

Food Security and the Importance of Big Data

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Abstract:- Food security is an important component of the country's security. The problem was exacerbated by the Russia- Silk Road 2022 Conference Proceedings International Black Sea University Page | 128 Ukraine war, although it retained its relevance even before that, as evidenced by the programs of independent Georgian governments and political parties, which pay attention to the necessity of develop the agricultural sector. Food import dependence itself is risky, and increases the vulnerability when strategically important resource (cereals) import depends on long-term threats (Russia), or on countries in danger (as the war has shown Ukraine, Kazakhstan). A full-scale war between Russia and Ukraine is exacerbating the global food crisis. The prospect of a protracted war threatens to deplete strategic food reserves, which will greatly exacerbate the political, economic and social situation in the Middle East (main grain consumers of Russia and Ukraine) and lead to destabilization, creating risks of new waves of migration, similar to the "Arab Spring" of 2011, when cause of climatic changes of 2009-2010 - drought in the south of Ukraine and Russia and social issues in the Arab- Islamic world. According to the definition of the Food and Agriculture Organization of the United Nations (FAO): "Economic and physical access to safe food in sufficient quantity and nutritional value for all people to maintain an active and healthy life - is food security." The present report presents not only the theoretical justification, but also the already implemented operational tools, algorithms and applications, developed within the framework of the research on methods of ensuring food security through big data and digitalization. Also new concepts, "triple crisis", "new formation", "digital democracy".

Keywords:- Food Security, Triple Crisis, Digital Transformation, Agricultural Sector, Food Reserves, Digitization, Digital Democracy.

I. INTRODUCTION

Since gaining independence, the priority of the sector in the election programs of all governments and more or less influential political parties shows the urgency of the problems in the agricultural sector of Georgia. The country's reliance on food imports is dangerous in itself, especially because, on the one hand, it increases the its vulnerability in the most strategically important resources (cereals), with long-term threats (Russia), and on the other hand, in perilous situations (as the war has shown, Ukraine, Kazakhstan).

A full-scale war between Russia and Ukraine is exacerbating the global food crisis. The prospect of a

prolonged war threatens to deplete strategic food reserves, which in the Middle East (in the main grain consumers of Russia and Ukraine) will greatly aggravate the political, economic, and social situation and lead to destabilization, creating risks of new waves of migration, similar to the "Arab Spring" of 2011, which was caused by the climate changes of 2008-2009-2010 - drought in the south of Ukraine and Russia, and social issues in the Arab-Islamic world.

To determine the connection between climate change in the Northern Black Sea and the socio-political crisis in the Middle East, it is necessary to consider several factors:

- Islamic socialism, which implies the existence of affordable (social) bread in the retail trade at a formal price in the consumer market;
- the impact of drought on exports, for example, in case of wheat-producing countries, the drought did not cause the harvest to decrease to a critical level, but ...
- Self-organized social protest through social networks, which ended with the change of regimes in several Middle Eastern countries. It should be noted here that the importance of social networks to a certain extent confirms the idea, which is outside of the presented issue, but carried out as a whole within the framework of the research, about the importance of digitalization and the upcoming transformation, i.e. the possibility of a certain new formation - "digital democracy".
- The harvest deficit was entirely accounted for by exports (according to Oxfam's research report, the share of exports decreased to 30%);
- Social issues, in terms of women's rights and gender equality.

The abovementioned factors have led to the violation of the "conditional social contract" of Islamic socialism (the government maintains a stable low price for bread and the people are not interested in the government's activities), resulting in mass discontent, regime collapse or acute crisis, civil wars, economic hardship, and the IDP/migrant crisis.

The grain shortage caused by the ongoing war is highly likely to be a trigger similar to the aforementioned crises: **for example, in Sri Lanka:** food shortages and logistical complications created by the Russia-Ukraine war prolonged the crisis and increased import taxes. Sri Lanka has become the first country in Asia to default on its foreign debt for more than two decades. It depleted foreign exchange reserves, resulting in fuel, medicine, and food shortages in the country. In addition, according to the locals, the lobbying of Sri Lanka's Prime Minister Ranil Wickramasinghe and the

promotion of monopolies became one of the reasons for the social explosion.

