Development of the agrarian and industrial complex of Russia through the use of new technologies

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Abstract. The agrarian complex of Russia in modern times is a steadily developing sector of the economy. The priorities of the scientific and technical development of the agro-industrial complex have become the Federal Scientific and Technical Program for the Development of Agriculture (FSTP). The program implementation period is from January 01, 2017 to December 31, 2025. At the heart of the program, the main tasks are the promotion of innovations in agriculture, the training of personnel for work in rural areas, the development of selection and seed production and other areas. The program also set tasks to increase the competitiveness of domestic agricultural enterprises and reduce dependence on foreign companies. Two areas of the program are already actively developing - seed and potato breeding and sugar beet production.Agriculture is becoming a more competitive industry with the introduction of new digitalization and automation. These transformations also affect the higher wage growth of agricultural workers, since a modern agricultural worker is a specialist who is able to apply new technologies in his work experience and is able to manage new equipment. The use of new advanced machines and robots speeds up the harvesting process, and new bio-engineering helps to improve the level of development of crops and monitor their growth in real time. Computer technology helps to control weather conditions and avoid crop losses.Digitalization in agriculture is currently a new technology that increases the volume and quality of products, as well as reduce its cost. Information technology is an integral part of modern agricultural production and helps turn backward agriculture into a competitive sector of the economy.

1 Introduction

In the past few years, the agrarian and industrial complex of the country has been developing especially actively through the use of new technologies. This became possible with the improvement of the quality of management, a large investment in agriculture and an increase in domestic demand for agricultural products. Significantly intensified innovation processes and import substitution. But positive trends do not mean that

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agriculture in Russia is developing successfully. The share of innovation costs in the industry is no more than 12% and 7% in the food industry [1].

And if the development of technological progress in spite of everything is growing, this means the replacement of human labor by new generation machines. And these machines will be controlled by people who will have to have the necessary competencies in managing such machines. Therefore, technical and biological knowledge will come first.

2 Method

For the results of the study, the article uses a statistical method to analyze data on the use of new technologies in agriculture. Methods of analysis and synthesis are used when comparing the cultivation of agricultural products in city - farms and in the traditional way. The method of comparative analysis was used by the authors in the conclusions when summing up the prospects for the use of new technologies and innovations in the agricultural sector of the country.

3 Study detail and result

Much attention is now being paid to biotechnologies, which involve the use of living organisms and their systems. Genetics is the study of the variability of living organisms. This is the creation of new varieties of plants that are resistant to weather changes, and new, most productive breeds of animals. Technologies of modern breeding allow to reduce the time of creation of new varieties of plants. And if the method of classical selection of creation is at least 10 - 15 years, then new technologies speed up this process by about three times [2].

In genomic breeding of animals, it is possible to determine the breeding value and the level of genetic progress more accurately with new technologies. This direction is connected with synthetic biotechnologies. In addition, a new direction is epigenetics, which complements genetics. The essence of this direction lies in the fact that epigenetics can control changes in the hereditary formation, which are caused by the actions of external factors [3].

If we consider synthetic biology, then its field of activity includes the study of genetic engineering producers. This is the production of products of synthetic origin. These products include vaccines, feed and food additives, flavors and amino acids [4]. The development of synthetic biology opens up great opportunities for the use of third-generation technologies. One such possibility is to obtain food without the use of agricultural resources.

Nanotechnologies, as one of the new directions, have been widely used in medicine and electronics. Nanotechnologies in agriculture will provide significant progress in the processing industry and in solving the problems of efficient use of agricultural resources. One of these innovations can be called the «optoelectronic nose» - a system that allows you to track changes in the color and smell of products. Such sensors on food packaging can convey information about the degree of freshness and quality of this product, which are important qualities for all consumers. The same sensors can be used to determine the disease of animals, as well as to determine the condition of plants.

Also among the new technologies can be called NDS nanosensors, which track the irrigation needs of certain plants. Such nanosensors are placed on the leaves of plants and transmit information through the network. This allows for precise watering, reduces plant irrigation costs and improves product quality. Thanks to such nanosensors, crop production receives as much moisture as it needs for its growth [5].

In biopharmaceutics, nanotransports are used to create feed additives, as well as new plant protection products, veterinary drugs and fertilizers are being developed. Also one of the new directions is nanobionics. This is an experimental direction that deals with the creation of fast-growing plants. The essence of this direction lies also in the fact that plants are designed and introduced new functions that are not provided for by nature [6]. At present, such areas as increasing the efficiency of photosynthesis and creating plant-detectors have already been developed. In plant detectors, a built-in sensor measures the level of humidity, helps determine the required temperature for plant growth and solar protection for plants.

Much attention is now being paid to algae aquaculture. Algae have an advantage in protein and amino acids in relation to other plants. Therefore, the development of the use of such algae in food production is already underway. Such algae can be eaten. In addition, alginic acid and carrageenal are extracted from them, which are widely used in the food industry as food additives or as thickeners. Such algae are distinguished by a high content of dietary fiber and protein, as well as iodine. Such algae can be harvested on all coasts of countries, but they are especially widespread in Japan. Among the producers of edible algae, countries such as Iceland, France, Norway and Ireland stand out [7].

