Integrated assessment of food security in agricultural region (based on the Krasnodar territory)

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Abstract. The article considers the concept, essential characteristics and key factors of food security at different structural levels of organization in the global economic system. A comprehensive assessment of the self-sufficiency level in food resources is carried out using the materials of the Krasnodar Territory with agrarian orientation, located in the Southern Federal District. The analysis has resulted in the formation of recommendations to improve the regional agro-food policy in terms of providing the population with food.

Keywords: food security, regional agro-food complex, sustainability of socio-economic development, food resources, improving the quality of living of the population, development of the agricultural sector, integrated assessment.

1. Introduction

In the context of macroeconomic and geopolitical changes in modern Russia, it is especially relevant to solve the problems of increasing the efficiency of own agricultural production and increasing the volume of agricultural products, which contributes ensuring of food security at all levels.

The concept and essential characteristics of food security from an economic perspective have been addressed in academic research from various points of view and range from the individual to the global level as a priority component of global economic security (Figure 1).

The concept of food security is very comprehensive, grouping together various studies, concepts and theories [1-10] that have been developed for achieving food security.

Considering the definition of food security as an indicator of state welfare, it refers to the food provision of adequate quality and quantity to the population, and the creation of conditions to maintain consumption at recommended levels.
The Federal Law «On Food Security of the Russian Federation» [11] defines food security as a state of the economy that ensures food independence of the country and guarantees the availability of food for the entire population in the quantities necessary for an active and healthy life. If about 80% of the products consumed by the population are home-grown products, the level of food security is ensured.

The key drivers of food security at different structural levels of the organization in the global economic system are shown in Figure 2.

| Global meta-level | Macro level | Meso-level |
|-------------------|-------------|------------|
| • The volatility of the global food market; | • The underdevelopment of most national agri-food market institutes; | • The state and strategic focus of agriholdings and other regional market players that ensure food security and contribute to the sustainability of the regional food complex; |
| • Insufficient protection of property relations in the regional food market to activate the investment process; | • The inertia of state policy in the agricultural sector; | • Institutional characteristics of regional food market actors; |
| • Development of financial and investment infrastructure in the context of the food system and food security. | • State support for the national food sector for the development of the food system; | • Regional economic policy; |
| | • The state of domestic agri-food market institutions. | • Production factors and the development of regional infrastructure; |
| | | • Bureaucratic hurdles and transaction costs; |
| | | • Entrepreneurial activity of agribusiness entities in the region. |

Figure 2. Key factors for food security at different structural levels of the organization in the global economic system
Generalization of the results of the system analysis [12-18] makes it possible to identify the current strategy for the development of the regional agro-food complex, which is designed to solve the problems of reproduction processes in the agricultural sector, which influences on the degree of regional food security and sustainability of territorial socio-economic development.

2. Methodology
To solve the problems of regional self-sufficiency in food resources and to assess the level of food security in Russia we used the following methods: analysis and synthesis, data grouping, logical synthesis, comparative, expert, economic and statistical analysis, system and comprehensive approaches that provide a basis for a comprehensive study of the analyzed problems and ensure the reliability of the results.

The information base of the study is represented by the official data of the Federal (Rosstat) [19, 20] and regional (Krasnodarstat) [21, 22] services of the state statistics.

3. Results and discussion.
The multidimensional nature of the studied processes is accompanied by the impact on regional food security of large variety of factors (Figure 3).

Given the highlighted levels of food security, Altukhov A.I., Vermel D.F., Uskova T.V. [23] focused on the lack of unified system of indicators to analyze and assess food security at different levels, because at each level there is a specific management entity with its own functions, powers, and the meso-level has its own internal capabilities and reserves.

Furthermore, we consider to pay attention to agricultural policy, considering the fact that many agricultural policies are implemented with the stated objective of improving food security. In many countries, market interventions in the agricultural sector (e.g. subsidies or export restrictions) are often aimed at ensuring food security through self-sufficiency in food production. However, such policies often result in higher prices for staple foods, with a negative impact on household food security.
Many support measures [24-28] not only fail to achieve their objective, but may also divert public resources from actions that could tangibly improve food security. This includes efforts to create more favorable conditions for improving agricultural productivity or developing agricultural innovation systems to stimulate productivity growth. Other investments that contribute to improving food production and availability include rural infrastructure and storage facilities, as well as appropriate training and advisory services. Strong and effective systems to improve resilience and risk management capacity in agricultural production are also critical in order to improve food security at national and global levels.

For a large number of constituent entities of the Russian Federation, agriculture is a priority sector of the regional economy, ensuring economic growth and improving the quality and living of the local population. The development of the agricultural sector directly affects the level of food security.