➤ *In Lebanon*

The aftermath of the war has further exacerbated the humanitarian crisis. 2020 An explosion at the port of Beirut severely damaged grain silos (storage facilities) that accounted for 85% of the country's reserve stocks. Lebanon was supplied with 80% of Ukrainian wheat before the Russo-Ukrainian war, and the current processes have only exacerbated the global food crisis. As of today, there are bread lines in the capital and the social protest is gradually intensifying.

➤ *In Georgia*

This year, the decision of the Georgian government to ban the export of wheat for 1 year is related to the current issue in the world. To avoid a food crisis, Georgia cannot meet the quota set by the United Nations Food and Agriculture Organization (FAO) regarding the minimum 12% wheat reserve. By banning re-export, since the country does not have export potential at the moment, it will neutralize the severity of the issue in the force majeure situation according to today's forecast.

According to the definition of the Food and Agriculture Organization of the United Nations (FAO): "Economic and physical access to safe food in sufficient quantity and nutritional value for all people to maintain an active and healthy life - is **food security**."

For the sustainable economic development and inclusive economic growth of the country, great importance is attached to the development of the agricultural sector of Georgia, therefore it is vitally important to reach a public-political consensus based on seeing the perspectives, utilizing the existing potential, and using it for the purpose. The development and implementation of policies aimed at production and digitalization. Today, the agricultural sector is facing many challenges, there are different opinions and studies on how to overcome these challenges in political, media, and academic spaces, highlighting the relevance of the issue. However, the implementation of result-oriented reforms turned out to be an insurmountable barrier for the country. All over the world, including in Georgia, the issue of ensuring food safety and food safety is characterized by increasing urgency, especially during the pandemic, and it was named as the number one challenge on the agenda of global economic forums in 2020. Economic growth in agricultural sector is 2-3 times more effective than in other sectors of the economy in reducing poverty and ensuring food security.

Policy development is a necessary component in emerging from the post-pandemic situation. Against the backdrop of the world's triple crisis¹, in the era of

¹ The triple crisis is mentioned in detail in the article, Vol.II Mamulaidze "Digital transformation new (unknown) formation perspectives" at

technological revolution and digital transformation, the digitization of sectors puts Georgia on equal footing with other actors, creating a favorable condition for changing the dynamics in the agricultural sector of Georgia. The Russia-Ukraine war aggravated the above issue even more.

As a result of empirical observation and expert survey (conducted at the level of the state, international donor organizations, sectoral and sectoral associations, and independent experts), the discussion of the issue in a non-traditional paradigm² showed us the hidden perspectives and opportunities of the sector, such as digitalization, stimulation of traditional sectors, integration of artificial intelligence and the importance of big data in terms of strategic food reserves management policy.

II. NEW FINDINGS

➤ *Algorithm and application*

- The artificial intelligence (AI) algorithm integrated into the Georgian mobile application, which takes into account micro zonal features (soil, climate, etc.), their seasonal and periodic fluctuations/oscillations $Yr = 100 - b (ECe - a)^3$ for 315 agricultural products;
- Based on national, regional, municipal, and in some cases (when it is necessary to take into account micro zonal features) even at the village-level agro-historical data, theoretical and technological assumptions, starting the planning stage of integrating the assembled AI algorithm into agribusiness;
- The operational commercialized digital platform "Agronavi", which was created and implemented based on theoretical research and the aforementioned algorithm;
- *Theoretical generalization of statehood, that is, state management and public administration in the formative context, with a new interpretation from the point of view of digital democracy;*
- Digital democracy is presented as a new formation, that is expected to emerge as a result of a new kind of mutual integration based on the digitization of not only

<https://drive.google.com/file/d/1JP77k8PtELXcy9IYbSJTiEDsNdORWea/view>

² Approaches formed during the industrial (Soviet) era in the agricultural sector implied the industrialization of agricultural production. This involved cultivating monocultures on large areas, which was considered a traditional paradigm. However, in the context of the new paradigm, modern approaches are being considered. These approaches are focused on small areas and utilize digital technologies for sectoral development, offering exclusive products and services.

