Assessment of food security in the region by example
Kabardino-Balkarian Republic

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Abstract. The article analyzes the food security of the region on the example of the Kabardino-Balkarian Republic, according to the chosen method. [1] A group of indicators on the region's self-sufficiency in food products, as well as the levels of their physical and economic accessibility for the population of the republic, are considered. According to the calculations, the food security of the Kabardino-Balkarian Republic is estimated at 7 points out of 10 possible, which corresponds to the acceptable value. Measures aimed at increasing the level of food security of the analyzed region are proposed.

1. Introduction
The problem of ensuring food security is one of the priority state tasks facing the government of any country at the present time.

Ensuring food security is a solution to issues of a socio-economic nature associated with filling the national market with quality food products, in the required volume, sufficient for the entire population of the country.

The main parameters used in assessing food security at the national level are defined in the Food Security Doctrine of January 21, 2020, according to which the national market should be provided with domestically produced products from 60% to 95% for the main types of products. [2]

2. Materials and Methods
Research and analysis of regional food security is impossible without the use of theoretical and practical research methods, in particular, analysis and synthesis of existing literary sources and works of domestic economists in this area of research. To analyze the food security of the Kabardino-Balkarian Republic, information resources and databases of state statistical bodies were used

The work used a monographic research method, as well as such methods of cognition as: analysis, synthesis, generalization, the method of economic comparison.

3. Results and Discussion
The problems of regional agri-food security are reflected in the works of many economists, which confirms the relevance of this research area, however, it should be noted that currently there is no single methodological approach for determining the level of food security in the region, taking into account territorial characteristics.
In this direction, there are various developments of scientists-economists who, when assessing regional food security, determine: indicators characterizing the state of the regional agro-industrial complex as a whole; the level of food consumption and compliance with the recommended consumption standards; living standards in the region, purchasing power, incomes of the population and other socio-economic indicators.

In particular, such scientists as A.I. Altukhov [3, 4], N.A. Kulagin [5], V.I. Nazarenko [6], M.G. Leshcheva [7], A.A. Zolotarev [8], D.B. Epstein [9], T.M. Yarkova [10] and others.

In general, some general methodological approaches to assessing food security at the regional level are noted in the works of D.G. Olovyannikov, [11] E.N. Antamoshkina, G.V. Timofeeva, [1] L.N. Shapkina [12, 13], since all these authors in their works assess the level of physical and economic accessibility of food to one degree or another.

Having studied the existing methods for assessing the security of the region, to determine and assess the food security of the Kabardino-Balkarian Republic, we chose the method developed by E.N. Antamoshkina and Timofeeva G. The. [one]. Advantages of this technique include: simplicity of calculations; availability of indicators required for calculations; commensurability of the final values, expressed in points, to compare the results across the regions of Russia. According to the chosen methodology, it is supposed to calculate certain groups of indicators:

1. The level of food independence (self-sufficiency) of the region, where the calculation is required:
   - the coefficient of self-sufficiency.

2. The level of satisfaction of the physiological needs of the population in basic foodstuffs, it is necessary to calculate:
   - coefficient of actual food consumption

3. The level of economic affordability of food assumes to assess:
   - poverty rate;
   - consumption coefficient;
   - Ginny coefficient.

The indicators of the third group do not require calculations, since they are calculated by state statistics bodies.

The calculated values are interpreted into points, which will determine the indicator of regional food security, expressed in points. This methodology, based on indicators of the economic and physical availability of food, allows for a simple and prompt calculation, the final value of which, expressed in points, allows for a comparative analysis by regions of the country.

A more detailed algorithm for calculating indicators, according to the chosen methodology, as well as the procedure for interpreting the calculated values into points, is presented in Table 1.

