

Improving the training of agricultural personnel in the context of agricultural digitalization: the case of Sverdlovsk region, Russia

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Abstract. The article presents the theoretical, methodological and empirical aspects of improving the training of personnel for agriculture on the example of digital agriculture in the Sverdlovsk region. A review of scientific sources on the studied issues is carried out. The basis of empirical research is the analysis of statistical data on the state of agriculture in Russia, as well as the analysis of statistical indicators of official reports of the agro-industrial complex and the consumer market of the Sverdlovsk region (2014-2019). The work uses data from independent Russian and foreign consulting and research institutions. In this article, the author solves the main problems in the field of agriculture.

1 Introduction

The selected topic is relevant in connection with the need to study personnel management in the field of digitalization of agricultural sphere in order to determine ways to improve their provision.

In the context of the digitalization of the social life, the role and need for training personnel, including for agriculture, is growing.

Traditionally, employee training in the organization is seen as a process of continuous improvement of knowledge and competency, skills and abilities of the employee, his creative activities [2]. As a rule, the training process is long and begins with the acquisition of knowledge and the formation of values, motives, incentives, etc. For example, for Russian companies, the most relevant educational technologies such as training, testing, implementation of a competency-based approach and other.

Particular importance is given to the process of training in a higher education, which is the main way to obtain a professional education. Education at a university is a process of purposeful, organized, systematic and systematic mastery of knowledge, skills, and

communication methods under the guidance of experienced teachers, tutors, specialists, and leaders [10]. At the same time, joint cooperation between professional and corporate education in the current conditions is very advisable and can benefit all agents of the educational services market [13].

For modern Russian enterprises, the problem of personnel training and increasing personnel potential is as obvious as for foreign ones. And the most acute issue is facing the enterprises of the agricultural sector, which in recent years has achieved significant success.

Unfortunately, Russian agriculture is almost the only industry where the share of personnel with agricultural education has significantly decreased over the past decade. In conditions of low wages and commercialization of education, many rural school graduates or already working professionals cannot afford to continue their studies and get higher education. In addition, only 20% of graduates begin work after graduation from a higher educational institution or college. Most of them remain in the city or are not employed in a specialty.

There is a reduction in specialists with both higher (59%,) and secondary specialized education (39%); the share of the most experienced managers and specialists aged 30–55 years is decreasing (4–5%) [8].

As one of the leading economists O.V. Inshakov said, the future of sustainable development of the agro-industrial complex «will be decided by people, their qualifications, skills, labor motivation and culture. Therefore, training and retraining, advanced training, staff formation are crucial for all areas of the complex» [9].

The unfavorable situation with personnel in the agricultural sector is developing in many agricultural regions of our country, although there are 59 agricultural universities and 25 institutions of additional professional education in the higher education system. Training with higher professional education is carried out in 122 specialties and 70 areas of undergraduate and graduate programs. Training of personnel with secondary vocational education is carried out by 26 higher educational institutions in 51 specialties [12, 13].

The issue of personnel training in the context of agriculture's digitalization has a great importance.

Digital agriculture is based on the use of automated decision-making systems, integrated automation and robotization of production. It involves minimizing the use of external resources (fuel, fertilizers and agrochemicals) with the maximum involvement of local production factors (renewable energy sources, biofuels, organic fertilizers, etc.).

Digital technologies can ensure a sharp increase in the efficiency of agribusiness, but so far they are not being introduced in the Russian agro-industrial complex as actively as in many other industries. The sensible uses of information technology can almost double the effectiveness of the Russian agricultural sector. The issues of agriculture digitalization remain rather unexplored. Features of digital technologies in agriculture are considered in the works of Nikitina A.S., Chevtaeva N.G. [14].

Digitalization of agriculture will allow to achieve a significant increase in the efficiency and sustainability of its functioning due to dramatic changes in the quality of management, both technological processes and decision-making processes at all levels of the hierarchy, based on modern methods of production and further use of information about the state of controlled elements and subsystems, as well as the conditions of the economic environment of agriculture.

