

# AGRONOMY, FORESTRY AND WATER MANAGEMENT

## General Farming and Crop Production

UDK 633.15/.16:631.8

### **Formation of productivity elements of winter barley and corn for grain, depending on different doses of fertilizers applied**

**Marina Kh. Balkarova, Khazhset A. Khamokov**

**Abstract.** This article analyzes the results of studies to establish the dependence of winter barley and corn productivity on different doses of applied fertilizers. The experiments were conducted in the foothill zone of Kabardino-Balkaria from 2019 to 2021. The soil of the experimental plots is represented by leached chernozem. The humus content (according to Tyurin) is within 3.5%, phosphorus – 8.7 mg/100 g, potassium – 11.1 mg/100 g (according to Chirikov). The soil pH is neutral – 6.7. The winter barley variety "Babylon" and the grain corn variety "Kavkaz 307 MV" were chosen as the objects of research. The experiments showed that in winter barley crops, in the variants with the application of fertilizers, the indicators of productivity elements were higher than in the control ones. An increase in the fertilizer doses (in the first year of the studies) from  $N_{40}P_{40}$  to  $N_{145}P_{160}K_{155}$  resulted in an increase in the number of stems before harvesting from 3.48 million pcs/ha to 4.67 million pcs/ha. The number of grains and the weight of grain in one ear were significantly higher when fertilizers were applied. The results of the experiments on corn crops for grain also showed the dependence of the productivity elements and the structure of the crop on the amount of fertilizers applied. The increase in the weight of 1000 seeds, when using fertilizers, in the first year of the experiments was from 231 to 278.6 g (about 19%); in the second year – from 213 to 250.4 g (about 14%); in the third – from 224 to 269.7 (about 19%). The length of the cobs, on average over three years, increased with the application of fertilizers and reached 18.2 cm. Weather conditions also had a positive effect on the formation of productivity elements, which ultimately led to an increase in crop yields.

**Keywords:** productivity elements, barley, corn, climate conditions, fertilizers, crop structure

UDK 633.15:632.9

### **Efficiency of biological preparations and seed treatments against corn diseases**

**Zarema A. Ivanova, Fatima Kh. Thazeplova, Suzana A. Zhemukhova**

**Abstract.** The article presents the results of studies conducted in 2020-2023 on crops of the Rodnik 292 MV corn hybrid and the Etna variety. The purpose of the study is to study the effect of biopreparations and seed treatment agents against diseases of the Rodnik 292 MV corn hybrid and the Etna variety. Albit and Nikfan were used as biopreparations, and tetramethylthiuram disulfide (TMTD) and Fentiuram were used as seed treatment agents. The plant density was 60 thousand/ha. Fertilizers were applied at a dose of  $N_{120}P_{90}K_{40}$ . Phosphorus-potassium fertilizers were applied under primary soil cultivation, nitrogen fertilizers under spring cultivation. The experimental design included: Control, Albit, Nikfan, Albit and TMTD, Nikfan and Fentiuram, Albit and Fentiuram, Nikfan and TMTD. Control was carried out without

treatment. Corn seeds were treated with biopreparations at a dose of 10 liters of working solution per 1 ton of seeds. Seed treatment with TMTD was carried out at a dose of 4 liters of the preparation per 8 liters of water, and Fentiuram at a dose of 2 kg per 1 ton of seeds. The best results were noted with the combined treatment of corn seeds with biopreparations and seed dressings. The resistance to diseases of the Etna variety of corn was slightly higher than that of the Rodnik 292 MV hybrid corn. This can be explained by the fact that the Etna variety is more resistant to unfavorable environmental factors than the Rodnik 292 MV hybrid. It has been proven that the treatment of corn seeds before sowing with the Albit and Nikfan biopreparations has the greatest effectiveness against diseases than the action of the TMTD and Fentiuram seed dressings. The use of the recommended dose of the biopreparation with half the dose of the seed dressing has the greatest effectiveness in increasing the resistance of corn hybrids to diseases.

**Keywords:** corn, seeds, biological preparations, seed treatments, pests, diseases

## **ANIMAL SCIENCE AND VETERINARY MEDICINE**

### **Private Animal Husbandry, Feeding, Feed Preparation and Livestock Production Technologies**

UDK 636.234.1.03

#### **Productivity potential of introduced Holstein heifers**

**Albert B. Kazdokhov, Timur T. Tarchokov**

**Abstract.** Identification of the productivity potential of Holstein cattle and the nature of implementation depending on paratypic factors and linear affiliation is relevant and is of scientific and practical interest. A comparative study of the productivity potential of introduced Holstein heifers, which was carried out in Agro-Soyuz LLC, Chegem District, Kabardino-Balkarian Republic, showed that differences due to linear affiliation were established between the groups of experimental animals. Among the mothers of heifers, higher milk yield values for 305 days of lactation were found in animals of the V.B.Aidiala 1013415 line, which exceeded their peers of the R.Soveringa 198998 line by 5.7% ( $P < 0.95$ ). Higher milk fat content was found in cows of the R.Soveringa 198998 line mothers compared to the mothers of heifers of the V.B.Aidiala 1013415 line, which amounted to 0.14 abs.% ( $P < 0.95$ ). Similar results were obtained in the study of milk protein content, i.e. the superiority of R.Soveringa 198998 line cows over V.B.Aidiala 1013415 line animals in terms of protein content in milk is 0.04 abs.% ( $P < 0.95$ ). In general, the introduced Holstein heifers are characterized by a high genetic productivity potential, which varied in milk yield within the range of 10,621-11,073 kg, in butterfat content – 3.88-3.94%, in protein content – 3.19-3.2%. The maternal ancestors of the imported heifers of different lines were characterized by similar indicators of milk yield, butterfat content, although reliable differences were found in protein content in the groups of mothers of mothers and mothers of fathers.