**Table 1. System of indicators and evaluation criteria food security of the region.**

| Indicator | The formula for calculating the indicator | Indicator score |
|-----------|-------------------------------------------|----------------|
| Criterion 1. Level of food independence (self-sufficiency) of the region | | |
| 1. Coefficient of self-sufficiency | $K_s = \frac{q}{n \times q_p}$ where $K_s$ - coefficient of self-sufficiency; $q$ – actual volumes of food production in the region; $n$ - population size in the region; | $K_s \leq 0.5$ low value $0.5 < K_s \leq 0.9$ permissible value 1 |
Criterion 2. Level of satisfaction of physiological needs population in staple foods

1. Coefficient characterizing the actual level of food consumption in relation to rational consumption norms

\[ K_{ac} = \frac{q_{fact}}{q_{norm}} \]

where
- \( K_{ac} \) – actual food consumption ratio;
- \( q_{fact} \) – actual food consumption over a period of time;
- \( q_{norm} \) – rational consumption rates

| Value | Description |
|-------|-------------|
| 0.9 < \( K_{ac} \) ≤ 1 | optimal value |
| \( K_{ac} \) ≤ 0.5 | low value |
| 0.5 < \( K_{ac} \) ≤ 0.95 | permissible value |
| \( K_{ac} \) = 1 | optimal value |

Criterion 3. Level of economic affordability of food

1. Share of the population with incomes below the subsistence level

\[ K_p = \frac{K_p}{K_{poverty}} \]

where
- \( K_p \) – poverty rate

| Value | Description |
|-------|-------------|
| \( K_p \) > 0.4 | high value |
| 0.2 < \( K_p \) ≤ 0.4 | permissible value |
| \( K_p \) ≤ 0.2 | optimal value |

2. Share of expenditures on food in the structure of household final consumption expenditures

\[ K_c = \frac{K_c}{1} \]

where
- \( K_c \) – consumption coefficient

| Value | Description |
|-------|-------------|
| \( K_c \) > 0.5 (or >50%) | high value |
| 0.25 < \( K_c \) ≤ 0.5 | permissible value |
| \( K_c \) < 0.25 | optimal value |

3. The degree of uneven distribution of the population by income level

\[ K_G = \frac{K_G}{G} \]

where
- \( K_G \) – Ginny coefficient

| Value | Description |
|-------|-------------|
| \( K_G \) > 0.5 | high value |
| 0.3 < \( K_G \) < 0.5 | permissible value |
| \( K_G \) < 0.3 | optimal value |

The level of food security in the region

| Points | Description |
|--------|-------------|
| 9-10 | optimal, high |
| 5-8 | average, acceptable |
| less than 5 | low |

Source: compiled by the author based on data from [1].

Let us apply this methodology to assess the food security of the Kabardino-Balkarian Republic.

To calculate the coefficient of self-sufficiency, information is required on the population of the Kabardino-Balkarian Republic (866.2 thousand people at the end of 2019) [14] and information on the volume of agricultural products produced in the republic, the data are presented in Table 2.
Table 2. Dynamics of production of main types of agricultural products in Kabardino-Balkarian Republic (thousand tons).

|          | 2015  | 2016  | 2017  | 2018  | 2019  | % change 2019 to 2015 |
|----------|-------|-------|-------|-------|-------|-----------------------|
| Potatoes | 175.5 | 174.9 | 184.9 | 182.9 | 196.0 | 112.0                 |
| Vegetables | 357.5 | 380.2 | 498.9 | 470.4 | 404.4 | 113.1                 |
| Meat (slaughter weight) | 75.2 | 75.8 | 73.9 | 70.5 | 72.1 | 95.9                 |
| Milk     | 469.6 | 479.5 | 490.5 | 499.2 | 514.4 | 109.5                 |
| Eggs, mln. | 208.5 | 214.1 | 229.5 | 229.8 | 230.1 | 110.4                 |

Source: compiled by the author based on [14].