³ was developed within the framework of the research and explained in detail in Colloquium II: „The possibility of justification (which was tested in the study "Digital transformation and perspectives of new unknown formation")“;

individual sectors but also economic, political, social, and cultural life as a whole;

- Based on the fact that each formation determines the peculiarities of economic activity and state management methods and at the same time is itself determined by them, the political or macroeconomic and technical or micro-economic role of state management is understood in a new way, on the one hand, by promoting digitalization in individual sectors, and on the other hand, taking into account the results of digitalization, transforming prospects. This general finding is the basis for further in-depth analysis for the final phase of the study;
- A scientific novelty is the study of public administration and state management in the historical context based on the retrospective analysis of formative development and historical transformations. The strengthening of the general, intuitive, public idea about the acceleration of current changes in modern societies and technologies, based on research, gave rise to the scientific expectation of a new formation.
- A scientific innovation is the consideration of the combination of technological, economic, political, social, and cultural aspects in the formative or transformational aspect, allowing the assessment of the perspective of new formation in the era of technological revolution and digital transformation. Based on this, it is proposed to divide the countries into four large groups according to two components (so far);
- Another scientific innovation is the evaluation of the perspectives of the mentioned groups of countries and the attempt to predict the development; The options of forecasting, more precisely, the question of possible perspectives are discussed in the "Digital transformation and perspectives of new unknown formation" published within the scope of this study. Although the mentioned issues are debatable, their formalization and scientific understanding is a scientific novelty, especially in terms of the search for methodological foundations.

The increasing dynamic intergradation of all separate sectors highlights the need for large scale generalization in parallel with the study of public administration and state management in the historical context, retrospective analysis of formative development and historical transformations, strengthening of a general, intuitive, public idea about the acceleration of current changes in modern societies and technologies. The research gave rise to the possibility of scientific substantiation of the expectation of a new formation, which was reflected in the subsequent study "Digital transformation and perspectives of a new unknown formation". It was not only presented a scientific novelty but also emphasized the need to focus on the issue in a new way in light of such large-scale generalization, which may be reflected in the final research stage.

Among the innovations found, one is the integration of artificial intelligence in the primary production process in the agro sector and direct practice planning (receiving recommendations without soil laboratory analysis), which is **the first precedent** not only at the local but also at the

international level. With the aforementioned technological support, it is possible to overcome one of the main challenges, namely reducing the low productivity rate in the overall dynamics of the agricultural sector of Georgia.

The focus was on discovering and realizing the hidden opportunities of agribusiness through completely new digital technologies, mobile applications, and various software, which on the one hand was a novelty for traditional sectors, and on the other hand, was promising due to the potential of technical and commercial approbation. The experiment started during the research process "Prospects of integrating digital technologies in the agricultural sector and the mechanism of facilitating the simplification of agribusiness planning processes utilizing artificial intelligence (AI)" and ended with the development of an artificial intelligence algorithm and its integration into the application. "Digitalized agrotourism as a hub for multifaceted economic development" was a kind of innovation, which not only contributed to the development of one of the sectors but in general, it meant research of the mutually conditioned development of various fields. It gives particularly interesting results in terms of study, research, and analysis of tourism as a "variety of conditional exports". From the point of view that the customer (Tourist) with funds created and accumulated outside the country, acquires domestically produced products but with the difference of the aforementioned services. To get the product, they go to the supplier/manufacturer, although it should be noted that it was an event similar to a side effect. The main focus is on the agricultural sector and the digitalization of agritourism and cooperation, for which an exclusive product offer for the customer and the international market, was a completely new, exclusive event. Creation of a new sector and attraction of additional financial resources from outside the country is aimed for the recovery of the economy. Agrotourism was discussed from the noted point of view.

With the prediction that food consumption will increase to 70% by 2050, research has identified the possibility of integrating artificial intelligence in the agricultural sector to solve the current challenge.

According to the forecasts of the Food and Rural Organization of the United Nations (FAO), the World Farmers' Organization (WFO), the International Food Policy Research Institute (IFPRI), and the Georgian Farmers' Association (GFA), joint efforts between agriculture and other sectors are needed to balance the growth trend of food consumption with the dynamics of food production, through integrating modern technologies in sectors aligned with the Sustainable Development Goals (SDGs). Since 1983, the definition of food availability has led to the initiation of programs in particularly vulnerable countries, which were aiming:

- Establishing a policy for access to wholesome food with it and management;
- Creating a legal basis for local food production and consumption;

- Encouragement of small and medium farms and women farmers and their involvement in the process of developing food security policies and strategies.

