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Digital Agriculture: Current State, Problems And Development Prospects.

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ABSTRACT

This article discusses a comparative analysis of indicators of the level of development of the main directions of agricultural production with the values of the developed world economies indicates the huge potential of the domestic agribusiness. The digital innovation model of economic development should activate obvious and hidden reserves by overcoming the existing limitations and solving specific applied problems.
Keywords: digital agriculture, innovation potential, agricultural innovation, investment, agribusiness entities, technological innovation.

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INTRODUCTION

The modern domestic agro-industrial complex is not included in the list of industries with the greatest innovative potential. However, in agricultural production and processing, processes of modifications have begun, which are caused by a large number of nano- and biotechnologies, the introduction of new integrated production systems and the adoption of effective management decisions, the transition of agribusiness from food to service models of business processes with the activation of synergy from the integration of production and understanding the producers of the need to adapt agricultural products to the needs and parameters of specific while minimizing the level of external resources involved and maximizing the use of local (potential regional) ecosystems. In order to level the negative influence of global factors in the field of food security of the country, we need an agro-industrial sector of the economy with a new development model, which ultimately will provide new qualitative growth and reduce the size of our technological gap to the most developed economies of the world.

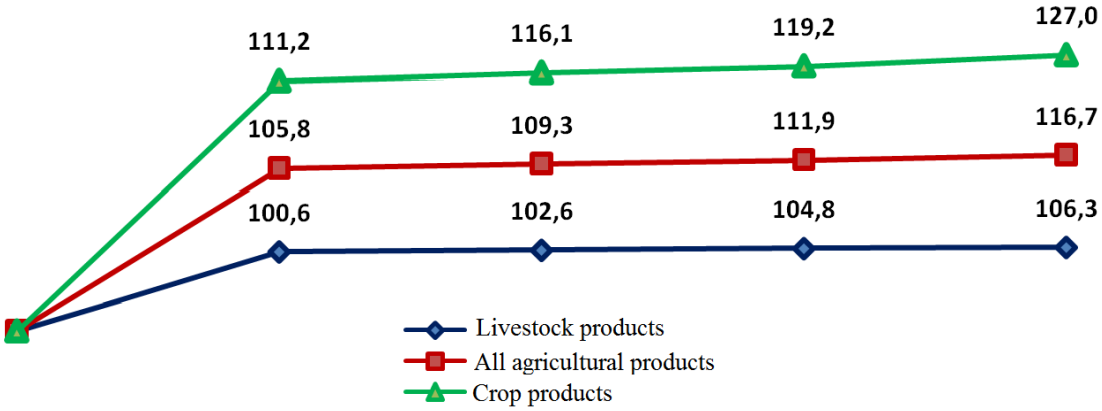

Figure 1: Agricultural production index (2012)

MATERIALS AND METHODS

Domestic agricultural production, with its enormous potential and opportunities (in terms of the embargo on the import of agricultural food from the EU, the USA, Canada and Japan), shows a very modest growth trend. Even taking into account the significant growth in the volume of crop production and the more modest, but positive dynamics of the livestock industry, in general, the agricultural production index grew at a very modest pace. It should be emphasized that higher rates of the crop industry are directly related to the increase in grain yield, which, according to Rosstat, has increased by 60% since 2000, but still lags 3-4 times behind the leading countries (USA and Germany).

The low level of use of the potential of agricultural industries reflects our multiple lag in labor productivity. The value of the cost of manufactured products per worker, for example, in the United States exceeds the level we have achieved by 22 times.

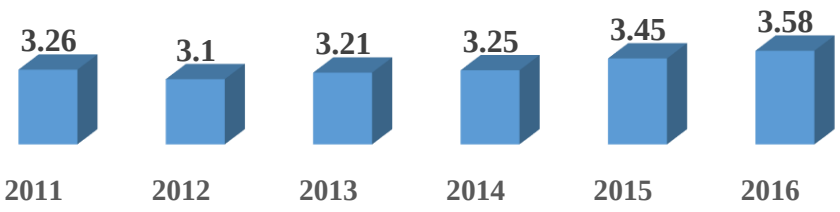

Figure 2: Contribution of agriculture to gross value added, %

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The growth rates of labor productivity in the agricultural sectors lag far behind the average indicators of the domestic economy as a whole. Even taking into account record yields and gross grain harvest (2006. - 119.1 million tons, 2017 - 135.4 million tons), a record volume of their export (2017 - 36.4 million tons) and total export revenues for the industry as a whole in the amount of $ 20.7 billion in 2017, the share of agricultural production in the Russian GDP did not exceed the threshold value of 4%.

