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Legal and Economic Basis of Western Sanctions and their Impact on Food Security and Russian National Independence

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Abstract
Aim. Develop an algorithm to diagnose the consequences of Western sanctions on Russian agricultural development, considering state priorities for independence and import substitution. The need stems from agriculture's localization and the imperative to ensure food security/national independence via domestic resources or trade.
Utilized statistical databases on agriculture in Russian regions. Employed statistical analysis, indicative planning, security diagnostics, and algorithm-based modeling.
The outcomes include legal identification of the nature and expected goals of Western sanctions in the sphere of food security and national independence; a methodology for assessing sanctions' impact on agricultural activity and its independence; proposals to improve planning for regional independence from sanctions' negative effects within national food market.
Presents the results of developing a methodology for assessing the impact of sanctions on the development of Russian agriculture, based on the function of food independence for meta-group food products (Russian Food Security Doctrine). An original system of indicators for diagnosing the level of agricultural dependence/independence on sanctions was proposed, spanning from micro to macro levels. Testing the original methodology for assessing the sanctions impact on agricultural development yielded evaluation results at both regional and national levels, covering individual meta-group food products and their aggregate.

Key Words
Food independence function, level of sanctions independence, agricultural sensitivity (elasticity) of sanctions, food independence multiplier.

Правовая и экономическая основа западных санкций и их влияние на продовольственную безопасность и независимость страны

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Резюме
Цель: состоит в проработке алгоритма диагностики последствий влияния санкций на состояние и перспективы развития сельского хозяйства в РФ с учетом приоритетов независимости и импортозамещения, реализуемых в государственной политике. Локальность сельского хозяйства и возможность формировать продовольственную безопасность и независимость собственными ресурсами и мощностями или за счет внешнеэкономической деятельности определяют необходимость выстраивания алгоритма диагностики состава, ожидаемых целей и возможных последствий западных санкций для АПК России.
Использовались статистические базы данных по состоянию сельского хозяйства ряда субъектов РФ для апробации авторских методов и подходов. В ходе исследования были использованы методы статистического анализа, индикативного планирования, диагностики уровня безопасности, моделирование с помощью алгоритма.
Результаты исследования включают: правовую идентификацию природы и ожидаемых целей западных санкций в области продовольственной безопасности и независимости государства; разработку методики оценки влияния санкций на состояние сельскохозяйственной деятельности и ее независимость от этих мер; предложения по совершенствованию подходов к планированию и обеспечению независимости регионов от негативных последствий западных санкций как части национального продовольственного рынка.
В работе представлены результаты разработки методики оценки влияния санкций на развитие сельского хозяйства РФ, в основе которой заложена функция продовольственной независимости по продовольственным товарам мета-группы (в соответствии с Доктриной продовольственное безопасности РФ); предложена оригинальная система показателей диагностики уровня санкционной зависимости/независимости сельского хозяйства от микро- до макроуровня; проведенная апробация оригинальной методики оценки влияния санкций на развития сельского хозяйства позволила получить результаты оценки на региональном и национальном уровне реализации сельскохозяйственной деятельности по отдельным продовольственным товарам мета-группы и по их совокупности.

Ключевые слова
функция продовольственной независимости, уровень санкционной независимости, чувствительности (эластичности) сельского хозяйства к санкциям, мультипликатор продовольственной независимости.

INTRODUCTION

The continuous escalation of western sanctions targeting Russia`s and several other nations` economies, which pose significant competition in global and domestic markets for mineral or financial resources, raw materials, food products, etc., demonstrates the incorporation of such measures into western nations` economic practices. These countries aim to preserve their post-industrial economic model, secure markets for their own production and consumers, maintain technological advantages, and ensure high living standard and access to benefits.

Academic literature has developed a substantial body of research on the use of environmental norms and "green" rhetoric as tools for gaining competitive advantages. For instance, Lyon and Montgomery (2015) [1] analyze how companies leverage a "green" image to suppress competitors. Clapp and Dauvergne (2010) [2] examine environmental standards as instruments of economic competition. Articles by Fuchs and Kalfagianni (2010) [3], Levy and Egan (2003) [4], and Banerjee (2008) [5] explore the policies of large corporations imposing "green standards" to marginalize smaller competitors. The works of Porter (e.g., [6]) also investigate the relationship between environmentalism and competition, including market players' exploitation of sustainable development factors.

International studies of this issue (e.g., Bergenas & Knight, 2017 [7]) predominantly promote the carbon neutrality agenda, aligning with state policy priorities such as the EU Green Deal. The European Green Deal's 2050 targets [8] include reducing imports of oil, natural gas, and coal, on which European industry has long depended, thus carrying significant geopolitical implications, reshaping Europe's energy security and trade relations with neighboring oil- and gas-producing nations. In this context, it is noteworthy that 73.2 % of global greenhouse gas emissions are attributed to energy production, while agriculture accounts for only 18.4 % (with livestock and manure contributing 5.8 % of total emissions) [9].

