

Consumption as the main element of the reproduction process in agriculture

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Abstract. One of the criteria for ensuring food security is the consumption of basic food products per capita, which characterizes the level and quality of life. Food consumption is the result of the reproductive process in agriculture. The article discusses the level of self-sufficiency on the materials of the Irkutsk region, is compared with the food security criteria provided for in the Doctrine. All food products, except for potatoes, residents of the Irkutsk region consume significantly less, compared with residents of the Russian Federation. For meat, milk, egg, vegetables, consumption does not meet the rational standards recommended by the Ministry of Health for a healthy diet. A regression model of the relationship between per capita incomes of the country and milk consumption per capita is presented. The mismatch between the excessive content of fat in food, potatoes, sugar and bread in the diet and the lack of calorie intake affects the health of the population of the Irkutsk region. It is necessary to achieve the level of production of the main types of high-quality food products, enough to provide the population of the Irkutsk region and reduce food dependence.

1 Introduction

Being the final phase of the reproduction process, consumption serves as a prerequisite for the formation of a new reproductive cycle and is the result of the reproductive process.

2 Problem statement

Indicators of food consumption are among the most important characteristics of the level and quality of life of the population, are included in the system of general indicators of socio-economic development of any country and are an integral basis of human life. The quality and structure of consumed food products affect the health status of the country's population, determining its economic and food security.

After the introduction of retaliatory restrictive measures in foreign trade by the Russian Federation, the food problem worsened when about a fifth of the total volume of Russian imports of food products and agricultural raw materials for its production fell under foreign sanctions, which corresponds to almost 15 % of their domestic consumption [1].

The imposition of foreign sanctions following the reunification of Crimea with Russia and the outbreak of the Ukrainian crisis exacerbated the problems of reliable food supply to the country.

3 Purpose of the study

Assess the consumption of basic foodstuffs in the Irkutsk region and the achievement of the criteria provided for in the Doctrine of Food Security and the recommended norms of consumption for a full and healthy lifestyle.

4 Research questions

One of the criteria for ensuring food security is the consumption of basic foodstuffs per capita, which in our region has not reached a rational norm.

The region fully provides itself with poultry meat (30 kg), eggs (191 pcs.), and potatoes (121 kg). However, the level of self-sufficiency of the population of the Irkutsk region in agricultural products in 2017 amounted to 64.1 % for meat, 87.2 % for milk, and 58.4 % for vegetables. In accordance with the Doctrine of Food Security of the Russian Federation – 2010, the necessary level of self-sufficiency should be 85.0 % for meat, 90 % for milk, 90 % for vegetables, 95 % for grain.

The Ministry of Agriculture of Russia has developed a draft new Doctrine of Food Security in Russia, which includes an indicator of economic affordability of food, which reflects the possibility of the population acquiring food at current prices in enough quantity and assortment within the framework of established consumption standards.

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Also, the Doctrine will consider the physical accessibility of products, that is, the sufficiency of providing the population with objects of trade. As a result, the methodology for calculating indicators is changing, where food security in the country will be assessed not by the share of domestic production, but by the degree of satisfaction of domestic market needs at the expense of domestic production.

Table 1. The level of self-sufficiency in products in the Irkutsk region for the period 2005–2017, %

Type of product	2005	2010	2017
meat	58.7	58.6	64.1
milk	94.2	86.1	87.2
egg	175.7	167.1	162.5
potatoes	93.4	105.4	88.7
vegetables	74.3	75.8	58.4

Table 2. Food Security Criteria for the Doctrine

The value at which food security is achieved	Type of product
Greater than or equal to 80	sugar, vegetable oil, fish products
greater than or equal to 85	meat and meat products, food salt
greater than or equal to 90	milk and dairy products
greater than or equal to 95	grain, potatoes

For goods exceeding 100 percent, the export potential will be calculated. Updating the Doctrine is

associated with the emergence of new risks and threats to food security caused by economic sanctions,