According to the results of the 2016 All-Russian Agricultural Census, the basis of the industry is 7.5 thousand large, 24.4 thousand medium and 4.1 thousand small subsidiary organizations, more than 174 thousand farms, more than 23 million households of the population. The overall difficult economic situation caused by the negative influence of geopolitical factors largely affected the volume of investment in the agricultural sector, while the level of investment in fixed capital of agricultural sectors in 2017 was the lowest in the last 7 years (less than 400 billion rubles) . The situation is complicated by the geographical unevenness of agrarian investments, which in absolute terms differ by several times. So in the most favorable from the point of view of agricultural production of the North Caucasus Federal District, the volume of investments is 8 times lower than in the Central Federal District, 5 times lower than in the Volga and Ural Federal Districts, and about 3 times lower than the level of investments in the Far Eastern, North -West and Siberian Federal Districts.

RESULTS AND DISCUSSION

The problem of low investment activity is directly related to a decrease in effective demand. Currently, food expenditures in the household income structure reach 50%, which ultimately limits and reduces food consumption and incomes of agricultural producers.

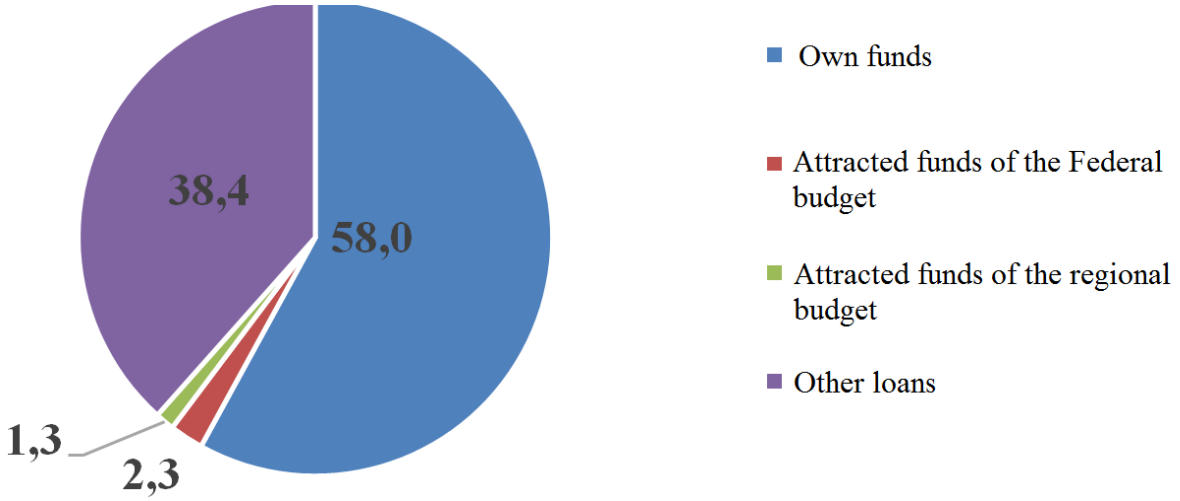

Figure 3: Investments in fixed assets, %

The high cost of credit resources and the debt load of industries, combined with the fact that in the final selling price the selling prices of farmers do not exceed 20%, limits the level of investment activity, which is 58% financed from the own funds of agribusiness entities.

According to the Ministry of Agriculture, the lack of growth in investment activity has led to the fact that, in terms of the level of development of agricultural technology, Russia is below the 15th place in the world. The Federal Science and Technology Program for the Development of Agriculture, in which 2017 was designed to offset the low export potential, technological lag and negative dynamics of the level of investment in the industry. State support measures in excess of 194.7 billion rubles were financed, and by 2020 the level of federal budget expenditures will reach 217.9 billion rubles.

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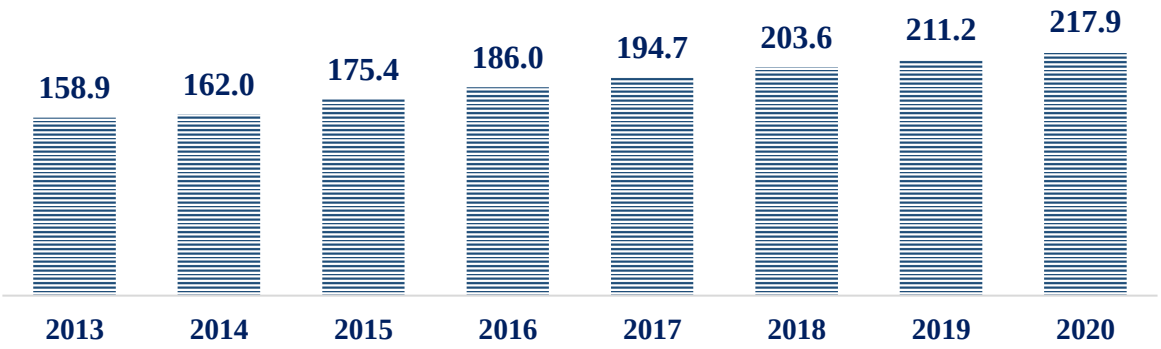

