

Methodological Approaches to Assessing the Development of the Food Complex

Marina Alexandrovna Zhukova¹; Vadim Anatolyevich Zhukov¹; Tatiana Sergeevna Markova²;
Olga Ruslanovna Tsabolova¹; Pavel Nikolaevich Sharonin³

¹State University of Management, 99 Ryazansky Prospect, 109542, Moscow, Russia.

²Russian State Social University, 4,1 V.Pika Ave., 129226, Moscow, Russia.

³Moscow Polytechnic University, 38 Bolshaya Semenovskaya Street, 107023, Moscow, Russia.

Abstract

The article considers methodological approaches to assessing the development of the food complex. The authors have revealed that the functioning of the food complex is associated with a food-related problem. The algorithm for its solution depends on such aspects as population growth (a factor in increasing food demand), the use and conservation of land (the most important natural source that satisfies the needs of humankind for food). The analysis of food consumption by the population of the Russian Federation has shown that certain types of products did not achieve production volumes that would correspond to the physiological norms of nutrition. Regarding crop production in the Russian Federation, potatoes, grapes, sunflower seeds and sugar beets had high profitability. Livestock products experience a different situation. This negatively affects the sphere of agricultural production, i.e. it weakens the effect of financial encouragement for workers; the costs of purchased resources prevail; there is a simplification of production technology (primarily in crop production), which leads to a decrease in crop yields and reduces the quality and competitiveness of products.

Key-words: Agricultural Potential, Agricultural Production, Financial Encouragement, Food Complex, Food Products, Market, Technology.

1. Introduction

In modern conditions, the development of the food market becomes extremely important since the state of the country's food market determines its food security and place in the world. In this case, the insufficient provision of food products in other countries and the high demand for agricultural raw materials serve as a good opportunity for the Russian Federation to reveal and

demonstrate its significant agricultural potential. Both the future and development of countries depend on how timely and efficiently they can solve problems in the agro-industrial sector.

The joint efforts of many scholars, international organizations and foundations spread ideas that the global food problem is an integral part of the world economy. Furthermore, it hinders the development of humankind and cannot be solved by a simple increase in food aid from the world community to those regions and countries suffering from food shortages.

The issues of assessing the development of the food complex were addressed by O.I. Botkin [1], L.N. Dulepinskiikh [2], I.A. Minakov [3], Yu.Ya. Rakhmatullin [4], E.G. Reshetnikov [5], E.V. Fudina [6], etc. Nevertheless, the issues concerning the development of the food complex and its evaluation are insufficiently studied.

2. Materials and Methods

The research algorithm is based on managing the final product of the agri-food complex, whose parameters reveal the development of a certain country. The theoretical and methodological base of this study comprises the abstract-logical method, induction, deduction, analysis, synthesis, systematization (to substantiate approaches to assessing the development of the food complex) and the graphical method (to study changes and trends in some parameters of the food system).

The information base of this article is the data provided by state bodies, legal documents regulating the assessment of the food complex in modern conditions and results of scientific research [7-9].

In the course of the study, we plan to form methodological approaches to assessing the development of the food complex, introduce measures to increase the output of food products and substantiate mechanisms for food provision in an unstable economic situation.

3. Results and Discussions

Assessing the contribution of the food complex to the national economy in financial terms, it is worth noting that its share in the gross value added is more than 10%. However, this sector of the economy has not used its potential to the fullest [10-12]. Since the main economic indicator for assessing the efficiency of agricultural production is its profitability, we need to consider this indicator for certain types of crop and livestock production between 2006 and 2019 (Table 1).

The data analysis shows that crop production by agricultural enterprises was profitable in the period between 2006 and 2019. In particular, potatoes (except for -21.5% in 2018), grapes, sunflower seeds and sugar beets had the highest profitability. The reverse is true for the profitability of livestock production. These products are often commercially unfeasible. Moreover, this trend aggravated each year.

