

# Staffing of agricultural organizations of Ryazan region in conditions of economy digitalization

I.G. Shashkova\*, L.V. Romanova, S.V. Kornilov, P.S. Vershnev, and E.I. Mashkova

Ryazan State Agrotechnological University named after P.A. Kostychev, 390044 Ryazan, Russia

**Abstract.** The article presents the main problems of the introduction of digital technologies in agro-industrial complex. It is revealed that at present there is no single integrated solution for agricultural enterprises, which would integrate solutions for various branches of agriculture. It is substantiated that the task of creating a digital platform, with the help of which various digital solutions of specific business processes will be integrated, is a top priority. The tools for managing the digital transformation and innovation activities of the dairy industry enterprises and the platform solutions being created are considered on the example of Europe's largest robotic animal husbandry complex in the dairy sector.

## 1 Introduction

The digital transformation of the country's economy is one of the main challenges Russia is facing in the coming years. This means that the tools of the digital economy should be clear and accessible to all participants in business processes.

The state has developed and actively implements programs for the development of digitalization for various industries, including the agro-industrial complex of Russia. It is important to note that its implementation is impossible without the interaction of the state and business. To introduce digitalization into the business processes of agricultural enterprises of the country, many problems need to be solved. And one of them is reluctance of most enterprises to introduce new comprehensive technologies [1].

Questions of automating business processes have been discussed since the 60s of the 20th century. At that time methods of modeling business processes were actively used. At the end of the 90s of the last century, automation of work places began. A popular theory was that organizations would create islands of "automation", which would then be combined into a single automated enterprise management system. Unfortunately, for most agricultural enterprises this stage ended with automation of accounting only. But even here the merit of the enterprises themselves is not obvious. The requirement of the authorities for the delivery of financial statements in electronic form is the main reason for progress in this direction [2].

## 2 Results and discussion

One of the main problems of the lag in the introduction of digital technologies in agriculture as compared with other industries is the low profitability of production, and as a result, the lack of funds for development in this

direction. The realities of today's time show that without the introduction of advanced technologies, the country's agro-industrial complex will not be able to reach a qualitatively new level of development. It is estimated that the average cost savings in land use with the use of GPS navigation technology is 11–14 %, with variable fertilization – 8–12 %, and thanks to parallel driving systems – 8–13 % [3]. Consequently, each enterprise will either keep up with the times, introducing digital technologies and integrating into the global digitalization process, or will leave the market. Affiliations of authors should be typed in 9-point Times. They should be preceded by a numerical superscript corresponding to the same superscript after the name of the author concerned. Please ensure that affiliations are as full and complete as possible and include the country [4].

In 2019, the Ministry of Agriculture of the Russian Federation began to implement Departmental project "Digital Agriculture" [5]. This project consists of the following five areas:

- "Effective hectare" – the creation of the Unified Information System for Agricultural Lands (UIS AL), in which the state and use of each land plot will be indicated. In the future, on the basis of UIS AL, effective use of each hectare will be planned.
- "Smart contracts" – the creation of personal cabinets for obtaining subsidies and future automation of the provision of subsidies and other types of government support on the basis of smart contracts.
- Agroexport "From Field to Port" – modeling of export flows and, in the long term, linking the forecasted yields to the rolling stock of Russian Railways to avoid "bottlenecks".
- "Agro solutions for agribusiness" – creation and scaling of projects "Smart farm", "Smart field", "Smart flock", "Smart greenhouse", "Smart processing", "Smart warehouse", "Smart marketing office".

\* Corresponding author: [irina@rgatu.ru](mailto:irina@rgatu.ru)

- "The Land of Knowledge" – the creation of an electronic educational system and training of 55 thousand specialists of agricultural enterprises for 3 years.

According to industry experts, integrated digitization of agricultural production will allow farmers to reduce costs by 23 %. The use of digital economy tools in the agro-industrial complex will make it possible to restructure the entire process of production and marketing of agricultural products profoundly, which, in fact, is called digital transformation. Digitalization due to its end-to-end nature informationally connects the end user and the agricultural producer, eliminating unnecessary intermediaries, who now account for up to 80% of the cost in the retail price of the product [2].

The main difficulty of digitalization in the AIC is the integration of all systems and business processes. Currently, a single integrated solution for agricultural enterprises has not been developed that would integrate solutions for various branches of agriculture. Therefore, the task of creating a digital platform, by means of which various digital solutions of specific business processes will be integrated, is of prime importance [6].

In addition to modern technological solutions, special staff training is required with skills to work with modern software. The introduction of digital technologies will require IT specialists capable of supporting digital technologies, preparing software, etc. According to the information on professions in demand until 2020, received from agricultural enterprises, first of all, it is necessary to stimulate the influx of young professionals to organizations to work in specialty "Electrification and Automation".

