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APPROACHES TO ASSESSING THE FOOD SECURITY OF THE REGIONS OF KAZAKHSTAN IN MODERN CONDITIONS

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Abstract. *This article proposes a methodology for comprehensively assessing the level of food security in the regions of Kazakhstan based on three components: physical accessibility, economic accessibility and food safety. A system of indicators and their threshold values are justified for a component-by-component assessment. As a result, a comprehensive assessment of the food security of the regions of Kazakhstan in 2021 is carried out.*

The paper uses the method of mathematical modeling to assess the food security of the region, which includes the method of logical analysis in the selection of statistical and legal data to ensure the completeness and consistency of their coverage of the studied area. The methods of systematization, comparison, ranking and visualization are used to interpret the results.

The information base for the study was the data of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

Keywords: *food security, food security indicators, food quality, region.*

Reikšminiai žodžiai: *aprūpinimas maistu, aprūpinimo maistu rodikliai, maisto kokybė, regionas.*

Introduction

In light of recent events (the COVID-19 pandemic, military conflicts, sanctions), food security issues are becoming even more relevant. After all, any crisis can affect food production, supply chains, prices, as well as financial opportunities and consumer preferences, and food security is a critical aspect of human well-being and sustainable development.

Currently, the evaluation of food security is carried out by the Ministry of Agriculture of Kazakhstan only at the level of the whole country. To ensure food security, it is necessary to regularly assess and monitor the food systems of the regions. Regional assessments of food security complement nationwide studies, and allow researchers to identify unique challenges and problems in each region and then develop targeted measures to address them, including specific agricultural development programs, support for local producers, and strengthening infrastructure. This provides opportunities to prevent possible crises in some regions while there is a surplus of food in others, to assess the effectiveness of ongoing regional policies, and to identify successful practices and best approaches to food security for distribution. The purpose of this study is to develop an approach to the comprehensive assessment of the level of food security in the regions of Kazakhstan in the context of digitalization in order to better manage its condition.

Literature review

The assessment of the food security of the regions can be carried out using various approaches.

According to the Food and Agriculture Organization of the United Nations (1996), which leads international efforts to combat hunger, the following definition is used: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."

The work of Frantsisko et al. (2020) considered methodological approaches to assessing the physical availability of food products, which involve assessing the level of development of marketing infrastructure, taking into account FAO food safety metrics.

Some countries use extended food security indicators. For example, the methodology of the Global Food Security Index includes 68 quantitative and qualitative indicators of food security distributed in three areas. At the same time, the index also has a fourth direction, "Sustainability and adaptation," which reflects the quality of the environment

in the territories used for agriculture (GFSI 2022). The Integrated Food Security Phase Classification (IPC) protocols provide for the collection and analysis of a wide variety of data similar to GFSI, including data on the availability and accessibility of food (IPC Global Partners 2021).

At the same time, the Global Hunger Index (GHI) uses indirect indicators that are not directly related to food security – for example, stunting, low weight and child mortality (GHI 2023).

Hart (2009) explored in greater depth such concepts as "vulnerability," dividing it into internal and external components, as well as the notion of a "lack" of food security, relating it to duration and intensity.

The set of indicators of food security may also vary depending on the purpose of the study: some were created to measure the current state of food security and compare countries with each other (GFSI, IPC), while others are aimed at forecasting changes in the level of food security and the early warning of possible threats, including from worsening climatic conditions (FEWS NET 2018).

Some researchers determine the state of food security mainly at the national level, while assessments at the level of administrative territories within countries are not carried out due to the unity of certain countries' food markets. For Kazakhstan, the main factors of food security are formed at the regional level, taking into account climatic and geographical features, living standards, and income distribution. Thus, the assessment of food security at the regional level is justified. Therefore, the control object in this study consists of socio-economic subsystems which are characterized by the heterogeneity of their development in each region.

