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REGIONAL FOOD SECURITY MANAGEMENT BASED ON DATA DRIVEN DECISION MAKING

DATA DRIVEN DECISION MAKING НЕГІЗІНДЕ АЙМАҚТЫҢ АЗЫҚ ТҮЛІК ҚАУІПСІЗДІГІН БАСҚАРУ

УПРАВЛЕНИЕ ПРОДОВОЛЬСТВЕННОЙ БЕЗОПАСНОСТЬЮ РЕГИОНА НА ОСНОВЕ DATA DRIVEN DECISION MAKING

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Abstract: Annotation. *The goal* is to study the effectiveness of food security management in the country and regions based on the principles of Data Driven Decision Making (DDDM) for making justified and effective decisions. This research was carried out as part of implementation of the tasks of the project on grant financing of Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan on the topic AP14871923 "Management of regional food security in the context of global challenges based on the concept of Data Driven Decision Making." *Methods* - the works of domestic and foreign economists concerning the problems of food supply in the context of globalization and integration of the country's economy were used as theoretical and methodological basis for the study. Scientific research methods: monographic, abstract, logical, systemic and complex analysis, statistical data processing, structural-functional approach. *Results* - the authors considered the possibility of using DDDM in agricultural sector. *Conclusions* - implementation of the results allows to obtain a multiplier effect associated with achieving sustainability of agro-industrial system of the country's regions through the implemen-

tation of DDDM principles in practical activities of central state and local authorities. It is substantiated that the use of the concept of decision-making based on Data Driven Decision Making contributes to objective assessment of economic and physical availability of food, food safety, when quality of raw materials and products meets established requirements and guarantees safe consumption. It is necessary to support domestic production and reduce imports. This policy is followed by many countries with high level of food self-sufficiency.

Аңдатпа. ***Мақсаты*** **– негізделген және тиімді шешімдер қабылдау үшін Data Driven Decision Making (DDDM) қағидаттары негізінде елдің және өңірлердің азық-түлік қауіпсіздігін басқарудың тиімділігі мәселелерін зерттеу. Бұл зерттеу «Data Driven Decision Making» тұжырымдамасы негізінде жаһандық сын-қатерлер жағдайында өңірдің азық-түлік қауіпсіздігін басқару" AP14871923 тақырыбы бойынша Қазақстан Республикасы Ғылым және жоғары білім министрлігі Ғылым Комитетінің гранттық қаржыландыру жөніндегі жобасының міндеттерін орындау шеңберінде жүргізілді.** ***Әдістері*** **– зерттеудің теориялық-әдіснамалық базасы ретінде отандық және шетелдік ғалым-экономистердің жаһандану және ел экономикасының интеграциясы жағдайындағы азық-түлікпен қамтамасыз ету мәселелеріне қатысты еңбектері пайдаланылды. Ғылыми зерттеу** ***әдістері***: **монографиялық, дерексіз, логикалық, жүйелік және кешенді талдау, статистикалық деректерді өңдеу, құрылымдық-функционалдық тәсілдер.** ***Нәтижелері*** **– авторлар агроөнеркәсіптік кешен саласында DDDM қолдану мүмкіндігін қарастырған.** ***Қорытындылар*** **– нәтижелерді іске асыру DDDM қағидаттарын орталық мемлекеттік және жергілікті органдардың практикалық қызметіне имплементациялау есебінен ел өңірлерінің агроөнеркәсіптік жүйесінің тұрақтылығына қол жеткізуге байланысты мультипликативтік әсер алуға мүмкіндік береді. Data Driven Decision Making негізінде шешім қабылдау тұжырымдамасын пайдалану шикізат пен өнімнің сапасы белгіленген талаптарға сай болған кезде азық-түліктің экономикалық және физикалық қолжетімділігін, азық-түлік қауіпсіздігін объективті бағалауға ықпал ететіні негізделді және қауіпсіз тұтынуға кепілдік беретіні анықталды. Өз өндірісін қолдау, импортты қысқарту қажет. Мұндай саясатты азық-түлікпен өзін-өзі қамтамасыз ету деңгейі жоғары көптеген елдер ұстанады.**