Table 1 - The profitability of different types of agricultural products between 2006 and 2019, in %

Product types	2006	2011	2015	2016	2017	2018	2019
Cereals and pulse crops	64.8	3.1	7.3	13.9	26.1	15.2	1.5
Sunflower seeds	52.2	24.3	41.4	64.7	57.0	45.8	28.5
Sugar beet	6.1	4.8	37.0	16.7	36.5	15.7	2.7
Vegetables	-1.7	16.1	19.1	23.5	9.9	-6.8	7.0
Potatoes	14.0	17.8	12.9	62.1	17.7	-21.5	23.0
Fruit	-1.1	12.7	16.2	14.9	17.9	8.8	154.7
Grapes	62.7	31.7	92.1	91.6	57.1	72.6	101.7
Milk	-6.0	12.2	1.4	17.9	18.5	2.3	13.6
Cattle meat	-42.3	-25.0	-32.9	-35.9	-24.8	-29.5	-43.3
Pork	-44.3	14.9	12.1	-7.8	-3.7	2.0	0.2
Lamb and goat meat	-46.4	-32.1	-31.8	-29.5	-39.6	-40.0	-42.8
Poultry	-33.2	24.9	-22.5	-4.4	-16.8	-7.2	-10.0
Eggs	10.6	23.5	13.1	18.6	38.8	52.6	47.6
Wool	-75.8	-72.8	-79.4	-82.2	-70.6	-61.0	-72.7

Source: [13]

The analysis and assessment of the effective development of the food complex and the food market, in particular, also characterize the basic market conditions for the demand and supply of agricultural products and processed products. To determine the effective functioning of the food complex, we propose to use the following indicators:

– The coefficient of the food supply of the Russian population by various agricultural products (K_{pz}) can be calculated through the formula:

$$K_{pz} = \frac{S_f}{S_n}, \quad (1)$$

where S_f is the actual consumption of a certain food product per capita per year (kg); S_n is the consumption of a certain food product per capita per year at rates (kg);

– The self-sufficiency of a country (K_s) is defined as the ratio of the domestic production of the i product in a certain period of time (P_{vt}) to its consumption in the domestic market in the t period (usually in a particular year) (H_{vt}):

$$K_s = \frac{P_{vt}}{H_{vt}} \times 100\%, \quad (2)$$

– The dependence of any country on import purchases of the i product (K_z) should be determined as the ratio of external purchases of some product (P_{zt}) to its internal consumption (H_{vt}) according to the formula:

$$K_z = \frac{P_{zt}}{H_{vt}} \times 100\%, \quad (3)$$

– The balance of supply and demand of the i product in a country (K_{it}) in a certain period of time can be calculated by the formula:

$$K_{it} = \frac{R_{it}}{Q_{it}} \times 100\%, \quad (4)$$

where R_{it} is the volume of supply in the agri-food market of a country that includes the volume of domestic production and import purchases of the i product for a certain period of time; Q_{it} is the total volume of real (actual) demand for the i product which is defined as the sum of its demand in the domestic and foreign markets.

Under these conditions, the balance of supply and demand for a certain type of agro-food products in a country, which is more than 100%, means that its supply exceeds demand at some moment. As a result, there is an increase in the carry-over of this product and vice versa. This circumstance allowed us to calculate the coefficients of food supply for the population in relation to different types of crop and livestock products between 2006 and 2019 (Table 2).

Table 2 - Coefficients of food supply of the Russian population by basic food products between 2006 and 2019

Types of food products	The coefficient of food supply of the population						
	2006	2011	2015	2016	2017	2018	2019
Meat and meat products	0.41	0.49	0.62	0.65	0.64	0.68	0.70
Milk and dairy products	0.52	0.59	0.56	0.54	0.54	0.57	0.58
Bread products	1.24	1.22	1.11	1.10	1.09	1.08	1.07
Potatoes	1.09	1.09	1.07	1.04	1.12	1.13	1.09
Vegetables and gourds	0.63	0.75	0.85	0.89	1.01	1.01	1.01
Fruit, berries and grapes	0.33	0.41	0.51	0.53	0.58	0.59	0.63
Fish and fish products	0.42	0.72	0.76	0.73	0.67	0.68	0.73
Sugar	0.97	1.00	1.00	0.98	1.01	0.99	0.98
Vegetable oil	0.72	1.04	1.18	1.14	1.05	1.00	1.02

Source: calculated based on the relevant data [13, 14]

The above-mentioned coefficients show that the highest level of food security was achieved for such commodity groups as bread products and potatoes. Vegetables and gourds, sugar and vegetable oil had a slightly lower level of this indicator. The lowest level was typical of fruit, berries and grapes, milk and dairy products, meat and meat products, fish and fish products.

While analyzing this indicator in dynamics, we can see that the food supply of the population increased in relation to such food products as meat and meat products (by 0.29); milk and dairy products (by 0.06); vegetables and gourds (by 0.38); fruit, berries and grapes (by 0.30); fish and fish products (by 0.31); sugar (by 0.01); vegetable oil (by 0.30) in 2019, if compared to 2006. During this period, the coefficient of the food supply of the population with grain products decreased by 0.17. Moreover, the value of such a coefficient for potatoes did not change during the same period. We also determined indicators characterizing the self-sufficiency of the population of the Russian Federation in agro-food products during 2006-2020 (Table 3).