Maulana and Yulianti (2022), in examining the problems of fishing in the Karangantu coastal region in Serang (Indonesia), found that multi-stakeholder cooperation has a positive impact on the development of the industry. At the same time, the role of local authorities was defined as being among the most important. Firyal Akbar et. al (2022), when examining the influences of stakeholder relationships on the effectiveness of public policies to ensure food security, came to the same conclusion.

Using an indicator approach, Jatav et al. (2022) assessed the food security status of the districts of Rajasthan in India, which showed that due to climatic differences, the levels of food security of each district also differ.

In this regard, the authors of this study attempt to determine a methodology for assessing food security at the regional level in Kazakhstan.

Methodology

To assess the food security of the region, a methodology is needed that has a simple calculation algorithm and that involves the use of both quantitative and qualitative data. The choice of food security indicators is an important step in the monitoring and evaluation process, where the key criteria for selecting indicators are their significance, validity and data availability. The indicators used for evaluation should have a number of characteristic features:

1. Reliability – the indicator reflects the real state of agricultural producers and the processing industry, and is officially recognized and documented;
2. Constancy – the indicator can be observed (measured, recorded) continuously in time (daily), or at regular intervals;
3. Public availability – the indicator should be made publicly available on the official Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, allowing for detailing by region.

Based on these indicators, the required indices can be calculated.

Table 1. *The system of indicators and indices for assessing food security used in this study*

Indicator/Index	Calculation formula, interpretation
Physical security (Physical accessibility)	
PA 1: Regional output per capita, in tenge.	Enables differentiation between the regions regarding the production of food products, thus denoting regions of suppliers and consumers.
PA 2: The volume of production of certain types of agricultural products per capita, in kilograms.	This is an indicator on the basis of which the food security level in the region is assessed. The threshold value (standard) of the indicator is the permissible values at which the region is considered to be provided with a specific type of food.
Economic security (Economic affordability)	
EA 1: Food import coverage ratio.	The ratio of food imports to exports (a standard value would be no more than 1.6:1). A high food import coverage ratio may indicate a region's low self-sufficiency in food production and dependence on external supplies. A low coverage ratio, on the contrary, indicates a higher self-sufficiency of the region in food production.
EA 2: The purchasing power of the average monetary income of the population per capita reflects the potential of the population to purchase goods and services, and is expressed through the commodity equivalent of average monthly monetary income.	The indicator of the ratio of average per capita income to the subsistence minimum directly characterizes the standard of living of the population in the country. Its optimal value should be 7–8:1 or more (taking into account the approach used to determine the subsistence minimum); it is advisable to set the threshold value at the level of 6:1.
EA 3: Funds ratio (income differentiation ratio).	This characterizes the degree of social stratification and is defined as the ratio between the average levels of the monetary incomes of the 10% of the population with the highest incomes and the 10% of the population with the lowest incomes.
EA 4: The Engel coefficient reflects the share of household expenditure on food from total expenditure. It is used to measure the standard of living and social well-being of the population, as well as to assess the patterns of food consumption in different countries and regions.	The Engel coefficient is calculated as the ratio of household food expenditures to their total expenditures. A high Engel coefficient indicates that households spend a large share of their income on food, which may be indicative of poverty or a low standard of living in the country. In contrast, a low Engel coefficient means that households spend a smaller share of their income on food. However, this indicator does not take into account the quality of food and may not reflect the real situation in the country if, for example, households save on quality food due to a lack of funds.

Our proposed algorithm for assessing the food security of the region consists of 4 consecutive stages:

1. Forming a system of indicators for a comprehensive assessment of the state of the food market according to physical accessibility (PA), economic affordability (EA), and food quality and safety (QS);
2. Substantiating the system of indicators and their threshold values for component-by-component assessment;
3. Compiling a summary table and calculating the level of regional FS;
4. Analyzing and developing proposals for improving the provision of food security.