This updates the new requirements for a specialist in agro-industrial production and the level of training of graduates of agricultural universities. The modern agrarian sector needs personnel of a new format, possessing the skills of organizers, production technology, production management and marketing, who know the methods of analysis and forecasting of economic activities, as well as IT specialists. In the longer term, the agricultural education system should become a part of the full-cycle management model "from farm to fork", which will systematically ensure the implementation of the country's food safety strategy.

The Ministry of Agriculture of the Russian Federation has developed a Strategy for the Development of Agrarian Education until 2030, aimed at modernizing the existing system of agricultural universities. The main directions of development of agrarian education are aimed at:

- Improvement of the content and technologies for the implementation of educational programs.
- Development of research potential of agrarian education.
- Ensuring effective investments in human potential in the interests of the agro-industrial complex and sustainable development of rural areas.
- Modernization of the network of educational institutions and optimization of education management.
- Development of resource provision of the system and expansion of the circle of persons and organizations

interested in the development of agricultural education [3].

As a part of this strategy, agricultural universities should become advisory centers for all market participants, while students' training should be focused on the close interaction of science and business. The Ministry of Agriculture of the Russian Federation also developed the Federal Scientific and Technical Program until 2025, providing for an increase in the number of licensing agreements of agricultural enterprises with scientific organizations by 50 %, as well as improving the staffing of the agro-industrial complex in three main areas:

- Improvement of the content and technologies of continuous agricultural education.
- Stimulating the retention of young professionals in the agricultural sector of the economy.
- Development of a system to monitor and manage staffing of the agricultural sector.

One of the main directions of improving agricultural education, in our opinion, is its life-long character, which implies that the agricultural sector workers receive additional professional education and undergo advanced training programs shown in Table 1 [3].

**Table 1.** The number of employees who received training, got education in 2010–2018

Parameter	Year			2018 in % to 2010
	2010	2013	2018	
Trained workers, total, thousand	4,996.8	4,365.7	6,069.5	121.4
Trained agricultural workers, thousand	57.7	51.9	83.9	145.4
Of them:				
- received additional vocational education, thousand	15.5	20.9	26.2	169.0
- trained in professional retraining programs, thousand	2.3	3.4	7.4	in 3.2
- trained in advanced training programs, thousand	13.3	17.5	19.4	145.8

Educational institutions of the Ministry of Agriculture of Russia are implementing additional professional education programs. Each year, educational institutions under the Ministry of Agriculture of Russia are involved in professional retraining and advanced training of more than 30 thousand students, including 19 thousand at the expense of the federal budget. It is necessary to note a tendency to increase the proportion of the number of agricultural workers who received training or got education in the total number of trained workers. So, in 2018, this figure was 1.3 % or 83.9 thousand people. At the same time, the number of employees who received additional vocational education increased by 69 % in 2018 compared to 2010. The highest growth rate was noted in terms of an increase in the number of employees trained in vocational retraining programs – 3.2 times during the analyzed period [7].

Thus, agrarian educational organizations of higher education should become the core of the innovative development of the agro-industrial complex of the regions, since universities are professional educational and research institutions, which include scientists of higher qualification represented by a wider range of research in various scientific and information areas [8].

These are the main problems to be solved in the coming years. And the success of digitization of agriculture both in Russia as a whole and in individual regions of the country depends on how well they will be solved.

Ryazan region is actively involved in the process of digitization of agriculture. Agribusiness in Ryazan region has reached a certain maturity, as evidenced by the stabilization of the level of investment in agriculture and increased competition among agricultural producers shown in Table 2.

**Table 2.** The dynamics of agricultural production in Ryazan region

Parameter	Year					2018 in % to 2014
	2014	2015	2016	2017	2018	
Total agricultural products (billion rubles), including:						
plant growing products	20.20	21.92	24.27	24.28	25.01	123.8
livestock products	9.16	9.00	11.46	10.11	10.29	112.3
The structure of agricultural production, %	11.04	12.92	12.81	14.17	14.73	133.4
plant growing:	100	100	100	100	100	–
- agricultural organizations	45.3	41.1	17.2	41.6	41.1	90.7
-C(F)E	31.1	29.5	33.9	38.1	44.4	142.8
- PSF	5.8	6.3	7.4	8.2	9.0	155.2
livestock:	63.0	64.0	58.6	53.5	46.5	7.8
- agricultural organizations	54.6	58.9	52.7	58.3	58.9	107.9
-C(F)E	50.1	63.2	64.1	64.7	65.6	130.9
- PSF	6.9	5.5	5.9	5.0	4.7	68.1
	42.9	31.2	29.9	30.2	29.6	69.0

Recently, the volume and quality of application of modern technologies, including systems for collecting, storing and processing data, has been growing in the regional agro-industrial complex. Data from satellites, sensors, operational and transactional systems are used. At the same time, both the amount of data and the need for high-quality processing and reliable conclusions that can be relied upon when making decisions increases. As a result, there is a demand for industrial analytical systems and depth analytics, in particular [9].

