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Assessment of Food Security in the East Kazakhstan Region

Abstract. The article assesses the food security of one region of Kazakhstan - the East Kazakhstan region. In the analyses, criteria such as the level of the region's food independence, the degree of satisfaction of the population's physiological needs in basic food, and the level of economic availability of food were applied. The research has shown that the food security in the East Kazakhstan region was at an acceptable level. However, some threats to food security were identified, including: a high level of income differentiation among the households of the East Kazakhstan region, an increase in the price index for food products, and a significant proportion of the population with incomes below the subsistence minimum. The results of the evaluation can be useful for creating agri-food policy measures that will ensure, maintain and improve the level of food security at both a regional and national level.

Key words: sustainability, agriculture, agri-food policy, food security

JEL Classification: Q01, Q10, Q18

Introduction

In the global economy, the need to ensure food security was first identified at the World Food Conference in Rome in 1974 (Olaoye, 2014). According to the definition coined at the conference, food security should be based on four principles: the availability of good food products, the economic availability of food, the consumption of the necessary amount of food following dietary norms, and stable access to quality and safe food.

At the World Food Summit in 1996, a broader definition of food security was given: "Food security exists when all people have physical and economic access to sufficient, safe, and nutritious food" (Capone et al. 2014b). This definition, with the addition of the word "social" to the phrase "socio-economic access," was officially confirmed in the Declaration of the World Summit on Food Security in 2009. At the same time, particular emphasis was placed on the term "safety" of the food itself.

In international practice, various indicators are used to assess the economic availability of food at the micro and macro levels (Davis et al, 2014; Eckert, Shetty2011; Lin et al, 2014; Ma et al, 2013; Sohi, 2014; Widener, 2013). At the macro level, indicators such as the exchange rate, customs duties and tariffs on agricultural products and food, and food price indices are analyzed. At the micro-level, the degree of ensuring_ food security for individual households is analyzed. In addition, the access to health and social protection services is also considered, especially in times of crisis (Capone et al, 2014a). For example, in Russia as well as in other post-Soviet countries, food security is mainly considered as an element of the

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economic security of the state, and its provision is primarily associated with: improvement of national agri-food policy; modernization of the material and technical base of the agro-industrial complex; the implementation of import substitution strategies; increases in agricultural production; and development of the agricultural sector as a whole (Altuhov, 2014; Kulagina, 2014; Nazarenko, 2011; Ushachev, 2014). In the European Union, ensuring a stable supply of affordable food is one of the aims of the Common Agricultural Policy (CAP). Other aims of the CAP are related to the economic situation of farmers, climate change, and agricultural provision of public goods. As Zahrnt (2011) emphasizes, food security is the most pervasive and powerful argument for the protection of EU agriculture. This is the result of complex socio-economic reasons, such as the dreadful impact of food shortages after the Second World War.

The aim of this paper is to assess the level of food security in the East Kazakhstan region.

Research methodology

The assessment of food security at the macroeconomic level is carried out by analyzing food self-sufficiency. It reflects the assumption that food self-sufficiency determines the degree of physical and economic availability of food for the population. The study and analysis of food security as a priority direction of the agricultural policies of Russia and Kazakhastan is carried out in the works of Obolentsev, Kornilov, Sinyukov (2006), Nazarenko (2011), Epstein (2010).

Some researchers focus on studying threats to food security. Altukhov (2014) and Ushachev (2014) identify as threats many phenomena, such as: oversaturation of the domestic market with imported food; price imbalances and insufficient development of the infrastructure of the agri-food market; a shortage of qualified personnel in certain professions and specialties in the agro-industrial complex; a low level of effective demand for food; and an undeveloped system for monitoring and forecasting the food market.

A large number of studies are devoted to studying factors affecting the food security of the states of Post-soviet countries, especially Russia. In the works of Kulagina (2014), Miloserdova (2014), Mikhailushkin, Barannikov (2013), Kholodov (2012), Smirnov (2015), and Semenova (2012), food security is considered as a dependent variable on such factors as resource security (providing the agro-industrial complex with qualified personnel, land, material, and technical resources), the safety of the natural environment and the techno-genic sphere of agriculture.

