International Journal of Engineering & Technology, 7 (4.38) (2018) 523-527

SPC

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Food Safety in the Sphere of Production and Consumption of Vegetable Products

Vladimir Alekseevich Solopov[1]*, Ivan Alekseevich Minakov[1]

[1]*Michurinsk State Agrarian University, Internatsionalnaya Str., 101, Michurinsk, 393760, Russian Federation*
**Corresponding author E-mail: solopov.v.a@mail.ru*

Abstract

The aim of the study is to develop theoretical provisions and practical recommendations for solving the problem of food security in the production and consumption of vegetable products. During the research, the following methods were used: statistical-economic, monographic, economic-mathematical, computational-constructive. The article considers the problem of providing the Russian population with vegetable products, especially during the off-season. The actual consumption of vegetables is 112 kg per capita per year with a rational diet of 140 kg. In the food basket of Russians, imported vegetable products occupy a significant share. Analysis of the state and trends of development of vegetable growing in the open and sheltered ground is given. For 2000-2016, the gross harvest of vegetables increased from 10.8 to 16.3 mln. tons because of higher yields while decreasing the area of vegetable crops. In vegetable production structure, production of sheltered ground occupies 9.6%. The households of the population are the main producers of vegetables. They accounted for 66.5% of the gross harvest of vegetables. The volume of vegetable production and the main directions of its increase are justified. To ensure food security, it is necessary to increase the production of vegetables and food melon crops from 18.1 to 22.5 mln. tons, including vegetables from 16.3 to 20.3 mln. tons, food melon crops – 1.8 to 2.2 mln. tons. The increase in production of vegetable products will be facilitated by improvement of state support for vegetable growing and its increase in size, its concentration in specialized farms, intensification of the industry, the revival of Russian seed production of vegetable crops, construction of modern energy-saving greenhouses and modernization of the old ones, development of agro-industrial integration.

Keywords: *Russia, vegetable growing, food security, level of self-reliance, state support, specialization, intensification, agro-industrial integration.*

1. Introduction

In conditions of international sanctions and reciprocal embargo on the import of agricultural products and food from the EU countries and the USA, the problem of providing Russia's population with vegetable products is particularly acute. The achieved level of vegetable production does not fully meet the population's needs for these products. In 2016, the actual consumption of vegetables was 112 kg per capita per year with a rational diet of 140 kg. At the same time, the share of imported vegetables in the food basket of Russians is 14.2%.

Insecurity of the Russian market with domestic vegetable products makes it possible to freely fill it with imported products. The import of vegetable products tended to increase until the introduction of international sanctions, after them its decline became evident. Import of vegetable products for 2000-2014 increased from 2.3 to 2.9 mln. tons, in 2016 it decreased to 2.3 mln. tons.

The main countries of vegetable supply are China (25%), Turkey (14%), Israel (10.5%), Morocco (8.6%), Belarus (8.3%), Egypt (7.8%). In the structure of vegetable imports, tomatoes (35%), onion (10%), cucumbers (8.8%), carrot, beet, turnip, radish (6.1%), cabbage (3.7%) prevail.

The solution to food problem on the basis of import substitution provides for the further development of Russian vegetable production and increase in investment attractiveness of the industry. In this regard, studies on ensuring food security in production and consumption of vegetable products are of particular urgency.

2. Methods

The statistical-economic method was used in the study of the state and trends in the development of vegetable growing, providing the population of Russia and its regions with vegetables. The monographic method was used to study the activity of vegetable-growing enterprises distinguished by high economic results, the economic-mathematical method – in the optimization of vegetable production, the computational and constructive method – to justify the development of vegetable production in order to ensure food security.

3. Results and Discussion

Food security – the state of a country's economy, which ensures food independence, guarantees physical and economic accessibility for every citizen of the country of food products in volumes not less than the rational norms of consumption of food necessary for active and healthy lifestyle [1]. It is determined by the level of development of domestic production.

