Influence parameters identification of resource potential components on food security

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Abstract. This article delves into the crucial aspect of food security, focusing on the identification of parameters influencing it through an analysis of resource potential. With the growing concern over global food security, understanding the multifaceted dynamics of resource availability and utilization becomes paramount. The study employs a comprehensive approach to identify and assess the key components of resource potential that impact food security. Through empirical research and data analysis, the article highlights the intricate interplay between various factors such as agricultural productivity, natural resource availability, technological advancements, and socio-economic factors. By elucidating the relationships between these components, the study aims to provide valuable insights for managers, researchers, and stakeholders to formulate effective strategies and interventions aimed at enhancing food security on a global scale.

1 The need for innovative development of the country in the context of its impact on food security

The situation with global and domestic resource prices is changing rapidly, and leading countries are moving to a fundamentally new paradigm of socio-economic development based on innovative development. The tools for assessing the use of the country's resource potential have not been developed, and the existing recommendations on this issue are of a general nature, so the concept of development of resource, or rather natural resource potential and assessment of its use are of particular relevance in terms of theoretical and practical implementation.

The purpose of the article is to identify and analyze the parameters that determine the impact of resource potential components on the level of food security. This includes identifying key factors, such as the availability of land, water, technological development and others, which play a significant role in ensuring sustainable food production and reducing the risks of food crises. The results of the study will contribute to a better understanding of the mechanisms of interaction between the components of resource potential and food security, which may open up ways to optimize food security policies and develop appropriate strategies.

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2 Literature review

The impact of resource potential components on food security is one of the key issues that attract the attention of both scientists and practitioners in the modern world. Given the growing global population, changing climate conditions and the impact of geopolitical factors, there is a need to improve methods and tools for identifying the parameters of resource potential that affect food security. The main task of research in this area is to identify the relationship between the components of resource potential and the level of availability and quality of food for the population, which will allow developing effective management strategies to ensure sustainable development of the agricultural sector and food security in the face of current challenges.

The scientists contribute diverse perspectives to the overarching theme of identifying parameters influencing the components of resource potential on food security. Thus, the modeling study of Beach et al. (2019) explores the combined impacts of elevated atmospheric carbon dioxide levels and projected climate change on global diets. While not directly addressing resource potential, it provides insights into how environmental factors affect food availability and quality, which is crucial for understanding food security. The article (Costa et al. (2021)) focuses on Lean Six Sigma methodologies in the food industry. While it doesn't directly relate to resource potential, the emphasis on process optimization and efficiency could indirectly contribute to enhancing food production and distribution systems, thereby impacting food security [1-10].

Investigating the relationship between fiscal expenditure and green agricultural productivity gains, the study (Deng et al. (2023)) delves into policy interventions' effects on agricultural outcomes. Understanding the influence of fiscal policies on resource allocation and agricultural productivity is essential for assessing their impact on food security. The research (Džananović & Dacić-Lepara (2016)) explores the relationship between GDP and electricity consumption in Southeast European countries. Although not directly linked to food security, it provides insights into the broader economic factors affecting resource availability and utilization, which can indirectly influence food security outcomes. The systematic review (Haughey et al. (2023)) examines sustainable intensification and carbon sequestration in agricultural systems. By assessing the environmental sustainability of agricultural practices, the study contributes to understanding how resource management practices impact food security in the context of climate change.

Focusing on the measurement and determinants of food security, the empirical investigation (Maitra & Rao (2017)) provides insights into the factors influencing food access and availability. Understanding the determinants of food security is essential for identifying the parameters affecting resource potential and its impact on food security outcomes. Analyzing the macroeconomic impacts of power grid infrastructure investments in Germany, the study (Schreiner & Madlener (2021)) sheds light on how infrastructure development influences resource utilization and economic growth. Infrastructure investments play a crucial role in enhancing resource potential and, consequently, food security. Wang et al. (2023) discuss the pursuit of zero-grain livestock production in China, emphasizing sustainable agricultural practices. By exploring innovative approaches to livestock farming, the study addresses resource efficiency and sustainability, which are central to ensuring long-term food security. Investigating the role of green finance in addressing energy poverty and promoting green economic recovery, the study (Zhao et al. (2022)) highlights the intersection of financial mechanisms, environmental sustainability, and socio-economic development. Financial instruments can play a vital role in facilitating investments in resource management practices that enhance food security.