Table 3 - Changes in the self-sufficiency of the Russian population with the main types of agro-food products between 2006 and 2020, in %

Types of food products	2006	2011	2014	2015	2016	2017	2018	2019	2020	2020 vs 2006
Meat and meat	103.23	86.61	81.45	83.71	86.37	91.66	89.18	93.69	101.51	-1.72
Milk and dairy	129.31	129.07	118.92	118.71	118.79	118.40	116.14	114.31	116.20	-13.11
Eggs	107.86	116.38	123.82	127.29	128.42	131.91	136.30	139.36	146.70	38.84
Grain and grain	315.68	490.53	759.01	670.96	576.84	843.19	694.66	958.51	1026.01	710.33
Potatoes	297.87	304.76	320.46	321.03	316.28	380.78	363.62	143.56	390.91	93.04
Vegetables and gourds	123.85	134.31	142.08	142.21	134.83	141.96	145.13	143.56	147.07	23.22
Fruit, berries and	136.62	121.89	95.47	99.33	97.78	100.54	101.36	112.15	108.27	-28.35
Sugar	118.68	119.16	83.08	73.07	105.93	147.10	125.10	74.91	131.69	13.01
Vegetable oil	302.39	226.30	283.29	407.74	456.03	522.88	688.16	614.57	878.07	575.68

Source: calculated based on the relevant data [13, 14]

Based on the calculated data, it can be concluded that the highest indicator of self-sufficiency was achieved by vegetable oil, grain and potatoes. However, fruit, berries and grapes, as well as meat and dairy products had the lowest values. If compared to 2006, the self-sufficiency of the population of the Russian Federation increased in relation to eggs (by 38.84%), grain and grain products (by 710.33%), vegetables and gourds (by 23.22%), oil (by 575.68%) in 2020. During the same period, the availability of meat and meat products decreased by 1.72%, milk and dairy products by 13.11%, fruit, berries and grapes by 28.35%.

The calculated dependence of the Russian agri-food market on imports for the period of 2006-2020 indicates large imports of fruit, berries and grapes (38.06%), vegetable oil (39.75%), meat and meat products (8.065%) (Table 4).

Table 4 - The dependence of the Russian domestic market of agro-food products on imports between 2006 and 2020, in %

Types of food products	2006	2011	2014	2015	2016	2017	2018	2019	2020
Meat and meat products	2.36	17.62	23.50	19.17	15.86	10.43	17.07	13.02	8.65
Milk and dairy products	0.51	1.05	2.37	4.65	2.88	2.74	4.18	5.45	3.73
Eggs	0.42	0.77	1.00	0.97	0.91	0.37	0.49	0.62	0.91
Grain and grain products	13.04	2.92	3.16	1.98	2.57	4.06	3.43	3.68	4.23
Potatoes	0.17	0.08	0.16	0.24	0.51	0.64	0.36	0.37	0.66
Vegetables and gourds	0.58	1.77	5.96	3.68	4.73	3.83	2.86	3.19	3.21
Fruit, berries and grapes	12.44	49.14	61.44	54.21	51.29	48.36	48.15	45.78	38.06
Sugar	6.80	9.86	4.81	5.27	5.28	2.73	0.58	0.65	0.45
Vegetable oil	39.05	41.57	69.16	44.44	46.91	39.84	39.09	49.00	39.75

Source: calculated based on the relevant data [13, 14]

In addition, the domestic agri-food market of the Russian Federation was hardly dependent on import purchases in 2019-2020: milk and dairy products (5.45% and 3.73%); eggs (0.62% and 0.91%); grain and grain products (3.68% and 4.23%); potatoes (0.37% and 0.66%); vegetables and gourds (3.19% and 3.21%); sugar (0.65% and 0.45%).

While analyzing the balance of real demand and supply for certain types of agro-food products in the Russian Federation during 2006-2020, we have noticed that, despite the excess of supply over demand for all types of food, there was practically no increase in their consumption or it was rather insignificant (Table 5).