Russian research from 2018–2024 frequently examines the impact of Western sanctions on Russia's food security (e.g., Gorbunova & Shcheglov, 2020 [10]; Bartenev, 2021 [11]; Perekhodov, 2022 [12]; Lyasnikov, 2023 [13]; Timofeeva, Bulekova, & Skachkova, 2024 [14]), as well as other economic sectors (e.g., Sinichenko, 2021 [15]; Zhiryaeva & Svetlov, 2022 [16]) and specific territories (countries, regions), examples include Mirabyan (2020) [17], Tian (2021) [18], and Glinskaya & Polezhaev (2023) [19].

MATERIALS AND METHODS

The study employed traditional methods of statistical analysis (comparison, systematization, and trend analysis). In order to determine the contribution of individual regions and federal districts to ensuring the independence of agricultural activities from Western sanctions, the authors applied the index method, an indicative approach, and developed formulas for calculating the coefficient of agricultural sensitivity to Western sanctions and the food independence multiplier. Additionally, the modeling method was used through the construction of an algorithm for diagnosing the consequences of western sanctions on the development of Russian national agriculture.

RESULTS AND DISCUSSION

Sanctions, as a legal instrument, constitute coercive measures applied against a state or other subjects of international law to influence their behavior or actions. The legal nature of sanctions lies in their capacity to impose specific legal consequences aimed at altering undesirable actions or political courses. Crucially, the determination of what constitutes "desirable" or "undesirable" is defined not by legal norms – international or domestic – but almost exclusively by the political will of specific individuals or groups. Sanctions may vary in nature: economic, political, military, or social. Depending on their objectives and scope, they may be individual or collective. The legal mechanism of sanctions ensures their legitimacy and lawfulness, enabling states and international organizations to implement them within established legislation or international norms.

The essence of the legal mechanism of sanctions is to ensure the legitimacy and justification of restrictive measures. It encompasses both the legal grounds for imposing sanctions and their juridical consequences. Within this framework, it is essential to recognize that sanctions must target specific (at least declared) objectives, such as restoring international legal order, halting human rights violations, or preventing aggression. International organizations like the UN play a pivotal role in this mechanism by establishing rules and procedures governing sanction implementation. They create a relative, constructive legal framework defining when and how sanctions may be imposed.

The legal mechanism of sanctions also includes monitoring and evaluation to assess the effectiveness of imposed measures and their impact on the target state. Thus, the legal mechanism of sanctions can be defined as an organized set of juridical rules and procedures regulating the imposition and execution of restrictive measures against states. Its purpose is to modify behavior according to the will of those imposing sanctions, aligning with declared objectives and compliance with international norm, while balancing the efficacy of such measures against the protection of fundamental rights and freedoms.

Each country pursues its own approach to overcoming sanctions. China's response, for instance, was the enactment of the Law of the People's Republic of China on Countering Foreign Sanctions, which establishes grounds for adopting "countermeasures" recognized under international law. Despite China's partial successes, unresolved issues persist—such as further clarifying the division of responsibility regarding the implementation of countermeasures under this law and ensuring their consistency with China's international obligations [20, p. 48].

In Russia, beyond measures introduced by Presidential Decree No. 79 of February 28, 2022 (On Special Economic Measures in Response to Unfriendly Actions by the United States and Affiliated Foreign States and International Organizations) and Decree No. 81 of March 1, 2022 (On Additional Temporary Economic Measures to Ensure Financial Stability of the Russian Federation), Presidential Decree No. 100 of March 8, 2022 (On Special Economic Measures in Foreign Trade to Ensure the Security of the Russian Federation) established the following measures until December 31, 2025, to safeguard national security, industrial continuity and its uninterrupted functioning:

a) A ban on exporting from and/or importing into the Russian Federation products and/or raw materials specified on the lists determined by the Government of the Russian Federation;

b) Restrictions on exporting from and/or importing into the Russian Federation products and/or raw materials specified in lists determined by the Government of the Russian Federation;

c) Increased export and/or import customs duty tarrifs for products and/or raw materials exported from and/or

imported into the Russian Federation, as per lists determined by the Government of the Russian Federation.

Additionally, under Russian legislation, force majeure exempts parties from liability for breaches of obligations in commercial activities. This provision may be overridden by contractual agreement (Clause 3, Article 401 of the Civil Code of the Russian Federation).

The legal avenue for contesting sanctions constitutes a set of juridical mechanisms and procedures enabling states or their entities to challenge the legality and validity of restrictive measures imposed against them, utilizing norms of international and domestic law. This process involves access to legal remedies—such as litigation, appeals, and petitions to international bodies vested with the authority to assess the lawfulness of sanctions.

The economic basis of Western sanctions rests primarily on implementing the European model of competitive struggle against the largest "adversary" in global markets for grain and other commodities. Through this, the EU and other Western nations seek not only preferential access to resource markets but also advantages in finished goods and services markets. This includes establishing price monopolization for their exported products and protecting against the dissemination of new technologies, which are sourced and utilized for these purposes by their residents.