Figure 4: Financing of the state program for the development of agriculture from the federal budget, billion rubles

With the assistance of the state support mechanisms of the agro-industrial complex, the amount of financing for the purchase of agricultural equipment on preferential terms (over 5.2 billion rubles) increased by 3 times, which certainly directly contributes to the growth of the technical equipment of the industry.

The decrease in investment activity of the industry, in turn, characterizes the low innovative component of agribusiness, since the share of agricultural producers introducing technological innovations in 2016 amounted to only 3.4% of the total number of economic agents of the industry (including livestock 3.9% , in crop production, 3.7%), while in industry it reached 9.2%, which is significantly lower than the ratio in the agricultural production of leading European economies: in Spain - 8.7%, in Denmark - 40.9%, The Netherlands - 48.4%, in Norway - 59.9%.

One of the key problems that has a negative threshold effect on the rate of introduction of innovations of an innovative and technological nature is their availability. Even the smallest technologies are currently available only to large and medium agribusiness entities, while the majority of peasant (farmer) farms do not have the opportunity to test and introduce advanced methods and technological solutions.

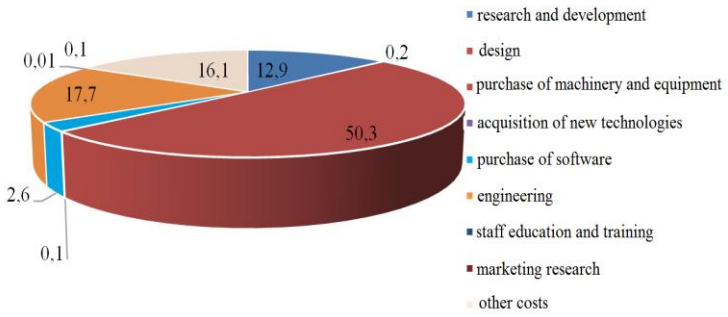

Figure 5: Costs of technological innovations of large and medium-sized agricultural organizations, %

The volume of investment by agribusiness entities in technological innovations is not able to have a significant impact on the intensification of the industry, since their total volume does not exceed 15 billion rubles, while the share of such costs in the value of sold agricultural products does not exceed 0.9%, which is twice below average industries It should be noted that this indicator in the economies of the European Union exceeds the level achieved by domestic agricultural producers by several times (Spain - 1.4%, Denmark - 1.8%, Norway - 2.5%, the Netherlands - 8.5%).

At the present stage of development of the industry, agricultural producers primarily solve the problem of re-equipping the material base with new machines and equipment. In the cost structure of technological innovations, their share exceeded 50%, which corresponds to average values in industrial production, while the share of investment in research and development does not exceed 13%, which is almost two times lower than similar costs in industrial production. This ultimately characterizes the low value of

demand for R & D results, while the share of expenditures on engineering innovations is almost two times higher than that in industry and is more than 17.8%. It should be emphasized that the total cost of marketing research, software and innovative technologies does not exceed 3% in total.

According to Rosstat, agricultural innovations are one-third financed by agribusiness own funds, the value of which in the aggregate is currently 59.3%. The amount of state support in this case is extremely small - their share is 1.1%, so in the absence of available funds and insufficient profitability to finance long-term projects, agribusiness entities are forced to turn to external sources of financing (credit resources), the proportion of which reached 39% . At the same time, about a third of producers note that innovations are reflected primarily in the growth of crop yields and livestock productivity, and just over 20% of respondents point out the impact of innovations on the preservation and improvement of soil fertility.

The high degree of negative influence of geopolitical risks and significant structural transformations in the domestic economy on the one hand require an adequate response, and on the other hand open up a window of opportunity for agriculture to activate its reserves and huge potential. But for this, agricultural production should become a high-tech industry, capable of adapting and introducing innovative technologies and developments, which is currently impossible without modern digital technologies.

According to the Ministry of Agriculture, the index of development of information and communication technologies in Russia is significantly inferior to the leading and not only economies of the world and is at a modest 45th place, while its level in agricultural sectors is much lower. In the European Union countries, there are more than 25 IT specialists per 1,000 workers in the industry, only 5 in the domestic agricultural sector, while the most developed countries invest in digital technologies from 350 to 500 rubles per hectare, while on average, including RF - less than 10 rubles / ha. Therefore, the Internet of Things should become the driver of digital transformations in agricultural production, which, in turn, will allow manufacturers at the initial stage using a large number of devices and systems to automatically generate and subsequently analyze various current data on the state of current technological processes for adopting true, effective management making.