Despite the existing initiatives, the COVID-19 pandemic and later the Russia-Ukraine war completely changed the agenda of not only the agricultural sector but also the industrial production process. Instead of having monopolistic producers, the initiative announced at the Qatar Economic Forum accelerated the process of sectoral decentralization.

In Georgia, the issue of food safety is aggravated by several main factors in the sector:

- Absence of the definition of a farmer;
- Small land ownership and natural (non-market) farming;
- Absence of elevators and silos (storage);
- Difficulty in accessing financial capital;
- Unprestige of sectoral education and shortage of specialists;
- Low dynamics of spreading modern technologies in the agricultural sector;
- Inflexibility and unavailability of agrarian insurance;
- and other general socio-economic challenges that are generally characteristic of post-socialist countries in protracted transformation.

In the definition of food security, focusing solely on physical and economic availability does not fully capture the complexity of the problem. Factors such as the food quality, safety and traceability also play a crucial role. All these mentioned components can become a target not only of special services of the hostile states but also of internal and external trade competitors. In Georgia, the demand for food safety is increasing both from the side of legislation and consumers. This is facilitated by the growing trend of the tourism sector, which is reflected in the increase in demand for locally produced products, similar to the international one. The creation of the Georgian Standard on a private initiative (by the Georgian Farmers' Association) and its digitization demonstrate the importance of food safety and contribute to the development of the issue. The "Geo Gap" standard is adapted to local conditions and legislation and is developed based on the international standard GLOBAL G.A.P.

III. STRATEGIC RESERVES MANAGEMENT POLICY

One of the main issues is why some countries are unable to manage strategic food reserves. The creation of grain reserves was one of the reasons for the emergence of statehood as such. Since then, for the last ten thousand years all states more or less have tried to have secure, guaranteed food supplies. This paradigm changed immediately after the end of the Cold War, as a result of, on the one hand, the high cost of supply services, on the other hand, the globalization and universal access to food, and finally, the "eternal removal" of external threats (the Russia-Ukraine war clearly demonstrated the fallacy of the last statement). For example, in the early 1990s, the United States of America opened its

strategic reserves and started supplying the Soviet Union to overcome the worsening food crisis in Russia. Today, the Russia-Ukraine war has raised expectations of food shortages even in America, and the American public has talked about renewing the strategic food stockpile policy. The American Security Project (ASP) cited China's model of strategic food stockpile management (which includes 650 million tons of rice and wheat, as well as corn and pork stockpiles) as a model.

The above-mentioned attitude is characteristic of liberal democracies, which are integrated into international trade, are focused on satisfying the interests of voters, and cannot take into account the possibility of an acute global crisis.

However, there is also a second group of countries - in the form of authoritarian regimes, which systematically solve only current problems. It may not be surprising that the above-mentioned regimes, according to their positioning, the main advantage is a coherent strategy, independent of changes in the political conjuncture, elections, and parties and politicians of different views. Paradoxically at first glance, they are not engaged in strategy at all, and mostly solve short-term tasks, reacting to the challenges of the current moment;

Russia, China, and possibly other countries, whose positioning in the geopolitical arena is carried out under the guise of an object of aggression, actually create and systematically update strategic reserves, which allows them to manipulate food security in the international market.

Thus, the first two of the mentioned three groups, although for various reasons, are unable to find financial resources in terms of creating and managing strategic food stocks. The crisis caused by Russian aggression may lead to a revision of the naive paradigm of the international global market and eternal universal peace in liberal democracies. The necessity of creating and systematically replenishing and renewing food stocks for the stability of the state and national security, as well as their management, is becoming obvious.

On July 7 of this year, the burning of the strategic agricultural fields of Ukraine by the Russian occupying forces will most likely raise the risks of a repetition of the "Arab Spring". The interruption of grain supply from the world's two largest wheat exporters (Russia, and Ukraine) exacerbates the threat of a global food crisis. Currently, fourteen countries of the world depend on 10% of Ukraine's grain reserves, including some (such as Lebanon (50%), Libya (43%), Malaysia (28%), Indonesia (28%), Yemen (22%), and Bangladesh (21%)) critically. Wheat stocks are already running low in Canada, and the United States, Argentina, and other countries are likely to limit exports as domestic consumption is assured.