Аннотация. ***Цель*** **– изучение вопросов эффективности управления продовольственной безопасностью страны и регионов на основе принципов Data Driven Decision Making (DDDM) для принятия обоснованных и эффективных решений. Данное исследование проведено в рамках выполнения задач проекта по грантовому финансированию Комитета науки Министерства науки и высшего образования Республики Казахстан по теме AP14871923 «Управление продовольственной безопасностью региона в условиях глобальных вызовов на основе концепта Data Driven Decision Making».** ***Методы*** **– в качестве теоретико-методологической базы исследования использованы труды отечественных и зарубежных ученых-экономистов, касающиеся проблем продовольственного обеспечения в условиях глобализации и интеграции экономики страны. Методы научных исследований: монографический, абстрактный, логический, системный и комплексный анализ, обработка статистических данных, структурно-функциональный подход.** ***Результаты*** **– авторами рассмотрена возможность применения DDDM в сфере агропромышленного комплекса.** ***Выводы*** **– реализация результатов позволяет получить мультипликативный эффект, связанный с достижением устойчивости агропромышленной системы регионов страны за счет имплементации принципов DDDM в практическую деятельность центральных государственных и местных органов. Обосновано, что использование концепции принятия решений на основе Data Driven Decision Making способствует объективной оценке экономической и физической доступности продовольствия, безопасности питания, когда качество сырья и продуктов соответствует установленным требованиям и гарантирует безопасное потребление. Необходима поддержка собственного производства, сокращение импорта. Такой политики придерживаются многие страны с высоким уровнем самообеспечения продовольственными товарами.**

Key words: food security, DDDM data processing, management decisions, economic and physical accessibility, food security, import reduction, food self-sufficiency.

Түйінді сөздер: азық-түлік қауіпсіздігі, dddm деректерін өңдеу, басқару шешімдері, экономикалық және физикалық қолжетімділік, азық-түлік қауіпсіздігі, импортты азайту, азық-түлікпен өзін-өзі қамтамасыз ету.

Ключевые слова: продовольственная безопасность, обработка данных DDDM, управленческие решения, экономическая и физическая доступность, безопасность питания, сокращение импорта, самообеспеченность продовольствием.

Introduction

The provision of food and the well-being of the country's population depend on sustainable food security (FS) (Kalashnikov P., Kulanov A., Nesipbekov E. et al.) [1]. FS remains a global priority in the development strategy of modern countries. One of the most important tasks of the state is to ensure the national security of the country, i.e., its autonomy and independence from neigh-boring countries. One of the main ways to ensure security is to provide improved access to safe and nutritious food and support FS.

Based on the need to achieve the principles of sustainable development, which developed and developing countries are guided by, public policy should be aimed at ensuring FS, preserving the environment, protecting territories from the degradation of water and land resources and destruction of biodiversity, and motivating social institutions, business, and the population to care about the nutrition quality (Kurmanova D., Ismailova A., Ukibayeva G. et al.) [2].

Researchers (Cappelli A., Cini E.) [3] note that FS should be considered within each region, considering the regional characteristics of the territories, since each region differs from others by its inherent natural resources, material wealth, social living conditions, and economic and environmental situation. Complementing this approach to understanding regional FS, researchers focus on the ability of the region to meet the needs of the population with food in volume, structure, quality, and caloric content corresponding to rational norms, based on the fullest use of the possibilities of regional production potential and the system of interregional relations following the territorial division of labor (Kaldiyarov D.A., Nurmukhankyzy D., Bedelbayeva A.E.) [4].

Summarizing the components of regional FS, it can be argued that among researchers, a structural and systematic approach is predominant, focused on understanding the food structure of the local demographic population, formed from interconnected subsystems according to functional, organizational, resource, and technological characteristics and aimed at uninterrupted, sufficient, and high-quality satisfaction of the physiological needs of the population with basic foodstuffs from internal and international sources (Kashina E., Yanovskaya G, Fedotkina E. et al.) [5].

Accordingly, any type of analysis, assessment program, and monitoring of FS management in a region requires an understanding of a set of relevant factors affecting the level of FS there. It is not enough to limit oneself to creating a system of collected factors. One needs to apply it as much as possible in many situations.

The most difficult task is to create a system of assessment and forecasting, starting with the selection of indicators, until the final stage when enterprises can make decisions about creating a new product in the field of agriculture or the food industry, considering not only their business but also national interests aimed at reducing threats from the influence of certain factors. In modern management practice, it is necessary to create special software that would help solve such problems. Thus, to solve this problem, it was necessary to create a theoretical and methodological system for managing regional FS in modern conditions.