The importance of existing problems is understood by the country's leadership and for building a common strategy for introducing breakthrough innovations by order of the Government of the Russian Federation No. 1632-p of July 28, 2017, a targeted federal program “Digital Economy” was established, which should initiate the formation of 10 large-scale high-tech ones IT sector companies that have the potential and opportunities to compete on equal terms with the main players on the world market, and the creation of about 500 companies of lower rank. This involves the design and launch of 10 industry platforms, including in the agro-industrial complex. The target indicators are the cumulative contribution of the agricultural sectors to the GDP of the Russian Federation, which should increase by 2024 to 8.9 trillion rubles, and the total export volume of the industry, which by 2025 should reach the level of 45 billion dollars.

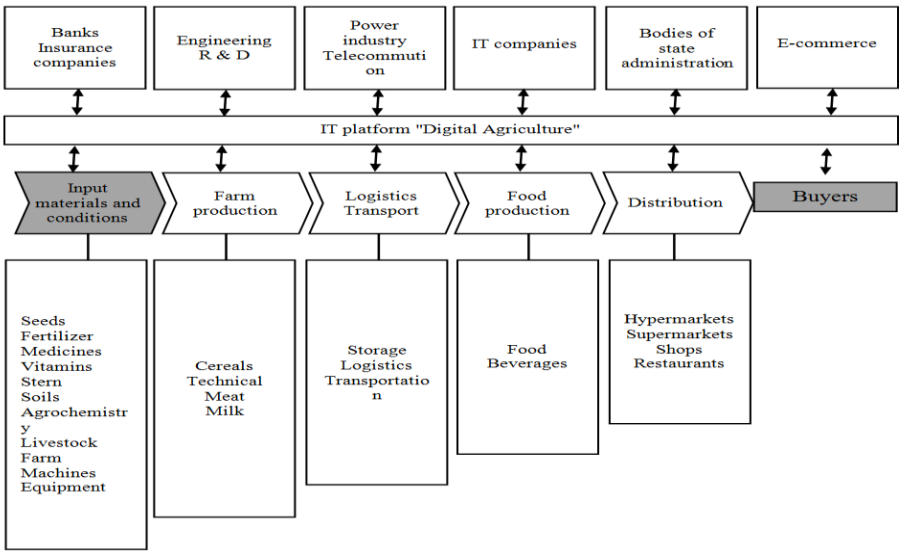

Figure 6: Block diagram of the model «Digital Agriculture»

Considering the fact that the increase in the efficiency of agricultural production without integration and involvement of related branches of the agro-industrial complex and directly end-users, the structure of the future model «Digital agriculture» is horizontal (Figure 6), where as a system integrator and communicator at all stages of production and the movement of products, at all stages of its redistribution, at all stages of logistics and distribution, will be an IT platform that will ensure the collection, processing and analysis of information coming from all interested participants of the market, providing end-to-end digital solutions to increase labor productivity and increase the efficiency of both agricultural production and the system as a whole, growth in the industry's profitability, including through the development of knowledge-intensive and high-tech industries in the agro-industrial sector.

CONCLUSION

- A comparative analysis of the indicators of the level of development of the main areas of agricultural production with the values of the developed world economies indicates the enormous potential of the domestic agribusiness, and the digital model of economic development should activate obvious and latent reserves by overcoming the existing restrictions and solving applied problems:
- Solving the problem of financing the industry by creating a complete and up-to-date registry of agribusiness entities, developing on its basis a simplified lending mechanism and administering state support funds, including financing and encouraging investment in the creation and development of innovative industries and technologies.
- increasing crop yields and livestock productivity based on the accumulation of relevant digital data on the state of agricultural lands and their fertility, livestock structure. Creating a complete digital data bank on breeding and genetics. Stimulation of the development of technologies for the collection and processing of digital data monitoring fields, animals and plants for the introduction of new technologies, and methods of improving efficiency through the use of information resources and platforms of accelerated professional advice of engineering companies.
- increasing labor productivity on the basis of technical and technological re-equipment of agricultural sectors, developing and introducing innovative machines and mechanisms with the potential to integrate them into the systems of «smart field», «smart farm», «smart greenhouse», etc. for accelerated automation of most technological processes.
- reduction of transaction costs of agribusiness entities by increasing their interaction level, smoothing seasonal recessions based on the digital platform and implementing models for forecasting yields and productivity, demand, stocks of finished products and storage capacities.

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