

# The role of training industry experts with digital competencies in the development of rural areas

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**Abstract**— This article presents the results of monitoring staffing of the agro-industrial complex of the region, educational services of higher and vocational education programs which include digital competencies. The following key problems in this area were revealed: lack of personnel, low qualification level, lag in the presence of digital competencies in the industry. The analysis of educational service proposal of higher and vocational education programs with digital competencies was carried out, as well as of the formation of continuous education system for managers and industry experts in agriculture of the region. The experience of the Federal State Budgetary Educational Institution of Higher Education “Omsk State Agrarian University” was given, in creating a resource personnel center for the agro-industrial complex and providing the industry with qualified specialists. Understanding the importance of digital skills for working in agricultural sector, the project in its development provides for the availability of distance learning courses for manufacturers in the field of digitalization.

**Keywords**— *personnel, agro-industrial complex, rural areas, digitalization, resource personnel center, education.*

## I. INTRODUCTION

In order to ensure the progressive multifunctional development of rural areas, it is necessary to solve a number of urgent problems, such as: acute shortage of personnel in rural areas, its low qualification level, and weak implementation of digital innovations in agriculture.

Thus, according to Agrarian Education Development Strategy of the Russian Federation until 2030, for agricultural sectors, specialists are required with skills and professional competencies that meet the demands of modern technological and high-tech production (particularly in the field of genetic engineering, production robotization, precision farming, etc.) [2, 3].

Providing the rural areas with specialists with necessary qualification is difficult because of the low popularity of agricultural work, especially among young people, and low wages [6]. In this regard, issues of staffing the agricultural sector during transition to a digital economy are matters of priority for state and regional policies aimed at the effective development of rural areas [5].

The goal of this research is to monitor the staffing of the agro-industrial complex of the region, educational services of higher and vocational education programs with digital competencies, as well as the formation of continuous

education system for managers and industry experts of agricultural sector in the region.

## II. LITERATURE REVIEW

Theoretical and applied research of the following Russian scientists made a significant contribution to solving a wide range of problems associated with sustainable development of rural territories and the mechanism of their functioning: R.Kh. Adukov, A.N. Adukova, V.M. Bautin, V.I. Belousov, S.N. Bobylev, V.R. Boev, L.V. Bondarenko, I.N. Buzdalov, V.N. Burkov, A.G. Granberg, I.B. Zagaytov, A.P. Zinchenko, A.V. Chayanov, A.V. Shalaev, A.A. Shutkov et al. Foreign scientists, such as Joel Jebadurai D., Luca L., Fernando M., Crunel E., Smith L.O., Petrin T., Tkachuk V.A., D. Sepik, A. Bonfiglio, S. Carter, P. Rosa, G. Feenstra, J. Jebadurai, M.PaulI, A. Sharma made a great contribution to the development of the theoretical and practical knowledge related to rural territories. Certain issues of the development of management systems in general and the problems of designing information management systems in particular were developed in the works of the following scientists: V.P. Bozhkov, G.R. Gromov, G.V. Dvas, O.V. Zaborovskaya, Yu.M. Kanygin, G.A. Krayukhin, V.G. Lebedev, V.V. Lipaev, S.V. Prokopenkov, K. Shannon, U. Ashley et al. In turn, the following scientists currently took up the problems of the development the personnel potential of industry enterprises and increasing the effectiveness of vocational education institutions: K.A. Kubarev, R.I. Isaev, Z.G. Danilova, A.M. Dodov, E.A. Kiuru et al. However, the problem of resource concentration and creation of resource personnel centers in the conditions of the development of economy digitalization processes has not been studied yet, and the existing works do not sufficiently reveal approaches to solving the problem of training industry experts with digital competencies for the development of rural areas.

## III. RESEARCH METHODS

Theoretical and methodological basis of this research was formed of the works of modern domestic and foreign scientists addressed to the study of the socio-economic problems of providing industry enterprises with specialists with digital competencies. In this case, by digital competencies we mean the ability of employees to apply digitalization technologies for their professional activities. In addition, because of understanding the importance of staffing the industry with competitive personnel in the system of sustainable development of rural areas, the experience of Russian and foreign scientists in this field was studied. Our

research was based on general scientific methods (analysis, synthesis, induction, etc.). The opportunities of the study area were assessed from the point of employment attractiveness, actual professional level of managers and the availability of programs for improving this level. Information base of the study included materials obtained from the Ministry of Agriculture of the Russian Federation, the Ministry of Labor and Social Development, Federal State Statistics Service, expert assessments and the results of authors' calculations.