Exploring the interaction between environmental degradation, energy efficiency, and health expenditures in SAARC countries, the study (Zhong et al. (2022)) underscores the

interconnectedness of environmental sustainability, public health, and economic development. Understanding these interrelationships is crucial for developing holistic strategies to enhance resource potential and ensure food security. Focusing on key technologies for smart energy systems in the context of carbon neutrality, the article (Zhu et al. (2022)) discusses innovations in energy management that contribute to sustainability goals. Smart energy systems can optimize resource utilization and minimize environmental impact, thereby supporting food security objectives [11-19].

Overall, the analyzed scientific resources collectively provide valuable insights into various dimensions of resource potential and its impact on food security, encompassing environmental, economic, technological, and policy aspects. Integrating findings from these diverse perspectives can inform comprehensive strategies for enhancing resource potential and ensuring food security at local, regional, and global scales.

3 Influence of resource potential components on the level of food security: parameter analysis

In this study, natural resource potential is defined as a factor in the allocation of productive forces, which includes natural resources and natural conditions. According to the most common interpretation, natural resources are understood as bodies and forces of nature that, at a certain level of development of productive forces, can be used to meet the needs of humanity.

Table 1. Parameters of the impact of resource potential components on food security

Parameter name	Description	Features of influence
Environmental parameters	Include environmental conditions, soil, water, air and biodiversity.	They can determine the availability of land for food production, pollution levels and the ability to develop the agricultural sector.
Economic indicators	They cover the level of income, availability of financial resources for agriculture, and food prices.	They determine the ability of the population to buy food and the ability of the agricultural sector to provide the population with the necessary goods.
Social aspects	They take into account demographic and cultural characteristics, level of education, access to healthcare and social protection.	They can determine the ability of the population to take care of themselves, the degree of education about healthy eating, and the need for government support.
Technological factors	They describe the level of availability and use of modern technologies in agriculture, food processing and storage.	They affect agricultural productivity, food quality and safety, and shelf life.
Political conditions	They include the stability of the political situation, legal regulations and government policy towards the agricultural sector.	They determine the direction of agricultural policy, the level of investment and state support for agriculture.

The following countries were selected for comparison with Ukraine:

1. European countries such as Germany and France: Ukraine can be compared with them in terms of the structure of the agricultural sector and measures to increase agricultural productivity.

2. Argentina is similar to Ukraine, as it is a major exporter of agricultural products and has a significant influence on the world food market.

3. Canada, like Ukraine, has large territories with high potential for agricultural development and food exports.

4. Australia, like Ukraine, is one of the world's leading producers of grain and meat.

To determine the parameters that affect the components of the resource potential and food security, the following indicators should be taken into account and analyzed:

- Agricultural productivity: assessment of trends in agricultural productivity indicators, such as yield per hectare, crop productivity index, and livestock productivity;
- Food production and consumption: examine data on food production levels, trends in food imports and exports, and per capita food consumption;
- Land use and land degradation: analysing indicators related to land use patterns, such as the percentage of arable land in total land area, changes in forest area and land degradation.
- Access to resources: considering indicators of access to resources critical for food production, such as coverage of irrigation infrastructure, access to improved water sources and use of agricultural machinery;
- Economic indicators: analysing economic factors that affect food security, such as GDP growth, poverty, income distribution and agricultural investment;
- Environmental sustainability: assessment of indicators related to environmental sustainability in agriculture, such as fertiliser consumption, pesticide use and greenhouse gas emissions from agriculture;
- nutrition and health: indicators related to nutrition and health outcomes, such as the prevalence of malnutrition, stunting, wasting and access to basic health services, are taken into account.