The data presented in the table above indicate a positive dynamics of production for almost all analyzed product groups, with the exception of meat (in carcass weight), the production of which has decreased by 4.1% over 5 years. The data in Table 2 clearly indicate that animal husbandry is a weaker competitive position of the Kabardino-Balkarian Republic, in contrast to crop production. [15]

To calculate the self-sufficiency ratio by product groups, we will take the actual volumes of agricultural production in the KBR at the end of 2019, in addition, it is necessary to calculate the required volumes of agricultural production in accordance with the indicated population in the region and rational consumption rates presented in Table 4.

Table 3. Level of food independence (self-sufficiency) Kabardino-Balkarian Republic in 2019.

| Product name          | Actual food production in the region (q) | The required volumes of food production in accordance with rational consumption rates and population in the region (qp * n) | Coefficient of self-sufficiency Ks | Average Ks value for the region |
|-----------------------|---------------------------------------|--------------------------------------------------------------------------------|-----------------------------------|-------------------------------|
| Potatoes              | 196.0                                 | 77.9                                                                              | 2.52                              |                               |
| Vegetables            | 404.4                                 | 121.2                                                                             | 3.33                              |                               |
| Meat (slaughter weight) | 72.1                                  | 63.2                                                                              | 1.14                              |                               |
| Milk                  | 514.4                                 | 281.5                                                                             | 1.83                              |                               |
| Eggs, mln.            | 230.1                                 | 225.2                                                                             | 1.02                              |                               |

Source: compiled by the author based on data from [14], [16]

The data in Table 3 indicate that the coefficient of self-sufficiency in the KBR varies from 1.02 to 3.33, for various product groups, and the average value of the coefficient was – 1.97, which corresponds to the optimal value.

The next stage in assessing the food security of the region, according to the chosen methodology, is to determine the level of satisfaction of the physiological needs of the population in basic food products. Table 4 presents information on the actual volume of food consumption, as well as rational consumption rates approved by the Ministry of Health of the Russian Federation on August 19, 2016.

Table 4. Level of satisfaction of the physiological needs of the population of the Kabardino-Balkarian Republic in staple foods in 2019.

| Product name           | Actual food consumption over a period of time (q_{fact}) | Rational consumption rates (q_{norm}) | Actual consumption (K_{dc}) | Food ratio |
|------------------------|---------------------------------------------------------|---------------------------------------|-----------------------------|------------|
The data in Table 4 indicate that actual consumption exceeds the approved norms of rational nutrition, with the exception of meat ($K_{ac} = 0.93$) and milk ($K_{ac} = 0.88$), which are within acceptable values (0.5 < $K_{ac}$ ≤ 0.95). In general, the value of the coefficient of satisfaction of the physiological needs of the population of the KBR in basic food products was 1.18, which corresponds to the optimal value.

To determine the level of affordability of food, consider the value of some indicators, the dynamics of which is presented in Table 5.

| Indicator | 2015 | 2016 | 2017 | 2018 | 2019 | 2019 to 2015, % |
|-----------|------|------|------|------|------|-----------------|
| Population with incomes below the subsistence level, % of the total population | 21,1 | 25,8 | 24,7 | 24,2 | 24,2 | 114.7 |
| Share of expenses for the purchase of food products in the total structure of income, % | 40,6 | 37,6 | 41,0 | 43,6 | 43,1 | 106.2 |
| Ginny coefficient | 0,370 | 0,354 | 0,351 | 0,368 | 0,338 | 91,4 |

The data in Table 4 indicate that actual consumption exceeds the approved norms of rational nutrition, with the exception of meat ($K_{ac} = 0.93$) and milk ($K_{ac} = 0.88$), which are within acceptable values (0.5 < $K_{ac}$ ≤ 0.95). In general, the value of the coefficient of satisfaction of the physiological needs of the population of the KBR in basic food products was 1.18, which corresponds to the optimal value.