If we analyze self-sufficiency indicators across Russian regions before and after 2022, we observe increased food production (according to "The Level of Self-Sufficiency in Basic Food Products in the Russian Federation for 2019–2023" Rosstat materials). These food products can be categorized into three groups based on observed changes in self-sufficiency levels over time:

Group I: Products for which Russia has restored self-sufficiency levels regardless of sanctions applied from 2014 up to present, indicating high food independence. This group includes: meat, milk, eggs, potatoes, vegetables.

Group II: Products demonstrating stable self-sufficiency during the analysis period (since 2010), with no significant growth, reflecting stagnant domestic demand and high external competition (primarily among former Soviet republics). This group includes: milk and eggs.

Group III: Products of combined nature, characterized by dependence on Western sanctions and imported components. We propose including foods that showed negative growth in self-sufficiency levels in 2023 compared to 2022: grain, fish, fruits, berries.

Fig. 1 shows the distribution results of these agricultural products across Russia.

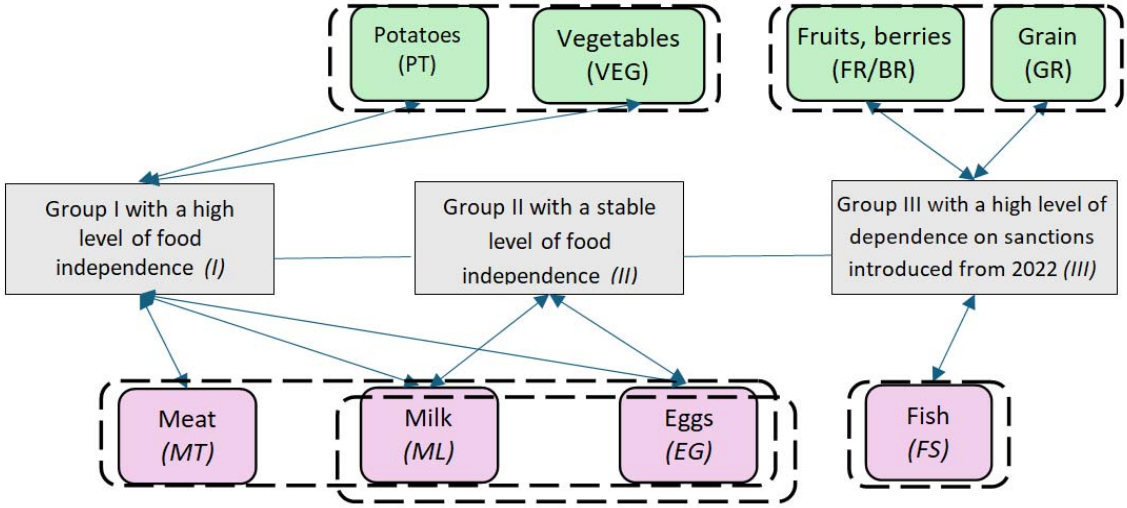

Figure 1. Distribution of meta-group food products into 3 groups by Russia's food independence level
Source: Compiled by the authors

In order to systematize the distribution of these food products across groups, we present the results in matrix form (Table 1). This matrix enables the identification of combinations for dual-product production models and varying levels of import dependency.

The Matrix notations carry the following core interpretations:

1) Alphabetic numerics (GR, MT, ML, etc.): Identify meta-group food products and classify them as crop/livestock origin;

2) x_1 and x_2: Denote the factor's role and position in the food independence function (sanctions resilience, import dependency, etc.);

3) "−" and "+" signs: indicate negative (inverse) or positive (direct) impact of sanctions on the meta-group product's contribution to food independence;

4) V_i values (weights of x_i in achieving food independence): Expert-assigned, sum to 1 (100 %).

Consequently, the food independence function for meta-group products takes the form:

$$F(food\_Ind) = a + V_1 * x_1 + V_2 * x_2 \qquad (1)$$

where:

a: Equation parameter (theoretical minimum food independence threshold when x_1 and x_2 = 0) (it is a theoretical value and cannot be measured in practice);

V_1: Weight of x_1 in achieving food independence;

x_1: Tier-1 meta-group product (prioritized by agricultural output share, domestic/export demand, sustainable price growth, etc.);

V_2: Weight of x_2 in achieving food independence;

x_2: Tier-2 meta-group product (secondary influence by share, demand, price dynamics, etc.).

The authors propose a sanctions impact assessment methodology using this two-factor food independence function to optimize production structures from micro to macro levels:

Phase 1: Apply multiple food independence functions (from 56 combinations) to identify optimal meta-group production structures at enterprise, municipal, regional, and national levels (universality of application within the framework of the scale-invariant approach). This yields context-appropriate production strategies accounting for sanctions.