Leading agricultural enterprises in the region are successfully introducing digital technologies into the industry system, such as:

- SMT (GPS / GLONASS trackers, fuel sensors).
- Animal activity sensors / boluses.
- Personal identifiers (RFID cards, IButton).

- Parallel driving systems.
- Precision farming systems.
- UAV / drones.
- Smart weather stations.
- Weight measuring instruments.
- IP cameras.
- Animal milking systems.
- ERP systems.

Much attention in the region is paid to the training of qualified personnel for agriculture. One of the goals of the State program of Ryazan region "Development of the agro-industrial complex" is to increase production efficiency in the agro-industrial complex through information and consulting services for the agro-industrial complex, scientific research, as well as the formation of the personnel potential of the agro-industrial complex of the region. The implementation of the Program should ensure by the end of 2025 an increase in the number of retraining and advanced training of personnel in the agricultural sector of Ryazan region on the basis of educational organizations (annually at least 50 people).

Program activities to ensure the fulfillment of its objectives include:

- Scientific agribusiness support;
- State support for young specialists in the agricultural sector (one-time benefits and monthly benefits);
- Subsidies for retraining and advanced training of personnel in the agricultural sector.

Further professional education is one of the areas of activity that can help employees of agricultural organizations master digital technologies. At Ryazan State Agrotechnological University, this area of activity is given special attention. The programs of advanced training and retraining include sections that make possible to acquire the necessary competencies. Improving the efficiency of livestock and crop production today is the use of intelligent technology. The number of agricultural robots to be controlled is increasing. In 2017, the production of robots and robotic devices amounted to 73 thousand units. By 2024, this figure should grow by a factor of 8. The largest number of robots is involved in the production of cattle milk – 55 %, followed by robots for other livestock farms – 22 %. The share of robots for the crop industry is 18 % (11 % – robots for crop care and 7 % – robots for tillage).

The leader among agricultural organizations of Ryazan region in the digitalization of business processes is LLC Vakinskoe Agro, a modern agro complex organized in 2012. The company's activity is plant growing, feed production, cattle breeding, production and sale of dairy products under its own brand "ECOVAKINO".

Two livestock farms in LLC Vakinskoe Agro are equipped with robots that carry out automated milking of cows. In total, the company has 33 milking robots. This is the largest number of robots concentrated in one place in Europe, in Russia. All milking robots are manufactured by DeLaval. Structurally, each milking body is divided into four sections and each section has

2 milking robots. Each section provides 4 zones: a feeding area, where there is food on the feeding table, a rest area, where there are beds for insemination, to perform any medical work and the feeding and milking area. Animals themselves are accustomed to the robot and milked without problems. Each animal is provided with a responder collar and a sensor that allows it to pass through the selection gate and through the robot, where the cow then closes. On the left there is the activity sensor, which detects a cow in estrus, all is done by means of a special program that is used in the camera room. The cow comes into the robot for a mixed fodder.

In the camera room, there are specialists of the zoo-technical and veterinary services. Online management can look at the current state of the farm. The program has everything you need, all the information for each cow. Every specialist of the company can see the information he needs. Robotic milking provides a cleaner product than other milk production technologies: with accurate measurements of fat and other nutrients for each breeder. The use of these advanced technologies makes it possible to unify the milking process, reducing the risk for the animals and increasing their productivity.

Table 3 presents the dynamics of the main parameters of livestock production.

**Table 3.** The dynamics of the main parameters of livestock production in LLC Vakinskoe Agro.

Parameter	Year				
	2014	2015	2016	2017	2018
Number of robots	33	33	33	33	33
Total livestock	4.121	4.420	4.826	5.375	5.470
including cows	2.151	2.317	2.557	2.813	3.014
Milk yield per 1 fodder cow, kg	7.326	7.814	7.918	8.369	8.946

As it can be seen from Table 3, the number of robots has not changed over the entire period of operation of the modernized farms. The livestock increases. The number of cows increased by 40 %. The milk yield per cow increased by 22 %.

As can be seen from Table 3, animal productivity increased due to milking parlors. The main advantage of this innovative equipment at the enterprise is the reduction in labor force. Among the automated functions of milking parlors used in Vakinskoye Agro LLC, it is worth highlighting:

- Storing information about each animal;
- Analysis of product quality;
- Operative feed intervention in the event of a shortage of any of the batteries;
- Diagnosis and prevention of animal diseases;
- Automatic cleaning and hygiene standards.