Literature Review

The problems of studying the management of food security in the region are of great importance and relevance among scientific areas in the world. Important aspects of food security are reflected in the works of such foreign authors as Horn B., Ferreira C., Kalantari Z. et al. [6], Vu K., Vuong N.D., Vu-Thanh T. et al. [7], the content of which proves the positive relationship between management and food management in the context of economic globalization. The studies of Laborde D., Martin W., Vos R. et al. [8] offer experience in managing food security at the regional level based on a comparison of panel data. However, the formation of the conditions of the market environment and its competitiveness are sharply different and Western methods for managing the problems of food security in the region cannot be fully integrated into the management of Kazakhstan.

Within the framework of the problem being studied, the works of scientists. Barons, M.J., Fonseca C., Davis A. et al. [9], Jiméneza D., Delercea S., Doradoa H. et al. [10], Zaitsava M., Marku E., Guardo M. [11] which propose the use of an integrated decision-making system based on statistical data (IDSS), based on expert assessments and statistical data for making management decisions, including at the regional level, have

some overlap with the model based on the DDDM concept. Strubea J., Glennaa L., Hatanakab M. et al. [12] discuss managing the sustainable development of the food system based on the field-to-market food supply in the United States.

Kazakh scientists have made a great contribution to the study of food security issues. Esjanova J.J., Ermekbaeva D.D., Myrzaeva U.A. [13], conducted research to analyze changes in the properties of food security, assess the state of economic availability of food and its quality.

The problems of providing food to the regions of the Republic of Kazakhstan are discussed in the articles by Niazbaeva A.A., İmanbaeva Z.O.; Abylkasimova J.A., Orynbekov G.A., Alibaeva M.M. [14, 15]. Kantarbaeva Sh.M. [16]. Work was carried out to assess the regulatory impact of the state on the development of agricultural production, the effect of the assessment was shown to be expressed in improving the quality of management decisions in the field of allocating financial resources for the development of the agricultural sector However, the study is based on country indicators and is of a review nature without highlighting any practical recommendations that would influence the management of food security processes at the regional level.

An analysis of previous scientific research has revealed a poor representation of works on food security management at the regional level, highlighting any practical recommendations, including the implementation of world experience, mechanisms for using modern digital management technologies, and specification of solutions at the regional level. The development of practical tools requires an integrated approach to research using multidimensional data in all areas of the region, analysis of existing business processes, interaction of information flows with a focus on meeting the needs of key stakeholders.

Materials and methods

Due to the novelty of the phenomenon under study and the research nature of the goal, we chose a qualitative approach to research.

In this paper, we tried to answer the following research questions: What factors of influence on regional FS should be considered when making management decisions based on data? And what indicators of regional FS should be considered when making management decisions based on data concerning Kazakhstan?

In order to fulfill the research objectives and study problematic issues, the theoretical and methodological aspects of food security were analyzed.

The following methods were used to uncover research questions:

- formation of a broad evidence base, accumulation, systematization and interpretation of statistical and other data, including analysis of the effectiveness of measures already implemented;

- analysis of direct and indirect effects from the implementation of the system, as well as alternative options for achieving the goals, including the option of the absence of government intervention. Next, for the selected options of measures, the benefits from their implementation and the costs of their implementation are compared (direct and indirect costs, negative external effects are taken into account);

- justification of theoretical concepts, assessment methodology and description of the main relationships of the object under study, development of a model for decision-making, processing of research results, conclusions and recommendations.

Information and statistical data reflected in official government and international documents, analytical and statistical reports are used to analyze the state of agricultural goods and food.

Results

In Kazakhstan, food security is an important component of the security of the country's economy and is expressed by the state's ability to ensure the physical and economic availability of high-quality and safe food products for the population in sufficient quantities. Independence in the country's food supply is not reflected in determining the country's food security, but is an important element. Food security is considered insufficient if the annual production of basic food products is less than 80% of the annual needs of the population, subject to compliance with physiological consumption standards.

In the aspect of food sufficiency, the main indicators of the FS state in Kazakhstan are:

* self-sufficiency in basic agricultural products (the ratio of internal production to internal consumption);

* the ratio between the actual indicators of the average per capita consumption of basic foodstuffs and the accepted standards (rational norms) (table 1).