Table 1. Matrix of multi-scenario interpretation for the two-factor food independence function F(food_Ind) for meta-group food products (56 combinations)

Meta-group products	Grain (GR), x_2	Meat (MT), x_2	Milk (ML), x_2	Eggs (EG), x_2	Fish (FS), x_2	Potatoes (PT), x_2	Vegetables (VEG), x_2	Fruits, berries (FR/BR), x_2	Value V_i
Grain (GR), x_1	I III*	x_1- x_2+	x_1- x_2+	x_1- x_2+	**x_1-** **x_2-**	x_1- x_2+	x_1- x_2+	**x_1-** **x_2-**	0,02
Meat (MT), x_1	x_1+ x_2-	I	**x_1+** **x_2+**	**x_1+** **x_2+**	x_1+ x_2-	**x_1+** **x_2+**	**x_1+** **x_2+**	x_1+ x_2-	0,02
Milk (ML), x_1	x_1+ x_2-	**x_1+** **x_2+**	II	**x_1+** **x_2+**	x_1+ x_2-	**x_1+** **x_2+**	**x_1+** **x_2+**	x_1+ x_2-	0,02
Eggs (EG), x_1	x_1+ x_2-	**x_1+** **x_2+**	**x_1+** **x_2+**	II	x_1+ x_2-	**x_1+** **x_2+**	**x_1+** **x_2+**	x_1+ x_2-	0,01
Fish (FS), x_1	**x_1-** **x_2 -**	x_1 - x_2 +	x_1 - x_2 +	x_1 - x_2 +	III	x_1 - x_2 +	x_1 - x_2 +	**x_1 -** **x_2 -**	0,01
Potatoes (PT), x_1	x_1 + x_2 -	**x_1 +** **x_2 +**	**x_1 +** **x_2 +**	**x_1 +** **x_2+**	x_1+ x_2-	I	**x_1+** **x_2+**	x_1+ x_2-	0,01
Vegetables (VEG), x_1	x_1+ x_2-	**x_1+** **x_2+**	**x_1+** **x_2+**	**x_1+** **x_2+**	x_1+ x_2-	**x_1+** **x_2+**	I	x_1+ x_2-	0,005
Fruits, berries (FR/BR), x_1	**x_1-** **x_2-**	x_1- x_2+	x_1- x_2+	x_1- x_2+	**x_1-** **x_2-**	x_1- x_2+	x_1- x_2+	I III**	0,005

** Meta-product with highest global grain market competition level*
*** Meta-products with highest import dependency in domestic production*

Phase 2: Conduct graphical analysis (correlation field for x_1 and x_2) with interpretations of each combination's optimal production structure under sanctions and other factors (state protectionism, falling domestic demand, high storage/transport costs, etc.).

Phase 3: Determine sanctions dependency/independence level for the meta-group for an agricultural enterprise, municipal economy, regional or national economy using Table 2 formulas:

If 0<Usan<1 ia an acceptable sanctions independence.

If Usan>1 is high sanctions dependency.

Phase 4: Additional calculations of the elasticity (sensitivity) of food independence to sanctions pressure on meta-products and the food independence multiplier (see Table 3).

Table 2. Formula system for calculating sanctions dependency/independence level of meta-group food products

Indicator	Calculation Formula	Formula Breakdown
Level of sanction dependence/independence for the micro level:	$U_{san\_farmer} = \frac{D_{x\,san\_farmer}}{D_{x\,no/san\_farmer}}$	U_{san_farmer} is a level of dependence/independence of agricultural producer on sanctions; D_{xsan_farmer} is a share of meta-level food products showing dependence on the introduction of sanctions through a decrease in production volume; D_{xno/san_farmer} is a share of meta-level food products not showing dependence on the introduction of sanctions and not reducing the rate of growth of production volume
Level of sanction dependence/independence for the municipal/regional/national level:	$U_{san\ mun} = \frac{D_{x\,san\_mun}}{D_{x\,no/san\_mun}}$ $U_{san\ reg\ econ} = \frac{D_{x\,san_{reg}}}{D_{x\frac{no}{san_{reg}}}}$ $U_{san\ nat.\ econ} = \frac{D_{x\,san\_nat}}{D_{x\,no/san\_nat}}$	U_{san_mun} is a level of dependence/independence of municipal economy/regional economy/national economy; D_{xsan_mun} is a share of meta-level food products showing dependence on the introduction of sanctions through a decrease in production volume over the period; $D_{xno/sanmun}$ is a share of meta-level food products not showing dependence on the introduction of sanctions and not reducing the rate of growth of production volume over the period

Source: Compiled by the authors

Consequently, the algorithm for diagnosing the consequences of sanctions on food security and independence is structured as follows (Fig. 2).

The developed approach to assessing import substitution levels and sanctions' impact on national agricultural development complements official tools and

methods of state and private agricultural anti-sanctions policy. It enables proactive responses to Western competitive strategies in the global meta-group food market.

Table 3. Indicators for assessing food independence elasticity and the multiplier effect from meta-group food production dynamics

Indicators	Calculation Formula	Formula Breakdown
1. Coefficient of agricultural sensitivity (elasticity) to sanctions	$\|E\| = \frac{Y_1 - Y_0}{Y_0} \div \frac{X_1 - X_0}{X_o}$ $1 > E > 0$	Measures agriculture's sensitivity (Y) to changes in sanctions composition (X). Represents the percentage change in Y when X changes by 1%.
2. Food independence multiplier	$m_{food\_ind} = \frac{\Delta FInd_{lev}}{\Delta Q_{meta}} > 1$	Measures how food independence ($\Delta FInd_{lev}$) changes based on self-sufficiency level data when the production volume of meta-group food products (ΔQ_{meta}) changes.