The implementation of the national project “Development of AIC” and the State Program for Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

and Food for 2013-2020 allowed stabilizing the production of vegetable products (Table 1).

For the period from 2000 to 2016 the gross harvest of vegetables increased from 10.8 to 16.3 mln. tons, or by 50.9% as the result of higher yields with a decrease in the area of vegetable crops. The yield of vegetable crops increased from 143 to 227 centners per ha, or by 58.7%.

The total area of vegetable crops for this period decreased from 744 to 692 thous. ha, or by 7.0%. In recent years, this trend has remained, but the rate of decline in the area of these crops has changed sharply.

Table 1: Development of vegetable growing in Russia (in farms of all categories)

	2000	2010	2013	2014	2015	2016
Area of vegetable crops, thous. ha	744	662	671	684	694	692
Gross harvest of vegetables, mln. tons	10.8	12.1	14.7	15.5	16.1	16.3
Productivity of vegetable crops, centners per 1 ha	143	180	214	218	225	227

The production of vegetables in agricultural enterprises for the indicated period increased from 2.4 to 3.1 mln. tons, or by 29.2% as a result of an increase in yield from 135 to 262 centners per ha, or by 94.0%, with a decrease in the sown area from 179 to 93.6 thous. ha, or by 47.7%. The increase in vegetable production in this category of farms was also influenced by such factors as modernization of old and construction of new modern greenhouses.

As a result of agrarian transformations, the structure of vegetable production by categories of farms has changed. If in the pre-reform period the main producers of vegetables were agricultural enterprises, then at present time – the households of the population. In 2016, they accounted for 66.5% of the gross harvest of vegetables.

In the households of the population for 2000-2016, production of vegetables increased from 8,100 to 10,827,000 tons, or by 33.7% as the result of an increase in the yield of vegetable crops from 152 to 214 centners per ha.

High rates of development of vegetable production in the households of the population can be explained by the fact that many families, in the face of a sharp rise in food prices, are trying to solve the food problem through their own production of vegetable products. In connection with this, the personal and collective vegetable growing received further development.

In 2016, farms raised 2379 thous. tons of vegetables or 14.6% of their gross harvest. The volume of production of vegetable products in this category of farms is growing with every year.

Despite the fact that the main producer of vegetable products are the households of the population, agricultural organizations supply the bulk of vegetables to the agro-food market. In 2016, agricultural organizations sold 2.443 mln.tons of vegetables or 36.7% of products sold by farms of all categories. The households put 2410 thous. tons of products on the market, or 36.2% of the total number of vegetables sold. However, it should be noted that farms play a significant role in providing the population with vegetable products. They account for 27.1% of sales.

The current situation with the provision of Russia's population with domestic vegetable products is determined by the level of marketability of production. In agricultural organizations and farms, there is the high-margin production. In agricultural organizations, the level of marketability of vegetable production was 79.4%; in farms, respectively – 75.9%. The low level of marketability of vegetable production is observed in the households of the population, where it was 23.3%. In the households, vegetable products are mainly grown for own consumption and only the surplus of their products is supplied to the food market.

Vegetable growing has spread in all federal districts of Russia (Table 2). The bulk of vegetables is grown outdoors. It accounts for 90.4% of the gross harvest of vegetables. The predominant part of the sown area and the volume of production of open ground vegetables is concentrated in the zones where the most favorable climatic and economic conditions are most favorable for it. In four federal districts 80.4% of vegetables are grown: Southern – 24.5%, Privolzhsky – 20.3%, Central – 19.9%, North Caucasus – 15.7%.

The major producers of open ground vegetables in Russia are the Republic of Dagestan – 1400 thous. tons, or 9.5%, the Astrakhan region – 894 thous. tons, or 6.1%, the Volgograd region – 883 thous. tons, or 6.0%, the Krasnodar region – 772 thous. tons, or 5.2%, the Rostov region – 714 thous. tons, or 4.8% of the gross harvest of vegetables.