According to data from the United States Department of Agriculture, Food and Agriculture Organization (FAO), this interactive map shows wheat-importing countries. The map shows the so-called Global South (countries marked in

a relatively dark color), which is critically dependent on the import of cereals and especially wheat, characterized by several risk factors, such as: social injustice, political instability, and economic hardship, together will be a condition of increasing risks and possible crises in terms of food security for vulnerable countries.

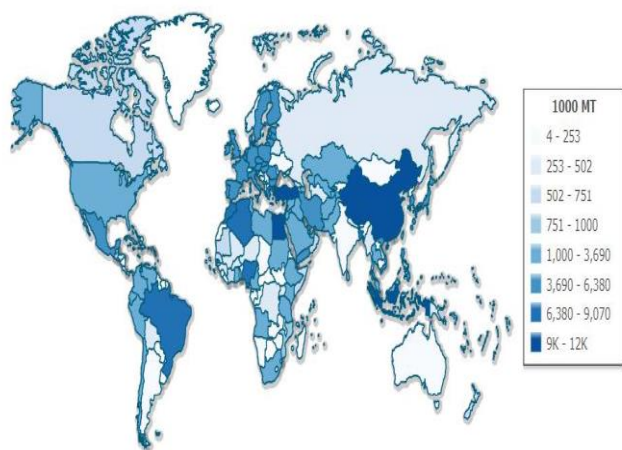


Fig 1 Global South

Source: United States Department of Agriculture, 2022

Regarding the review of the Georgian wheat market, our research showed that the average household/family in Georgia spends the largest part of their finances on food, which is also reflected in the weights of the consumer basket, where the share of food in the total index is 33.1%⁴. According to the single categories, bread products are the most essential products in food. Not only did the price of bread not increase from 2011 to 2017, but it decreased by 5% in 2011-2012. For the first time in the last decade, the price increase was recorded in 2018, which was the result of poor yields in Russia (where we import wheat). Since May 2021, the price of wheat bread has been increasing every month, and the annual increase was 30% in April.

A review of the literature and official statements surrounding current events in the world and the actual research process highlighted the relevance of food security and strategic food reserve management policy as a global agenda issue. Within the framework of the presented research, the present-absent expert panel method and the experts according to the mentioned method were selected.

- The deputy minister of rural and agricultural development of the sectoral ministry participated in the research from state structures;
- Representative of the Agrarian Committee;
- Seven employees of the Counterintelligence Department of the State Security Service;
- Chairman of Georgian Farmers' Association and four representatives of Wheat Growers' Association from local sectoral institutions of civil society;

- World Farmers' Association and "Copa Cogeca" from international sectoral institutions.
- Also, two independent experts.

In total, sixteen respondents from seven institutions answered the preliminary questionnaire.⁵

The questionnaire was mainly aimed at determining how important food security is for the state and to what extent the policy in this direction is implemented in Georgia in the form of both declared and hidden strategies, and how important the big data is for the management of strategic reserves.

It is important to have big data (big data) for managing strategic reserves as it is, in terms of politics.

Almost all respondents emphasized the importance of food security and management of strategic reserves and the potential of big data. However, the expert assessments revealed the main in the issue of the existence of declared and covert strategies. In particular, independent experts noted the existence of covert strategies, but they could not provide any examples to substantiate their claims. In contrast, the officers of various ranks and divisions of the State Security Service counterintelligence department unequivocally denied the existence of covert strategies and/or dealing with this issue. The work of a specialist (deep encryption or special task officer), highlights the absence of a policy. Nothing is said about this in the rural and agricultural development strategy.

Also, in the presence of policies in the mentioned direction, the possibility of economic sabotage (such as contamination of food, destruction, for example, the artificial spread of various plant diseases with the aim of destroying and reducing reserves) was mentioned as a risk factor.

Opinions of independent experts different from the consolidated position of field experts may indicate a kind of belief that the state is implementing some kind of hidden strategy, since its absence threatens not only the country but also the regime, increases vulnerability, threats of sabotage, creates an economic crisis, social tension and unexpected political risks of fluctuations.