Table 3. The level of food dependence of the Irkutsk region

	2005	2010	2017
meat and meat products			
Production, thousand tons	78.6	88.4	104.0
import, including import, thousand tons	58.3	66.9	73.6
share of import to production, %	74.2	75.7	70.8
milk and dairy products			
Production, thousand tons	489.2	451.1	458.0
import, including import, thousand tons	37.5	82.2	97.5
share of import to production, %	7.7	18.2	21.3
eggs and egg products			
Production, thousand tons	817.6	905.3	1009.7
import, including import, thousand tons	38.0	41.0	72.1
share of import to production, %	4.6	4.5	7.1
corn			
Production, thousand tons	645.0	554.3	871.6
import, including import, thousand tons	59.0	47.5	36.0
share of import to production, %	9.1	8.6	4.1
potatoes			
Production, thousand tons	594.8	632.9	397.3
import, including import, thousand tons	0.3	0.4	7.1
share of import to production, %	0.05	0.06	1.79
vegetables			
Production, thousand tons	130.7	153.3	107.3
import, including import, thousand tons	42.8	45.8	75.9
share of import to production, %	32.7	29.9	70.7

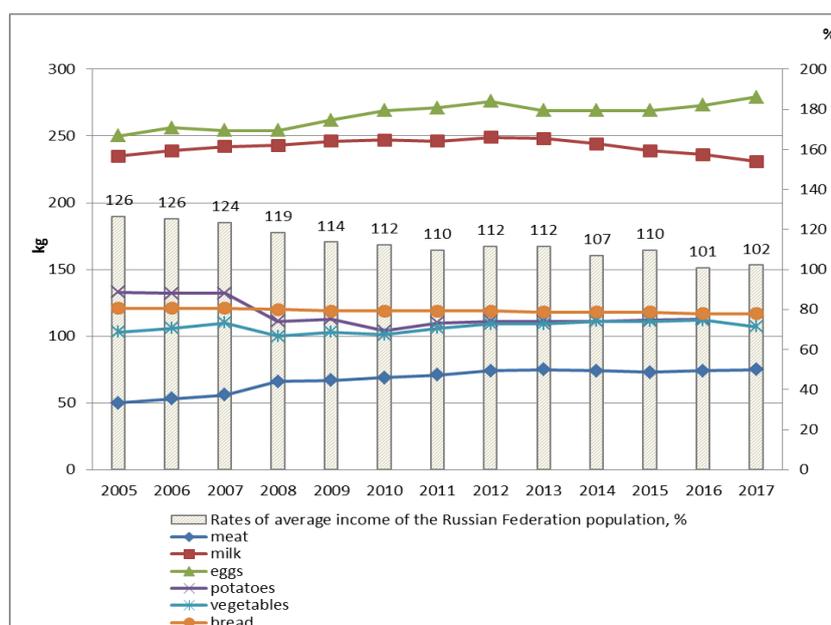


Fig. 1. Dynamics of incomes per capita and food consumption in the Russian Federation for 2005–2017.

Russia's entry into the WTO and the deepening of integration processes within the EAEU. The main volumes of import substitution will be required in the production of beef meat, milk, cheese, butter, vegetables, open and closed ground, food wheat [2].

Criteria of food independence were achieved in the Irkutsk region for grain, potatoes, and eggs, except milk, meat and vegetables. Indicators of import dependence improved due to an increase in production of meat, egg and grain. During the analyzed period, imports,

including imports to the region, increase, except for grain.

Incomes per capita are growing in dynamics, as they are presented at current prices and it is difficult to assess the impact on the possibility of improving the nutrition of the population.

Each year, each resident of the Russian Federation consumed an average of 67 kilograms of meat and meat products, 242 kg of milk and milk products, 265 eggs, 115 kg of potatoes, 107 kg of vegetables, 119 kg of bread products (flour, cereals, legumes, pasta), 39 kg of sugar and 13.3 kg of vegetable oil. In 2017, the country's inhabitants consumed 75 kilograms of meat and meat products (11 % higher than average), 231 kg of milk and milk products (5 % lower than average), 279 eggs (5 % higher than average), and 96 kg of potato (16 % lower than average), 107 kg of vegetables (no change), 117 kg of bread products (no change), 39 kg of sugar (5 % higher than average) and 13.9 kg of vegetable oil (2 % lower than average). It should be noted that the structure of consumption is improving, the growth of vegetable

crops in 2017 compared to 2005 by 4 % and a decrease in potatoes by 28 %, bread – 3 %.

Based on the regression model between the average income per capita of the country's population (x_1) and milk consumption per capita (y_x), the following dependence was manifested – with an increase in the average per capita income of the population by 1 ruble, milk consumption increases by 0.07 kg. The relationship between the studied factors is direct and close, which is confirmed by the significance of the correlation coefficients (multiple correlation coefficient 0.83, determination coefficient 0.69, the regression equation has the form: $y = 226 + 0.07x$).