Assessing the general characteristics of the current stage of digitalization in our agriculture, several points should be highlighted:

1. Digitalization is extremely uneven in the context of regions and enterprises. According to the Ministry of Agriculture of Russian Federation, conducted in 85 constituent entities of the Russian Federation, 20% of them demonstrate a high level of IT development, while the average is 29%. In half of the regions, the level is low. According

to the All-Russian Agricultural Census (VSHP), the share of large agricultural organizations for which the Internet is available is 63,5%, small agricultural organizations – 42,6%, peasant (farmer) households and individual entrepreneurs – 17,7% .

A system of accurate driving and remote quality control of technological processes, both portable and stationary, mounted in certain types of equipment was used by 12,3% of large agricultural organizations and only 3,3% of small, 0,5% of peasant (farmer) households and individual entrepreneurs [16].

This is partly due to the fact that there is still a digital divide between city and village, in rural areas, especially in the "rural outback", there is insufficient development of the so-called Digital infrastructure.

2. Lack of qualified personnel. According to the Ministry of Agriculture of Russian Federation, today there are half as few IT specialists working in agriculture as in countries with the traditionally developed agricultural sector in Russia. At present, the Russian agricultural sector needs about 90 thousand IT specialists

3. Weak use of information technology in the management and the implementation of agricultural and rural policies. In particular, we have practically no electronic registration of subsidies; agribusiness management bodies do not provide farmers with medium-term and short-term forecasts of food and resource markets, which creates great risks in drawing up business plans of enterprises and determining the specialization of regions; there are no rural development services.

Thus, it is necessary to improve the training of agricultural personnel in the context of digitalization of agriculture. Consider the process data for the example of the Sverdlovsk region.

2 Method

The basis of the empirical study is a method of analyzing statistics data about agricultural personnel in Russia and analyzing statistical indicators in official reports of the Ministry of Agriculture and the Consumer Market of the Sverdlovsk Region (2014-2019). Analysis of official statistical open data posted on the official websites of the Ministry of Education and Science and the Ministry of Agriculture of the Russian Federation, the Federal State Statistics Agency of Russia, the European Statistical Agency, and the resources of the BRICS coalition. In addition, the work used data from independent Russian and foreign consulting and research agencies. These methods allow us to identify the main trends in the field of innovative personnel for the agricultural sector, identify possible problems and propose measures to solve them.

As theoretical research methods, methods of deduction and induction, comparison, generalization, data forecasting were used as well.

3 Study detail and result

3.1 Results of statistics data about agricultural personnel in Russia

The level of education is one of the main competitive advantages of any business entity. There is a shortage of highly qualified personnel in agriculture in Russia. A comparison of the data employed in the Russian economy, hunting, agriculture and forestry is presented in table 1.

Table 1. Comparative structure of employed in the Russian economy and agriculture by educational level, % of the total number of employed, 2018

Occupation	Education level
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	High education	Secondary general education	Do not have basic general education
Economy in general	32,2	19,2	0,2
Agricultural	10,5	35,5	1,4

The above dynamics is aggravated by the age of those working in the agricultural sector. An analysis of information sources (Labor and employment in Russia for the period 2002-2017) suggests that the average age of employees increased from 41 to 43,7 years

It is necessary to pay attention to the fact that, according to open data, the level of providing the national agro-industrial complex with human resources with an appropriate level of education, according to the results of 2015, amounts to about 71% in agriculture and not more than 78% in food production. In other words, one third of the workers in agriculture do not have the education necessary for their position. The situation in the food production sector is slightly better, since only one fifth of the workers here do not have the proper education. At the same time, the provision of the Russian agricultural sector with human resources varies from region to region and, according to state statistics, is 82%.

However, independent consulting and research agencies indicate that in reality this figure does not exceed 66% (Figure 1).

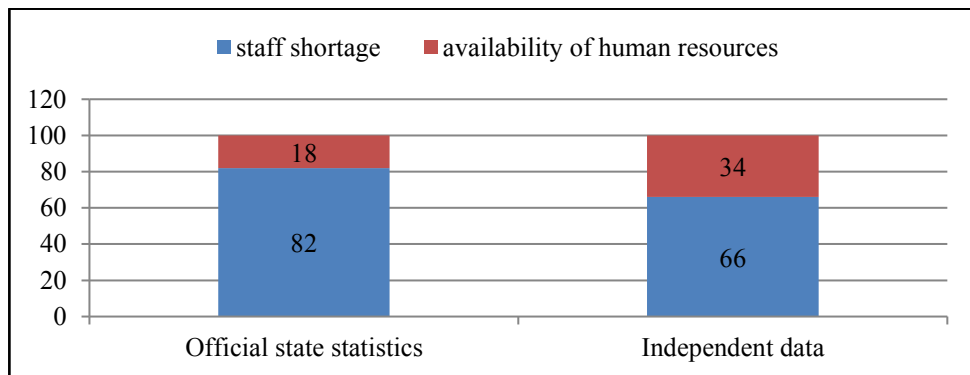


Fig.1. The staffing structure of the Russian agricultural sector with human resources (2017), %