The assessment of the level of the region's FS is determined as the average of the sum of the assessments of the main FS criteria:

$$\text{Assessment of FS level of region} = \omega_1 \text{ PA} + \omega_2 EA + \omega_3 \text{ QS} \qquad (1)$$

Where ω_i satisfy the relations:

$$\sum_{i=1}^{3} \omega_i = 1$$

Each of these criteria has its own evaluation levels: 1 (unacceptably low), 2 (low), 3 (acceptable), 4 (high).

To measure the assessment of the components of each region's FS level, we introduce the following classification:

- high level assessment of the level of the region's FS: 3.5–4 (green in the table);
- acceptable level: 3–3.5 (blue in the table);
- low level: 2–3 (yellow in the table);
- unacceptably low level: 1–2 (white in the table).

If the criterion contains sub-criteria, then the criterion score is calculated as a weighted average of the sub-criteria.

For regions with a low score, priority areas of state regulation should be formulated and goals and methods for improving the indicator should be determined. Thus, assessing the level of food safety in the region is an objective basis for the formation of a strategy and tactics for ensuring food safety both at the regional and national levels.

A comprehensive assessment of the FS level is calculated via the weighted average assessment of its components.

Results

Food security management is a multi-level hierarchical system based on the subject that solves the food problem and its functions.

The most difficult task is to quantify the quality of food. The most applicable indicator (although it characterizes the general quality of food only incidentally) can be recognized as the ratio of the number of products recognized by control bodies as meeting the quality requirements to the total number of products inspected. According to the database for 2021 from the register of non-conforming products (CSEC 2021), the number of non-conforming products by regions of Kazakhstan for 2022 is depicted (Table 2).

Table 2. *The number of non-conforming products in the regions of Kazakhstan in 2022*

Region	Falsified products	Violation of phys.-chemical value	Violation of information label (date, deadline)
Zhambyl	1		59
Almaty city	3	5	57
North Kazakhstan	6		36
Astana city	5	2	25
Atyrau	1	6	25
Shymkent	2		15
East Kazakhstan	1		7
Karaganda	1	1	6
Turkestan	1		6
West Kazakhstan	1		5
Pavlodar	1		5
Mangystau	1		3

Based on these data, it is not possible to determine how many verifications were carried out, including laboratory tests, in order to calculate the proportion of nonconforming products. Most of the violations in the regions of Kazakhstan relate to compliance with the requirements for providing information on labels.

Unlike quality requirements, which can change depending on the requirements of specific consumers, food safety requirements are constant. Food hazards can occur at any stage of the food chain, and therefore good management throughout the food chain is essential. Food safety is ensured through the joint efforts of all parties involved in the food chain. At present, due to the lack of data, it is difficult to adequately assess food quality assurance processes. In this regard, food safety for all regions will be considered to be at the minimum acceptable level.

The next section considers the indicators characterizing the magnitude of PA and EA.

Indicator PA 1: Regional output per capita, in tenge.

To analyze the sphere of production, it is first of all necessary to estimate the regional volumes of output by the type of "Agriculture, fisheries and forestry" economic activity per capita (Table 3).

Table 3. *Output volumes for "Agriculture, fisheries and forestry" in thousand tenge at current prices per capita*

Region	Gross output, million tenge	Population	Gross output of agricultural products per capita, thousand tenge	PA 1
Turkestan	931,043	540,391	1,722.9	4
North Kazakhstan	899,985	749,034	1,201.5	4
Akmola	740,621	734,733	1,008.0	4
Karaganda	493,443	663,585	743.6	3
Pavlodar	428,194	730,232	586.4	3
Almaty	1,088,280	2,092,567	520.1	3

Region	Gross output, million tenge	Population	Gross output of agricultural products per capita, thousand tenge	PA 1
Kaostanay	604,598	1,373,926	440.1	3
East Kazakhstan	875,641	2,059,937	425.1	3
Zhambyl	478,135	1,144,553	417.7	3
Aktobe	374,973	900,266	416.5	3
Kyzylorda	170,840	861,204	198.4	2
West Kazakhstan	242,007	1,360,098	177.9	2
Atyrau	112,946	662,600	170.5	2
Shymkent city	44,498	1,093,468	40.7	1
Mangystau	21,668	821,255	26.4	1
Almaty city	8,059	1,212,078	6.6	1
Astana city	503	2,001,060	0.3	1

This indicator allows certain decisions to be made regarding the nature of a region's specialization.

