

Trends in the Production, Consumption, Import of Vegetables and Potatoes in the Russian Federation



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Abstract: *Vegetables and potatoes are the most valuable food and sources of vitamins, coarse fibers, biologically active substances and amino acids for a human being. The consumption of vegetables has a beneficial effect on the human health. The growing population in the world causes the increase in the production of vegetable crops and potatoes.*

Over the recent decade the world production of vegetables and potatoes has been constantly increasing. The production grows mainly due to the leading countries: China, India, the USA, and Turkey. The Russian Federation is the eighth in the world by the production, and is one of the main importers of these products in the world. In the present article, the production and consumption of potatoes and vegetables in the Russian Federation have been analyzed. The statistical data on federal districts have been analyzed for the following indicators: volumes of production and consumption, and import by federal districts. Besides, the cultivated areas, the yield and production by categories of farms of the Russian Federation have been considered. The factors that have impact on the development of the vegetables and potatoes production have been determined. The areas for solving the problems associated with the market of vegetables and potatoes in the regions have been suggested. The indicators of vegetables and potatoes production and consumption (for food purposes) in the Russian Federation have been calculated.

Keywords: *production and consumption of vegetables, potatoes, import, yield, intraregional import, production and consumption indicators.*

I. INTRODUCTION

About 35 types of vegetable crops are industrially grown in the world, including approximately 15 types of vegetables

cultivated in the Russian Federation: cucumber, tomato, cabbage, onion, garlic, beets, carrots, radishes, green crops, etc. The Russian Federation is the eighth in the world by the production of vegetables and gourds. The global production of vegetables and gourds grows annually. In 2016 the volume of production was 1,223 mln t. From 2012 to 2016 it had increased by 111 mln t, or by 10 %. According to the vegetables and gourds production, Russia is the eighth following Vietnam (16.0 mln t) and Mexico (16.1 mln t) [1].

China (638 mln t) and India (121 mln t) are the leaders in the production of vegetables and gourds. China produces more than 51 % of the world production, and actively exports them worldwide. Over the past decade, these countries have considerably increased the areas used for vegetable crops. They are followed by the United States (35.7 mln t), Turkey (30.2 mln t), the Islamic Republic of Iran (19.7 mln t), and Egypt (19.5 mln t).

For the period of 2012 – 2016 the Russian Federation had increased the production of vegetables and gourds from 14.3 up to 15.1 mln t, or by 6 %. This amount is not enough to meet the needs of the population. This is the reason why Russia is the largest importer of these crops in the world.

II. METHODS

The purpose of the study is to develop and scientifically ground practical recommendations on developing the market of vegetables and potatoes in the Russian Federation.

The object of the study is the system of economic, organizational and managerial relations between producers of vegetables and potatoes both in the Russian Federation and abroad.

The subject of the study is the trends, terms and conditions, and factors that have impact on the development of the vegetables and potatoes market in the Russian Federation.

The object of the observation is agricultural organizations, peasant farms and private farm holdings.

The theoretical basis of the study included scientists' works on the issue under study and legislative acts of the Russian Federation. During the study, the data from the Federal State Statistics Service of the Russian Federation, planning documents and reports of agricultural organizations, special, reference and other literature were used.

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The theoretical importance of the work is to identify the factors that have impact on the development of vegetables and potatoes production, to analyze the production and consumption trends, and import of vegetables and potatoes by federal districts. The dissertation study has practical importance because the obtained results were used as a basis for the development of indicators related to the production and consumption (for food purposes) of vegetables and potatoes in the Russian Federation. The paper substantiates the main activities to achieve the calculated indicators.

The following methods were used in the work: monographic, analytical, abstract-logical, calculation and constructive, economic and mathematical.