Analysing these indicators, the different components of resource capacity and their impact on food security are substantiated, which helps to identify key parameters for further research and corrective measures.

Table 2 analyses the parameters of the impact of the components of the resource potential of the countries under study on their food security.

Table 2. Parameters of the impact of the resource potential components of the countries under study on their food security

Parameter name	Country	Features of the impact
Environmental parameters	Germany	Strong emphasis on environmental standards and environmental protection measures.
	France	Much attention is paid to environmental aspects in agriculture, particularly organic farming.
	Ukraine	Environmental issues, including soil and water pollution, can have a negative impact on food security.
	Argentina	Environmental performance can have an impact on human health through the use of pesticides and other chemicals.
	Canada	There is some attention to environmental aspects, especially in the context of water conservation.
	Australia	Drought and other environmental challenges may affect crop production and food security.
Economic indicators	Germany	A strong economy favours investment in agriculture and the development of new technologies.
	France	Large investments in agriculture, but problems with profitability may affect food security.
	Ukraine	Economic instability and corruption can hamper agricultural development and affect food security.
	Argentina	Economic difficulties may affect the availability and quality of food for the population.
	Canada	A strong economy allows for investment in agriculture and high quality products.
	Australia	A significant share of agricultural exports contributes to the country's

		economic development.
Social aspects	Germany	Great attention to social standards and ensuring access to food for all segments of the population.
	France	Programmes to support disadvantaged groups, but accessibility issues may exist.
	Ukraine	Social issues such as poverty and unemployment can make access to quality food difficult.
	Argentina	Unequal access to food can lead to social conflict and instability.
	Canada	Social support programmes promote food access for all segments of the population.
	Australia	High living standards allow the majority of the population to have access to quality food.
Technological factors	Germany	Highly developed production and processing technologies contribute to the improvement of food quality and safety.
	France	Large investments in research and development of agricultural technologies to increase productivity and quality.
	Ukraine	Insufficient modernisation of technologies can make production difficult.
	Argentina	Technological development in agriculture may be limited due to economic difficulties and limited access to the latest technologies
	Canada	Large investments in research and development of new agricultural technologies to increase efficiency and sustainability of cultivation.
	Australia	The use of advanced technologies in agriculture helps to maintain high productivity and product quality.
Political conditions	Germany	A stable political environment is conducive to agricultural development and sustainability.
	France	A strong focus on agricultural policy and support for the agricultural sector through various subsidies and programmes.
	Ukraine	Political instability can affect the agricultural sector and create unfavourable conditions for its development.
	Argentina	Political instability may hamper agricultural development and create uncertainty for investors.
	Canada	Stable political situation is conducive to the development of the agricultural sector and transparent business environment.
	Australia	Government support and a stable political situation are conducive to agricultural development and exports.
Natural factors (weather conditions, soil type, geography, water resources, climate zones, biodiversity, etc.)	Germany	Excessive rainfall can cause flooding and crop damage.
	France	Differences in soil types can affect the yield and availability of some crops.
	Ukraine	Location on the plains or in mountainous areas can affect the types of crops that can be grown and the seasonality of cultivation.
	Argentina	The availability of water for irrigation or watering can be critical for the cultivation of some crops. A lack of water can lead to crop losses.
	Canada	Different climate zones may be suitable for different types of crops.
	Australia	Diversity of ecosystems can provide different food sources and affect biodiversity.

Thus, the study of the impact of resource potential components on food security is an urgent and important task in the context of ensuring sustainable development of society. The resource potential of a country is determined by the diversity of its natural, environmental and socio-economic factors. One way to assess this potential is to analyse environmental parameters that characterise the state of the environment and its ability to support food production. Table 3 shows the average values of environmental parameters of the resource potential components of the countries under study for the period from 2000 to 2023. Assessment of environmental parameters is an important step in understanding and forecasting the food production capacities of countries. It allows us to identify key factors that affect the sustainability of the agricultural sector and the provision of food to the population.