In addition to food algae, attention is paid to the study of biotechnological meat. Such products are obtained without slaughtering animals. There is the following technology for obtaining such meat: meat from a test tube or, in other words, cellular meat. The procedure consists of culturing muscle tissue from animal cells. The development of such technologies will help reduce the price of meat products by several times. Biosynthetic meat is also referred to such technologies. In this case, the product is assembled at the molecular level from substances of plant origin, but obtained by biotechnological means. Such products are created with specified nutritional properties without cholesterol and gluten. This technology is no longer experimental and is actively developed in Western countries. Such products are very popular in fast food establishments and in a number of restaurant businesses. The main volume of sales in the market of such meat belongs to the USA and Canada. But so far, these products are priced significantly higher than pure biological products.

The next direction is biorefining. This direction involves the production of a number of products from biomass, which are obtained from non-renewable resources. But the development of this direction is associated with high environmental costs. First generation technologies involve the use of crops as raw materials with a high content of starch and fat. Developments of the second generation are associated with the development of «green chemistry». Such developments are aimed at the transition to cheaper raw materials. They are based on the transition to cellulose to obtain glucose and the rejection of starch, as a more expensive material. Further evolution already involves the use of algae and microorganisms [8].

Next, we will consider new models of a smart farm. The essence of such farms lies in the maximum robotization in production. In addition, it is the use of modern information technologies in precision farming. This makes farming more precise and controlled. The essence of this approach lies in an individual approach to the needs of individual plants and animals.

Among the new areas of farming are desert crop production, marine farms, urban agriculture. Desert crop production is developed mainly in oases, where there is the necessary amount of water. One such area is the Volga Delta. In addition to vegetables and watermelons, wheat and rice are grown here.

Marine farms have several directions. One of them is sea gardens. They are broken up in sandy shallow water for growing algae and seaweed. The next direction is the artificial cultivation of fish. For example, in the Kaluga region, a marine farm has been created to

grow fish artificially. At the same time, automation controls the level of salt in the water, the number of algae and microorganisms, and the quality of the water. A new trend in marine farming is the cultivation of bivalve molluscs to create pearls. Black pearls are currently farmed in Polynesia and white pearls in Japan and China [9]. To do this, a plastic seed is placed in special oysters, which later becomes mother-of-pearl, and after a few more years it turns into a pearl. Then the pearl is taken out and the whole process is repeated again.

Urban farms produce crop and livestock products in a limited space within the urban environment. Such farms are called city - farms, or vertical farms. They mainly create urban farms in large metropolitan areas where the amount of land is limited. The beds on such farms are located in greenhouses one above the other, which significantly saves space and the yield is much higher than on ordinary beds. Plants are grown on such farms in the ground and with the help of a hydroponic system. With the help of such farms, you can grow vegetables anywhere in Russia. In recent years, self-sufficiency in domestically produced vegetables has been steadily growing. For cucumbers, self-sufficiency is almost 90%, for tomatoes up to 65%. And this type of cultivation is also beneficial in the sense that when vegetables are delivered from other regions of the country, up to 40% of the crop turns into waste, and those that arrive lose an average of up to 45% of nutrients [10]. Therefore, such farms help to reduce the amount of fertilizer consumption and provide fresh produce to the population of the region where the farm is located. In addition, such farms are also quickly built without additional material and time costs.

The main positive point is the automation of these farms, with which you can control most of the processes and the microclimate. Here the plants receive a balanced diet. The ripening time is also reduced by about 10 to 15 days compared to the traditional cultivation of vegetables in conventional greenhouses or open ground. One of the most promising city-farms in Russia is the Novosibirsk iFarm farm, which was created by IT-specialists in computer games. Vegetables are grown on the farm. Another city-farm is Agrorus, which grows basil, lettuce, and herbs.

4 Discussion

Russia has always been one of the largest agricultural countries in the world. In recent years, the country has made great strides in strengthening food security and increasing self-sufficiency in agricultural products. Previously, agricultural production developed due to the growth of investments and the improvement of the quality of management, as well as by increasing the purchasing power of the population. Modern Russian agriculture is facing global challenges and must move to a new level in the use of modern technologies to strengthen its role in the domestic and foreign markets.

The Russian Federation has a strong position in the global export of agricultural raw materials and foodstuffs. Import dependence on many groups of goods has significantly decreased in the country. But the country needs new equipment for agricultural production. According to many indicators, this equipment is of foreign origin. In addition, the level of import dependence in biotechnologies is over 70%, and in the segment of food additives - more than 80%. Purchasing veterinary drugs and feed additives in other countries at world prices, the country has a low level of advantage in foreign markets. Therefore, strengthening national food security is the main current task of the country's agrarian complex.

The country has great resources in order to completely eliminate import dependence in a short time. Russia accounts for 10% of the global fund of arable land, and in terms of fresh water reserves, the country is one of the world leaders. But at the same time, it should be noted that agricultural resources are not optimally distributed, since many agricultural areas

do not have high fertility and are located in risky farming areas. And this is an average of 44% of the land. Fresh water reserves are mostly concentrated in the northern regions of the country, which are not suitable for agriculture. And the southern agrarian regions face problems of water shortage for irrigation. Therefore, the transition to a new technological stage in the development of agriculture, associated with the development of precision farming infrastructure, is important and necessary for the growth of the agricultural complex within the country and in overcoming the lag in new technologies in relation to the advanced countries of the West. Another problem is the low activity of agricultural enterprises in the development and application of new technologies in their activities. Therefore, the Federal Scientific and Technical Program for the Development of Agriculture became the priorities of the scientific and technical development of the agro-industrial complex.

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