**IV. RESULTS**

One of the core tasks of managing sustainable rural development is the recovery and rational use of existing resources, including human ones. The training of specialists in agro-industrial complex should ensure that the future demands of agriculture are met, that is, it should be forward-looking. In this regard, the issue of training industry experts with digital competences for the development of rural areas is particularly relevant [1, 4].

As part of this study, monitoring of the demand for qualified personnel in organizations of the agro-industrial sector of the region was carried out for different natural and climatic zones: northern, northern forest-steppe, southern forest-steppe and steppe. The results are shown in Table 1.

**TABLE I. NUMBER OF VACANCIES IN THE ORGANIZATIONS OF AIC OF THE OMSK REGION IN 2018<sup>a</sup>**

Field	Natural and climatic zone			
	northern	northern forest-steppe	southern forest-steppe	steppe
Livestock farming	18	33	50	52
Crop production	4	6	69	20
Mechanization	7	19	31	38
Recycling	0	2	1	1
Economy	2	5	7	5
Management	2	3	1	1
Other	0	3	2	3
<b>TOTAL</b>	<b>33</b>	<b>71</b>	<b>161</b>	<b>120</b>

<sup>a</sup> Designed by authors on the basis of source 8

The disproportion was revealed – the closer the territory is to the regional center, the more acute the staff shortage associated with the development of new production is. In the field of livestock farming there is the largest personnel shortage of 153 vacancies, or 40% of the total. Approximately the same shortage of personnel was found in the closely related spheres of crop production and mechanization, 99 and 95 vacancies, respectively. Economy accounts for 5%, and other field – no more than for 2% of vacancies.

The rate of development of rural areas is largely dependent not only on their geographical location, but also on the professional competence and age of the heads of local authorities, agricultural and processing enterprises (Table 2).

Result of the study of 544 managers showed that persons in senior positions are people of age from 24 to 80 years. The group of young managers under the age of 34 is the smallest – 27 (or 5%), the number of the leaders of middle age (35 to 54 years old) amounts to 237 (43%).

**TABLE II. NUMBER OF MANAGERS OF DIFFERENT AGE AT AGRICULTURAL ENTERPRISES IN THE OMSK REGION<sup>b</sup>**

Age, years	Managers, number	Age, years	Managers, number
Under 30	5	55–59	112
30–34	22	60–64	111
35–39	35	65–69	45
40–44	53	70–74	10
45–49	64	75 and older	2
50–54	85	<b>TOTAL</b>	<b>544</b>

<sup>b</sup> Designed by the authors according to the data obtained from the Ministry of Agriculture of the Omsk Region

The group of managers of pre-retirement and retirement age (older than 55 years) turned out to be the most numerous – 280 persons, or 52%. This speaks for their experience and competence, however, there is an intergenerational gap between age groups, there is no mentoring system; 67% of enterprises showed the low level of knowledge of modern digital technologies; there is slow career growth of young professionals.

To achieve their goals, managers need to develop the appropriate competencies in order to manage the company successfully regardless of the situation and current factors. In this regard, it is necessary to raise the level of education and qualifications.

It should be noted that there are managers (8.6%) who have only initial vocational education what is not enough for the effective management of the organization at the present time. Therefore, this group of managers needs professional development and additional training.

In the course of this study, a forecast for staff renewal was made on the basis of their pre-retirement and retirement age and taking into account their level of education (Table 3).

**TABLE III. THE FORECAST OF DEMAND FOR MANAGERS AND SPECIALISTS IN THE FIELD OF AIC IN THE OMSK REGION FOR 2019-2023 (PERSONS)<sup>c</sup>**

Demand for personnel	2019	2020	2021	2022	2023
For managers	82	62	58	49	47
For specialists, total:	1,777	1,625	1,567	1,519	1,491
including:					
- replacement of working retirees	1,392	1,255	1,211	1,177	1,162
- open vacancies	385	370	356	342	329
<b>TOTAL</b>	<b>1,859</b>	<b>1,687</b>	<b>1,625</b>	<b>1,568</b>	<b>1,538</b>

<sup>c</sup> Designed by the authors on the basis of the study

In the coming years until 2023, the region will require more than 8,000 qualified specialists and about 300 managers.