Table 3. Environmental parameters of the resource potential components of the studied countries on average for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Agricultural methane emissions, % of total	73,54	27,11	47,33	64,57	66,67	19,22	45,63
Agricultural nitrous oxide emissions, % of total	94,65	69,38	66,72	74,88	91,74	76,45	77,59
Alternative and nuclear energy, % of total energy use	6,26	18,56	13,53	45,89	1,44	17,79	8,75
CO2 emissions, metric tons per capita	3,89	16,05	9,33	5,30	17,26	5,58	4,43
Combustible renewables and waste, % of total energy	3,19	4,48	2,94	3,87	3,21	0,65	7,79

The analysis of the environmental parameters of the resource potential components of the studied countries for the period from 2000 to 2023 on average allows to draw several important conclusions. Significant differences in the levels of methane and nitrogen oxide emissions from agricultural activities between countries have been identified. In particular, countries in South America, such as Argentina, have high levels of methane emissions, which may indicate inefficient agricultural technologies in these regions. On the other hand, countries with advanced agricultural technologies, such as Canada and Germany, have much lower methane and nitrogen oxide emissions.

Another important factor is the ratio of alternative energy sources to CO2 emissions. For example, countries that actively use alternative and nuclear energy sources, such as France and Germany, have relatively low CO2 emissions per capita compared to countries where coal and other hydrocarbons predominate. The general trend is towards increasing use of renewable energy sources and decreasing use of hydrocarbons in countries around the world. However, there are significant differences between countries in the ratio of these energy sources, which may affect their environmental sustainability and impact on the global climate.

Table 4 presents the economic parameters of the resource potential components of the studied countries on average for the period 2000-2023. An analysis of these parameters will allow us to better understand the economic context in which the food sector of the countries is developing and to identify their potential opportunities and constraints in ensuring food security.

Table 4. Economic parameters of the resource potential components of the studied countries on average for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Agricultural raw materials exports, % of merchandise exports	1,16	4,54	0,83	0,83	3,33	1,56	1,52

Agricultural raw materials imports, % of merchandise imports	1,27	1,04	1,46	1,34	0,82	1,14	1,66
Agriculture, forestry, and fishing, value added, % of GDP	6,63	1,82	0,83	1,67	2,58	9,61	3,81
Foreign direct investment, net inflows, % of GDP	1,96	3,14	2,55	2,18	3,31	3,33	2,79
Foreign direct investment, net outflows, % of GDP	0,31	3,94	3,40	3,73	1,33	0,20	2,63
GDP growth, annual %	1,98	2,07	1,24	1,31	2,81	0,84	2,95
Inflation, GDP deflator, annual %	26,80	2,49	1,56	1,50	3,05	17,26	4,03
Tax revenue, % of GDP	11,83	12,83	11,23	22,87	22,92	16,76	13,97

In general, it can be noted that the countries studied have different levels of dependence on agricultural raw materials in both exports and imports. For example, Ukraine has a high level of exports and a significant contribution of the agricultural sector to gross domestic product. On the other hand, countries that do not have a large contribution of the agricultural sector to GDP, such as Germany and France, still enjoy stable levels of investment and economic growth. With regard to the impact of these parameters on food security, it can be noted that high levels of agricultural exports can provide additional resources to supply the domestic market with food, as well as contribute to economic diversification and increase incomes. However, it is also important to take into account other factors such as production efficiency, market access, technological development and the stability of the political environment.

The study of the social aspects of resource potential components is an important part of the analysis in the context of food security. Table 5 shows the average values of the social aspects of the resource potential components of the countries under study for the period 2000-2023. As part of the study aimed at identifying the parameters of the impact of resource potential components on food security, the analysis of social aspects is key to understanding the wide range of relationships between resources and social conditions that affect food availability and sustainability.