III. RESULTS

A. Analysis of Production and Consumption of Vegetables and Potatoes in the Russian Federation

According to the Ministry of Health of the Russian Federation, an average Russian should consume 459 kg of food of vegetable origin per year [2]. This includes at least 50 % of vegetables and potatoes: 140 kg of vegetables and 90 kg of potatoes per year. The annual diet of an average Russian citizen should contain 40 kg of cabbage, 10 kg of onions, tomatoes, cucumbers, 17 kg of carrots, 18 kg of beets, as well as 15 kg of gourds. Table 1 shows the consumption of potatoes, vegetables and gourds for the period from 2005 to 2017 [3].

Table 1: Consumption of Potatoes and Vegetables in the Russian Federation per Citizen, kg

Region	Vegetables and gourds			Potatoes		
	2005	2010	2017	2005	2010	2017
Russian Federation	90	101	107	110	104	96
Central Federal District	84	92	96	105	95	92
North-Western Federal District	76	86	93	81	80	78
Southern Federal District	116	138	147	94	96	93
North Caucasus Federal District	131	148	170	98	101	98
Volga Federal District	86	94	103	125	107	101
Ural Federal District	79	88	89	108	105	95
Siberian Federal District	85	97	95	129	134	112
Far Eastern Federal District	101	106	103	118	102	96

In the Russian Federation potatoes are as important as bread. High rates of the population’s consumption of this product are associated with the culture of consumption, the use of root crops for feeding livestock, and low income of the

population in some districts of the country. In 2017 the potato consumption by the population decreased from 110 kg down to 96 kg as a whole in the Russian Federation, and this indicator varied depending on a district. The lower the standard of living of the district population is, the more potatoes are consumed. Thus, in the Siberian Federal District, where the standard of living is quite low, the consumption of potatoes per capita is the highest.

The Food Security Doctrine of the Russian Federation established threshold values for the own production of the most important food products. Thus, for potatoes they were defined as 95 %, and for vegetables and gourds – 80 %. This indicator is complied with only in three out of eight districts of the country (Table 2).

Table 2: Volumes of Production and Consumption of Vegetables and Gourds in the Russian Federation, thous. t

Region	Production		Consumption	
	2010	2017	2010	2017
Russian Federation	13,278.0	15,430.4	14,426.3	15,759.8
Central Federal District	2,260.6	2,420.4	3,532.7	3,764.4
North-Western Federal District	553.9	459.7	1,173.5	1,292.1
Southern Federal District	3,136.2	4,479.1	1,909.0	2,411.9
North Caucasus Federal District	1,935.5	2,703.2	1,405.6	1,666.9
Volga Federal District	2,649.6	3,409.9	2,808.2	3,048.7
Ural Federal District	753.4	602.8	1,061.5	1,101.1
Siberian Federal District	1,572.2	1,012.0	1,869.9	1,839.2
Far Eastern Federal District	416.3	343.3	665.9	635.5

Vegetables are consumed in the volumes recommended by the Ministry of Health in only two districts of the country: South and North Caucasus, where a lot of vegetables were traditionally used in the diet and the cost of growing them was low [4]. For a number of objective and subjective factors, the population of other federal districts consumes vegetables below the recommended standards by 26 % (Volga and Far East) and 29 % (Ural). It is possible to note a positive trend as a whole in the country related to the increase in the consumption of vegetables by the population. While in 2005 an average Russian had consumed 64 % of vegetables from the standard, in 2017 this number was already 76 %.

In Russia, the production of vegetables and gourds for 2010 – 2017 had increased by 2,152.4 thous. t, or by 16 %. However, these volumes are still not enough to meet the needs of the population in these food products. In 2010, the difference between production and consumption in the Russian Federation was 9 %. In 2017 it decreased down to 2 %. This dependence is different in each district. Thus, in the South and North Caucasus districts, the production is considerably higher than the consumption by 86 % and 62 %, respectively. The Volga Federal District fully provides itself, while the rest districts import the deficient products from other regions or other countries [5].