Source: Compiled by the authors

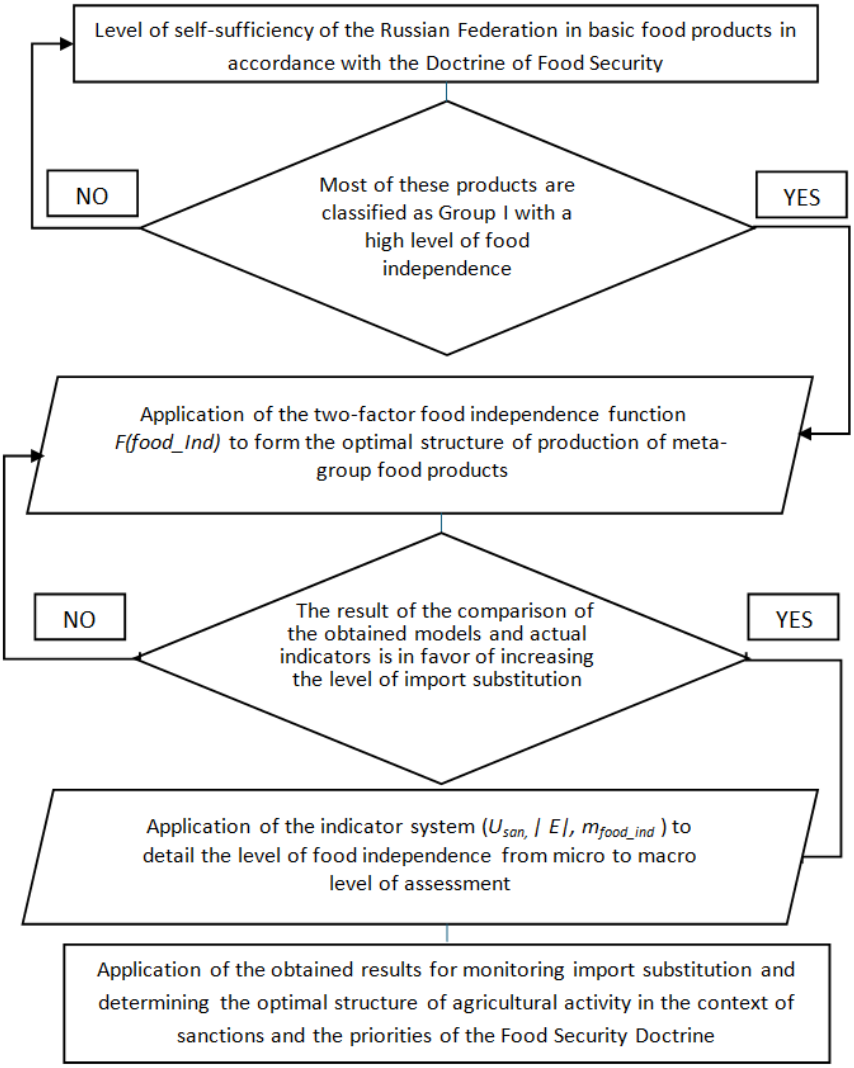

Figure 2. Algorithm for diagnosing the consequences of sanctions on food security and independence
Source: Compiled by the authors

In order to test the proposed framework, we utilized regional classification results by food independence level from the authors' 2024 study [14]:

Type I: "Low food independence" (0–50 % of the Food Security Doctrine threshold);

Type II: "Medium food independence" (50 % to the Doctrine threshold);

Type III: "High food independence" (Doctrine threshold and above).

Table 4 presents the 2023 distribution of Russian regions across these three types for meta-group food self-sufficiency.

Table 4. Distribution of Russian regions by meta-group food self-sufficiency level (2023)

Russian constituent entity type	Grain		Meat		Milk		Eggs		Potatoes		Vegetables		Fruits/ Berries	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Type I	23	28,0%	21	25,6%	13	15,9%	24	29,3%	10	12,2%	28	34,1%	46	56,1%
Type II	12	14,6%	25	30,5%	30	36,6%	25	30,5%	32	39,0%	35	42,7%	19	23,2%
Type III	47	57,3%	36	43,9%	39	47,6%	33	40,2%	40	48,8%	19	23,2%	17	20,7%
Total	82	100%	82	100%	82	100%	82	100%	82	100%	82	100%	82	100%

Source: Compiled by the authors using Rosstat data "The Level of Self-Sufficiency in Basic Food Products in the Russian Federation for 2019–2023"

The following key conclusions can be made from Table 4:

- Grain production is concentrated in 47 regions (Type III, exceeding the Food Security Doctrine threshold), representing 57.3 % of all regions;
- Similar trends appear for a number of other food products - meat, milk, eggs, and potatoes;
- Vegetables show the highest concentration in Type II constituent entities (with a share of 42.7 % of regions);
- Fruits/berries exhibit the lowest threshold compliance: only 17 constituent entities (20.7 %) achieve Type III status, while 46 constituent entities (56.1 %) fall into Type I.