Table 1 - FS indicators in Kazakhstan for basic types of agricultural products/food in 2023 [17]

Basic types of agricultural products/food	Level of self-sufficiency	Actual and normative indicators of average per capita consumption, kg per person per year
Grain/bread and grain processing products	125	99.2 (109)
Potatoes	104	107.4 (100)
Vegetables and melons	108	230.6 (149)
Fruit and berries	38	48.7 (132)
Meat and meat products recalculated as meat	82	78.7 (78.4)
Fish and fish products	-	15.1 (14.0)
Milk and dairy products recalculated as milk	93	247.0 (301)
Eggs	100	228.7 (265) (units per year)
Sugar	8	26.5 (17.0)
Vegetable oils	91	21.1 (12.0)

Note: Compiled by the author on the basis of data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan [17]

According to the information in table 1, there is a low level of self-sufficiency in Kazakhstan only in sugar, fruits and berries. For some types of food products (dairy and meat products, eggs, fruits and berries, vegetables, bakery products), average per capita consumption in Kazakhstan remains below accepted standards. For individual products (primarily sugar, bakery products and vegetables), the actual levels of average per capita consumption in Kazakhstan significantly exceed the established rational standards.

In terms of economic access to food, the situation is less optimistic. The share of food expenditures in the total consumer expenditures of the population of the countries of the Eurasian Economic Union (EAEU) exceeds 30% (although the actual level of consumption of some types of food products is lower than accepted rational norms).

According to estimates, in 2023, the share of households with consumer spending below the level corresponding to the cost of a food basket built according to rational norms was 70-75% in Kazakhstan (Bureau of National Statistics of the Agency…) [17]. This indicates insufficient purchasing power of disposable incomes of the population and insufficient economic availability of food in the required volumes and variety. Kazakhstan is completely dependent on imported sunflower seed material. Thus, the achievement of high self-sufficiency in sunflower oil is conditional if we exclude the import component in the production chain.

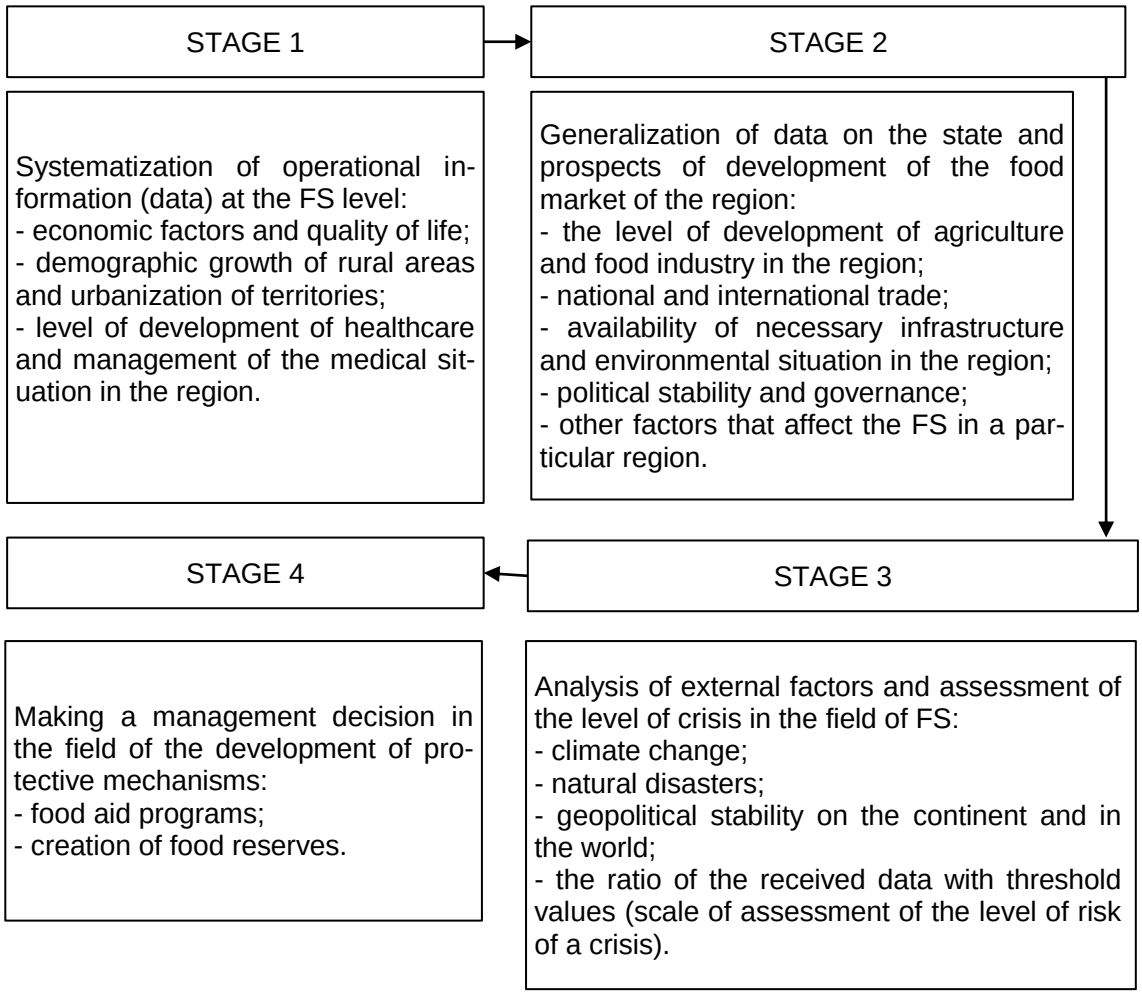
The analysis of the results of the expert survey made it possible to develop an algorithm for making managerial decisions in the field of regional FS based on DDDM (figure 1).