Table 5 Social aspects of the resource potential components of the studied countries, on average for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Access to clean fuels and technologies for cooking, % of population	98,78	100,00	100,00	100,00	100,00	94,08	58,93
Access to electricity, % of population	98,25	100,00	100,00	100,00	100,00	99,77	84,47
Gini index	45,10	33,42	30,83	31,97	34,08	26,41	-

Population growth, annual %	1,01	1,08	0,09	0,51	1,41	-1,16	1,19
Electric power consumption, kWh per capita	2544,81	16324,62	7071,40	7424,86	10587,64	3291,50	2741,98

Analysing the data in Table 5 on the social aspects of the resource potential components of the countries studied for the period 2000-2023, the following conclusions can be drawn. All the countries studied have a high level of access to clean fuels and technologies for cooking and electricity, which is an important aspect of social infrastructure. However, the level of income inequality, as measured by the Gini index, reveals significant differences between countries, with some performing well, such as Argentina, while others, such as Ukraine, show lower levels of inequality.

Population growth rates vary among the countries studied, but the overall average is 1.19% per year. The highest growth is recorded in Australia, while Ukraine has negative growth, which may indicate some demographic challenges in the country. Electricity consumption per capita also shows a wide variation between countries, with Canada and Australia having significantly higher levels than the other countries studied. Ukraine has a relatively low level of electricity consumption compared to other countries.

Technological innovations and the development of production sectors have a significant impact on the food security of nations. For a detailed understanding of this impact, Table 6 provides an analysis of the technological factors that characterize the components of the resource potential of countries, the average values of which are studied for the period from 2000 to 2023. This analysis will help identify the main technological trends that affect food security.

Table 6 Technological factors of the components of the resource potential of the studied countries, on average for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Electricity production from coal sources, % of total	1,95	14,69	47,83	4,33	73,82	34,29	39,93
Electricity production from hydroelectric sources, % of total	31,36	58,29	3,35	10,75	6,45	5,94	15,97
Electricity production from natural gas sources, % of total	49,99	7,58	11,65	3,54	14,97	12,36	20,79
Electricity production from nuclear sources, % of total	6,33	14,56	22,81	77,73	0,00	46,24	13,49
Electricity production from oil sources, % of total	8,99	1,96	1,32	0,96	1,54	0,42	5,05

Analyzing Table 6, which shows the technological factors of the resource potential components of the countries studied on average for the period 2000-2023, it can be drawn several conclusions about their impact on food security. In countries with a high level of use of coal-based electricity sources (Argentina, Australia), there is a low percentage of

water resources use. This may indicate significant limitations in access to water resources, which may affect the agricultural sector and its production. On the other hand, countries with a high use of nuclear energy (France) have significant potential for using other energy sources, which can reduce dependence on coal resources.

Political stability or instability, and the policy decisions that are made, can have a significant impact on a country's resource potential, including agricultural policy, investment in agriculture and infrastructure, and the availability of resources for food security. Table 7 provides a comparison of the political environment that characterizes the study period on average for the countries under study to reveal their possible impact on resource potential and, consequently, on food security.

Table 7. Political conditions of the resource potential components of the countries under study, on average, for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Current health expenditure, % of GDP	8,84	10,15	10,90	10,84	8,84	6,69	9,48
Domestic general government health expenditure, % of GDP	5,27	7,23	8,29	7,86	6,35	3,45	5,65
Expenditure on secondary education, % of government expenditure on education	39,61	26,40	44,30	-	36,09	28,66	33,84
General government final consumption expenditure, % of GDP	14,99	20,45	19,62	23,43	19,27	19,35	16,89
Government expenditure on education, total, % of GDP	4,82	4,85	4,63	5,51	5,13	5,62	4,21
Time spent dealing with the requirements of government regulations, % of senior management time	18,47	-	5,20	20,70	-	11,92	8,43

Analysing the data in Table 7, it can be argued that healthcare expenditures reflect the level of provision in this area in different countries. Countries with higher healthcare expenditures (Canada, Germany and France) have more developed healthcare systems than countries with lower expenditures (Ukraine). Education expenditures, in particular on general secondary education, reflect the efforts of countries to support the education system. Countries with higher education expenditures (Germany and France) have more developed education systems than countries with lower education expenditures (Ukraine). The level of government involvement in the economy, expressed as government spending as a percentage of GDP, indicates the level of public sector development in a country. Interaction with the requirements of government agencies can affect the time spent by management on administrative issues, which affects the efficiency of enterprises and the overall economic situation in the country. Thus, the diversity of the political environment in

the countries studied may affect the level of resource potential and, by extension, food security.