In addition to the introduction of robotics in animal husbandry, the company introduced modern automated lines for the production of various types of dairy products. To date, the following products are available under the brand "ECOVAKINO": milk, cream, sour

milk, baked yogurt, sour-milk drink "Snowball", sour cream, as well as organic foods.

Thus, the company has organized a closed production cycle with quality control at each stage, which ensures a high standard of products and the company's reputation.

Implementing the concept from the field to the counter, the company sells 60 % of its production in Ryazan region, the rest of the products are sold in Kaluga, Tula and Moscow regions. Contracts have been negotiated for the supply of products with various grocery stores, such as Pyaterochka, Karusel, Globus, Magnet. Direct delivery to Metro cash-and-carry in both Ryazan and Moscow has been organized. The company is planning to conclude an agreement with one of the world's largest retail chain operators, Auchan.

Despite the fact that the main business processes of the enterprise are automated, LLC Vakinskoe Agro plans to continue the implementation of digital technologies in the processes of both production and management. Today, the task is to create a unified dairy plant management system, introduce a product traceability program and temperature control regimes, consolidate with the Mercury veterinary system, digital labeling for packaging of manufactured products.

At the same time, the company pays great attention to specialists' training, since work in modern production requires not only theoretical knowledge, but also practical training. Close cooperation with the Federal State Budgetary Educational Institution of Higher Education "Ryazan State Agrotechnological University Named after P.A. Kostychev" makes possible to provide the company with highly qualified specialists - veterinarians, zoo technicians, engineers. In turn, at the university, LLC Vakinskoe Agro equipped a computer classroom with on-line access to its robotic farm. All processes occurring on the farm are available to students during theoretical training. In the framework of practice-oriented training, students travel to the enterprise for practical training. LLC Vakinskoe Agro also takes students to practice, giving the opportunity to consolidate their knowledge in production.

### 3 Conclusion

Summing up the research, we can say that digitization of business processes is being actively implemented in the agriculture of Ryazan region. The tasks of applying tools for managing digital transformation and innovation activities of agricultural enterprises using models of information, financial and organizational interaction of subjects and their integration entities, as well as platform solutions being created in the face of increasing competition, are being solved. At the same time, special attention is paid to training the specialists who possess skills in the digital environment and who are able to apply the latest technologies in their work.

### References

1. T.I. Gulyaeva, V.I. Savkin, E.Y. Kalinicheva, O.V. Sidorenko, E.V. Buraeva, *Modern*

- organizational and economic aspects and staffing issues in breeding and seed production* J. of Environmental Managem. and Tourism **9(8)**, 1789–1798 (2018)
2. S. Stapleton, C. Fruin, C. Shorey, L.N. Taylor, C. Dinsmore, *Partnerships in agricultural publications: University of Florida's marston science library and the Florida state horticultural society* Library Trends **65(3)**, 359–377 (2017)
  3. *Official site of the analytical center of the Ministry of Agriculture of Russia* Retrieved from: <https://www.mcxac.ru/upload/medialibrary/>
  4. J. Swanberg, J.M. Clouser, W. Gan et al., *Poor safety climate, long work hours, and musculoskeletal discomfort among Latino horse farm workers* Archives of Environmental and Occupational Health **2(5)**, 264–271 (2017)
  5. *Government Decree of 07.03.2008 no. 157 "On the creation of a system of state information support for agriculture"* Retrieved from: <http://base.garant.ru/12159225/>
  6. L. Buchholz, *The research of the current state of economic activity in the Romanian agricultural sector. Case study: Braila and Ialomita counties in Proc. of the 24th Int. Busin. Inform. Manag. Association Conf. "Crafting Global Competitive Economies: 2020 Vision Strategic Planning and Smart Implementation"* 1177–1185 (2014)
  7. I.G. Shashkova, L.V. Romanova, *The development of priority markets in the region as a factor in improving its competitiveness in Proc. of the Int. Sci. Conf. "Competitive, sustainable and safe development of the regional economy: the answer to global challenges" (CSSDRE 2018). Series: Advances in economic, business and management research* **39**, 650–653 (Sian, Shaanxi, China, 2018)
  8. M.M. Skalnaya, *Staffing of agricultural organizations* Economics of agriculture of Russia **2**, 72–78 (2014)
  9. A.S. Zavgorodnyaya, I.G. Shashkova, V.S. Konkina et al., *Adaptive Management of the Agricultural Enterprise in the Conditions of Environmental Uncertainty* J. of Advanced Res. in Dynam. and Control Syst. **7(Special iss.)**, 2022–2031 (2018)