The initial scatter of indicators can be explained both by the difference in the methodology of accounting for labor, and by various approaches to the formation of the sample for the study. But if we take the average value, we get that about a quarter of the agricultural enterprises are not provided with qualified human resources. In fact, this indicates that the Russian agro-industrial complex is in a state of permanent personnel shortage.

To improve the quality of labor resources, many economic entities of the agro-industrial complex carry out staff training and development. For example, at the end of 2018, about 46 thousand agricultural workers underwent professional training. At the same time, three most popular forms of training for agricultural workers within their professional activities can be distinguished: advanced training, training directly in the organization, vocational training, retraining and mentoring.

Training programs for agricultural workers focus on issues of technological security and environmental management. But issues related to the analysis and assessment of environmental risks of unsustainable environmental management are not always presented in training and retraining programs for middle and senior managers of agro-industrial enterprises. It is worth noting the trend related to the fact that not all higher education

institutions of agricultural profile are integrated into international projects aimed at implementing educational programs in the field of sustainable development of agricultural territories. For example, the SARUD program (International project “Sustainable Agriculture and Rural Development”, project initiator: University of Hohenheim from Germany) includes about 10 Russian agricultural universities. At the same time, the Russian universities that participate in this project focus on the development of an integrated master's program (economics, ecology, renewable resources and the social sphere). Undergraduate and secondary vocational education institutions do not have such integrated training programs for the agricultural sector and the agricultural sector.

It is also important to note that digitalization programs for agricultural personnel still do not exist. It is obvious that the current situation in the Russian agro-industrial complex in terms of ecology and innovation requires fundamental changes, which should begin with a change in approaches to building the entire training system.

3.2 Results of official statistics of the Ministry of agriculture and the consumer market of the Sverdlovsk region (2014-2019)

Let us analyze the main indicators of the ministry activity, particularly, the volume of gross agricultural output (table 2).

Table 2. Agriculture in the Sverdlovsk region

Indicators	2014	2015	2016	2017	2018	2019
The volume of gross agricultural output in farms of all categories in Sverdlovsk region, billion rubles	65,9	75,6	74,2	77,7	82,5	70,4
Labor productivity in agriculture of the Sverdlovsk region, thousand rubles per employee	1571	1894	2025	2169	2256,1	2216
Creation and modernization of high-performance jobs in the agricultural sector of Sverdlovsk region, thousands of workplace	0,995	1,075	0,916	1,287	1,821	2,145

As you can see from the figure, on average, the gross agricultural output in farms of all categories tends to increase. The highest rates in the region relate to 2018. In 2019, a significant decline of 10% is observed. Thus, based on the data obtained, it can be concluded that the agricultural economy of the region is healthy, and its implementation and maintenance require a significant number of highly qualified personnel.

These trends reflect on indicators of labor productivity in agriculture of the Sverdlovsk region (table 2).

Labor productivity has been increasing for 6 years. The creation and modernization of high-performance jobs in the agricultural sector also has positive dynamics. The exception is 2016 year when we had a crisis for the Ural agriculture. In general, we are seeing a positive trend. This conclusion is very important for us, because it is closely related to the digitalization of agriculture. Without modernization of the agro-industrial complex, we cannot talk about the digitalization of this sphere.

Then, we are going to analyze the staffing of the agro-industrial complex with qualified personnel.

Unfortunately, the number of implemented additional professional continuing education programs leaves much to be desired (table 3). A positive trend is observed only in the last 2 years. However, in comparison with other regions of Russia, the indicators are very small: on average, a total of 85 programs have been implemented. Among these programs, there are no programs on the digitalization of personnel for agriculture in the Sverdlovsk region.