Studying the natural components of resource potential is important for understanding and forecasting a country's ability to provide sufficient food for its population. Table 8 provides an overview of the natural components of resource potential on average for the period 2000-2023 for the selected countries.

Table 8 Natural components of the resource potential of the studied countries, on average, for 2000-2023

Indicator	Argentina	Canada	Germany	France	Australia	Ukraine	World
Agricultural irrigated land, % of total agricultural land	1,13	1,42	2,31	5,55	0,56	1,05	0
Agricultural land, % of land area	45,37	6,61	48,19	53,03	50,83	71,40	36,95
Annual freshwater withdrawals, agriculture, % of total freshwater withdrawal	73,05	8,46	1,00	12,06	63,01	32,24	71,31
Annual freshwater withdrawals, total, % of internal resources	12,19	1,36	29,94	14,75	3,18	24,56	9,10
Aquaculture production, metric tons	2727,62	168239,36	41530,50	215141,85	70095,98	23795,00	831112 00,68
Capture fisheries production, metric tons	881748,92	960745,18	244911,37	563188,06	187112,70	185319,86	9186726 2,41
Cereal production, metric tons	52871 865,1	52853 807,5	45265 316,04	65168 610,77	36202 257,34	50703 120,15	25795 55389, 13
Cereal yield, kg per hectare	4381,07	3435,03	6887,27	7002,00	1952,07	3550,49	3650,10
Coal rents, % of GDP	0,01	0,13	0,04	0,01	0,98	1,04	0,29

The study showed significant differences in the natural components of the resource potential among the countries studied during 2000-2023. Table 8 shows that the level of agricultural development and water use varies between countries. For example, countries with a high level of agricultural development, such as France and Germany, have a higher percentage of irrigated land and high grain yields. Whereas other countries, such as Argentina and Ukraine, have significant agricultural production but use less irrigated land.

There are also significant differences in the use of freshwater resources for agriculture and aquaculture. For example, Canada has large amounts of freshwater resources but uses them only to a limited extent for agriculture, while Australia and Argentina use a significant part of their freshwater resources for agricultural activities.

The dynamics of food exports, shown in Figure 1 as a percentage of total merchandise exports, is an important indicator of the state of the country's food sector and its ability to meet the domestic and foreign food needs of the population. A detailed study of the dynamics of food exports allows us to identify trends in agricultural development and identify ways to improve food security through optimising the use of resources.