Using the Rostov region as an example, we present the procedure for applying the algorithm for diagnosing the consequences of sanctions on food security and independence of this territory:

1) based on data on changes in the level of self-sufficiency of the Rostov region in basic food products for 2019–2023 (Table 5), the following conclusions can be drawn:

We demonstrate the sanctions impact diagnosis algorithm using Rostov region:

Table 5. Self-sufficiency level dynamics for basic food products in Rostov region (2019–2023, %)

Food products from Doctrine	Threshold value	Self-sufficiency level for basic food products, %					Growth rate 2023 vs. 2022, %	Growth rate 2023 vs. 2019, %
		2019	2020	2021	2022	2023		
Grain	95	450,3	463,0	500,0	549,1	612,8	136,1%	111,6%
Meat	85	60,5	59,3	73,5	91,8	89,0	147,1%	96,9%
Milk	90	99,1	98,9	98,3	98,0	96,2	97,1%	98,2%
Eggs	-	116,2	115,9	94,1	109,1	106,2	91,4%	97,3%
Fish	85	no data	no data	no data	no data	no data	no data	no data
Potatoes	95	88,4	86,1	87,9	102,7	102,0	115,4%	99,3%
Vegetables/melon crop	90	96,7	89,4	88,0	91,8	96,0	99,3%	104,6%
Fruits and berries	60	36,4	35,9	34,9	33,4	27,3	75,0%	81,7%

Source: Compiled by the authors based on Doctrine of Food Security of the Russian Federation (approved by Presidential Decree No. 20 of 21.01.2020)

- Group I with a high level of food independence (I) includes *grain, meat*, and *potatoes* (eggs and vegetables did not enter this group compared to nationwide results);
- Group II includes, in addition to the above food products, milk, eggs, and vegetables (contrary to milk and eggs in the nationwide baseline);
- Group 3 was assigned *milk, eggs*, and *fruits/berries* (versus fruits/berries, grain, and fish for Russia overall (Fig. 3)).

2) To apply the two-factor food independence function for meta-group food products $F(food_Ind) = a + V_1*x_1 + V_2*x_2$c, considering Phase 1 results, we select two combinations with the most positive and negative positions regarding sanctions and sustainable self-sufficiency growth:

- First combination: "*Grain-Meat*"
- Second combination: "*Eggs-Fruits*"

	Meat (MT), x_2	Fruits, berries (FR/BR), x_2
Grain (GR), x_1	**x_1+ / x_2+**	-
Eggs (EG), x_1	-	x_1+ / x_2-

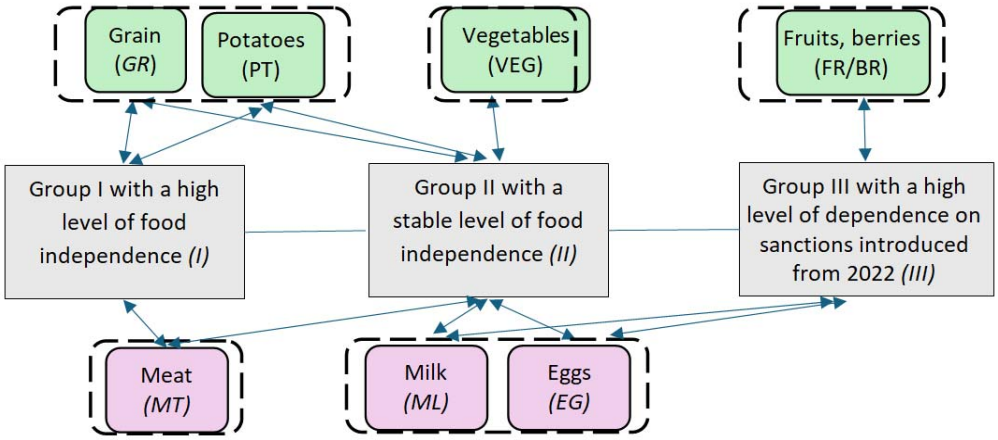

Figure 3. Result of distributing meta-group food products into 3 groups for Rostov region in 2023
Source: Compiled by the authors based on Table 5 data

The data source for *F(food_Ind)* comes from official materials of the Rostov region territorial branch of Rosstat for 2023 (Table 6).

The calculation results for *F(food_Ind)* for these two combinations are as follows:

- Grain-Meat:

$F(food\_Ind) = a + V_1*x_1 + V_2*x_2 = 0 + 0,02*16170,3 + 0,02*287,0 = 329,15$

- Eggs-Fruits/Berries:

$F(food\_Ind) = a + V_1*x_1 + V_2*x_2 = 0 + 0,01*1629,7 + 0,005*89,4 = 16,74$

Using the "Grain-Meat" combination, we present the correlation field for the structural shift in food independence during 2022–2023. The vector shows a pronounced positive direction in both the growth of produced goods and the enhancement of the region's food independence (Fig. 4).