To provide the AIC with highly qualified personnel, a content analysis of the educational services provided in the city of Omsk and in the Omsk Region was conducted which showed that the appropriate training is conducted in 23 educational institutions of higher, secondary and primary vocational education on a wide range of training programs (82 proposals).

For the agrarian sector in the region, specialists of different levels are trained in nine integrated groups of specialties and training programs. The maximum number of proposals is provided for the group 35.00.00 – Agriculture, forestry and fishery, among them, 9 programs in the systems of higher and secondary vocational education each, 7 programs in primary vocational education. Half as many proposals were presented in all levels of education for the

following programs: 38.00.00 – Economics and Management (13 proposals), 19.00.00 – Industrial Ecology and Biotechnology (12) and 21.00.00 – Applied Geology, Mining, Oil and Gas and Geodesy (eleven). In the veterinary and zootechnical programs there are eight proposals, five of which are in the higher education system.

In addition to basic vocational education, specialists and managers need additional retraining or professional development which is one of the main elements in the system of continuous professional education. These programs are realized by the Institute of Additional Professional Education on the basis of the Federal State Budgetary Educational Institution of Higher Education “Omsk State Agrarian University”. Among the most popular additional education programs are “Economics and management of agricultural enterprise”, “Farming business”, “Information and communication technologies”, “Electronic certification of goods under the supervision of the state veterinary inspection in “Mercury” automated information system” and others (Table 4).

TABLE IV. LIST OF THE MOST POPULAR PROGRAMS IN THE SYSTEM OF ADDITIONAL EDUCATION OF THE FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION OF HIGHER EDUCATION “OMSK STATE AGRARIAN UNIVERSITY” FOR 2017<sup>E</sup>

Educational program	Students, number of
<b>Professional retraining</b>	
Economics and management of agricultural enterprise*	21
Farming business	13
Safety of AIC technological processes and production	13
Accounting, analysis and audit *	12
<b>Professional development</b>	
Information and communication technologies*	265
Improving agricultural production efficiency*	91
Modern problems of veterinary-sanitary inspection, requirements for the organization and conducting of state veterinary inspection*	89
Electronic certification of goods under the supervision of the state veterinary inspection in “Mercury” automated information system*	60
Improving the efficiency of peasant households (farms) in present-day conditions	53
Current issues of accounting and taxation in AIC*	52
Actual methods of prevention, diagnostics and treatment of infectious and non-communicable diseases of farm animals	49
Strategy and tactics of adaptive technologies in crop production*	41
Using of distance learning technologies in education*	40
Business organization*	40
Ultrasound diagnostics of small pets	38
Veterinary pharmacy with the basics of clinical pharmacology	36
Improving livestock production efficiency*	32
<b>Total students</b>	<b>945</b>

<sup>d.</sup> Programs including issues of digitalization in AIC

Thematic scope of realized additional education programs is determined in accordance with the requests of employers and labor market. In 2017, 4 retraining programs and 13 professional development programs were the most popular. Personalization of additional educational programs allows creating individual educational paths in accordance with the requirements of professional standards. The structure of specialist training is constantly being adjusted; training in popular specialties of agro-industrial complex starts; programs of disciplines are changed in accordance with the requirements of employers of agricultural enterprises for the quality of training of specialists and workers under the transition to the digitalization of regional agrarian economy.

The leader in the field of agrarian education and science in the Omsk Region is the Federal State Budgetary Educational Institution of Higher Education “Omsk State Agrarian University” whose graduates are in demand not only in the Omsk Region, but also in other regions of Russia. Total number of graduates in 2017 amounted to more than 2,600, including 1,385 in higher education system, 273 in secondary vocational education system and 945 people in additional education system.

However, it should be noted that with a large variety and a significant number of proposals, there are not enough specific programs aimed at obtaining knowledge, skills and competencies to effectively work with digital technologies, such as: “smart farm”, “smart flock”, “smart field”, “smart greenhouse” and so on. Not only leading experts, but also management representatives of agricultural enterprises have no idea about basic digitalization technologies. However, the task is definitely set at the highest level. Thus, the May Decrees of the President of the Russian Federation defined the creation of “...a modern and safe digital educational environment which provides high-quality and available education of all types and levels...”, “...providing fast implementation of digital technologies in economy and social sphere”.