The leading regions (suppliers) producing agricultural products are Turkestan, North Kazakhstan, Akmola and Karaganda. The regions of the middle producers (suppliers) are East Kazakhstan, Pavlodar, Almaty, Zhambyl, Aktobe, and Koastanay, with output volumes from 416,000 to 587,000 tenge per capita. The outsider regions (suppliers) are Kyzylorda, Atyrau, and West Kazakhstan, with production volumes of more than 200,000 tenge. The consumer regions are Shymkent city, the Mangystau region, Almaty city, and Astana city, with issue volumes of less than 41,000 tenge.

Indicator PA 2: Volume of production of certain types of agricultural products per capita in kilograms, 2021.

This FS indicator is an indicator on the basis of which the level of the region's FS is assessed. The threshold value (standard) of the indicator represents the permissible value of the indicator at which point the region is considered to be provided with a particular type of food. Calculations are shown in Table 4, where the indicators of the standards are taken from Kaygorodtsev (2019).

Table 4. *Gross production of certain types of agricultural products per capita in kilograms and estimated indicators*

Region	Gross harvest of grain and leguminous crops	Gross potato harvest	Gross harvest of vegetables	Milk of all kinds	Meat (in slaughter weight)	Eggs of all kinds, pcs.	PA 2
North Kazakhstan	6,341.0	1,020.4	345.0	1,175.6	112.9	1,033.3	4.00
Almaty	650.7	377.4	509.6	405.0	113.5	385.3	3.83
Pavlodar	1,342.1	776.7	309.3	562.5	78.1	341.3	3.83
Akmola	5,275.2	364.8	65.3	552.9	172.5	1,079.5	3.67
East Kazakhstan	721.1	327.6	209.5	763.9	132.5	117.2	3.50
Kostanay	3,299.2	193.1	77.5	507.7	72.8	695.9	3.50

Region	Gross harvest of grain and leguminous crops	Gross potato harvest	Gross harvest of vegetables	Milk of all kinds	Meat (in slaughter weight)	Eggs of all kinds, pcs.	PA 2
Aktobe	280.7	117.4	98.7	393.5	91.0	258.7	3.00
Zhambyl	479.3	233.9	1,024.4	291.9	70.6	130.5	3.00
Karaganda	624.9	285.7	86.5	387.2	64.2	478.5	3.00
Turkestan	285.2	152.1	575.6	375.2	64.5	110.8	3.00
West Kazakhstan	249.6	87.5	88.2	362.2	79.4	292.5	2.83
Kyzylorda	562.5	67.0	127.9	120.1	25.0	9.7	2.33
Atyrau	0.0	44.6	150.2	106.2	44.9	59.0	2.00
Shumkent city	8.1	4.4	35.6	44.4	7.9	142.1	1.17
Mangystau	0.0	0.0	9.6	10.2	11.8	1.4	1.00
Almaty city	0.0	0.7	0.0	0.9	0.0	0.2	1.00
Astana city	0.6	0.5	0.0	0.2	0.1	0.0	1.00
Standard	1,000	97	146	405	82	292	

Kazakhstan exports mainly agricultural products in the form of raw materials, and imports finished food products. It is well known that finished products are much more expensive than raw materials. Therefore, it is necessary to increase the volume of products processed in the republic.