The standard error of the regression equation is: $\sigma_y = 2.9$, the evaluation of the quality of the parameters of the regression equation by the Fisher criterion showed that the regression equation is significant, since $F_\varphi = 54$ significantly exceeds the table value $F_T = 1.96$. Assessment of the significance of the coefficients using Student's t-test $t_{\text{calc}} = 78 > t_{\text{table}} = 2.1$ at a significance level of $\alpha = 95\%$ shows that the coefficients of the equation are significant.

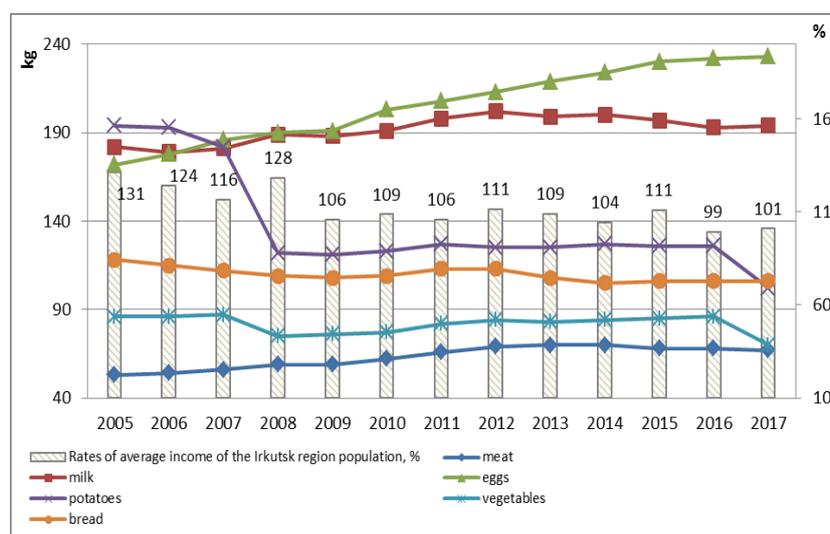


Fig. 2. Dynamics of incomes per capita and food consumption in the Irkutsk region for 2005–2017.

Each year, every resident of the Irkutsk region consumed an average of 63 kg of meat and meat products, 192 kg of milk and dairy products, 206 eggs, 138 kg of potatoes, 82 kg of vegetables, 110 kg of bread products (flour, cereals, legumes, pasta), 32 kg of sugar and 12.4 kg of vegetable oil. In 2017, the population in the region consumed 67 kilograms of meat and meat products (6 % higher than the average), 194 kg of milk and milk products (1 % higher than the average), 233 eggs (13 % higher than the average), 102 kg of potatoes (26 % lower than the average), 70 kg of vegetables (14 % lower than average), 106 kg of bread products (4 % lower than average), 31 kg of sugar (4 % lower than average) and 12.7 kg of vegetable oil (3 % higher than average).

For products such as milk, egg, meat, there is a tendency to increase consumption by the population of the Irkutsk region. All food products, except for

potatoes, residents of the Irkutsk region consume significantly less, compared with residents of the Russian Federation. So, meat is consumed less by an average of 6 % over the period, and by 11 % in 2017; there is less milk on average for the period by 21 %, and for 2017 – by 16 %; eggs are less on average over the period by 22 %, and in 2017 – by 16 %; less vegetables on average for the period by 24 %, and in 2017 – by 35 %; sugar is lower on average for the period by 18 %, and in 2017 – by 21 %; vegetable oil is less on average for the period by 7 %, and in 2017 – by 9 %; There is less bread on average over the period by 8 %, and in 2017 – by 9 %, only potatoes consume more on average by 20 %, and in 2017 – by 6 %.

Secured consumption of agricultural products is carried out through own production and import from other constituent entities of the Russian Federation and import into the region of about 36 % of meat, 13 % of milk, 42 % of vegetables, and potatoes 11 % in 2017 [3].

