Problems of personnel training for the digital transformation of the agricultural industry

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Abstract. The article is focused on the problems of providing the agrarian industry with qualified personnel. The authors emphasise the relevance of these problems in the conditions of the country's aspiration to digital transformation of the agrarian sector. The article analyses the results of a survey of 100 respondents, representatives of the agricultural industry. According to the respondents, today in Russia there are problems that hinder the successful digital transformation of the agricultural industry. One of the most acute problems is the shortage of qualified personnel due to the outflow of able-bodied population from rural areas and the high average age of the existing working population. In the framework of this article, proposals are made to improve the professional level of existing workers through additional professional education. The authors propose a methodology for the formation of additional professional programmes based on the modular principle, which allows to carry out professional retraining of workers in the agrarian sector with the use of minimal time and resources.

1 Introduction

The digital transformation of the global economy provokes changes in all industries, including agro-industrial production [1-3]. The catalyst for the introduction of digital technologies in Russian industry was the approval of state development programmes focused on the digitalisation of various spheres (e.g., Order of the Government of the Russian Federation No. 1632-r of 28 July 2017 on the approval of the programme "Digital Economy of the Russian Federation").

The level of digitalisation of the economy in the world is assessed by several indicators (composite indices), among which the International Digital Economy and Society Index (I-DESI) is the most interesting in terms of assessing the digitalisation of industries. The International Digital Economy and Society Index measures the progress of countries in the development of the digital economy and society according to the following components: connectivity, human capital, internet usage, integration of digital technologies, digital public services (for 28 EU countries and 17 other countries). Such component as "Integration of digital technologies" directly depends on the level of implementation of digital technologies in all industries, including the agricultural industry. The conditions for the introduction of digital technologies include: provision with qualified personnel, the latest equipment, and the

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availability of appropriate digital technologies [4-5]. Next, let us consider whether the human resource potential of the agricultural industry allows making the transition to the digital economy.

2 Problem statement

According to experts, the staffing situation in the agricultural sector of the economy is a cause for concern. The lack of decent living standards leads to demographic problems in rural areas: the outflow of the able-bodied and economically active part of the population to the cities continues. As a consequence, the level of qualification and the number of rural personnel is decreasing. The average age of agricultural workers is increasing. Under such conditions, the issue of training qualified personnel for the agricultural industry, who would be able to work with modern equipment and implement digital technologies, is relevant [6-8]. One of the most common reasons for the outflow of young population from the village is the lack of decent wages, prestige of profession and poorly developed infrastructure for comfortable life. The outflow of migrants in connection with the pandemic also aggravated the situation with staff hunger in the agricultural sector. According to the hh.ru service, the most in-demand specialists in the agricultural industry are agronomists, veterinarians, storekeepers, sales representatives, loaders, drivers, as well as labour safety specialists, engineers and technologists. According to RBC, a low percentage of employment by speciality is noted in many universities that train personnel mainly for the agro-industrial complex. Thus, in 2021, the employment rate at the Voronezh State Agrarian University named after Emperor Peter the Great was 64%, and at the Kuban State Agrarian University named after I.T. Trubilin (KubGAU) 54% were employed, while 7% of the total graduates started working in agricultural and timber processing companies. In 2021, a total of 1.2 thousand people graduated from agrarian programmes in the South of Russia, 63% of whom are employed in the agricultural sector, while the rest work in related and non-core areas.

3 Research issues

As part of the research, let us determine what are the ways to provide the agrarian industry with qualified personnel. First of all, we will identify weaknesses in the training of new personnel and in the retraining of existing ones. Secondly, we will search for new methods to solve the identified problems.

4 Research objective

The aim of the research is to find effective ways to solve the problem of staffing of the agrarian industry.

5 Methods and materials

The survey method (testing) was chosen as the research method [9-10].

The survey method is one of the most common methods of sociological research and helps to collect primary information about objects, phenomena and processes. However, it should be taken into account that the data obtained by the survey method contain subjective opinions of respondents. Therefore, it is necessary to compare this information with the information obtained by other methods. A sociological survey loses much of its meaning if the answers of respondents are not analysed in terms of their social and demographic characteristics. Therefore, questions about age, employment and social status were also
included in the questionnaire. For the greatest efficiency of the survey we will follow the following rules:

1) the respondent is aware of the purpose of the survey;
2) the respondent is not interested in giving out false information;
3) the respondent unambiguously understands the content of each question;
4) the questions are formulated competently and do not contain obscure words;
5) none of the questions has an offensive meaning for the respondent, does not humiliate his/her dignity;
6) the number of questions does not overwork the respondent.

The study involved 100 representatives of the agrarian industry from different regions of Russia, both employees of the agrarian industry and representatives of agrarian universities (teachers and students). Age category of respondents: from 20 to 70 years old. Both male and female representatives took part in the survey. The survey was conducted anonymously and exclusively on a voluntary basis. The questionnaire contained the following questions:

1) How do you assess the availability of qualified personnel in the Russian agricultural industry (from 1 to 10 on a ten-point scale)?
2) How do you assess the attractiveness of work in the agricultural sector for young people (from 1 to 10 on a ten-point scale)?
3) How do you assess the level of agrarian education (from 1 to 10 on a ten-point scale)?
4) Do you consider it necessary to make changes in the educational system of the agricultural sector in the conditions of transition to digital transformation?
5) What do you see as the causes of staff shortage in the agricultural industry?

The answers received from the respondents were analysed and formed into diagrams (Fig. 1-4).