Table 5. *Food import coverage ratio – EA 1*

Region	Food import coverage ratio, thousand $	EA 1
West Kazakhstan	16.3	1
Almaty city	15.3	1
Mangystau	13.6	1
North Kazakhstan	8.0	1
Almaty	6.9	1
Karaganda	6.4	1
Astana city	4.6	1
Pavlodar	4.0	1
Kostanay	3.5	1
East Kazakhstan	3.3	1
Almola	2.7	1
Republic of Kazakhstan	2.0	1
Aktobe	1.7	1
Shymkent city	1.3	2
Zhambyl	0.9	3
Atyrau	0.4	4
Kyzylorda	0.3	4
Turkestan	0.1	4

In 2021, the amount of food products and raw materials exported for production in the Mangistau region was 17 times higher than imports, which corresponds to an extremely strong indicator level (a score of 1). The higher the score, the worse this indicator is represented. If a region provides itself with products of its own production and its imports do not exceed 30%, then the level of the indicator is high (a score of 4); if the share of imports exceeds exports by 30%–60%, the level is acceptable (a score of 3); if the share of imports exceeds exports by 60%, then the level is acceptably low (a score of 2); if the share of imports exceeds 80%, then this is unacceptably low (a score of 1).

The value of the allowable level of food coverage ratio should not exceed 0.8. For regions with a large proportion of imported food, this can be provided through the supply of products from the internal regions of the republic, contributing to their development. To this end, the Government of the Republic of Kazakhstan should annually draw up a balance of the required volume of food in each region which is not provided with its own production. This is the basis for calculating the level of food security and the basis for planning regional cooperation for the production of vital food.

Indicator EA 2: Purchasing power of the average monetary income of the population per capita, which reflects the potential of the population to purchase goods and services.

The purchasing power coefficient is the ratio of the average per capita income to the established minimum subsistence level for the population of the region. The ratio of the average per capita income to the subsistence minimum reflects the population's potential to purchase goods and services. Its optimal value should be 7–8:1 or more (taking into account the approach used to determine the subsistence minimum), and it is advisable to set a threshold value at the 6:1 level.

Table 6. *Purchasing power of the average per capita monetary income of the population (EA 2)*

Region	Cost of living, tenge	Average salary, tenge	Purchasing power ratio	EA 2
Atyrau	36,229	406,166	11.2	4
Astana city	41,232	344,691	8.4	4
Mangystau	42,948	349,503	8.1	4
Almaty city	39,685	295,985	7.5	4
Karaganda	35,778	240,608	6.7	3
West Kazakhstan	34,275	226,537	6.6	3
Aktobe	34,264	217,597	6.4	3
Kyzylorda	35,140	212,777	6.1	3
Pavlodar	37,031	220,291	5.9	3
East Kazakhstan	37,791	224,700	5.9	3
Zhambyl	34,811	195,922	5.6	2
Kostanay	35,897	201,923	5.6	2
Shymkent city	34,634	193,682	5.6	2
Almaty	37,230	207,592	5.6	2

Region	Cost of living, tenge	Average salary, tenge	Purchasing power ratio	EA 2
Akmola	36,665	203,006	5.5	2
Turkestan	35,770	195,302	5.5	2
North Kazakhstan	35,660	187,501	5.3	2

Increasing the affordability of food products should be based, first of all, on positive economic changes. These changes should be manifested in an increase in: increasing the income of the population, especially the poorest; ensuring reasonable retail prices for food products; and providing a powerful program of targeted budget support for food.

Indicator EA 3: coefficient of funds.

This indicator characterizes the degree of social stratification and is defined as the ratio between the average monetary income level of the 10% of the population with the highest incomes (Svinukhova 2019) to that of the 10% of the population with the lowest incomes (Table 7).

Table 7. *Income differentiation coefficient*

Region	Funds ratio	EA 3
Almaty city	7.5	1
Karaganda	6.9	1
East Kazakhstan	6.8	1
North Kazakhstan	6.7	1
Pavlodar	6.5	1
Akmola	5.9	1
Almaty	5.4	1
Aktobe	5.2	1
Kostanay	5.1	1
Astana city	4.7	2
West Kazakhstan	4.5	2
Kyzylorda	4.2	2
Zhambyl	3.9	2
Atyrau	3.8	2
Turkestan	3.4	3
Mangystau	3.3	3
Shymkent city	3.2	3

The values of the coefficient of funds have an inverse relationship with the assessment of the level of food security. At the same time, some industrial regions have the highest coefficient of funds values, with an estimate of 1 (unacceptably high). One of the priorities of social development is to reduce the level of social differentiation of the population

and reduce excessive social distances, equalizing the level and quality of life of the population in different regions.

