 17855.0 | 12760.0 | 18760.0 | 13102.2 |

Table 5 shows the annual values of the used total equipment that was sold in the structure of sales and purchase relations between the manufacturers (enterprises and organizations, operating in the field of mechanical engineering and repair of agricultural equipment) and various categories of farms and small businesses in the agro-industrial complex. During the period under study, this value increased,
with the average value proving a positive trend in this area. There were also considered indices of certain types of equipment that showed an ambiguous picture, since the number of forage harvesters decreased and the number of grain harvesters and tractors increased over the past two years [5]. The situation in the number of tractors was very unstable, i.e. we can see an increase over the period of 2015-2017 that was replaced by a decrease in 2018 with a subsequent increase.

The issue of land reclamation for agricultural purposes, coming from various sources of the budgetary system of Russia, should be especially highlighted. This AIC sphere is supported both at the federal and regional levels, as well as at the expense of special extra-budgetary sources (table 6).

Table 6. Resource provision of the subprogram “Development of land reclamation of agricultural land in Russia,” mln. RUB.

| Name                                      | 2015      | 2016      | 2017      | 2018      | 2019      | Average value for the specified period |
|-------------------------------------------|-----------|-----------|-----------|-----------|-----------|----------------------------------------|
| Total                                      | 17477.0   | 16006.0   | 23994.5   | 20532.9   | 24429.5   | 20487.9                                |
| Including:                                |           |           |           |           |           |                                        |
|   federal budget                          | 7835.0    | 7338.0    | 11149.5   | 11225.3   | 13175.7   | 10144.7                                |
|   budgets of RF subjects                  | 1721.0    | 1077.0    | 2116.2    | 918.2     | 1245.0    | 1415.5                                 |
|   extrabudgetary sources                  | 7921.0    | 7591.0    | 10728.8   | 8389.3    | 10008.8   | 8927.8                                 |

Table 6 shows the financing indices that demonstrate a fairly stable growth in federal and extra-budgetary investments. Financing of individual constituent entities of the Russian Federation was noted for ambiguous results, namely, the financing decreased in 2016 and 2018 and grew in 2019, with the maximum value being registered in 2017.

The results obtained in various spheres of the Russian agro-industrial complex, the specifics of state support for agricultural activities, and financing are reflected in the real volume of financial and resource support for various projects of the State Program for the Development of Agriculture and Regulation of Markets for Agricultural produce, raw products and food. These indicators are manifested in the direct cash execution of financing the activities of the program (table 7).

Table 7. Resource provision for the implementation of the State Program (cash execution, million RUB).

| Name of subprograms, federal target programs, main events, main administrators of budget funds | 2015      | 2016      | 2017      | 2018      | 2019      | Average value for the specified period |
|------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|----------------------------------------|
| Development of the agro-industrial complex providing accelerated import substitution of the main types of agricultural products, raw materials and food | 70075.0   | 58840.1   | 58326.1   | 64095.3   | 59655.5   | 62198.4                                |
| Technical modernization of the agro-industrial complex | 5264.9    | 11162.0   | 15948.8   | 14000.0   | 19481.8   | 13171.5                                |
| Creation of a support system for farmers and development of rural cooperation | 11807.6   | 10195.3   | 3896.0    | 3755.0    | 5354.0    | 7001.5                                 |
| Development of a reclamation complex | 7835.1    | 7338.6    | 11149.5   | 11225.4   | 13175.7   | 10144.9                                |

Table 7 shows the growth in funding for various areas of technical AIC modernization with a certain decrease in creating and developing a support system for farmers and development of rural cooperation...
(with a minimum value in 2018 with a further increase in 2019). There is a steady growth in production of various products and raw materials [6, 7], with the reclamation complex also growing and being maximum in 2019.

3. Conclusions
The analysis of the parameters for the AIC development and trends identified in the production of certain types of agricultural products in Russia and abroad revealed a need for a comprehensive accounting and factors that determine work of the specified production complex. These factors are:

- natural conditions that contribute to the development of various types of agricultural crops (for example, the required level of soil moisture due to rains in certain areas);
- artificial and economic conditions that are necessary for the effective crop production and were created in agriculture due to amelioration and fertilization of sown areas, as well as in animal husbandry by protecting livestock from diseases and ensuring the necessary level of feeding;
- the effectiveness of various forms of public-private partnership in jointly solving the problems of further AIC modernization and increasing the productivity in certain sectors of agriculture. This serves as the basis for the development of effective management decisions that take into account the specifics of the agro-industrial complex, state policy in the agricultural sector, and interests of private business entities operating in the structure of the agro-industrial complex and society at the level of individual states and international relations
- the situation in the system of world production-consumer and finance-resource processes that determine the characteristics of the economic situations of individual states and the world community, and, therefore, determine the specifics of the economic and financial support for the agro-industrial complex.

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