According to the presented mechanism, at the first stage, data and all information on food security management issues are systematized. At this stage, information is collected, which includes economic factors, quality of life and population growth in the country, as well as the state of urbanization of territories, the level of healthcare development and management of the healthcare system in the region.

When assessing the state of food security in Kazakhstan, we propose to include such factors as the size and composition of the population; gender and age of the population; population of cities, villages and districts; general indicators of population reproduction; the state of the standard of living of the population, including its cash income, cost of living, accumulated average monthly nominal wage, purchasing power, per capita cash income of the population, the composition of final consumption expenditures of households of different social levels; economic categories; level of food consumption; population health status; food price level; food production. In addition, this group should include the food ration of the population, as well as regional food supplies.

At the second stage, generalization of data on the state of development of the food market at the regional level is carried out. Timely application of data provides the ability to predict and manage food crises. At this stage, it is necessary to take into account the state of development of agriculture and the food industry in the region and the availability of infrastructure necessary for national and international trade. Data and information will help regional authorities develop food management measures, including creating optimal food supplies in emergency situations, taking into account scientifically based consumption standards; conduct a comprehensive study of

the socio-economic situation of citizens in order to identify the most needy groups of the population, provide them with priority assistance in the event of a crisis situation, etc.



Note: Figure compiled by the author on the basis of (Hirvonen K., Brauw A., Abate G.) [18]

Figure 1 - An algorithm for making managerial decisions in the field of regional FS based on DDDM

In addition, data may include information on the number of food production establishments; price ratio for local and imported food products; the ratio of food consumption by the urban and rural population, including in the context of individual urban entities; assessment of physical and institutional infrastructure, political situation and other internal factors. This system makes it possible to increase the effectiveness of security measures.

At the third stage, the identification and assessment of the level of crisis in the financial sector is carried out based on the analysis of selected regional financial indicators and the influence of external factors on them. It is necessary to evaluate external factors that are almost impossible to control, but their occurrence significantly affects the FS of the region (geopolitical situation, natural disasters, climate change). After assessing the above indicators and factors, it is recommended to use an appropriate crisis risk rating scale (for example, high, low or medium) to compare them with the threshold values.

At the fourth stage, management decisions are made to minimize risk and negative impact. In case of food shortages, it is necessary to use protective mechanisms such as food assistance programs and food reserves.

Discussions

The demand for food is growing faster than its production. Therefore, the problems of ensuring food security are often discussed both in the literature and in society. As the results of the study showed, food security in the context of achieving the principles of sustainable development is, first of all, access of all people to sufficient, safe and nutritious food at all times to meet their nutritional needs

for an active and healthy lifestyle. The development of FS depends on various factors.

The results of the study confirmed the hypothesis that for effective management of FIs, various elements must be taken into account: from agricultural practices to global trade policies specific to a given region. Regional characteristics are very different, which allows us to differently assess the importance of factors influencing FS. For example, households in Ghana are characterized by low levels of food consumption due to factors such as low levels of education, employment status, and household location (i.e., in rural areas or the city).

The more factors influence the regional FS, the more opportunities for FS development, on the one hand, and, on the other, the more difficult it is to manage, which explains the need to create specific tools that would increase the effectiveness of FS management.

As a result of our research, we confirmed that when analyzing the main factors influencing regional food security, these factors should be divided into two categories: internal and external.

The analysis of regional characteristics of external and internal factors and the interpretation of the results of an expert survey involving the FS of Kazakhstan allowed us to draw theoretical and practical conclusions from the results of our study.