Table 4. Comparison of food consumption in the Irkutsk region with the Russian Federation

Type of product	Consumption in the Irkutsk region with the Russian Federation (average values 2005–2017)	Consumption in the Irkutsk region with the Russian Federation in 2017
Meat	0.94	0.89
Milk	0.79	0.84
Eggs	0.78	0.84
Potatoes	1.2	1.06
Vegetables	0.76	0.65
Sugar	0.82	0.79
oil rust.	0.93	0.91
bread	0.92	0.91

At the World Food Summit in Rome, the definition of food security was introduced, which understood the situation that the government of each country should strive for, when each of its inhabitants has physical and economic access to safe food enough for an active and fulfilling life. It was implied that not in all cases this access should be provided at the expense of national production. Governments must ensure the security of supply, and the population should be able to buy it in volumes enough for a full and healthy lifestyle.

The FAO methodology considers:

- availability of products to meet food needs; within the framework of this, the possibilities of own production, losses, stocks, imports, etc. are considered;
- economic and physical accessibility to food of the proper volume and quality, of all social groups (the ability to buy food in the right amount and reach the place where it is sold);
- stability of food supply, including analysis of changes in prices and production volumes; social conflicts should also be monitored, in which there is always a decline in food security in order to respond in a timely manner to what is happening;
- food consumption from the standpoint of nutrition in calories, protein, trace elements, etc.; it also considers the spread of obesity as a result of an unbalanced diet, the spread of anemia, stunted growth, etc.

Monitoring of food security in the world in 2017 confirmed the persistence of many problems, some of which are not critical for our country, but in 2014–2017. against the backdrop of a slowdown in economic development, food access for the poor has narrowed [4].

The Economist Intelligence Unit (EIU) has calculated the Global Food Security Index (GFSI) since 2012 for 113 countries. When calculating the Global Index, 28 main and 8 additional indicators are used, which are divided into three groups:

- availability and consumption of food;
- availability and sufficiency of food;
- food safety and quality and dietary diversification.

Food Security Index of Russia in 2013–2016 decreased relative to 2012, but in 2017 growth was recorded almost to the level of 2012. Among 113

countries, Russia fell from 39th to 48th place in this index (by 2015–2016), then rose to 41. Improving the global the index was due to the index “availability and sufficiency of consumption” – moving up 19 positions among 113 countries, the index of “accessibility and level of consumption” – by 4 positions, the index of food quality and safety – by one position.

However, the level of 2013 was not achieved. Obviously, given the growth in agricultural production and the lack of food shortages in stores, Russia's transition to a lower position compared to 2013 is due to other factors [5]. As can be seen from the analysis of individual indicators that form these three parts of the Global Index, the decrease was due to insufficient funding for research, a reduction in product diversity, as well as political risks and corruption in 2013–2016 [6].

The Doctrine of Food Security (2010) presents a system of indicators for monitoring food security in the Russian Federation. The system was approved by Order of the Government of the Russian Federation and includes four groups of targets:

- rational food consumption standards (per person per year), approved by the Ministry of Health;
- physiological requirements for energy and nutrients (per person per day) approved by the Federal Service for Supervision of Consumer Rights Protection (energy, protein, fats, carbohydrates, minerals, vitamins);
- threshold values of food independence for individual products (the share of domestic products in commodity resources), approved in the Doctrine of Food Security;
- standards for the provision of commodity space for the population of the constituent entities of the Federation (in meters per 1000 people), approved by the Ministry of Industry.

The Order proposes to use for monitoring a total of about six hundred indicators at the federal level and at the level of each subject of the Federation. Analysis and formulation of conclusions on the state of food security based on such many indicators is very difficult, therefore, official publications / statements on food security are based on a limited number of indicators: production, import-export, consumption [7]. In a rare number of cases, an indicator characterizing the share of household spending on food is provided.

Table 5. Consumption of basic food products in the Irkutsk region for 2005–2017 and dietary compliance with recommended standards (kg per person per year)

Type of product	2005	2010	2017	Rational norms
meat	53	62	67	73
milk	182	191	194	325
eggs	172	203	233	260
potatoes	194	123	102	90
vegetables	86	77	70	140
sugar	28	32	31	24
oil rust.	11.6	11.7	12.7	12
bread	118	109	106	96