Table 2: Accommodation of vegetable growing in Russia, 2016

Federal districts	Sowing area, thous. ha	Gross harvest of vegetables, thous. tons	including		Productivity of vegetables, centner per 1 ha
			Open ground	Sheltered ground	
Russian Federation	691.9	16283.4	14722.8	1560.6	226.6
Central	148.5	3203.8	2923.5	280.3	206.2
North-Western	21.0	557.0	424.0	133.0	245.6
Southern	175.2	3892.5	3600	292.5	215.2
North-Caucasian	97.9	2436.3	2304.6	131.7	241.5
Privolzhsky	129.0	3404.4	2993.5	410.9	251.6
Ural	30.7	772.7	689.7	83.0	241.2
Siberian	64.6	1602.9	1414.7	188.2	242.2
Far Eastern	25.0	413.8	372.8	41.0	165.8

The yield of vegetable crops varies as to federal districts from 165.8 centners per ha in the Far East to 251.6 centners per ha in the Privolzhsky Federal District. The higher yield of vegetable crops in the said federal district is explained by the structure of the sown area, in which the most productive cabbage crop prevails.

The important role in supplying the population with vegetables is played by sheltered ground. One of the main conditions for a healthy diet is regular consumption of fresh vegetables throughout the year. The tasks of vegetable growing for sheltered ground are year-round or off-season (outside the period of vegetation in the open ground) production of high-quality vegetables and growing seedlings.

In the structure of vegetable production in Russia, products of sheltered ground occupy a small proportion (9.6%). In 2016, the gross harvest of vegetables of sheltered ground was 1561 thous. tons or 10.6 kg per capita. This is almost 1.5 times less than the rational rate of their consumption. Therefore, the annual import of these products is more than 1 mln. tons. To meet the needs of one person in fresh vegetables during the year, it is enough to produce at least 15 kg per capita.

The main producers of vegetable products of the sheltered ground are agricultural organizations. They grow 52.1% of the total volume of vegetables in the sheltered ground. The households of the population produce 45.4%. The role of peasant (farmer) households in the production of vegetables of the sheltered ground is negligible (2.5%).

The main production of vegetables of the sheltered ground is concentrated in four federal districts: Privolzhsky – 26.3%, Southern – 18.7%, Central – 18.0%, Siberian – 12.1% of their gross harvest. The share of these districts accounts for 75.1% of the production of the sheltered ground.

Of the varieties of sheltered ground, the winter greenhouses prevail. In agricultural organizations, their area is 21425 thous. square meters or 68.0%; the area of spring greenhouses – 9132 thous. square meters, or 29.0%, the area of insulated soil and greenhouses – 961 thous. square meters, or 3.0% of the total area of the sheltered ground.

The most perfect type of structures is winter glazed greenhouses, in which it is possible to create, maintain and regulate optimal conditions for plant growth and development at any time of the year. In winter greenhouses, the highest yield of vegetable crops is observed. Here it is 34.4 kg per 1 square m., in spring greenhouses – 8.4 kg per 1 square m, in hotbeds, insulated soil and under the film – 1.4 kg per 1 square m.

The rational location of vegetable growing throughout Russia contributes to the increase in the volume of production of vegetable products and an increase in its economic efficiency. In many regions of the country favorable climatic and economic conditions have developed for the cultivation of certain types of vegetable crops. The solution of the problem of providing the population with vegetable products assumes the development of domestic vegetable production in these regions. Self-provision of the region with vegetables should become the main task of agrarian policy of many subjects of Russia.

Provision of the population with certain types of vegetable products is determined by the pedigree composition of vegetable crops. In the structure of vegetable crops the largest share is occupied by tomatoes – 17.3%, cabbage – 16.7%, onion – 13.0%, carrots – 10.4%, cucumbers – 10.0%, beet table – 7.0%. In the northern regions of Russia, white cabbage, carrots, beetroot dominate in the structure of crops, in the southern – tomatoes, cucumbers, onion, green and early types of vegetables. The share of individual vegetables in the structure of gross harvest by regions and zones is differentiated depending not only on climatic conditions but also on the availability of floodplain and other lands suitable for cultivation, irrigation water, labor and machinery, convenient roads, processing industry.