B. Trends in Import of Vegetables and Gourds in the Constituent Entities of the Russian Federation

About 3 – 3.5 mln t of vegetables and potatoes are imported to Russia annually. In 2010, 3,157.7 thous. t of vegetables and gourds were imported to the Russian Federation. In 2017, the import decreased down to 2,669.9 thous. t. The import of vegetables and potatoes annually costs Russia RUB 100 – 120 bln. The list of imported vegetable crops includes not only tomatoes, cucumbers, peppers, but also ordinary carrots and onions. According to the Federal State Statistics Service, in January – July 2017, 500.6 thous. t of potatoes, 384.7 thous. t of tomatoes, 284.8 thous. t of onions, 146.0 thous. t of carrots, 112.3 thous. t of cabbage, 90.9 thous. t of pepper, 66.3 thous. t of cucumbers, 32.9 thous. t of garlic, etc. were imported to Russia [6, 7]. The import volumes increased by 20 – 30 % as compared to the previous year, and two times for some crops. At the same time, according to the Federal State Statistics Service, the vegetable production is only 2 % lower than its consumption, and import is 20 %. This indicates that the intraregional supply of national products some of which disappear without reaching the consumer was not established [8, 9]. The amount of missed opportunities for the national agriculture is estimated in billions of rubles. Over the recent five years, the situation has begun to change. There are positive dynamics related to the growth of the intrastate transportation of vegetables of own production among various regions (Table 3). This indicates the revival of interregional relations between traditional supply regions (South, North Caucasus, and Volga federal districts) and consumers of vegetables and potatoes (Central, North-Western, Siberian, and Far Eastern federal districts).

Table 3: Import of Vegetables and Gourds in the Constituent Entities of the Russian Federation, thous. t

Districts of the Russian Federation	2010	2017
Central Federal District	2,134.0	2,988.6
North-Western federal District	1,202.6	1,271.5
Southern Federal District	773.3	896.1
North Caucasus Federal District	387.6	448.3
Volga Federal District	765.4	804.2
Ural Federal District	379.0	625.1
Siberian Federal District	632.0	1073.7
Far Eastern Federal District	354.4	401.5

The main consumer of vegetables is the Central District, the North-West District is in the second place, and the Siberian Federal District is in the third place. Demographic and climatic factors, the position and the role of large retail chains found in the region have impact on the import.

The ability of producers to carry out expanded production by using the latest technologies, including hydroponics and vertical placement of crops, the use of new early-maturing varieties and hybrids, and integrated plant protection products have direct impact on the development of production of vegetables and gourds [10, 11]. Intersectoral relations and the authorities’ support for the development of the regional vegetable market, where vegetable products can be offered not only by large agricultural organizations but also by

farmers, are as important when developing the regional vegetable production [12]. The buyers include not only the local population and resellers, but also processing organizations, large trading chains, and government structures [13].

The lag in the production volumes from the consumption demand is associated with the peculiarities of vegetable production in the Russian Federation, namely, the fact that most of the cultivated vegetables and potatoes are grown in private farms without the actual cooperation. This limits the growth of the supply market and makes it possible to actively develop import [14, 15].

C. Vegetable Production by Farms Categories in the Russian Federation

In the Russian Federation, out of 526 thous. ha of the cultivated area used for growing vegetables, only 17 % are used by agricultural organizations, the remaining 83 % are used by peasant farms and private households. The situation is similar for potatoes (Table 4).

Table 4: Cultivated Areas of Vegetable Crops in Farms of All Categories of the Russian Federation, thous. ha

Farm category	2013	2014	2015	2016	2017	2018
In total	571	563	563	551	535	526
Including agricultural organizations	82	86	93	94	95	92
Peasant farms and private farm holdings	489	477	470	457	440	434

For 2013 – 2018 the cultivated area under vegetable crops had decreased in the country by 45 thous. ha from 571 down to 526 thous. ha. At the same time, there was a slight increase in agricultural organizations by 12 %, and in private households and peasant farms, the areas under vegetable crops had decreased by 55 thous. ha, or by 13 %.

The production considerably increases in private farm holdings: potatoes – 69 %, and vegetables – 55.4 %. This factor does not allow the efficient use of land resources and has the impact on the yield of crops.