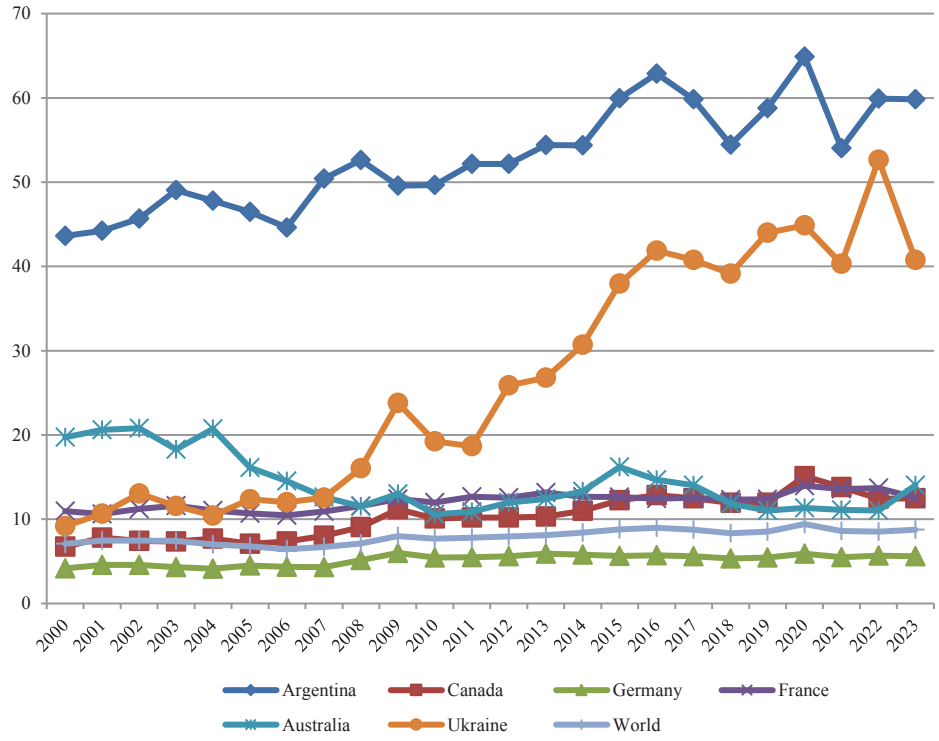

Fig. 1 Dynamics of food exports, % of merchandise exports

The analysed data (Figure 1) shows that countries such as Argentina, Canada, Australia and Ukraine demonstrate a significant increase in the share of food exports in total exports. In particular, Ukraine has seen a significant increase in this indicator from 9.17% in 2000 to 52.67% in 2023. At the same time, European Union countries such as Germany and France show a stable but less pronounced trend in food exports. In addition, it is worth noting that the overall global trend also shows a certain increase in the share of food exports, although this growth is less pronounced compared to individual countries.

In the context of globalisation and constant changes in the economic and political environment, analysing the dynamics of food imports is becoming an important task for understanding the factors that affect the country's food security. In this context, Figure 2 provides important information on the dynamics of food imports as a percentage of total merchandise imports. This visualisation allows to analyse changes in the structure of food trade and consumption, as well as to identify trends that may affect the country's food

security. The justification of the parameters of the impact of resource potential components on food security requires a comprehensive approach and consideration of various factors, including economic, socio-cultural, technological and environmental aspects. Analysing the dynamics of food imports is an important step in this process, allowing to identify dependencies and interrelationships between various factors affecting the country's food security.