On the sheltered ground, a narrow range of vegetables is grown. Cucumbers and tomatoes predominate in the structure of production of vegetables of the sheltered ground. In farms of all categories, cucumbers accounted for 54.4%, tomatoes – 39.7%. The rest of the crops (pepper, eggplant, green, mushrooms) occupy a small proportion (5.8%). In recent years, the structure of vegetable production has changed – the share of cucumbers has increased, and the specific weight of tomatoes has decreased.

Food security to a certain extent is characterized by the level of self-provision of basic agricultural products, which is defined as the ratio of production in the country to its internal consumption. Internal consumption includes personal and industrial consumption, loss of production. In recent years, this indicator for vegetables has a growth trend (Table 3). In 2016, the level of self-provision with vegetables was 91.6%. In comparison with 2005, the level of self-provision with vegetables increased by 6.7 percentage points.

During the period under review, domestic consumption of vegetables and melons from food crops increased from 12,388 to 1,907,000 tons, or by 53.9% as the result of an increase in their production.

The consumption of vegetable products varies sharply in the regions of Russia. The largest number of vegetables per capita is consumed in the North Caucasus (171 kg) and Southern (146 kg) federal districts. Among the subjects of Russia with a high level of consumption of vegetables and melons, one can note the Republic of Dagestan (245 kg), the Kabardino-Balkaria Republic (181 kg), Volgograd Region (171 kg), Astrakhan Region (168 kg). The high level of consumption of vegetable products in these regions is largely due to the large volume of its production per capita. Thus, in the North Caucasus Federal District vegetables and melons are produced 280 kg per capita, in the Southern District, respectively – 277 kg.

Table 3: Production and consumption of vegetables and melons in Russia, 2016

Federal district	Production per capita, kg	Consumption per capita, kg	Level of self-provision, %
Russian Federation	123	112	91.6
Central	83	102	69.0
North-Western	40	92	41.2
Southern	277	146	157.6
North-Caucasian	280	171	139.1
Privolzhsky	140	109	103.9
Ural	63	91	63.1
Siberian	84	102	73.6
Far Easten	69	108	56.7

The lowest level of consumption of vegetables and melons per capita is in the Ural (91 kg) and North-Western (92 kg) federal districts. In these districts, the least volume of production of vegetables and melons is observed per capita: in the North-Western – 40 kg, in the Ural – 63 kg.

The production of certain types of vegetable products per capita in Russia exceeds the rational norms of food consumption (Table 4). In 2016, the production of tomatoes per capita amounted to 20.4 kg, at the norm of 10 kg, cucumber, respectively, 13.6 and 10 kg, onion – 13.8 and 10 kg.

Table 4: Production of individual types of vegetable products per capita in Russia, kg

Products	Rational norms of consumption*	Production		
		2014	2015	2016
Vegetables and melons	140	117.6	121.5	123.2
including				
cabbage	40	24.4	24.7	24.8
tomatoes	10	19.6	19.4	20.4
cucumbers	10	12.7	13.1	13.6
carrot	17	11.6	12.2	12.6
beetroot	18	7.5	7.4	7.5
bow	10	13.9	14.4	13.8
other vegetables	20	18.0	18.9	18.5
melons	15	9.9	11.4	12.0

**Approved by the Ministry of Health of Russia, Order No. 614 of August 19, 2016.*

The essential aspect of food security is the physical and economic accessibility of food.

Physical accessibility of foodstuffs is the level of development of commodity distribution infrastructure, in which the population is able to purchase food or catering services in volumes and assortment that are not less than the established rational norms of food consumption in all the localities of the country [1]. It means the uninterrupted supply of vegetables to places of consumption in volumes and assortments that meet established standards. The physical availability of vegetables is characterized by a fairly high level, as the source of their receipt is their own production and imports.