Table 6. Data for applying the two-factor function *F(food_Ind)* for Rostov region

	2023	Reference – 2022	Self-sufficiency level in 2023, %	Weight values (V_i)
First combination x_1 and x_2				
Grain, thousand tons (x_1)	16170,3	15252,0	612,8	0,02
Meat, thousand tons (x_2)	287,0	286,3	89,0	0,02
Second combination x_1 and x_2				
Eggs, million pcs. (x_1)	1629,7	1673,6	106,2	0,01
Fruits/Berries, thousand tons (x_2)	89,4	н/д	27,3	0,005

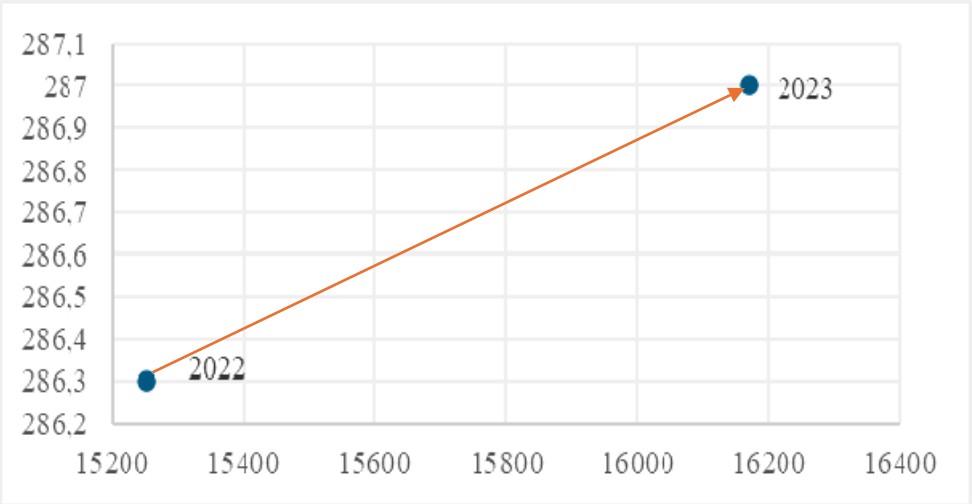

Figure 4. Correlation field for determining the structural shift in the "grain-meat" combination for 2022 and 2023 regarding the increase/decrease in food independence of Rostov region
Source: Compiled by the authors

4) To calculate the level of sanctions dependency/independence of the Rostov region economy in 2023, we use the formula $U_{sanregecon}c$ with the determination of its components:

- D_{xsan_t} includes 3 products – milk, eggs, and fruits/berries (see Fig. 1);

- $D_{xno/sant}$ includes other products – grain, meat, potatoes, vegetables.

Due to limited author access to detailed databases for calculations, we will use simulated dynamic indicators:

Parameters of the equation $U_{san\ reg\ econ}$ $D_{x\ san0\ (2022)} = 0{,}15$ $D_{x\ san\ 1\ (2023)} = 0{,}18$

$D_{x\ no/san0\ (2022)} = 0{,}85$

$D_{x\ no/san1\ (2023)} = 0{,}82$

$$U_{san\ reg\ econ\ (2022)} = \frac{D_{x\ san\_t}}{D_{x\ no/san\_t}} = \frac{0{,}15}{0{,}85} = 0{,}18$$

$$U_{san\ reg\ econ\ (2023)} = \frac{D_{x\ san\_t}}{D_{x\ no/san\_t}} = \frac{0{,}18}{0{,}82} = 0{,}22$$

Despite $U_{san\_reg\_econ}$ values being less than 1, the trend shows the indicator approaching the threshold value of 1, indicating increasing sanctions impact on the production structure of these meta-group food products.

The elasticity of food independence to sanctions pressure represents the degree of the national agricultural sector's responsiveness to external restrictions, manifested in changes to the volume and structure of food production under negative factors. This definition encompasses both quantitative and qualitative aspects, reflecting the system's ability to promptly adapt to sanctions-induced changes.

Legal foundations for assessing this elasticity include regulations governing agriculture, food security, and sanctions policy. A key element is the existence and content of strategies aimed at supporting and developing domestic agricultural production. These strategies should account for both the current state of the agricultural sector and forecast its development under instability.

Tools for determining the sensitivity of food independence to sanctions pressure may include economic indicators such as food self-sufficiency levels, domestic market price dynamics, agricultural import/export volumes, consumption structure analysis. The food independence multiplier can be measured through quantitative indicators illustrating how changes in one agro-economic sector affect related industries, including processing and product distribution.