Several points have been indicated as theoretical. When making management decisions in the field of food security in Kazakhstan, special attention should be paid to the factors that reflect the sufficiency of consumption of certain food products, which have the greatest weight, and not to what characterizes the number of people outside below the poverty line, as these groups are in greatest food danger, which is confirmed by the results of the study.

External factors (such as natural and climatic conditions) either cannot be influenced, or can only be influenced at the state level, as confirmed by the study results. In particular, the main external factor in securing the Kazakhstan Stock Exchange is the presence of geopolitical risks. The economy of Kazakhstan as a member of the EAEU integration association in connection with Russia's war in Ukraine has suffered from rising raw material prices, disruptions in supply chains, high volatility in the cost of agricultural products and stock availability. Resources. Therefore, in order to reduce the influence of the geopolitical risk factor, it is necessary to expand state-level partnerships in a multipolar world, pursuing a policy of multi-vector integration.

Analyzing the regional FS indicators proposed by experts, which should be considered when making data-driven management decisions, it should be noted that regional FS is guaranteed when, in addition to increasing food production, the nutrient balance in the food improves, and so does its quality, that is, energy value and nutrient content. Among the indicators of FS, this indicator is intentionally placed at the top.

One of the main indicators of a region's industrial safety is to include basic types of food products in the population's diet. In the food supply of Kazakhstan and its regions, an important role is played by the sufficiency of grain reserves in state resources, which is defined as the ratio of the volume of grain in state food reserves to the volume of domestic consumption of bread and bakery products of the regional population.

In addition, an important indicator in regional food security is the indicator of economic food security, which is defined as the share of total food costs in total household expenses, including in urban areas and rural areas. A significant share of these costs is represented by total consumer spending on food.

The level of food satisfaction of the population and regional FS depends not only on the physical needs of population groups but also on their purchase power. A priority indicator of regional FSs is the differentiation of the cost of food by social groups, which is tracked in dynamics.

Regional security is guaranteed when food production increases, food quality and nutritional balance improve; when access to food resources is ensured for every person. The structure of the regional national market for individual goods is determined in physical terms as the product of consumption of a particular product and the average annual population of the region.

Conclusion

As practical conclusions, we identified the following provisions.

1. Analysis of the main factors for ensuring industrial safety can contribute to the creation of a system for preventing food risks, as well as sustainable food supply to the region.

2. A feature of the decision-making system for managing regional FS is the ability of this system to predict the state of the regional FS and, through fluctuations in factors, determine the possibilities of influencing it. An important tool for improving the level of FS is to

provide correct data on cases in the field of ensuring FS to decision-makers, allowing them to make decisions based on the provided data.

3. The management of the regional FS using DDDM allows one to determine its state in the future, which in turn is the basis for creating a database and software that helps to determine the management strategy and make operational decisions.

4. FS management includes addressing negative impacts through interventions such as developing climate-resilient farming practices, implementing effective population control measures, investing in sustainable agricultural technologies, strengthening political stability, reviewing global trade policies, implementing anti-poverty programs, strengthening infrastructure, and promoting gender equality. The highlighted variety of factors makes it possible to evaluate the implementation of the FS management system in Kazakhstan using DDDM.

5. DDDM will allow for creating tools for making managerial decisions and reducing risks in FS in the context of the principles of sustainable development. The prospect of further research may be the practical use of DDDM for a specific region of Kazakhstan.

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References

[1] Kalashnikov, P. Impact of state and legal regulation on the sustainable development of agricultural territories and improving the standard of living of the population / P. Kalashnikov, A. Kulanov E. Nesipbekov, A. Kaishatayeva, Sh. Kantarbayeva // Journal of Environmental Management and Tourism.– 2023. -14(1).– P. 82-88.

[2] Kurmanova, D. Investments as a factor of sustainable development of rural areas / D. Kurmanova, A. Ismailova, G. Ukibayeva, N. Abdildinova, A. Bakyei // Journal Of Environmental Management And Tourism. – 2023. - 14(3). – P. 729-738.

[3] Cappelli, A. Challenges and opportunities in wheat flour, pasta, bread, and bakery product production chains: A systematic review of innovations and improvement strategies to increase sustainability, productivity, and product quality / A. Cappelli, E. Cini // Sustainability. - 2021. - 13(5). – P. 2608 - 2618.

[4] Kaldiyarov, D.A. The Mechanism for Sustainable Development of Rural Areas in the Republic of Kazakhstan / D.A. Kaldiyarov, D. Nurmukhankyzy, A.E. Bedelbayeva // Lecture Notes in Networks and Systems. – 2021. – V. 205. – P. 797–804.