The economic accessibility of vegetable products, which is determined by the possibility of purchasing them at current prices in volumes and assortments that are no less than the established rational consumption standards, is characterized by insufficiently high level. It is determined by the level of income of the population and consumer prices, which in recent years have increased dramatically. The significant part of Russia's population (more than 20 million people) is below the poverty line and is not able to purchase vegetables that meet the established standards in terms of quantity and range.

The economic accessibility of vegetable production is increased due to its receipt from farmer, personal subsidiary plots and from garden and vegetable plots, bypassing market channels. In Russia, a significant portion of vegetables is grown in households (67%). High rates of development of vegetable production in the households of the population can be explained by the fact that

many families in the conditions of a sharp rise in food prices are trying to solve the food problem through their own production of vegetables [2].

In order to increase the economic accessibility of vegetable products, the state needs to take measures to increase the effective demand of the population, reduce poverty and support the neediest segments of the population. To increase physical accessibility, it is necessary to increase the production of vegetables, develop interregional integration in the agro-food markets, increase the transport accessibility of individual regions for the food supply of their population, and create conditions for the development of market infrastructure.

To provide the population with vegetable products, it is necessary to increase the production of vegetables and food melon crops from 18.1 to 22.5 mln. tons, or 24.3%, including open ground vegetables – from 14.7 to 18.1 mln. tons, or 23.1%, vegetables of sheltered ground – from 1.6 to 2.2 mln. tons, or by 37.5%, food melons – 1.8 to 2.2 mln. tons, or by 22, 2%.

In order to fully satisfy the population's demand for vegetable products and melons, it is necessary to produce per capita at least 170 kg per year (including vegetables of sheltered ground – 15 kg), since more than 20% of the production is used for industrial consumption (for seeds and livestock and poultry feed) and spoils in the process of bringing it to the consumer. In Russia, 123 kg of vegetables and melons per capita per year are produced.

The State Program for Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials and Food for 2013-2020 provides for the solution of this problem through the development of vegetable growing in agricultural organizations and peasant farms. It is planned to increase the production of open ground vegetables in this category of farms to 6.1 mln. tons, or 10.9% as compared to 2016, to 4.7 mln. tons of open ground vegetables, or 51.6% vegetables of sheltered ground – up to 1.4 mln. tons, or 62.2%, which will ensure the import substitution of vegetables in the off-season to 768.6 thous. tons. In order to provide the population with fresh vegetables during the off-season period, it is necessary to build more than 1,5 thous. ha of modern energy-saving greenhouses and modernize about 1.0 thous. ha of the old ones [3].

Vegetable growing, especially the vegetable growing of sheltered ground, is a capital-intensive industry, requiring large investments for further development. In order to increase the investment attractiveness of this industry, it is necessary to improve the forms and increase the size of state support.

The State Program for Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials and Food for 2013-2020 provides for state support to the development of vegetable growing in 2015-2020 in the amount of 43096 mln. rubles. In 2016, more funds were allocated than provided for in the State Program. To compensate up to 20% of the direct costs incurred to create and modernize greenhouse complexes, funding from the federal budget in the amount of 2925 mln. rubles is provided, in fact, 5506 mln. rubles were allocated. This led to commissioning of 160 ha of modern greenhouses. To provide the population with vegetables with the sheltered ground, it is necessary to annually put into operation almost 2 times the area of greenhouses, which requires the increase in state support for the industry.

Growth in production of vegetable products will be facilitated by its concentration in specialized farms. The revival of industrial vegetable growing is a necessary condition for solving the problem of providing the population with vegetables. In the pre-reform period, agricultural enterprises produced 69.0% of vegetable products, in 2016 – 18.9%. Specialized enterprises use modern technologies of vegetable production, which positively affects the results of their activities. Thus, the yield of vegetable crops is 30% higher than in households [4].