To determine the elasticity (sensitivity) of food independence to sanctions pressure on meta-products and the food independence multiplier, we simulate a calculation database and result interpretation procedure:

- For the sensitivity (elasticity) coefficient |E|, we assert that:

o Tracking changes in X (% sanctions growth vs. prior period) is feasible at the national level by the relevant ministry;

o Values of agricultural development results Y should align with regional/national self-sufficiency levels for basic food products (according to Rosstat data);

o For the simulated X and Y database dynamics, it can be presented as:

Parameters for |E| equation $Y_{0\ (2022)} = 109{,}06^{**}$ $Y_{1\ (2023)} = 105{,}93^{**}$

$X_{0\ (2022)} = 1500^{*}$

$X_{1\ (2023)} = 1650^{*}$

$$|E| = \frac{Y_1 - Y_0}{Y_0} \div \frac{X_1 - X_0}{X_o} = |0{,}2856| > 0$$

Sensitivity exists but is closer to 0 than 1 (moderate)

** Hypothetical examples*

***Average self-sufficiency level for meta-group food products across all eight categories in 2022–2023*

- Regarding the food independence multiplier m_{food_ind} the following comments are necessary:

o The numerator value in the multiplier formula $FInd_{lev}$ is taken from meta-group food self-sufficiency results (Rosstat);

o Production volume dynamics are determined based on the selected entity (national, regional, or agricultural producer level);

o To demonstrate the formula testing results, we utilize nationwide data due to limited access to regional-level information:

Parameters for equation $m_{food\ ind}$ $FInd_{lev0\ (2022)} = 191{,}4\%\ ^{**}$ $FInd_{lev1\ (2023)} = 173{,}5\%\ ^{**}$

$Q_{meta0\ (2022)} = 157{,}67\ ^{*}$

$Q_{meta1\ (2023)} = 144{,}9\ ^{*}$

$$m_{food\_ind} = \frac{\Delta FInd_{lev}}{\Delta Q_{meta}} > 1 = \frac{-17{,}9\%}{-12{,}77\ млн.т.} = 1{,}4$$

Multiplier effect is a 1-ton change in Q_{meta} yields a 1.4-fold change in self-sufficiency for this meta-group product

** Grain production in Russia, million tons*

*** Average grain (meta-group product) self-sufficiency level in 2022–2023*

CONCLUSION

Ensuring agricultural development independent of the global economy and financial market processes entails risks and threats that may significantly undermine it – and sanctions undoubtedly constitute such factors. Western sanctions represent a set of measures aimed at restricting economic and financial capabilities of targeted countries, often implemented through market closures, asset freezes, and technology export restrictions. The legal basis for such sanctions typically stems from international agreements and national laws driven by political expediency and strategic interests of initiating states.

Food security remains a cornerstone of national long-term security, a factor preserving statehood and sovereignty, a vital component of social and economic policy, and a prerequisite for implementing the strategic national priority: enhancing Russian citizens' quality of life through guaranteed high living standards.

The consequences of sanctions pressure on Russian agricultural development manifest through reduced

availability of certain goods, price increases, and supply chain restructuring, necessitating diversification of food sources and domestic production expansion. In response to external challenges, Russia actively pursues import substitution, enhancing food independence. Simultaneously, this situation demands flexibility and innovative approaches to agricultural policy focused on sustainable development, which could reduce vulnerability to external economic pressures.

Testing of the methodology on the example of the Rostov region confirmed its effectiveness for identifying product groups with critical import dependence (Fruits/Berries), recording positive shifts (Grain and Meat cluster) and calculating multiplier effects when redistributing resources. The developed algorithm for diagnosing the consequences of sanctions, based on a two-factor function of food independence *F(food_Ind)* and a system of indicators from micro- to macro-level, allows for a quantitative assessment of sanctions risks and prompt adjustment of regional anti-crisis strategies. Thus, Western sanctions, acting as a catalyst for agro-political reforms, form an imperative for the transition to an adaptive model of agro-industrial complex management, where the proposed diagnostic system becomes a tool for scenario planning in the context of global market volatility.

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AUTHOR CONTRIBUTIONS

Rashida I. Yabbarova, Eida V. Golomanchuk and Natalia E. Buletova collected factual material on the research topic (theoretical and empirical data). Svetlana A. Skachkova and Galina V. Timofeyeva aligned the authors' ideas with fundamental principles of economic theory regarding sensitivity indicators and multipliers.
Ekaterina V. Stepanova and Mikhail G. Polozkov analyzed the consistency of the authors' ideas with foreign sources and compared conclusions and results.
All authors participated in analyzing the collected materials, drafting the manuscript, writing the abstract, and compiling the reference list. All authors are equally accountable for any identified plagiarism, self-plagiarism, or other unethical practices.

КРИТЕРИИ АВТОРСТВА

Рашида И. Яббарова, Эйда В. Голоманчук, Наталья Е. Булетова собирали фактический материал по теме исследования (теория и эмпирические данные), Светлана А. Скачкова и Галина В. Тимофеева проводили соотношение идей авторов с основными положениями экономической теории по показателям чувствительности, мультипликаторам; Екатерина В. Степанова и Михаил Г. Полозков проводили анализ соответствия идей авторов зарубежным источникам, сравнение выводов и результатов; все авторы принимали участие в анализе собранных материалов, написании рукописи, ее аннотации, списка литературы. Все авторы в равной степени несут ответственность при обнаружении плагиата, самоплагиата или других неэтических проблем.

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