In discussions on modern agri-food policy, researchers underline its complex, synergistic economic effect on the economy and society as a whole (Kulagina, 2014, Mihajlushkin, Barannikov, 2013, Obolencev et al 2006). Accordingly, when assessing the effectiveness of agri-food policy measures, it is necessary to analyze various types of its effectiveness: economic – related to the rational use of agricultural resources, ensuring the profitability of agricultural production; social – aimed at improving the level and quality of life of the rural population; environmental – related to the preservation of the natural resource potential of the agro-industrial complex, the production of safe (environmentally friendly) products, and reducing the negative impact on the environment.

Some researchers indicate that the analysis should be conducted on two levels – national and regional. The first is related to the impact of agricultural policy on the agro-industrial complex and society as a whole. The second focuses on the efficiency of regulation at the

level of individual regions of the country. Mihajlushkin and Barannikov (2013) outlined the following types of effectiveness of agri-food policy:

- industry efficiency associated with improvement of the socio-economic situation of the agri-food sector – agriculture, processing industry, enterprises specializing in the storage and sale of food products;
- corporate efficiency reflecting the effectiveness of agricultural policy for individual groups of agricultural producers and their associations (agricultural holdings, associations of farmers, and farmers);
- technological efficiency, which results in the production of high-quality, competitive food products.

The effectiveness of agri-food policy cannot be estimated by a single indicator since, along with ensuring food security, it includes several independent areas: agricultural production, improving the standard of living of the rural population, and increase in agricultural producer's incomes. In this regard, the evaluation of the effectiveness of agri-food policy should include a detailed analysis of various areas using specialized evaluation indicators.

It is theoretically and practically significant to assess the effectiveness of agri-food policy measures, which allows to recognize the correlation between the functioning of a regional agro-industrial complex and the expenditures of the region's budget, as well as to monitor its compliance with WTO requirements. It is advisable to evaluate the effectiveness of agri-food policy based on the following methodological principles:

1. The principle of system analysis, where agri-food policy is considered a component of the state's economic policy through regulation of the agricultural sector of production and the agro-industrial complex as a whole.

2. The principle of comprehensive analysis and evaluation of the effectiveness of agri-food policy. Assessing the effectiveness of agri-food policy involves taking into account the economic effect as well as social and environmental changes, which ultimately allows us to assess the complex effect and impact of agri-food policy on the economy, including at the regional level.

3. The principle of a structural and functional approach to analyzing agri-food policy and its effectiveness. Agri-food policy consists of several independent areas of regulation: ensuring food security, improving the standard of living of the rural population, developing agricultural production, etc.

The application of an integrated approach to the analysis of agri-food policy requires the identification of a system of factors that affects its effectiveness at the state and the regional levels (Figure 1).
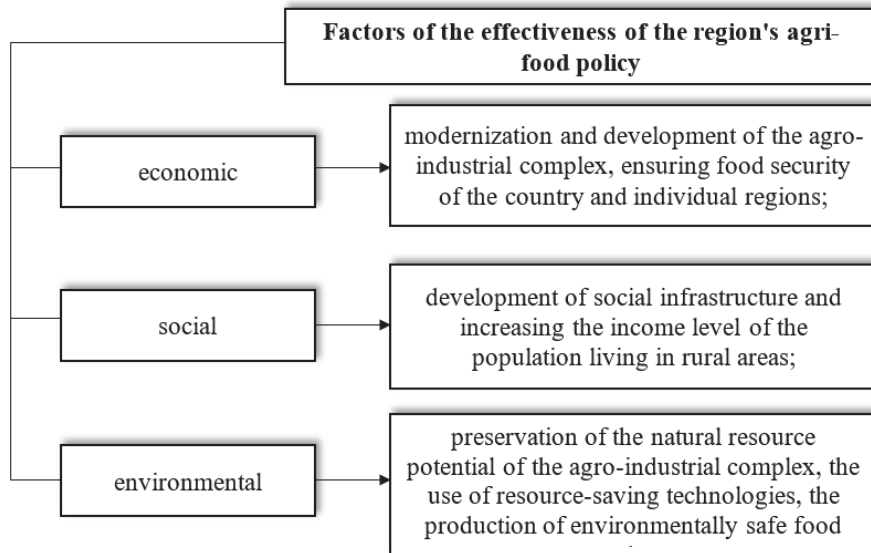
Fig. 1. Factors of the effectiveness of national and regional agri-food policy

Source: Authors' own elaboration.

The scientific community's interest in the problems of food security has contributed to the emergence of a relatively large number of assessment methods and models. Most models are applicable exclusively for the analysis of food security at the state or international level. For example, several predictive models (EPACIS, BLS, Aglink) assess food security at the macro level. The first is based on the modeling of partial equilibrium in agricultural markets. The second model reproduces the goals of market participants and limiting factors in the form of a mathematical programming problem. The third is a recursive dynamic model of partial equilibrium across states and regions of the world.