In zones of commercial vegetable production, it is advisable to organize specialized farms with the area of crops of 400-600 ha and production volume of vegetables of 12-15 thous. tons. They can use industrial technologies for cultivating vegetable crops and carry out expanded reproduction in the industry. As shown by calculations and experience of some farms of certain regions, the area of vegetable crops in agricultural enterprises should not be less than 100 ha. In this case, vegetable growing can be profitable [5].

Further development of vegetable production will be facilitated by intensification of production, transfer of the industry to innovative development path, which is characterized by the widespread use of scientific and technological progress, stimulation of investment in the industry and improvement of the material and technical base.

Intensification of vegetable production should be carried out not only at the expense of quantitative building up of resources, but first of all on the basis of their more rational use. It provides more intensive, the productive functioning of material, labor and land resources, the growth of volumes of production of vegetable products outpacing rates in comparison with the growth of expenses.

In this regard, the important area of intensification of vegetable growing is the application of intensive, resource-saving technologies for vegetable production. Resource-saving technologies are aimed at reducing labor intensity and material consumption of products, obtaining the maximum output and profits as a result of the effective use of all production resources. Thus, their use makes it possible to reduce the labor intensity of production of cabbage by 37%, carrots by 46%, onions by 68%, tomatoes by 63%. The cost price of their production is on average reduced by 26-30% [6].

The indispensable condition for the further development of vegetable growing in the sheltered ground is the construction of new, reconstruction and technical re-equipment of old greenhouses. The construction of new greenhouses makes it possible to increase the economic efficiency of the sheltered ground and make a qualitative breakthrough in the industry. In new greenhouses, the cost of thermal energy is reduced by 40-50% compared to hangar greenhouses and by 20-25% compared to old block greenhouses. The construction of new greenhouses will not only ensure energy saving, but also the use of modern technologies, which will increase yields and improve the quality of vegetables.

To the new technologies can also be attributed cultivation of cucumbers in non-traditional terms and in conditions of additional lighting (light culture).

Light cucumber is very interesting for greenhouses. First, the yield from fruit-bearing from the beginning of December to the middle of February is 32-36 kg/m^2. Secondly, there is high demand in the market and a high price. Although in the past two years there has been an increase in competition due to the receipt of products from other countries growing cucumber in the transition. Thirdly, the problem of the seasonality of the receipt of vegetables is removed, and for greenhouse farms, obtaining money in the winter months is quite attractive. However, the development of light culture limits the constant increase in prices for energy carriers, the lack of preferential tariffs for electricity consumption at night, the difficulties of organizing plant protection.

There is a similar situation with tomato light culture. With the only difference that today in the market in the winter months there are fruits of strong transportable tomato hybrids imported from the countries of northern Africa, Spain, Turkey, Uzbekistan. The cost of such fruits is only 0.20-0.25 US dollars, and to transport them is much cheaper than to grow on the spot. Under the conditions of light culture, it makes sense to grow low-transportable pink-fruit, cocktail and cherry tomatoes [7].

The seed production of vegetable crops is restraining the development of vegetable growing in Russia as well. During the years of agrarian reform, this industry has fallen into decay in Russia. The system “Rossortsemovoshch”, which was engaged in harvesting and selling seeds and helped to carry out approbation of crops of vegetable crops, was destroyed. For 2000-2016, the gross

collection of seeds of annual vegetable crops declined from 56.1 to 9.3 thous. centners, or 83.4%, the seeds of biennial crops – 7.7 to 0.6 thous. centners, or 92.2%. At the same time, production of onion-sowing increased from 92.2 to 138.3 thous. centners, or by 50.0%.

The achieved volume of production of seeds of vegetable crops does not allow to completely satisfy the demand of commodity producers. Therefore, imported seeds are widely used in Russia.

In Russia, almost 40% of the sown area is sown with foreign seeds, and in commercial vegetable growing – 50-70%. In the Russian market, there is a fierce competition between domestic and foreign firms for the varietal composition of the industry. To ensure import substitution, it is necessary to produce domestic seeds of vegetable crops corresponding to foreign and analogous sorting and sowing qualities.