In the Irkutsk region, for such foods as meat, milk, eggs, vegetables, consumption does not meet the rational standards recommended by the Ministry of Health [8] for a healthy diet for the population. So, in 2017, meat consumption is 67 kg, which is 6 kg lower than the norm (-8 %); milk 194 kg, which is below the norm by 131 kg (-40 %); eggs 233 units, which is lower by 27 units (-10 %); vegetables 70 kg, which is below the norm by 70 kg (-50 %). Potato consumption is above the norm by 12 kg (+13 %) and amounts to 102 kg; sugar is above the norm by 7 kg (+29 %) and amounts to 31 kg per year; vegetable oil is above the norm by 0.7 kg (+6 %) and is 12.7 kg; bread above the norm recommended for a healthy diet of 10 kg (+10 %) and is 106 kg per year. In general, the dynamics are improving, for the analyzed period 2005-2017. consumption increases for meat by 26 %, milk - 7 %, egg - 35 %, sugar - 11 %, vegetable oil - 9 %, and decreases for potatoes by 47 %, vegetables by 19 %, bread by 10 %.

For vegetable oil, the recommended consumption rate is exceeded, but at the same time, the actual level of vegetable oil consumption in Russia is much lower than in developed countries. For example, its consumption in Russia is about 14 kg per year compared to 17 kg in Germany, 18 kg in the UK, 21 kg in France, 28 kg in Italy and 31 kg in the USA. In 2017, 5.7 million tons of vegetable oil were produced in Russia, a little more than 1 million tons were imported (of which 0.9 million tons are palm), 1.8 million tons were exported.

Table 6. International comparisons of basic food consumption (kg per person per year)*

Type of product	Russia	Germany	United Kingdom	France	USA	Japan
meat	73	88	82	89	118	49
milk	239	436	241	250	276	89
eggs	269	233	191	227	263	305
potatoes	112	78	101	55	56	21
vegetables	111	93	94	104	113	92
sugar	39	33	40	38	59	19
oil rust.	13.6	15	18	21	31	13
bread	118	103	n / a	n / a	n / a	89

Table 7. Nutritional value of the existing diet, g per day per family member in the Russian Federation for 2005–2017

Indicator	Protein	Fats	Carbohydrates	Energy value, kcal per day
2005	71	96	368	2630
2010	77	105	348	2652
2017	80	108	338	2655
Rational norms	82	95	417	2850
2017 in 2005, %	113	113	92	101
2017 to rational standards, %	98	114	81	93

Most of all meat, vegetables, sugar, vegetable oil is consumed in the USA, milk in Germany, eggs – Japan, potatoes and bread – Russia.

Despite the fact that consumption is approaching the recommended norms, the nutritional value of the existing diet can hardly be called satisfactory, the recommended norm has not been reached for proteins by 2 %, for carbohydrates by 19 %, and in general, by the energy value of calories per day by 7 %, and Exceeded the rate of fat intake by 14 %.

Table 8. International comparisons of the nutritional value of the prevailing per capita diet for 2013 according to the Food and Agriculture Organization

Country	Protein	Fats	Energy value, kcal per day
Russia	103	106	3361
Germany	102	142	3499
United Kingdom	103	138	3424
France	111	159	3482
USA	110	162	3682
Japan	88	87	2726

According to the Food and Agriculture Organization, the energy value of the diet in Russia is lower than all countries except Japan, compared with the USA by 8.7 %, Germany – 3.9 %, France – 3.4 %, Great Britain – 1.8 %.

Note, despite the improvement in nutrition, it remains low-calorie relative to the recommended norm. The mismatch between the excessive content of fat in food, potatoes, sugar and bread in the diet and the lack of calorie intake affects the health of the population of the Irkutsk region.

To fulfill the standards established by the Food Security Doctrine of the Russian Federation, taking into account the population stabilization plan, it is necessary to produce 1200 thousand tons of grain, 620 thousand tons of potatoes, 212 thousand tons of vegetables, 637 thousand tons of milk, 234 thousand tons of meat (calculations were made based on actual consumption). To achieve these indicators, a significant expansion of sown areas, an increase in the number of livestock, including cows, the construction of new complexes in animal husbandry and greenhouses, and the improvement of breeding and breeding work to increase the productivity of animals and arable land will be required [9, 10].

5 Conclusion

To reduce the dependence of the Irkutsk region on imports and ensure food security as one of the main priorities of socio-economic policy, the following tasks will be required:

- achieving the level of production of the main types of high-quality food products enough to provide the population of the Irkutsk region;
- improving the efficiency and competitiveness of agricultural commodity producers through technical and

technological modernization of agricultural production with modern agricultural machinery, equipment and advanced technologies in crop production and animal husbandry;

- Creation of favorable socio-economic conditions for the development of rural areas.

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