Indicator EA 4: the Engel coefficient.

This represents the share of household spending on food from the total volume of consumer spending.

Table 8. *Engel coefficient*

Region	Engel coefficient	Expenditures on food products, tenge	EA 4
Akmola	48%	392,801	2
Aktobe	52%	382,038	2
Almaty	59%	473,577	1
Atyrau	58%	395,832	1
East Kazakhstan	54%	502,818	2
Almaty city	50%	567,665	2
Astana city	46%	450,748	2
Shymkent city	49%	286,237	2
Zhambyl	62%	395,796	1
West Kazakhstan	58%	394,544	1
Karaganda	45%	466,415	2
Kostanay	46%	376,269	2
Kyzylorda	52%	339,838	2
Mangystau	57%	385,007	1
Pavlodar	55%	509,570	2
Republic of Kazakhstan	53%	427,330	2
North Kazakhstan	47%	427,961	2
Turkestan	62%	339,746	1

The share of food expenditure in total income in each country/region can be classified as follows:

- 50%–60% – low, needs are barely met, the region is considered extremely poor;
- 40%–50% – below average, basic needs are met;
- 30%–40% – average, a relatively wealthy population;
- 20%–30% – above average, a wealthy society;
- 20% or less – a very wealthy society.

In Kazakhstan, regions where EA 4 = 1 are extremely poor, while the remainder are below average.

A comprehensive assessment of the level of PS in each region with the equal influence of factors can be seen in formula (2), and is presented in Table 9.

$$\text{Comprehensive assessment of the region's FS} = \frac{1}{3}(\text{PA} + \text{EA} + \text{QS}) \quad (2),$$

$$\text{where PA} = \frac{1}{2}(\text{PA1} + \text{PA2}); \quad \text{EA} = \frac{1}{4}(\text{EA1} + \text{EA2} + \text{EA3} + \text{EA4}).$$

Table 9. *A comprehensive assessment of the level of regional food safety*

Region	PA 1	PA 2	EA 1	EA 2	EA 3	EA 4	QS	PA	EA	Comprehensive assessment	Rank
Turkestan	4	3	4	2	3	1	2.5	3.50	2.5	2.83	1
Pavlodar	4	3.83	1	3	1	2	2.5	3.92	1.75	2.72	2
Kostanay	4	3.50	1	2	2	2	2.5	3.75	1.75	2.67	3
North Kazakhstan	4	4	1	2	1	2	2.5	4.00	1.5	2.67	4
Akmola	4	3.67	1	2	1	2	2.5	3.83	1.5	2.61	5
Aktobe	4	3.00	1	3	1	2	2.5	3.50	1.75	2.58	6
Almaty	4	3.17	1	2	1	2	2.5	3.58	1.5	2.53	7
Zhambyl	3	3.00	3	2	2	1	2.5	3.00	2	2.50	8
Atyrau	2	2.33	4	4	2	1	2.5	2.17	2.75	2.47	9
Karaganda	3	3.17	1	3	1	2	2.5	3.08	1.75	2.44	10
Kyzylorda	2	2.17	4	3	2	2	2.5	2.08	2.75	2.44	11
West Kazakhstan	3	2.83	1	3	2	1	2.5	2.92	1.75	2.39	12
East Kazakhstan	1	3.50	1	3	1	2	2.5	2.25	1.75	2.17	13
Shymkent city	1	1.5	2	2	3	2	2.5	1.25	2.25	2.00	14
Mangystau	1	1.17	1	4	3	1	2.5	1.08	2.25	1.94	15
Astana city	1	1	1	4	2	2	2.5	1.00	2.25	1.92	16
Almaty city	1	1	1	4	1	2	2.5	1.00	2	1.83	17