The expert survey with the representatives of international sectoral institutions naturally showed the relevance of the issue in the general global context, both in terms of vulnerable and EU member countries' farms, although there is a clear difference between the so-called "Global South" and "Golden Billion" countries, one of which is dependent on food on imports and unable to create reserves due to poverty and hardship, while the latter does not create reserves despite financial and infrastructural capabilities as previously thought due to impracticality, in

⁴ 1 National Statistical Service of Georgia, Weights of the electoral basket 2022

⁵ Questionnaires can be viewed and filled in electronic form at the following link: <https://forms.gle/oXUwfCseHxLHZmZ46>.

the conditions of an unpredictable global crisis, both groups of countries may find themselves in an equally vulnerable situation. The COVID-19 pandemic and the Russia-Ukraine war, two independent crisis events, seem like a kind of warning sign and require the development of a long-term strategy for the management of food reserves as a general recommendation, both at the national and international levels.

The presented expert study unexpectedly indirectly confirmed one of the recommendations revealed in the entire work process, which refers to the need for independent collection and dissemination of big data by the lower level of public administration. This recommendation is available in detail in the relevant paragraph.

IV. CONCLUSIONS AND RECOMMENDATIONS

As a whole, the present paper reflects the research carried out within the framework of the work, original findings, and innovations, based on them, recommendations are drawn up, the theoretical and practical value, which is confirmed by approbation.

The recommendation package includes the following points necessary for the transformation in the future paradigm of the agricultural sector of Georgia, in the appropriate order:

- Development of the definition of a farmer and reflection at the legislative level;
- Universal, mandatory registration of farmers to create a national base;
- Collection of accurate data on local production, import, and export;
- Forecasting, planning, and distribution of relevant recommendations based on the above-mentioned data;
- Development of strategic reserves management policy;
- Development of declared and hidden strategies for food security.

Implementation of the mentioned recommendations is possible through parallel measures through, namely:

- Functional load of extension centers, data collection, screening, prevention, and monitoring of problems (according to the **order No. 2-332** of the Minister of Environment Protection and Agriculture of Georgia dated May 11, 2018, units of the information-consulting services of the territorial bodies of the Ministry of Environment Protection and Agriculture of Georgia were established, the purpose of which is: implementation of agricultural extension for farmers and the population living in rural areas employed in the agrarian field in office, remote and field conditions. In parallel with the implementation of information-consulting activities in the field, the extension services ensure the promotion of ongoing projects implemented by the agency);
- Prioritizing the wheat sector in the state program of the Project Management Agency (RDA);

Time and time again, hard-to-predict risks, the so-called "black swan", appear in front of humanity, which the COVID-19 pandemic and the Russia-Ukraine war clearly demonstrated. Despite accelerated technological progress (5G technologies, Starlink, SpaceX, Metaverse, artificial and super-intel (Lect, Global Artificial Neural Networks), food security, the bread and butter of our existence, remains a basic dimension of vulnerability, which is a major concern of the country and a means of manipulation by unfriendly partners. Some aspects and provisions mentioned in the research carried out at this stage are more or less in-depth and widely presented in previous studies and publications. At the final stage of the research, it is planned to discuss the recommendation package and submit it to the sectorial institutions, to receive their feedback in order to strengthen the approval results and implement them at the sector level.

➤ *Recommendations based on international sectoral institutions*

- openness of global food and fertilizer trade to meet domestic and global needs;
- Finding new and more diversified markets, especially for countries dependent on food imports from Ukraine and Russia, finding alternative suppliers;
- Support of vulnerable groups, including internally displaced persons. Ensuring that governments expand social safety nets to protect vulnerable people, develop and implement targeted social protection programs;
- Control of global market prices, reduction of import tariffs and export bans, in the short term, may solve the food security challenges of individual countries, but in the long term, it is guaranteed to lead to market imbalances, thus it is recommended to control the global market, based on international agreements, with market mechanisms;
- Strengthening market transparency and dialogue. When agricultural markets are volatile, greater transparency of and information about global trade will help governments and investors make more informed decisions. Initiatives such as the G-20 Agricultural Market Information System (AMIS), with objective and timely market assessments, will help increase such transparency.

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