However, it is worth saying that the number of people aged 25 to 65 years who have been trained in the agricultural sector of the Sverdlovsk region who has undergone advanced training and (or) vocational training is increasing (table 3). This indicates the desire of people to self-develop, to improve their professional level.

Table 3. The number of additional professional development implemented programs of Sverdlovsk region in dynamics over the years

Indicator	2014	2015	2016	2017	2018	2019
number of additional programs	87	94	83	78	81	87
people aged 25 to 65 years employed in the agricultural sector of the Sverdlovsk region who underwent further training and (or) vocational training	7953	8300	8483	8588	8817	8810

The agricultural development program has been implemented in the Sverdlovsk region over the past 2 years. Within the framework of this program, great importance is given to personnel living in rural areas and working in the field of agriculture. Within the framework of the program, the following results were obtained (table 4). As can be seen from the table, the number of people living in rural areas and past qualifications has increased. But unfortunately, the number of people who have undergone professional retraining in the agricultural sector has decreased.

Table 4. The number of young professionals living in rural areas who underwent further training and (or) vocational training

Indicators	2018	2019
The number of people who underwent advanced training and professional retraining for agriculture	41	24
The number of young professionals living in rural areas and working in organizations of the agro-industrial complex, peasant (farmer) farms that received payment from agricultural producers to acquire an economy	9	17

4 Discussion

Thus, in general, the personnel policy pursued in agriculture is being implemented positively. Positive changes are observed for various indicators. But at the same time, problems were identified in the field of personnel in agriculture of the Sverdlovsk region.

First of all, this is the lack of digitalization programs for personnel in the field of agriculture. We offer the following directions for improving policies to improve the personnel policy of the agricultural sector in the digitalization of agriculture:

- development the industry platform (project) for digitalization of the agro-industrial complex and improvement of the regulatory framework for the development of digital technologies. In addition to the aforementioned amendment to Article 17 of the Federal Law “On the Development of Agriculture”, it is advisable to give the necessary regulatory and legal status to the products being created, in particular, the data contained in the Unified Federal Information System on Agricultural Land, and a number of others. In particular, to legalize the use of remote sensing data for the examination of crop insurance;

- development of national and regional services for industry management, market forecasting and rural development;

- development of a system of models for compiling production programs of enterprises and optimizing the industrial structure of the agricultural sector in the region. For this, it is important not only to have information on the bioclimatic potential of the cultivated land, on means of state support for the production of a particular product, but also medium-term and short-term forecasts of food and resource markets, an assessment of transport and logistics development trends in general and other factors. All this is possible only on the basis of processing large amounts of information.

- creation of IT-products for the implementation of the recently adopted State Program for the Integrated Development of Rural Areas. It is, above all, a typology of rural areas.

Thus, the proposed activities will contribute to the development of a new agrarian technological policy of the Russian Federation and growth in related industries. In addition, digitalization in agriculture creates the conditions for attracting private financing of the developed platforms and applications of agricultural producers, and the active involvement of agro-consulting services.

Summing up, it can be argued that at present it is necessary to modernize existing approaches to training and retraining specialists for the agricultural sector, taking into account the concept of a green economy, to restore a multi-level education system based on the integration of efforts of agricultural universities, secondary vocational education institutions, science and the state.

New conceptual approaches that form the scientific paradigm of the future, such as the green economy (such as the integration of the economic, environmental, social context and resource-renewed approach to environmental management), should be fully reflected in the educational process of agricultural universities, including in specialist training programs in institutions of secondary and continuing education. The education system that supplies human resources for the agro-industrial complex should be balanced in the context of introducing environmental disciplines and disciplines in the theory and practice of innovation into the training process.

To this end, at the macroeconomic and microeconomic levels, a unity of views should be ensured on resolving the issue of increasing the environmental responsibility of economic entities of the agro-industrial complex. At the same time, it is important to understand and remember that the task of modernizing the educational system is inextricably linked with solving the whole complex of problems of the socio-economic development of rural territories.

It seems that, as the experience of developed countries in this area shows, the national education system should be reformed and optimized taking into account the ecological scientific paradigm of innovative economic activity. The solution to this issue should already begin at the present time, including by developing scientific ties and the exchange of experience with leading universities in the world.

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