As can be seen from Fig. 1, the majority of respondents (39%) assessed the level of provision of the Russian agricultural industry with qualified personnel as 3 points on a 10-point scale. The attractiveness of work in the agrarian sphere for young people was predominantly estimated at 2 points on a 10-point scale (43%). [11-14] The level of agrarian education was predominantly rated 6 points on a 10-point scale (51%). Also 94 % of respondents answered that they consider changes in the educational system of the agrarian industry in the conditions of transition to digital transformation necessary. Among the reasons for staff shortages in the agricultural sector, the respondents named:

- Low labour remuneration of agricultural workers;
- low level of prestige of the profession;
- low quality of life in agricultural areas;
- insufficient level of social support of agricultural workers.

The method of expert judgement was used to assess the reliability of group assessments. It is considered that group assessments of objects are reliable if there is a high degree of consistency between the experts' assessments. Quantitatively, the degree of consistency of experts is calculated as the coefficient of agreement (E), which is a multiple correlation coefficient. The coefficient of agreement is calculated by the formula:

\[ E = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} R_{ij}}{n^2}, \]

here \( n \) is a number of respondents (experts), \( R_{ij} \) – grade correlation coefficient i and j of experts. The top limit of the coefficient E is equal to 1 and corresponds to the case when all experts’ evaluations of objects coincide: \( R_{ij} = 1 \) (complete agreement of experts). The lower limit is equal to zero. According to the results of calculations we obtained \( R_{ij} = 0.72 \). Thus, the opinions of the respondents can be considered to be fairly agreed.
6 Conclusions

According to the results of the conducted survey, as well as to the analysis of literary sources, the following conclusions can be drawn:
1) training of future personnel for the agrarian industry does not meet the current level of technology development and provokes "lagging behind" even at the stage of entering the digital transformation;
2) the professional level of existing employees in the agricultural industry lags behind the current level of technological development.

To solve the above problems, the following ways can be proposed:
1) introduction of "advanced" training in higher education programmes of agrarian universities, based on the best world practices with consideration of Russian specifics;
2) systematic professional retraining and advanced training of agricultural workers.

Today, continuous professional development is a necessity for every employee in any sphere of industry. The development of the digital economy leads to the emergence of new and renewal (change) of existing professions. The pace of scientific and technological progress is so high that the system of higher education does not have time to prepare graduates for the constantly changing requirements of the labour market due to the mismatch between the speed of updating educational programmes and the pace of technology development, and employers do not have time to respond to the transformation of employee qualifications and carry out rapid retraining / advanced training. In this regard, when we talk about training new personnel for the agricultural industry, who should participate in the digital transformation of the industry, i.e. today's students of agricultural universities, it is necessary to predict what competences will be in demand in the agricultural industry by the time they graduate. In this case, the advanced training of personnel means the formation of necessary professional competences in the field of introduced, emerging or planned to be introduced means of production, techniques and technologies.

In the process of organising advanced training there are such priority tasks as:
1) renewal of material and technical base of agrarian universities;
2) professional development of teaching staff;
3) updating the content of educational programmes.

For the organisation of professional retraining of personnel of the agrarian industry it is proposed to use a modular approach. The methodological basis of professional retraining programmes is the basic modules that complement the variable modules focused on specific specialization. Such a modular approach is considered in [15] and has proven itself in practical application.

Saving on staff training leads to a decrease in the economic efficiency of the implemented innovations. For full-fledged digitalisation of the agricultural sector, computer literacy of agricultural workers should be increased. Centres of professional development and vocational training for agricultural workers are needed. Training in digital competencies must be included in educational programmes [16-17].

### 7 Summary

At present, the economies of most developed countries of the world are in the stage of digital transformation. Various innovations, nanotechnologies, business projects and know-how are the new reality. Intelligent technologies are becoming faster, more compact, more efficient and more powerful every year and are becoming the key to solving problems in various spheres of activity [18-42]. The agricultural sector is not an exception. Over the last decade, the agro-industrial complex has undergone significant changes. On the agenda is the solution of a wide range of problems, the search for new technologies for the production of environmentally friendly and safe products, and the expansion of international trade in agricultural products [43-53]. The use of digital technologies in agriculture will contribute to reducing the level of production costs; increasing the financial accessibility of food products. The process of digital transformation of the industry should lead to the rational use of natural...
resources. The level of competitiveness of enterprises of the agro-industrial sector, both in the Russian and international markets in the future should increase. This will lead to an increase in the level, biosafety, quality and attractiveness of work in the agro-industrial complex. The development of digitalisation of the agro-industrial complex in the regions of the Russian Federation implies the use of human resources in this process, and the personnel involved in this process must have a list of all the latest competencies required to work in the new environment.

In Russia, in order to maintain a proper level of labour productivity in the agricultural industry, it is necessary, first of all, to solve the issue of qualified personnel supply. In addressing this issue it is important to combine the formation of a new social policy to attract young personnel (improvement of socio-economic conditions of the rural population), introduction of "advanced" training in the educational programmes of higher education of agrarian universities and improvement of the professional level of existing employees (through additional professional education - advanced training programmes, professional retraining, internships).

The Government of the Russian Federation is also taking more radical measures to address this problem. For example, in the summer of 2023, at the Russia-Africa summit, representatives of the Tver Region signed an agreement with a large Tanzanian company on the settlement of Russian villages by migrants from Africa, who are to be engaged in farming in Russia. The main activities of the above-mentioned Tanzanian company are viticulture, winemaking, production of sultanas, ginger and avocado. The opinion of experts and representatives of the agricultural industry on this issue is mixed. However, obviously, solving the problem of staff shortage in this way may take a long time. This is due to the need to adapt migrants to new climatic and cultural conditions. Moreover, it will certainly require training of resettlers in order to familiarise them with technologies and techniques, peculiarities of farming in the Russian climate. Time will show how productive these measures will be.

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