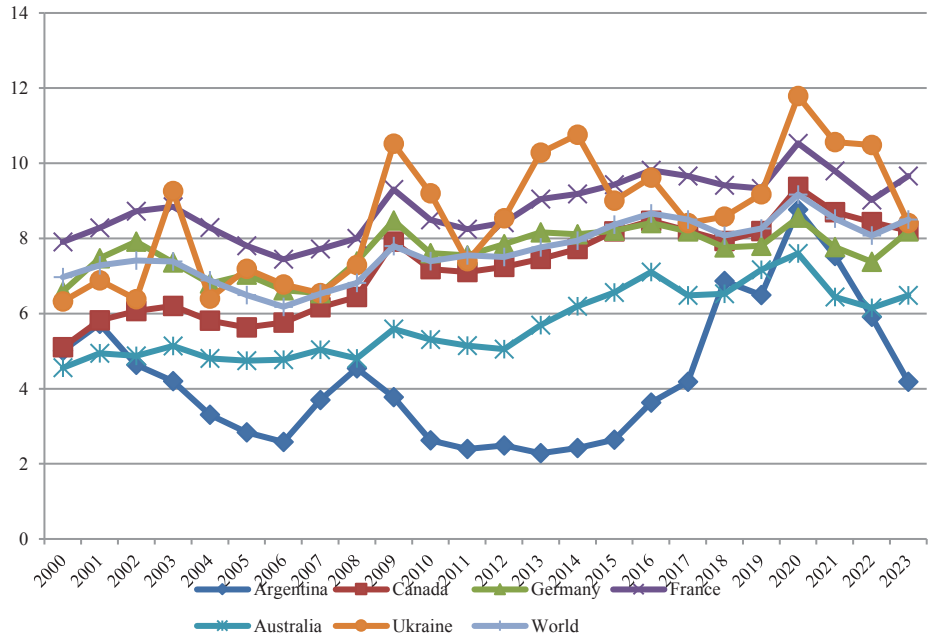

Fig. 2 Dynamics of food imports, % of merchandise imports

Observations show that countries with high levels of food imports may be more vulnerable to external shocks, such as price fluctuations on world markets or export restrictions by suppliers. In particular, Ukraine has a history of high food imports in certain years, which may be due to the volatility of domestic production or other factors such as climatic or economic conditions. It is also worth noting that the share of food imports in total imports has been decreasing in some years in some countries, such as Argentina and Canada. This may indicate an improvement in domestic food production or the development of strategies to ensure food security with national resources.

4 A model of the impact of resource potential components on food security: basic analysis and possibilities for expansion

Thus, in order to model the impact of the interrelationships of resource potential components on food security, it is necessary to take into account various aspects, including

- analysis of factors such as availability of land, water sources, infrastructure and technologies;
- efficient use of land resources and their rational use in agriculture;
- availability of water resources and their quality are critical factors affecting food production and food security;

- managing risks associated with natural disasters and climate change;
- promoting rural development and supporting agricultural enterprises;
- development of alternative energy sources and reduction of dependence on coal fuel;
- consideration of social aspects, such as access to education and healthcare, is also important in modelling the impact of resource potential components on food security;
- market development and entrepreneurship promotion;
- taking into account global trends such as population growth and dietary changes;
- continuously improve methods for assessing and forecasting the impact of resource potential on food security for effective management of these processes.

It is proposed a basic economic-mathematical model for modelling the relationships between the components of resource potential and food security. Let us have the following variables:

F - level of food security (measured in percentage);
R - resource potential;
L - access to technology and knowledge;
I - infrastructure and logistics;
C - cultural and social factors.
The model looks like this:
$F=f(R,L,I,C)$

Where f is a function that determines the impact of resource potential R, access to technology L, infrastructure I and cultural and social factors C on the level of food security F.

By analysing this model, it is possible to identify the parameters of the impact of each component on food security, as well as to determine their optimal balance to ensure the stability of the food system. To further develop the model, parameters can be added that take into account the dynamics of changes in each of the components of the resource potential and their relationship with the level of food security. In particular, time series or differential equations could be included to account for trends in food production, changes in technology or infrastructure development. Such a model would allow forecasting future changes in food security and developing strategies to address them.

The model can also be extended to take into account the impact of external factors such as climate change, political instability or global economic trends. This would allow for a more complete picture of the relationship between resource potential and food security, and an effective response to changes in the external environment. This approach will create a more accurate and realistic model that will provide reliable analysis and strategic decision-making on food security.

5 Conclusions and prospects for further research

The study found that identification of the parameters of the impact of resource potential components on food security is an important stage in the analysis and management of the food system. This process allows to effectively identify key aspects that affect the stability and availability of food resources for the population. The identified parameters can be used to develop strategies and measures aimed at improving food security, ensuring the sustainability of food systems and reducing the risks of food crises. The results of the study emphasise the importance of a systematic approach to analysing resource potential and the need to continuously monitor and update the identified parameters, taking into account changes in socio-economic conditions and natural factors.

An important area for further research is to analyse the interaction between the components of resource potential and other factors, such as climate change, demographic

trends, trade relations and technological innovations. Understanding these interrelationships will allow for the development of more comprehensive strategies to improve food security at the level of both national and global food resource management systems. Developments in this area have the potential to ensure sustainable and equitable access to adequate food for the entire global population, thereby contributing to sustainable development and improving the quality of life.

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