[5] Kashina, E. Impact of digital farming on sustainable development and planning in agriculture and increasing the competitiveness of the agricultural business / E. Kashina, G. Yanovskaya, E. Fedotkina, A. Tesalovsky, E. Vetrova, A. Shaimerdenova, M. Aitkazina // International Journal of Sustainable Development and Planning. – 2022. - 17(8). – P. 2413-2420.

[6] Horn, B. Links between food trade, climate change and food security in developed countries: A case study of Sweden / B. Horn, C. Ferreira, Z. Kalantar, // Ambio. – 2022. - 51(4). – P. 943–954.

[7] Vu, K. Income shock and food insecurity prediction Vietnam under the pandemic / K. Vu, N. D. Vuong, T. Vu-Thanh, A.N. Nguyen // World Development. – 2022. – 153(1). – P. 105838 - 105850.

[8] Laborde, D., Martin, W., Vos, R. Impacts of COVID-19 on global poverty, food security, and diets: Insights from global model scenario analysis / D. Laborde, W. Martin, R. Vos // Agricultural Economics. – 2021. - 52(3). – P. 375-390.

[9] Barons, M.J. A decision support system for addressing food security in the United Kingdom / M.J. Barons, C. Fonseca, A.Davis, J.Q. Smith // Journal of the Royal Statistical Society. Series A: Statistics in Society. – 2021. – P. 1-24.

[10] Jiméneza, D. A scalable scheme to implement data-driven agriculture for small-scale farmers / D. Jiméneza, S. Delercea, H. Doradoa, J. Cocka, L. Armando, M. Agamezb, A. Jarvisa // Global Food Security.– 2019.– V.23.–P.256-266.

[11] Zaitsava, M. Is data-driven decision-making driven only by data? When cognition meets data / M. Zaitsava, E Marku, M. Guardo // European Management Journal. – 2022. – 40(5). – 656-670.

[12] Strubea, J., Glennaa, L., Hatanakab, M., Konefalb, J., Connerc, D. How data-driven, privately ordered sustainability governance shapes US food supply chains: The case of field to market/J. Strubea, L. Glennaa, M. Hatanakab, J. Konefalb, D Connerc // Journal of Rural Studies. – 2021. -V.86. – P. 684-693.

[13] Есжанова, Ж.Ж. Оценка продовольственной безопасности Казахстана в условиях кризиса COVID 19 / Ж.Ж.Есжанова, Д.Д. Ермекбаева, У.А. Мырзаева // Экономика: стратегия и практика.- 2021.-16(2).-Р.145-153.

[14] Ниязбаева, А.А. Рынок продовольствия Актюбинской области Республики Казахстан: тенденции повышения конкурентоспособности / А.А. Ниязбаева, З.О. Иманбаева // Проблемы агрорынка. – 2021. – N3.-Р.154-161.

[15] Абылкасимова, Ж.А., Орынбекова, Г.А., Алибаева, М.М. Агропродовольственный рынок Восточно-Казахстанской области: потенциал роста / Ж.А Абылкасимова, Г.А. Орынбекова, М.М. Алибаева, // Проблемы агрорынка. – 2021. – N 3.-Р. 144-153.

[16] Кантарбаева, Ш.М. Оценка регулирующего воздействия государства на развитие аграрного производства / Ш.М. Кантарбаева // Проблемы агрорынка. – 2019. - №4. - Р.19-25.

[17] Данные Бюро национальной статистики Агентства по стратегическому планированию и реформам Республики Казахстан [Электронный ресурс]. -URL: https://www.stat.gov.kz (дата обращения: 29.12.2023).

[18] Hirvonen, K. Food consumption and food security during the COVID-19 pandemic in addis ababa / K. Hirvonen, A Brauw, G.Abate // American Journal of Agricultural Economics. – 2022. - 103(3). – P.772-789.

References

[1] Kalashnikov, P., Kulanov, A., Nesipbekov, E., Kaishatayeva, A., Kantarbayeva, S. (2023). Impact of state and legal regulation on the sustainable development of agricultural territories and improving the standard of living of the population. *Journal of Environmental Management and Tourism*, 14(1), 82-88.

[2] Kurmanova, D., Ismailova, A., Ukibayeva, G., Abdildinova, N., Bakyei, A. (2023). Investments as a factor of sustainable development of rural areas. *Journal Of Environmental Management And Tourism*, 14(3), 729-738.