The methods used to assess regional food security are not comprehensive. The models used are not sufficiently formalized. They are focused on assessing individual aspects of food security, and are based mainly on expert assessments. The proposed methodology, based on the indicators for assessing food production and consumption, defined by the Food Security Doctrine of the Russian Federation, allows us to overcome these shortcomings. The indicators for assessing the food security of the region are correlated with the following criteria:

- the level of food self-sufficiency of the region;
- the degree of satisfaction of the physiological needs of the population in food products;
- the level of economic availability of food.

The proposed assessment methodology assumes a consistent system of actions (see Figure 2).

1. Select the criteria for assessing the food security of the region (the level of food independence (self-sufficiency) of the region, the degree of satisfaction of the physiological needs of the population in food, the economic availability of food)

2. Determine the evaluation indicators for each criterion (the coefficient of self-sufficiency in food, the coefficient of actual consumption, the poverty coefficient, the degree of inequality in the distribution of income, the share of food costs in the total volume of consumer spending)

3. Set the value parameters for each rating indicator (optimal, acceptable, low, or high)

4. Determine the maximum and minimum number of points for each indicator of the food security assessment, depending on the parameters in which the indicator will be located (for indicators whose value is within the optimal limits, a score of 2 points is set. The value of the indicator within the acceptable limits corresponds to a score of 1 point. Low or high values of the indicator correspond to a score of 0 points).

5. Form criteria for assessing the level of food security in the region, depending on the total number of points (9-10 points corresponds to the optimal (high) level of food security in the region; 5-8 points corresponds to the average (acceptable) level of food security; less than 5 points - a low level of regional food security)

6. Calculate the indicators of food security in the region and evaluate them in points in accordance with the established parameters

7. Determine the integral assessment of regional food security as the sum of the scores for each indicator
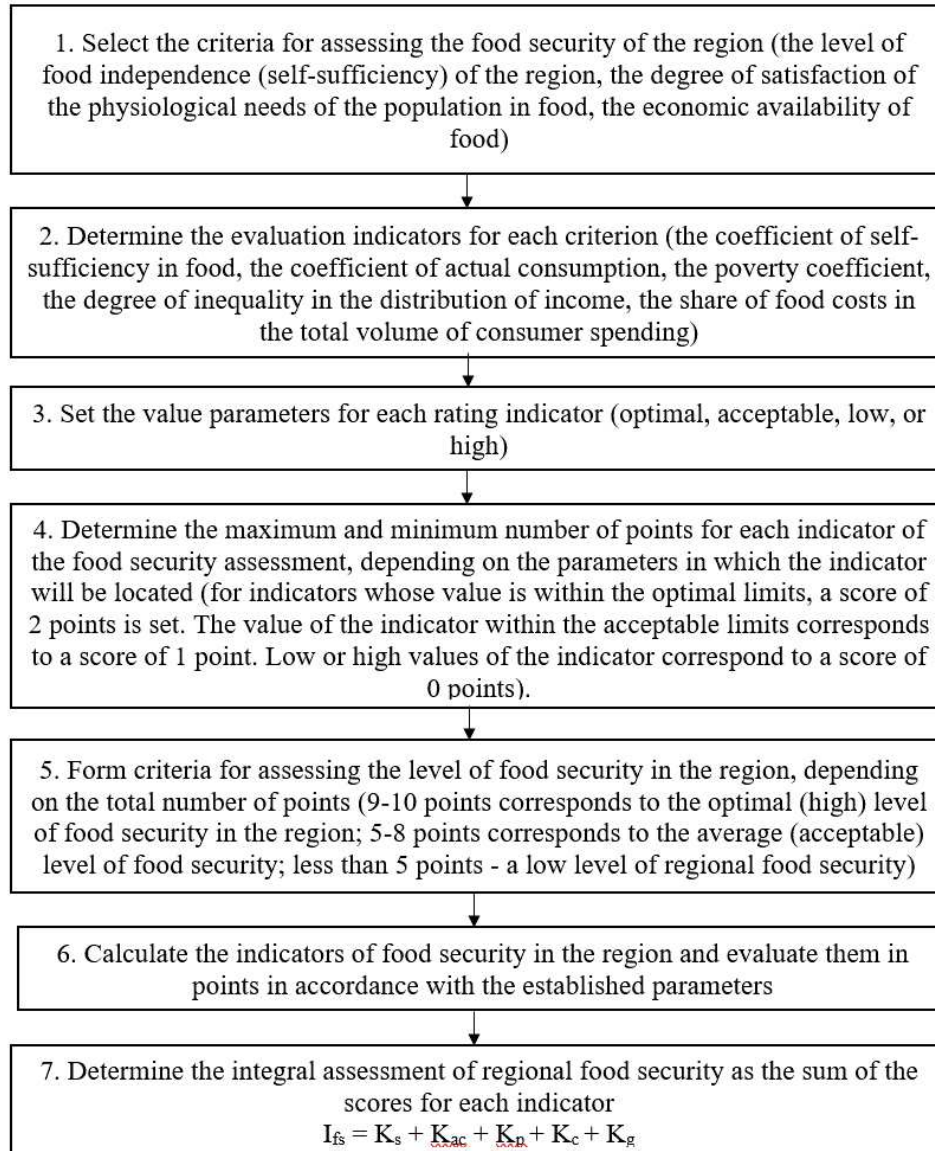$$I_{fs} = K_s + K_{ac} + K_p + K_c + K_g$$