Understanding the importance of solving the tasks set for the domestic economy, Omsk State Agrarian University established a regional resource personnel center (hereinafter referred to as RPC) which provides effective interaction of scientific and educational organizations, state authorities and business structures based on the balance of their interests in solving staffing problems, on mutual social responsibility and activity.

The activity of this center is aimed at solving problems related to the organization of continuous professional training and retraining of personnel in agricultural programs and specialties, including these with the development of digital competencies; monitoring and forecasting staffing needs of regional labor market; conducting information, consulting, expert, scientific activities in the field of rural development management.

Let us note that for the period of RPC operation since 2014, significant results have been achieved, however, the developed separate parts (information and analytical materials, scientific developments of the scientists of Omsk State Agrarian University) do not cover the issue of the integral development of agricultural production and rural areas in the region. In this connection, in the framework of continuous training of subject specialists with the competencies in digital economy, it is proposed to create a unified regional information and analytical system, on the basis of RPC, for the digital support of agro-industrial sector which will allow this to be carried out for the rural subjects for the main areas of focus: education, science and consulting services.

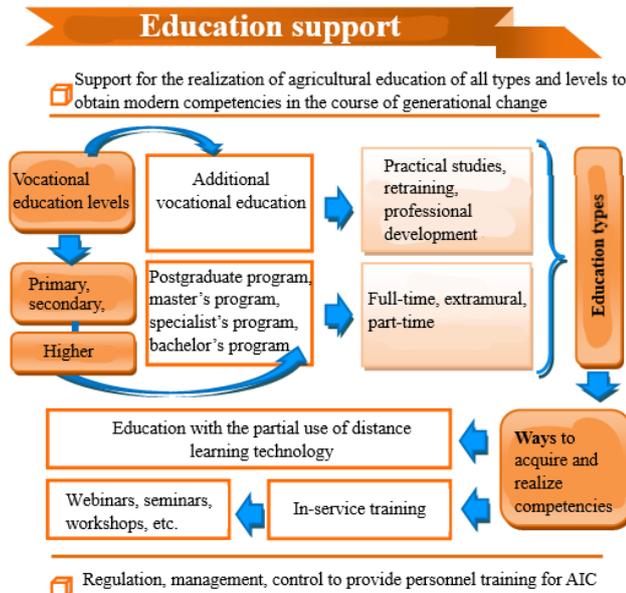


Fig. 1. Digital support carried out by the resource personnel center for continuous education of specialists in the agro-industrial sector (developed by the authors)

The main goal of creating a digital support system for continuous education is to increase the competence and digital literacy of specialists, productivity and efficiency of agriculture through innovation, and business involvement in the scientific and educational process to the end that employees can acquire modern digital competencies (Figure 2).

Understanding the importance of digital skills for working in agricultural sector, the project in its further development provides for the availability of distance learning courses for manufacturers in the field of digitalization. Since the future of agriculture lies in the active implementation and use of blockchain technologies, artificial intelligence, Internet of things, it is perfectly clear that without employees with digital competencies, neither further development of business structures in agro-industrial sector, nor effective development of agrarian economy is possible [7, 9].

## V. CONCLUSION

Modern technologies developed in agriculture require a completely new approach to the recruitment and the process of obtaining professional competencies by future specialists. Today it is perfectly clear that only a high level of training of employees with digital competencies can provide the global competitive advantages in this industry. In this regard, digital

support for personnel training, implementation of scientific innovations and online consulting in the realization of projects in rural areas, for support for first-time farmers, including high-tech agricultural start-ups, should be a key tool for the development of rural areas. Using of the resources of this system will increase the level of professional knowledge of rural producers and entrepreneurs to a level that allows them to make well-founded decisions, to increase the efficiency of their financial and economic activities, to attract young people to agro-business. Understanding the importance of this activity, Omsk State Agrarian University creates the conditions for training specialists for the industry with digital competencies. A resource personnel center has been established where personnel training and professional development are conducted within specific programs aimed at obtaining knowledge, skills and competencies for effective work with digital technologies.

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