The revival of seed production in Russia is possible only with the state support of the industry. State policy should be aimed at creating normal conditions for development and sustainable functioning of the domestic seed market, ensuring equal conditions for competition of seed companies. It is necessary to actively stimulate the work of domestic seed producers, restore 45 to 50 specialized seed producers in the main areas of commercial vegetable production, form federal and regional seed funds, improve the material and technical base for harvesting, cleaning and seed refinement.

The important condition for increasing the production of vegetable products and increasing its economic efficiency is the development of agro-industrial integration, which unites raw materials, processing and marketing in a single technological process. It allows one to take advantage of large-scale production, without infringing the interests of agricultural producers.

The basis of a combination of vegetable growing and food industry is that the products produced in the sectors are poorly transportable and perishable, must be processed as soon as possible, stored for storage and sold, as well as the seasonality of vegetable production leading to incomplete utilization of manpower and material resources. In addition, the development of agro-industrial integration is conditioned by the rather complicated macroeconomic situation in the country. This is, first of all, the presence of price disparity in the commodity exchange between agro-industrial sector, low investment appeal of vegetable growing, lack of well-established links in the system of commodity flows, and ineffective system of managing economic activity. Integration allows reducing costs associated with production and sale of the final product, with the study of market conditions and organizing the competitive production of vegetables, processed products.

In modern conditions, it is advisable to create integrated structures of various forms (agro-industrial enterprises, agro-firms, holding companies, clusters, etc.), united by common principles of work on the final result. These formations must take over the entire range of functions related to production, purchase of vegetables, their processing and sale. The mechanism for regulating production and economic relations among the participants in integration should be formed on the basis of equal profitability at the stages of production, processing and sale of products. The economic interest of agricultural enterprises and other organizations in the creation of integrated structures should be based on income, additionally obtained from improving the assortment, quality and profitable sales of finished products, as well as from increasing the efficiency of production at all stages.

The results of the research were discussed at the XXII international scientific and practical conference “Export Potential of Agroindustrial Complex: Status and Prospects” (Moscow, October 23-24, 2017), II International Scientific and Practical Conference “Social and Economic Problems of Food Security: Reality and Prospects” (Michurinsk, March 30, 2017).

4. Conclusion

The implementation of the State Program for Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials and Food for 2013-2020 and the Doctrine of Food Security of Russia made it possible to increase the production of vegetables of open and sheltered ground, but did not solve the problem of providing the country's population with vegetable products through own production. The improvement of state support for vegetable growing and its increase in size, its concentration in specialized farms, intensification of the industry, the revival of domestic seed-growing of vegetable crops, construction of modern energy-saving greenhouses and modernization of old ones, and development of agro-industrial integration will help to solve this problem.

References

[1] Doctrine of Food Security of Russia. Approved by the Decree of the President of Russia of January 30, (2010), No. 120.

[2] Kulikov IM, Minakov IA, Food safety in production and consumption of fruit and vegetable products. *AIC: economy, management*, 2, (2016), pp: 4-16.

[3] State Program for Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials and Food for 2013-2020. Decree of the Government of Russia No. 717 of July 14, (2012).

[4] Minakov IA, Beketov AV, Zyuzya AV, Problems of the revival of industrial vegetable production. *Economics of agricultural and processing enterprises,* 3, (2008), pp: 27-30.

[5] Minakov IA, Territorial and sectoral division of labor in vegetable growing. *Bulletin of Michurinsky State Agrarian University*, 1, (2016), pp: 109-116.

[6] Minakov IA, Innovative development of vegetable growing as the basis of food security. *Economics of agricultural and processing enterprises*, 11, (2014), pp: 26.

[7] Minakov IA, Features and trends in the development of vegetable growing of sheltered ground. *Economics of agricultural and processing enterprises*, 5, (2015), pp: 23-27.