In 2017 in the developed countries the potato yield was 490 dt/ha (USA), 404 dt/ha (Australia), 444 dt/ha (Germany), 420 dt/ha (the Netherlands), while in Russia it was 163 dt/ha. Even the Russian neighbors’ yield was higher by 20 – 25 % (Belarus – 205 dt/ha, Kazakhstan – 190 dt/ha). There was a similar situation for vegetables [16].

The low yield of vegetables and potatoes in the Russian Federation is explained by the fact that most of them are produced in private farm holdings, which are characterized by inefficient manual labor, the use of outdated technologies, and inefficient plant protection measures [2, 17]. Table 5 shows the yield of vegetable crops by category of farms in the Russian Federation for the period from 2013 to 2018.

Table 5: Yield of Vegetable Crops in Farms of All Categories of the Russian Federation, dt/ha.

Farm category	2013	2014	2015	2016	2017	2018
Average in the Russian Federation	214	219	226	229	241	243
Agricultural organizations	234	231	254	262	286	290
Peasant farms and private farm holdings	201	208	210	213	214	219

According to the Federal State Statistics Service for the period under consideration, the yield in agricultural organizations had increased by 56 dt/ha, and in private farm holdings – only by 18 dt/ha. Yields in agricultural organizations are on average by 30 % higher than in peasant farms and private farm holdings. In total, from 2013 to 2018, the average yield growth in the country had amounted to 29 dt/ha, or 14 %.

D. Vegetables Production by Districts of the Russian Federation

In the regions where special attention is paid to the development of vegetable growing, there is an increased interest of investors in this area, namely the development of modern greenhouse complexes for growing vegetable crops in closed ground [18]. Over the recent ten years, new greenhouse complexes have been built in several regions of the country, which has increased the production of closed ground vegetables in the Volga (up to 225 thous. t), Central (153 thous. t), South (130 thous. t), and North Caucasus federal districts (100 thous. t), etc.

In many regions, modern greenhouse complexes are constructed. For example, in the Novosibirsk Region, by 2017, 24.6 ha of modern greenhouses had been constructed. It is planned to build another stage of the *Tolmachevsky* greenhouse complex on 17.2 ha, with the production volume of 14 thous. t of vegetables, and the *Obskaya* greenhouse complex on 8.1 ha. The total amount of raised investments will amount to RUB 6.2 bln.

The yield in greenhouse complexes is considerably higher than the average one in the region. For example, in the Volga Federal District, due to greenhouse complexes, the average yield in the district increased from 197 dt/ha in 2005 up to 253 dt/ha in 2017, or by 28 % (Table 6).

For the period under consideration from 2005 to 2017, the yield of vegetable crops in the Russian Federation had increased from 170 dt/ha to 242 dt/ha, or by 42 %. The best yield indicators were noted in the Southern, North Caucasian, Volga, and Ural federal districts. The lowest yield was recorded in the Far Eastern Federal District – 174 dt/ha. For the period from 2005 to 2017 the growth had been 23 %. Over the period under consideration, the yield most of all had increased in the South and North Caucasus districts, where modern greenhouse complexes had been actively constructed. The increase was 212 % in the South and 181 % in the North Caucasus districts.

Table 6: Yield of Potatoes and Vegetables in Districts of the Russian Federation, dt/ha

Region	Vegetables and gourds			Potatoes		
	2005	2010	2017	2005	2010	2017
Russian Federation	170	179	241	124	100	163
Central Federal District	160	151	197	120	84	182
North-Western Federal District	231	248	246	117	126	127
Southern Federal District	121	167	256	95	97	166
North Caucasus Federal District	149	189	269	120	128	170
Volga Federal District	197	177	253	124	65	158
Ural Federal District	207	219	255	155	121	157
Siberian Federal District	225	229	241	129	148	150
Far Eastern Federal District	142	158	174	123	136	138

During this period the potato yield had increased from 124 dt/ha up to 163 dt/ha, or by 31 %. As for districts, the highest yields were recorded in 2017 in the Central and North Caucasian and Southern federal districts – 182, 170, and 166 dt/ha, respectively, and the lowest one was recorded in the North-West Federal District – 127 dt/ha, or 9 %. For 2005 – 2017 the potato yield had increased in the Southern Federal District, by 175 %. In the Central Federal District, the increase was by 52 %, and in the North Caucasus – by 42 %.