An unacceptably low level of FS (1 ≤ Assessment of the level of FS of the region < 2) is observed in the Astana, Almaty and Mangistau regions, although they have a high purchasing power based on the average per capita monetary income of the population (EA 2 – 4 points). All other regions have a low level of FS (assessment of the level of FS of the region – 2–3 points). At the same time, the North Kazakhstan, Almaty, Pavlodar, Akmola, East Kazakhstan, Kostanay, Aktobe, Zhambyl, Karaganda, Turkestan regions have a high level of gross production of certain types of agricultural products per capita in kilograms.

Discussion

The state of food security is mainly analyzed and assessed at the country level. However, country indicators are made up of regional indicators that reflect the significant geographical, territorial, climatic, economic and other features of the functioning of the

food markets of different regions. This actualizes the need for a differentiated approach to decision-making in order to ensure FS at the regional level.

The assessment of the food security of the regions of Kazakhstan has the following fundamental differences from the national model:

1. The highest level of dependence is typical for regions with unfavorable natural and economic conditions for agriculture. The state must build a regional balance for the distribution of food from the regions that supply products to consumer regions. With the loss of food independence of the country, its food security is violated. There is no such correlation at the regional level.
2. At the national level, the task is to create and maintain strategic food stocks, which is not the function of the regions.
3. To protect FS, the state uses customs tariffs, compensation fees, excises, sales taxes, quotas, etc., which are only within the competence of the government of the country.

One of the important elements of FS management is the system of transport and logistics infrastructure with the participation of the republic's budget. The implementation of logistics should focus on improving the movement of goods, optimizing inventory and costs, as well as providing high-quality customer service. It is necessary to remove all obstacles to the movement of food products, both within the regions and internationally, by: improving customs procedures; ensuring the safe transportation of goods without extortion; and organizationally developing key indicators for ensuring food security and including them in the assessment of the activities of state bodies, primarily customs and law enforcement agencies.

Conclusions and recommendations

Based on the proposed methodology for comprehensively assessing the food security level of regions, an automatic system of ratings of regions for differentiated management will be built. This will involve an analysis of risks and opportunities, taking into account the population, natural and climatic conditions, geographical location (border, logistics), the level of development of agricultural production, the state of the domestic market, and the position of consumers in it.

In the information system for the protection of consumer rights, it is necessary to provide for the coverage of not only trade entities, but also public catering points that allow its safety to be assessed. This is especially true for the working urban population and the youth. It is also decisive to ensure the level of food security of social security facilities, including kindergartens, schools, and hospitals. To motivate business entities, developing a rating system for food outlets by category, such as restaurants, cafes, and canteens, is advisable.

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POŽIŪRIAI Į KAZACHSTANO REGIONŲ APRŪPINIMO MAISTU VERTINIMĄ ŠIUOLAIKINĖMIS SĄLYGOMIS

Anotacija. *Straipsnyje siūloma visapusiško aprūpinimo maistu lygio Kazachstano regionuose vertinimo metodika atsižvelgiant į tris komponentus: fizinį prieinamumą, ekonominį prieinamumą ir maisto saugą. Rodiklių sistema ir jų ribinės vertės yra pateisinamos vertinant kiekvieną komponentą. Išsamus Kazachstano regionų aprūpinimo maistu įvertinimas buvo atliktas 2021 m. Tyrimo metu, siekiant įvertinti regiono aprūpinimą maistu, buvo taikytas matematinio modeliavimo metodas. Jis apima loginę analizę, kai atrenkami statistiniai ir teisiniai duomenys siekiant užtikrinti jų aprėpties išsamumą ir nuoseklumą tiriamoje srityje. Rezultatams interpretuoti buvo pasitelkti sisteminimo, palyginimo, reitingavimo ir vizualizavimo metodai. Tyrimo informacinė bazė buvo Kazachstano Respublikos Strateginio planavimo ir reformų agentūros nacionalinės statistikos biuro duomenys.*

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