Fig. 2. Methodology for assessing food security in the region

Source: Authors' own elaboration.

The level of food self-sufficiency of a region is estimated using the self-sufficiency coefficient (K_s), which characterizes how fully the region meets the needs of the population in various types of food products at the expense of local production:

$$K_S = \frac{q}{n * q_p}$$

To calculate this indicator, data is needed for the production of the leading agricultural products in the region for the reporting period (q); information on the population living in the region (n). It is also necessary to determine how much food is needed for this region under the established rational consumption standards (q_p).

To analyze the level of food independence of the region, it is necessary to compare the actual level of production of certain types of agricultural products in the region with the necessary amount of food calculated following rational norms of food consumption. It is advisable to calculate the self-sufficiency coefficient for those types of agricultural products obtained in mass quantities based on the natural and climatic conditions in the region. As a result of the calculations, the K_S can take a different value: the value of the indicator can be attributed to a low ($K_S \leq 0.5$), acceptable ($0.5 < K_S \leq 0.9$), or optimal level ($0.9 < K_S \leq 1$) of the region's self-sufficiency in food.

To assess the degree of satisfaction of the physiological needs of the population in food, it is advisable to use the coefficient of actual food consumption (K_{ac}), which shows the actual level of food consumption over a certain period (q_{fact}) in comparison with rational consumption norms (q_{norm}):

$$K_{ac} = \frac{q_{fact}}{q_{norm}}$$

The coefficient of actual food consumption by the population of the region (K_{ac}) can take the following values: $K_{ac} \leq 0.5$ – low; $0.5 < K_{ac} \leq 0.95$ – acceptable; $0.95 < K_{ac} = 1$ – optimal. Based on the results of calculating the coefficients of actual food consumption for different types of food, it is necessary to determine the average value of the indicator.

To assess the economic availability of food, it is necessary to analyze several indicators: the poverty coefficient (K_p), consumption (K_c), and the Gini coefficient (K_g) (Table 1). In this case, particular calculations are not required since these indicators are calculated by federal and territorial organizations of state statistics. Nevertheless, it is necessary to determine in which parameters for this region a particular indicator will be located. We suggest setting the following values of indicators and points (Table 1).

Table 1. The system of indicators and criteria for the economic availability of food

Criterion	Indicator	Indicator value
1) the share of the population with incomes below the minimal subsistence level	K_p	$K_p > 0.4$ – high; $0.2 < K_p \leq 0.4$ – acceptable; $K_p \leq 0.2$ – optimal.
2) the share of the expenditures on food in consumer spending	K_c	$K_c > 0.5$ (or $> 50\%$) – high; $0.25 < K_c < 0.5$ – acceptable; $K_c < 0.25$ – optimal.
3) the degree of uneven distribution of the population by income level	K_g	$K_g > 0.5$ – high; $0.3 \leq K_g < 0.5$ – acceptable; $K_g < 0.3$ – optimal.

Source: Authors' own elaboration.