On this basis, it is necessary to conduct a comprehensive assessment of the level of regional self-sufficiency in food resources, which will be carried out on the basis of the Krasnodar territory with agricultural orientation in the Southern Federal District.

An integral part of food security is economic independence in the food sector of the region, the dynamics of the criteria of which are illustrated in Figure 4.

Many researchers rely on the degree of regional self-sufficiency in basic foodstuffs in determining economic security in the food sector.

The level of self-sufficiency in all food groups in the Krasnodar Territory tends to increase, except fruit and vegetables.

The proportion of imported goods such as eggs, vegetables and potatoes is increasing. Additionally, it should be noted that in 2019 food imports declined to 78.2%, 52.4% and 66.1% for fruit, milk and dairy products, and meat and meat products, respectively.

![Graphs showing self-sufficiency level and share of imports for Potatoes and Meat and Meat Products from 2017 to 2019 with data points for each year.](image)
Figure 4. Assessment of food independence in the Krasnodar Territory [21, 22, 29]

A decline in purchasing power of the Krasnodar Territory population is observed for such products as frozen fish (except for salmon species), 2.5-3.2% milk, chicken eggs, wheat flour, and polished rice. All other foodstuffs are characterized by the increase (Table 1).
Table 1. Purchasing power of the population, kg per month

| Indicators                                      | 2017   | 2018   | 2019   | Growth rate, % |
|------------------------------------------------|--------|--------|--------|----------------|
| Beef (except boneless meat)                     | 107,4  | 109,3  | 109,3  | 1,8            |
| Frozen fish (excluding salmon)                  | 173,4  | 166,8  | 154,7  | -10,8          |
| Sunflower oil                                   | 323,7  | 343,1  | 354,0  | 9,4            |
| Milk 2.5-3.2% fat content                       | 668,2  | 666,8  | 662,4  | -0,87          |
| Chicken eggs, 10 pcs.                           | 6205,3 | 6110,6 | 5766,3 | -7,07          |
| Sugar                                           | 743,8  | 866,5  | 869,7  | 16,93          |
| Wheat flour                                     | 1087,0 | 1105,9 | 989,1  | -9,01          |
| Rice polished                                   | 574,9  | 546,1  | 517,4  | -10,00         |
| Potatoes                                        | 1101,0 | 1109,9 | 1133,7 | 2,97           |

The main indicators of food production and consumption in the Krasnodar Region [21, 22] are summarised in Table 2, and the necessary amount of consumption in accordance with rational norms is illustrated in Figure 5.

Table 2. Food production and consumption

| Indicators                                      | 2016-2017 | 2017-2018 | 2018-2019 |
|------------------------------------------------|-----------|-----------|-----------|
| Production in farms of all categories, thousand tonnes |
| grain                                           | 13844,8   | 14351     | 15967,1   |
| sugar beet                                      | 8581,2    | 10330,65  | 10892,85  |
| sunflower seed                                  | 1044,6    | 1084,3    | 1099,35   |
| soya beans                                      | 286,2     | 326,05    | 337,8     |
| potatoes                                        | 619,05    | 625,7     | 630,55    |
| Production in farms of all categories, thousand tonnes |
| vegetables                                      | 871       | 878,15    | 881,5     |
| livestock and poultry for slaughter             | 363,05    | 368,5     | 374,65    |
| milk                                            | 1342,3    | 1368,1    | 1373,6    |
| Eggs, mln.                                      | 1632,8    | 1761,1    | 1828,05   |
Based on a comparative analysis of production volumes and recommended consumption volumes, it can be concluded that almost all product groups are produced in sufficient quantities in the region. The indicators for meat products and milk and dairy products are falling behind the recommended norms. Accordingly, their insufficient production must be compensated for by imports of these products.

Most of the indicators are within their permissible values, which characterize the state of regional food security as rather stable and within the norm. However, it is necessary to pay attention to negative aspects. For example, the gap between personal incomes, low real incomes and rather high food prices is significant, which reduces the food availability and increases social dissatisfaction.

4. Conclusion.
The improvement of the regional agro-food policy should become a priority and a basic task in terms of providing the population with food. The solution should be accompanied by food import substitution, state support of agricultural enterprises, integration processes in agriculture, revision and adjustment of the current doctrine of food security.

As strategic directions, it is necessary to involve:
- attracting labor resources to the regional agro-industrial complex, which improves the social situation of the population;
- increase and availability of incentives for local producers, in order to support small and medium agribusinesses;
- creating effective mechanisms to regulate food markets;
- renewal and modernization of agricultural machinery, and implementation of innovations;
- increasing the level of competitiveness of locally produced goods by improving the quality of products;
- increasing investment activity in agricultural production;
- promotion of integration and cooperation processes in the production and processing sectors, as well as in the marketing of agricultural products, raw materials and foodstuffs;
- intensive development of market infrastructure.

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