IV. DISCUSSION

Food safety is an important factor in the implementation of various projects in the vegetable and potato industries. Only a large producer can guarantee the food security of the country, while many small producers are often unpredictable and more susceptible to various risks. Therefore, large agricultural organizations must be of high priority when developing vegetable and potato production [19, 20].

The authors have calculated the indicators on the production and consumption of potatoes and vegetables for the term up to 2030 (Table 7).

Table 7: Production and Consumption of Potatoes and Vegetables as Food in the Russian Federation in Farms of All Categories for the Term Until 2030

Products	Rational annual standards of consuming food of vegetable origin per one person, kg	2025		2030	
		The required volume of products according to medical standards for the entire population, mln t	Production, thous. t	The required volume of products according to medical standards for the entire population, mln t	Production, thous. t
Potatoes	90	13.20	18.1	13.19	16.9
Vegetables	140	20.53	16.67	20.52	17.49

The consumption was calculated only for food purposes. The needs of related industries using these products as raw materials but not for food production were not taken into account. The data obtained show that in 2030 the deficit of vegetables will still remain at the level of 3.03 mln t, i.e., it will be necessary to supply 3.6 – 4.2 mln t of vegetables to the Russian Federation per year. The bulk yield of potatoes will be decreased due to its reduced consumption and use as a main feed for livestock. Potatoes will be imported to the country on a seasonal basis during the periods when these national products are still not available in markets.

In order to achieve the calculated indicators for the production of vegetables and potatoes, it is necessary:

1. To modernize the vegetable subcomplex, using modern techniques and technologies, up to robotics.
2. To reconstruct the existing and build new irrigation systems for the production of open ground vegetables and potatoes.
3. To attract investors to the construction of modern greenhouse complexes for the production of vegetables and other crops.
4. To develop own seed production, use zoned varieties and hybrids, and an integrated plant protection system.
5. To establish interregional logistic relations for the internal import and export of national vegetable products.
6. To open workshops for processing vegetables and potatoes at large logistics centers for agricultural products.
7. To expand and improve the storage base for vegetables and potatoes, use new technologies, new types of containers and packaging.
8. To use public and private partnerships for the development of potato and vegetable production in the country.
9. To create cooperatives, vegetable trading warehouses and markets for purchasing surplus products from private farm holdings.
10. To oblige large retail chains to accept for sale the products of local vegetable producers.

V. CONCLUSION

1. In the Russian Federation, as well as around the world, there is a noticeable trend related to the increase in the production of vegetable crops and a slight reduction in that of potatoes. However, the production lags behind the growing needs of the population in these products. This is the reason why Russia remains the main importer of these products in the

world.

2. The insufficient production is associated not only with the climate, technological and economic conditions, but also with the peculiarities of vegetable and potato growing in the Russian Federation. Vegetable crops are grown by agricultural organizations (only 17 %), and peasant farms and households (the remaining 83 %). There is a similar situation for potatoes.

3. In Russia, at the federal and regional levels, projects and plans for the development and state support of the vegetable and potato industries have been adopted. The investors' interest in these sectors is noticeable. It is demonstrated in the construction of new modern greenhouse complexes throughout the country. This process and the measures suggested by the authors will make it possible to achieve the calculated indicators for the vegetables and potatoes production in the future until 2030. The bulk yield of potatoes should be 16.9 mln t, and vegetables – 17.49 mln t.

4. The obtained data show that by 2030 the deficit of vegetables will be 3.03 mln t, i.e., it will be necessary to import 3.6 – 4.2 mln t of vegetable products per year to the Russian Federation. The bulk yield of potatoes will be reduced due to the decrease in its consumption and its use as a main feed for livestock. Potatoes will be imported to the country on a season basis during the periods when this national product is still not available in the market.

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