Table 5 - Different indicators showing the balance of real demand and supply for certain types of agro-food products in the Russian Federation between 2006 and 2020, in %

Type of food products	2006	2011	2014	2015	2016	2017	2018	2019	2020
Meat and meat	95.89	99.79	103.72	101.12	100.21	98.76	101.15	99.60	100.71
Milk and dairy	116.70	110.38	108.75	112.77	110.51	109.84	111.03	111.25	113.67
Eggs	108.28	116.98	120.83	118.72	117.81	120.09	124.22	123.97	123.97
Grain and grain	340.90	207.08	243.15	147.47	203.91	286.94	141.65	183.92	161.73
Potatoes	297.99	304.55	320.47	321.01	316.36	380.65	363.58	360.73	390.47
Vegetables and	123.69	132.56	142.06	138.30	132.79	140.09	141.42	139.63	144.24
Fruit, berries and	140.47	145.64	139.43	135.26	128.48	135.44	130.65	136.96	126.63
Sugar	107.02	118.83	83.35	74.58	107.12	145.61	114.10	68.90	128.83
Vegetable oil	105.14	110.81	107.09	100.66	96.88	102.27	99.19	101.29	100.19

Source: [13, 14]

4. Conclusion

We can conclude that the functioning of the food complex is associated with a food-related problem. The algorithm for its solution depends on four aspects, including population growth (a factor in increasing food demand); the use and conservation of land (the most important natural source that satisfies the needs of humankind for food); trends and rates of increasing food production in general and per capita in particular; agricultural science (the main factor in ensuring the growth of food resources on the planet).

The analysis of food consumption by the Russian population has proved that production volumes that would have provided the physiological norms of nutrition have not been achieved for certain types of products. However, the country's agricultural production satisfies the existing demand for bread and bread products, potatoes, vegetable oil, sugar, vegetables and gourds.

References

- Botkin, O.I., Sutygina, A.I., Sutygin, P.F. 2020, *Different interests in the functioning of integrated structures of regional agri-food complex*. APK: Ekonomika, upravlenie, 1: 36-46.
- Dulepinskih, L.N., Svetlakov, A.G., 2021, *The genesis and evolution of the New Economic Policy in the agricultural sector of the Russian economy*. Mikroekonomika, 1: 36-42.
- Minakov, I.A., 2021, *Modern agricultural policy: trends and results*. Vestnik Michurinskogo gosudarstvennogo agrarnogo universiteta, 1(64): 148-153.
- Rakhmatullin, Yu.Ya., Akhmedina, G.B., Kuzyashev, A.N., Nasretdinova, Z.T., 2020, *The influence of subsidies on financial results in agriculture*. Biznes. Obrazovanie. Pravo, 1(50): 204-208.
- Reshetnikova, E.G., 2021, *Improving the wholesale trade of products as a factor ensuring the affordability of food*. Mezhdunarodnyi selskokhozyaistvennyi zhurnal, 1(379): 69-73.
- Fudina, E.V., 2020, *The relevant issues and prospects of developing the industrial complex in Russia*. International Agricultural Journal, 63(1): 14.
- Agamirova, E.V., Agamirova, E.V., Lebedeva, O.Ye., Lebedev, K.A., Ilkevich, S.V., 2017, *Methodology of estimation of quality of tourist product*. Quality - Access to Success, 18(157): 82-84.
- Malyugina, N.M., Polyakova, R.I., Fedorova, E.A., Tretyak, E.B., Shadskaja, I.G., 2020, *The specifics of discourse modeling in intercultural communication*. Revista Inclusiones, 7(4): 486.
- Zavalko, N.A., Kozhina, V.O., Zhakevich, A.G., Matyunina, O.E., Lebedeva, O.Ye., 2017, *Methodical approaches to rating the quality of financial control at the enterprise*. Quality – Access to Success, 18(161): 69-72.
- Kuzmina, E.E., Sharonin, P.N., Tayupova, O.I., Shabanov, O.A., Titova, A.D., 2021, *Formation of intercultural competency in personnel training for international tourism*. Revista Turismo Estudos & Práticas, S1: 2.
- Lukiyanchuk, I.N., Panasenko, S.V., Kazantseva, S.Yu., Lebedev, K.A., Lebedeva, O.Ye., 2020, *Development of online retailing logistics flows in a globalized digital economy*. Revista Inclusiones, 7(S2-1): 407-416.
- Ogloblina, E.V., Seredina, M.I., Altunina, J.O., Kodolov, V.A., Lebedev, K.A., 2020, *Socio-economic consequences of digital development of the economy*. Revista Inclusiones, 7(Especial): 421-430.
- Rosstat, 2021, *The main indicators in the Russian agricultural system*. <https://rosstat.gov.ru/compendium/document/13276>
- Rosstat. 2021, *The sale of agricultural products in the Russian Federation*. <https://rosstat.gov.ru/compendium/document/13277>