Results

The methodology was used for the assessment of the food security of the East Kazakhstan region. The peculiarity of the Kazakh agro-industrial complex, as many researchers recognize, is its pronounced asymmetry (Semenova, 2012). In Kazakhstan the vast majority of enterprises for the production and processing of agricultural products are located in the Southern, Central, and Eastern regions. East Kazakhstan region is a region with a historically developed agricultural and industrial specialization. Based on the population of the East Kazakhstan region at the end of 2020 (1.363 million people) and rational consumption standards, the level of food self-sufficiency in the region was estimated. The results are presented in Table 2.

Table 2. The level of food self-sufficiency in the East Kazakhstan region in 2020

Type of food	Actual production (q) (thousand tons)	Required food production volumes following rational norms (n * q_p)	K_s
Potatoes	435	137	3,17
Vegetables	855	139	6,15
Milk	379	371	1,02
Meat and meat products	173	107	1,64
Eggs, thousand pcs.	155080	362943	0,43

Source: Authors' own calculations.

As data shows, in 2020 in the East Kazakhstan region, the produced amounts of potatoes, milk, vegetables, and meat products assessed from the perspective of the rational norms of food consumption indicate a high level of self-sufficiency (Ks > 1). Egg production in the region was insufficient. Thus, the average value of the food self-sufficiency coefficient of the East Kazakhstan region in 2020 was 2.48, which corresponds to the optimal level under the established assessment parameters.

Next, it is necessary to assess the level of satisfaction of the population's physiological needs in food products. Among the regions of Kazakhstan, the East Kazakhstan region took first place in terms of consumption of chicken eggs, and second place in terms of milk consumption – 301 kg per person (Table 3).

Table 3. Food consumption in East Kazakhstan region in 2020

Specification	Bread products, cereals (kg)	Potato (kg)	Vegetables (kg)	Meat (kg)	Milk	Eggs, (pcs)	Sugar and confectionery products (kg)
Republic of Kazakhstan	140,9	50,3	86,6	83,9	260,2	199,0	43,3
East Kazakhstan Region	142,2	49,7	72,5	77	301,3	222,8	41,9
Rational consumption standards	109,0	100,0	149,0	78,4	271,0	265,0	33,0
K_{ac}	1,30	0,49	0,48	0,98	1,11	0,84	1,26

Source: Authors' own calculations.

The criterion "level of economic availability of food" characterizes the possibility of purchasing food, depending on the size of the population's income and the level of food prices that meet the WTO requirements related to tariff restrictions and market openness, which can lead to a decrease in the availability of food for the population.

The share of the population with incomes below the subsistence minimum in the East Kazakhstan region in 2020 averaged 4.3%. Accordingly, the average value of the indicator $K_p = 0.04$.

The next indicator that needs to be analyzed is the share of food costs in the structure of consumer spending (Kp). For the East Kazakhstan region, the value of this indicator was 54.7%. Accordingly, the Kp indicator for the East Kazakhstan region for the analyzed period takes the value of 0.55 – this corresponds to a high level.

The Gini coefficient to assess the level of food security in the region is due to significant differences in the structure of consumer spending of households with different levels of disposable income. The East Kazakhstan region is characterized by a high level of unevenness in the distribution of income; however, the value of $Kg = 0.329$ corresponds to the permissible level. The analysis will define the integrated assessment of food security of the East Kazakhstan region (Ifs) as the sum of the estimates in points for each indicator (Table 4).

Table 4. Assessment of food security in the East Kazakhstan region (point)

Evaluation indicators	Number of points
1) Food self-sufficiency coefficient, $K_s = 2.48$	2
2) Coefficient of actual consumption, $K_{ac} = 0.92$	1
3) Poverty coefficient, $K_P = 0.04$	2
4) The specific weight of food expenses, $K_c = 0.55$	0
5) Gini Index, $K_g = 0.329$	1
Total	6 points

Source: Authors' own calculations.

Thus, the food security of the East Kazakhstan region in 2020 was at an acceptable level:
Ifs (East Kazakhstan region) = Ks + Kac + Kp + Kc + Kg = 6 points.

Conclusions

The distinctive features of the proposed methodology are its complexity and universality, making it possible to conduct a comparative analysis of the level of food security in a particular country's regions, and to propose corrective measures within the framework of agri-food policy while taking into account the requirements of the WTO. The analysis showed that the levels of the partial indices and their contribution to overall assessment of food security was varied. The food self-sufficiency coefficient was very high and poverty was low, which influenced the food security positively, while the high proportion of food expenditures in consumer budgets gave a negative impact. The results show that in 2020, the food security in the East Kazakhstan region was at an acceptable level.

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For citation: