Development of scientific potential and introduction of innovative solutions to ensure competitiveness and further development of the agro-industrial complex of Russia

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Abstract. Appearance of a large number of modern, technological solutions in the field of agrarian complex of the Russian Federation, as well as the possibility of constant and rapid development of the potential of science in this area shall help the country in the development of this area as a whole. Of course, some unique features, signs of the challenges of the present shall be pointed out. They, as practice shows, have a significant impact on the entire system as a whole. Today it is important and necessary to be especially attentive to various trends and modern solutions. All this affects the development of the agrarian complex, which is important for Russia. Now it is required to point out some problems, as well as solutions in the field of technical, and most importantly, economic, scientific and professional development. If timely attention is not paid to key points, concepts and processes, then a completely unpleasant situation with all the negative consequences and phenomena may arise in the country in terms of studied direction.

1 Introduction

It can be pointed out that the systems in the food sector today are at a new level in terms of the development of modern, special technological solutions, which shall be carefully read. Agriculture is the direction in which it is important to focus, it needs and requires different
smart solutions that are unique in quality and efficient in application. Various alternative sources of resources, biotechnologies, come into view [1].

The opportunity to develop potential in the scientific field, to introduce new solutions related to innovation is important and necessary. Thus, it is possible to increase one's own competitiveness several times over in this sector chosen for study. In case when, for some reason, this is left without special attention and emphasis, then everything will go completely opposite to the established plan. Some markets for agro-industrial complex (AIC) products will not exist.

The main task that the agrarian complex of the Russian Federation faces with is the emphasis on agriculture. For this, modern, high-quality fertilizers are constantly needed [2].

2 Problem statement

The main opportunities and features are closely related to the development of potential in scientific activity. No doubt that they are closely related to the training of real professionals in this chosen direction, which is very important at the present time. To some extent the educational sphere, as well as scientific activity shall unite in order to show effective and better results and indicators in the future. In any case it is about the presence of positive, expected results and indicators. But while in this direction there are still some difficulties and challenges that will need to be actively overcome over time [3].

The main task set in this study is to assess the active and planned development and create solutions in the field of innovation in terms of agro-industrial complex and its improvement.

3 Research questions

In fact, with the support of the state structure, already in 2015 the Russian Federation will be able to get about 18% and up to more than 23% of the world market in terms of agriculture. If attention is paid to cash, then the market indicators in this area in relation to drones, modern devices in the considered sector (agriculture) were able to reach more than 25 billion rubles. This is a fairly significant and important indicator, which is recommended to pay attention to.

The Ministry of Agriculture of the Russian Federation has created a special unique project called agriculture of digital. The period of its implementation is until 2024. Its main task is to introduce, develop and apply original digital technologies, as well as worthy solutions that affect a breakthrough in various technologies, including the agro-industrial complex. Today it is necessary to pay attention to the growth of labor productivity with the use of digital solutions. In this direction the accounting of agricultural land can be pointed. Due to these solutions, it is possible to understand which lands are used and which are not [4,5,6].

4 Materials and methods

It is important to pay attention to the fact that in modern times, drones have not yet found great popularity in our country. Now everything is just developing, spreading. There are many unique projects and programs for the active use of drones in agriculture. However, most of the projects are not being implemented yet.

Let's have a look at the reasons. First of all, in order to manage them efficiently and competently, training is required. The operator must be accurate, must be able to build a route in such a way and cope with problems on the way and do not to damage property values, people, etc.
In addition, it is important to constantly think about the private life of the individual, not to violate it with the help of all sorts of so-called aircraft, which is quite difficult. But, as far as agriculture is concerned in this direction, there is a moment of quality of information that can be obtained due to such devices.

Weather conditions can also adversely affect the quality of the flight of the device.

And of course, the cost of the device shall be taken into account. Sometimes it is overpriced, and not everyone can afford to purchase such a device for agriculture and its study.

And there is one more thing - these are the laws of the country, they do not allow the full use of drones in this direction.

According to Federal Law No. 291-FZ “On amendments to the Air Code of the Russian Federation” [7], special documentation and certificates are required for UAVs operation in accordance with all the rules.

5 Results

The main directions in the development of the agro-industrial complex are associated with a special scientific program in the development of agriculture (2019). It was called the Federal Scientific and Technical Program for the Development of Agriculture. But it is important to point out that such a developed program does not fully develop the capabilities of this industry. It points to different tasks. They are mainly related to the possibility of development of import substitution, in addition, the tasks are aimed at supporting specific areas of the Ministry of Agriculture.

But at the same time, the possibility of competent development of important, key, modern technological solutions is not realized in the country. The National Technology Initiative (NTI) Foodnet had to cope with some actual goals, requests, but questions also appeared in this direction.

Despite the fact that the Russian Federation is a large agricultural country, it still lags far behind other states. This is especially noticeable as a product of scientific activity. This is influenced by inefficient investment activities in the agricultural sector. If there are investments, they are illiterate and incorrectly balanced:

- much attention is paid to the development of the state direction (customer), as well as research work (R&D). In terms of quantity, indicators of support from the state of the Russian Federation in relation to the agrarian direction, the Russian Federation is one of the leading states;
- but as far as official publications in agricultural science are concerned, the Russian Federation remains far from being the leader, it is significantly after numerous countries;
- the volume of Russian patent applications in terms of the entire world scale (2019) is equated to one percent (universities, research institutes are the copyright holders). They differ in a set of patents that are not active, valid. That is, business in this direction does not show sufficient activity [1];
- a rather low indicator in the development of the agrarian sector, at the moment the Russian Federation has significantly lagged behind different countries by several times. We do not have such significant commercial investments or investments of a private nature, as we would like.

As for this problem, it is associated both with a long period of cycles (investment), and such a concept as capital intensity in the implementation of this kind of design work, goals. It is required to pay full attention to the system aimed at the possibility of supporting innovative solutions in business.
It is also important to pay attention to another significant point. It lies in the shortage, namely the constant reduction of the potential of the staff. For example, this is significantly noticeable in the number of experienced researchers. There really isn't enough manpower in this area.

6 Findings

Especially in modern times, the agro-industrial complex is a developing industry in the country's economy [8,9,10]. The main phenomena and processes associated with development are investments and the improvement of management efficiency. But these methods, phenomena fade into the background. There are a lot of new methods and phenomena relevant for the modern world.

The embargo, as well as significant phenomena and actions related to import substitution have affected many areas. However, even the fact that many changes have been noted at the present time it still does not make it possible to come to qualitative, better results. Innovative activity in our country is still suffering greatly and needs to be changed, activated, and significantly improved.

Significant capital investments play a significant role in the cost of modern solutions. As for investments in R&D, there is a big lack of funds in this part. It is just a little bit more than 10% for agriculture. Since investments make up a small part, there are practically no innovative products in this considered area. In addition, it is growing and increasing slowly. For example, over the period from 2016 to the next two years, this indicator increased by only 0.6% [1].

The process associated with the modernization of the environment, the emergence of modern market solutions, unique technologies is always associated with the complexities of the environment, with difficult standards that integrate the entire production process [11,12]. For this, of course, a flexible, worthy of attention system of legal competent regulation is definitely needed. It can quickly and easily adapt to modern circumstances. Innovative development of the Russian Federation will require significant investments and vigorous activity. Development in the field of certification, obtaining licenses - all this plays a big role. The agro-industrial complex is no longer an obsolete and useless sector of products and solutions. The opportunity to strengthen food security, to develop specific objectives, all this is directed forward to the innovation system in development. It is required to create a high-quality application system for creating the best ideas, plans, projects and, as a result, real excellent products. But, of course, in this direction there are many questions, features that are important to focus on.

Next, it is important to pay attention to the development of the transfer support system. The measures that are currently in place are based solely on the development of certain areas, they are not aimed at the peculiarities of innovations, unique solutions. Venture investment is the sector that is not fully developed (in terms of agro-industrial complex). It negatively affects the process in the development of unique projects of various plans and types. It is required to develop a special fund in the development of innovative solutions in this area. It will be able to develop innovative solutions that meet the challenges of the agri-food sector. It is important to do everything possible to change agricultural education. This modern system is not open enough.

It is required to divide universities into several main levels:

- universities with a research orientation. They are in the very center and are represented by strong institutions. They provide science with qualified personnel, trained specialists;
- technical universities are oriented, first of all, to various popular, numerous specialties, helping the regions to find personnel.
Of course, all the noted areas need constant updating of special software solutions. It is imperative to take into account global trends and practices in the area we are considering. In addition, it is necessary to focus on the possibility of integration into the digital space.

The coordination of the federal executive authorities (FEA) shall be structured. Key technologies, their basis, competencies in the future will be noted in those areas that are not within the powers of the Ministry of Agriculture of the Russian Federation. A competent system shall be built for interaction with other federal executive authorities in the field of scientific, institutional platform. All this is related to the new stages in the development of technologies [1].

7 Discussion

As a fairly thorough and detailed forecast shows, the volume of agro-industrial complex 4.0 until 2024 will show an increase of more than 55%. And in general, this amount will be significant (more than 2 trillion dollars).

The main indicators influencing growth and development in this direction:

- the final product of the agro-industrial complex. In 2024, this segment will be in the range of more than one trillion dollars;
- technological products (modern tools and solutions presented in full in this direction). In this regard, the figures will be more than 210 billion dollars;
- marketing with its main features and unique solutions in application: these include a modern platform for the prompt delivery of food products, this is included in $80 billion (10 percent of the growth and development of the agro-industrial complex);
- waste recycling: growth will be more than 13 billion dollars;
- the finished final product: the indicator of this volume of the agro-industrial complex is reduced down to 70% for some reason. First of all, in this direction, it is important to pay special attention to healthy, wholesome nutrition. In this particular case the increase is significant. It will amount to more than 400 billion dollars. All this can be studied in details from the table presented below (See Table 1).

<table>
<thead>
<tr>
<th>Segment</th>
<th>Billion dollars</th>
<th>CAGR</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIC products</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>1078</td>
<td>5.7%</td>
<td>+509.3</td>
</tr>
<tr>
<td>2025</td>
<td>1 588</td>
<td>5.7%</td>
<td>+430.4</td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>905</td>
<td>5.7%</td>
<td>+430.4</td>
</tr>
<tr>
<td>2025</td>
<td>1 336</td>
<td>5.7%</td>
<td>+430.4</td>
</tr>
<tr>
<td>including healthy food</td>
<td>894.4</td>
<td>5.6%</td>
<td>+419.2</td>
</tr>
<tr>
<td>including organic</td>
<td>140.0</td>
<td>15.3%</td>
<td>+240.0</td>
</tr>
<tr>
<td>including other types</td>
<td>10.8</td>
<td>10.7%</td>
<td>+11.2</td>
</tr>
<tr>
<td><strong>Non-food (biorefining)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>including biofuels</td>
<td>166.0</td>
<td>5.0%</td>
<td>+67.6</td>
</tr>
<tr>
<td>including other types</td>
<td>7.2</td>
<td>14.5%</td>
<td>+11.3</td>
</tr>
<tr>
<td><strong>Technologies and means of production</strong></td>
<td>244</td>
<td>9.9%</td>
<td>+229.3</td>
</tr>
<tr>
<td>including agrobiotechnologies</td>
<td>35.4</td>
<td>8.8%</td>
<td>+28.3</td>
</tr>
<tr>
<td>including robotics</td>
<td>7.5</td>
<td>42.1%</td>
<td>+80.4</td>
</tr>
<tr>
<td>including precision farming</td>
<td>4.3</td>
<td>17.7%</td>
<td>+9.1</td>
</tr>
<tr>
<td>including indoor farming</td>
<td>26.0</td>
<td>10.7%</td>
<td>+27.1</td>
</tr>
</tbody>
</table>

Table 1. AIC 4.0 growth structure in the world (2025)
8 Conclusion

Now the attention shall be paid some problems, difficulties in innovative solutions in this area. Of course, they are closely related to low-quality interaction in the main areas, including business and science. All this is mainly manifested in the following:

- the legal framework itself is not fully developed and well-formed. There is such a widespread negative phenomenon as bureaucracy. It is recommended to avoid it with all possible forces and resources so that there are no additional problems and doubts in the development of new, unique ideas and projects;
- many officials do not take any effective, competent and high-quality decisions and actions;
- there is no full-fledged, competent and, most importantly, urgently needed dialogue between science and business. Of course, all this is closely related to various factors. They can be objective such as a low indicator in equipping scientific institutes, a shortage of personnel and specialists. But there are also subjective problems, for example, the set goals are seen and considered by different structures in different ways. The is why there are no competent and unambiguous decisions, ideas, projects;
- attention is not fully paid to maintaining the constant and careful development of the transfer of modern technological solutions adopted for deep and focused study and analysis.

The main changes in the field of science, technical disciplines, all kinds of unique discoveries that have occurred recently, various problems of the current period show how important it is for the agro-industrial complex to move to a new level, to be developed in a different way. Changes are now on a grand scale, they are attracting attention, and they continue to evolve at a remarkable pace.

References

1. N.V. Orlova, E.V. Serova, D.V. Nikolaev, et al., Innovative development of the agro-industrial complex in Russia. Agriculture 4.0/report to XXI Apr. International scientific conference on the problems of development of the economy and society, under the editorship of N.V. Orlova; National Research University "Higher School of Economics" (Moscow, Ed. house of the Higher School of Economics, 2020), p. 128
4. P. Bowers, Unconventional aircrafts (Moscow, Mir, 2016), p. 320
7. V. Zayarin, K. Udalov, Aviation and time 2, 4-28 (2003)