Let's take a closer look at the data in Table 5, during the study period the population with incomes below the subsistence level increased by 14.7%. The highest value of the indicator can be noted in 2016 - 25.8%, which is a quarter of the population of the republic, by 2019 the value of this indicator slightly decreased and amounted to 24.2%. The poverty ratio ($K_p$) for 2019 was 0.24, which corresponds to the acceptable value, according to the chosen methodology. In general, I would like to note that the standard of living of the population of the Kabardino-Balkarian Republic is assessed as low, the republic ranks 76th out of 84 subjects of the Russian Federation in terms of per capita income; 84th place - according to the average value of assigned pensions in the country; 75th place - in terms of consumer spending per capita [17]. The share of expenses for the purchase of food products for the analyzed period has a positive trend and increased by 6.2%, according to the results of 2019, this figure was 43.1%, i.e. consumption coefficient ($K_n$) was 0.43, which corresponds to the permissible value, in accordance with the selected methodology. The Ginny coefficient, which reflects the degree of unevenness in the distribution of the population by income level, tends to decrease for the analyzed period, in 2019 its value was 0.338, which also corresponds to the acceptable value, according to the chosen methodology.

Let's calculate the total score of the food security level of the Kabardino-Balkarian Republic, according to the chosen method.
Table 6. The level of food security of the Kabardino-Balkarian Republic in 2019, according to the methodology (points).

| No | Indicator                                | Indicator value | Number of points |
|----|------------------------------------------|-----------------|-----------------|
| 1  | Coefficient of self-sufficiency          | $K_s = 1.97$    | 2               |
| 2  | Actual food consumption ratio            | $K_{ac} = 1.18$ | 2               |
| 3  | Poverty rate                             | $K_p = 0.24$    | 1               |
| 4  | Consumption coefficient                  | $K_c = 0.43$    | 1               |
| 5  | Ginny coefficient                        | $K_G = 0.338$   | 1               |
|    | **TOTAL**                                | **7**           |                 |

Source: compiled by the author

4. Conclusion

The data in Table 6 demonstrate that the food security of the Kabardino-Balkarian Republic as of 2019 is estimated at 7 points, which corresponds to the acceptable value. The result obtained indicates the presence of problems in ensuring the food security of the region.

There are two areas of measures to support food security - support for regional agricultural producers and assistance to consumers. The first direction is focused on increasing the physical availability of food, and the second - economic. [18]

It should be noted that the level of self-sufficiency of the region, as well as the level of satisfaction of physiological needs for food are at a high level, with the achievement of maximum values, according to the chosen method. Agricultural production is a strong and competitive side of the agro-industrial production of the republic. Most of the gross regional product is created in this particular sector of the economy, more than 70% of the working-age population of the republic is employed in agriculture, which indicates a pronounced agrarian orientation in the economy of the KBR region. Key factors of competitiveness are indicated, first of all, by the resource component of the region: climatic, geographical conditions, as well as the availability of a qualified workforce. [19]

The calculations made indicate that there are no problems with the physical availability of food in the republic. The decrease in the total indicator of the region's food security is due to the low values of the indicators of the economic availability of food. Problematic indicators include: a significant share of the population in the region with incomes below the subsistence level (24.2%), an unsatisfactory structure of consumption, with a large share of spending on food (43.1%), as well as a high differentiation of incomes of the population of the republic. To achieve the optimal (high) level of food security in the Kabardino-Balkarian Republic, social activities are needed to improve living standards in the region, reduce poverty, increase per capita income, social benefits, and provide priority support for the most needy segments of the population.

The following can be proposed as measures to increase the affordability of food:
- introduction of food ration cards for that category of the region's population whose incomes are below the subsistence level. Food ration cards will cover some of the cost of food costs (30-40%).
- increasing financial support for regional social programs for the development of rural settlements;
- implementation of constant monitoring of the level of unemployment and the level of income of the population living in rural areas;
- diversification of rural employment;
- social development of rural areas, including the development of infrastructure to improve the overall quality of life of the population.
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