[3] Cappelli, A., Cini, E. (2021). Challenges and opportunities in wheat flour, pasta, bread, and bakery product production chains: A systematic review of innovations and improvement strategies to increase sustainability, productivity, and product quality. *Sustainability,* 13(5), 2608 - 2618.

[4] Kaldiyarov, D.A., Nurmukhankyzy, D., Bedelbayeva, A.E. (2021). The Mechanism for Sustainable Development of Rural Areas in the Republic of Kazakhstan. *Lecture Notes in Networks and Systems,* 205, 797–804.

[5] Kashina, E., Yanovskaya, G., Fedotkina, E., Tesalovsky, A., Vetrova, E., Shaimerdenova, A., Aitkazina, M. (2022). Impact of digital farming on sustainable development and planning in agriculture and increasing the competitiveness of the agricultural business. *International Journal of Sustainable Development and Planning,* 17(8), 2413-2420.

[6] Horn, B., Ferreira, C. & Kalantari, Z. (2022). Links between food trade, climate change and food security in developed countries: A case study of Sweden. *Ambio,* 51(4), 943–954.

[7] Vu, K., Vuong, N.D., Vu-Thanh, T., Nguyen, A.N. (2022). Income shock and food insecurity prediction Vietnam under the pandemic. *World Development,* 153(1), 105838 - 105850.

[8] Laborde, D., Martin, W., Vos, R. (2021). Impacts of COVID-19 on global poverty, food security, and diets: Insights from global model scenario analysis. *Agricultural Economics,* 52(3), 375-390.

[9] Barons, M. J., Fonseca, C., Davis, A., & Smith, J.Q. (2021). A decision support system for addressing food security in the United Kingdom. Journal of the Royal Statistical Society. *Series A: Statistics in Society,* 6(3), 443-451.

[10] Jiméneza, D., Delercea, S., Doradoa, H., Cocka, J., Armando, L., Agamezb, M., Jarvisa, A. (2019). A scalable scheme to implement data-driven agriculture for small-scale farmers. *Global Food Security,* 23, 256-266.

[11] Zaitsava, M., Marku, E., Guardo, M. (2022). Is data-driven decision-making driven only by data? When cognition meets data. *European Management Journal,* 40(5), 656-670.

[12] Strubea, J., Glennaa, L., Hatanakab, M., Konefalb, J., Connerc, D. (2021). How data-driven, privately ordered sustainability governance shapes US food supply chains: The case of field to market. *Journal of Rural Studies,* 86, 684-693.

[13] Esjanova, J.J., Ermekbaeva, D.D., Myrzaeva, U.A. (2021). Osenka prodovölstvennoi bezopasnosti Kazahstana v usloviah krizisa COVID 19 [Assessment of food security in Kazakhstan in the context of the COVID 19 crisis]. *Ekonomika: strategia i praktika – Economics: strategy and practice,* 16(2), 145-153 [in Russian].

[14] Niazbaeva, A.A., İmanbaeva, Z.O. (2021). Rynok prodovölstvia Aktübinskoi oblasti Respubliki Kazahstan: tendensii povyşenia konkurentosposobnosti [Food market of the Aktobe region of the Republic of Kazakhstan: trends in increasing competitiveness]. *Problemy agrorynka - Problems of AgriMarket,* 154-161 [in Russian].

[15] Abylkasimova, J.A., Orynbekova, G.A., Alibaeva, M.M. (2021). Agroprodovölstvennyi rynok Vostochno-Kazahstanskoi oblasti: potensial rosta [Agri-food market of the East Kazakhstan region: growth potential]. *Problemy agrorynka - Problems of Agrimarket,* 144-153 [in Russian].

[16] Kantarbaeva, Ş.M. (2019). Osenka reguliruiuşego vozdeistvia gosudarstva na razvitie agrarnogo proizvodstva [Assessment of the regulatory impact of the state on the development of agricultural production]. *Problemy agrorynka - Problems of Agrimarket,* 4, 19-25 [in Russian].

[17] Statisticheskie dannye Agentstva po strategicheskomu planirovaniju i reformam Respubliki Kazahstan Bjuro nacional'noj statistiki [Statistics from the Agency for Strategic Planning and Reform of the Republic of Kazakhstan Bureau of National Statistics]. Available at: https://stat.gov.kz (date of access: 29.12.2023) [in Russian].

[18] Hirvonen, K., Brauw, A., Abate, G. Food consumption and food security during the COVID-19 pandemic in addis ababa. *American Journal of Agricultural Economics,* 103(3), 772-789.

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