**Keywords:** genetic potential, breeding value, productivity, Holstein breed, female ancestors, selection indices

# **Breeding, Selection, Genetics and Biotechnology of Animals**

UDK 636.2.082.034

## **Reproductive capacity of Swiss cows depending on paratypic factors**

**Andzor A. Bolov, Aznaur Z. Tyubeev, Timur T. Tarchokov,  
Mukhamed M. Shakhmurzov**

**Abstract.** The Swiss cattle breed is being improved by the method of intra-breed selection using the gene pool of the best representatives of domestic and foreign selection with simultaneous improvement of feeding and housing conditions. Breeding herds of Swiss cattle are distinguished by a high genetic productivity potential, which indicates the competitiveness of the breed. Research on the age-related variability of the reproductive qualities of the Swiss breed, conducted in three breeding farms of the KBR, showed that all zooveterinary measures should be aimed at realizing the biological potential of the productive longevity of Swiss cattle, paying attention to the need for targeted cultivation of replacement young animals and the annual introduction of 25-35% or more of proven first-calf heifers into the herds. The feeding and housing conditions created at all stages of rearing and lactation contribute to the implementation of the reproductive capacity potential of Swiss cattle, as evidenced by the close to optimal values of the reproductive capacity coefficient, which varied within the range of 0.96-0.97. The main reasons for the withdrawal of animals from farms are disorders of the reproductive organs (gynecological diseases, infertility), diseases of the limbs and injuries associated with the technology of keeping, diseases of the udder and low productivity. The average age of cows leaving the herds of Swiss cattle varies within 3.6-5.5 calvings.

**Keywords:** Swiss breed, reproductive capacity, paratypic factors, reasons for the withdrawal of cows, productive longevity

## **AGROENGINEERING AND FOOD TECHNOLOGIES**

### **Technologies, Machines and Equipment for the Agro-industrial Complex**

UDK 631.31

#### **Study of the process of interaction of working organs of soil cultivation tools with soil**

**Rasul A. Apazhev, Yuri A. Shekikhachev**

**Abstract.** Mechanical tillage along with crop rotation system, fertilization, crop protection from weeds, pests and diseases is one of the most important links in any farming system. At all times, tillage has been and remains one of the most energy-intensive and expensive processes in agriculture. According to various estimates, today it accounts for an average of 40% of energy and 25% of labor costs of the total volume of field work. Modern requirements for tillage implements require their creation on the basis of technologies that provide for maximum adaptation to the technological process, taking into account specific soil and climatic conditions of work. The main goal is to ensure the necessary indicators of the quality of loosening, which, first of all, mean obtaining soil aggregates of a certain size and improving the technical and economic results of the work. Ensuring the receipt of the required size of aggregates at the

design stage with a sufficient degree of probability is possible under the condition of the most fully developed mathematical model of the interaction of the working surface of the tool with the processed environment. This, first of all, presupposes the presence of mathematical models of the soil and the working element itself. The studies are based on the methods of physical and mathematical modeling, comparison. A plow tillage implement was used as an object of study. The results of calculating the parameters of the process of interaction of the working elements of tillage implements with the soil were processed using the STATISTICA-5.0 software package. As a result of the conducted study, the dependence of the movement of the ploughshare tip from the start of the movement to the moment of breaking off the soil prism on the characteristics of the cultivated soil and the parameters of the working body of the tillage tool was established.

**Keywords:** soil, cultivation, energy intensity, tillage tools, parameters, operating mode, modeling

UDK 631.3(470.64)

### **Operational substantiation of zonal recommendations for the efficient use of machine-tractor units (MTU) in the conditions of the KBR**

**Ruslan A. Balkarov, Vyacheslav B. Dzuganov**

**Abstract.** The article proposes a fairly simple method for solving aggregation problems using only typical regulatory and reference information. Based on this method, it is possible to quickly develop relevant recommendations even before the start of wide industrial operation of new tractors. At the first stage, a study is carried out using the example of traction units, the most common and complex in terms of their assembly. The proposed methodology is simplified by sequentially studying the MTA on two mathematical models. The first model characterizes the functioning of the unit in these natural production conditions. For this model, a mathematical expression of the optimality criterion is compiled and the corresponding tractor power is determined, which can be realized with the greatest efficiency. Taking into account the features of the technological process in the specified conditions, the type and specific brand of the tractor are selected. The second model is characterized by the interaction of the tractor mover with the soil and the working bodies of the implement with the processed environment during the working stroke of the unit. This model, taking into account agrotechnical requirements, allows determining the values of capture width and speed, at which the specific net productivity (per unit of power) will be the highest or energy costs will be the lowest. The methodology was tested using the example of substantiating a plowing unit for the conditions of the Kabardino-Balkarian Republic. The proposed methodology allows developing recommendations for the effective use of units in specific working conditions in a visual and accessible form.

**Keywords:** operational development, zonal recommendations, efficiency of using MTA, optimization methodology, operational parameters of MTA

UDK 631.354.2.02

### **Completeness of separation of impurities from grain heap by conveyor cleaning of grain harvester**

**Alamakhad D. Bekarov, Vladislav Kh. Mishkhozhev, Aliy Kh. Gabaev**

**Abstract.** The article considers one of the problems of high-performance conveyor cleaning of a grain harvester, which is insufficient completeness of separation of impurities. Field tests of a combine equipped with conveyor cleaning during harvesting of rye, barley and oats showed that in all three cases the completeness of separation of impurities from the grain heap increases until

the heap layer thickness on the sieve reaches 3 cm. At the same time, when the heap layer thickness reaches 4-5 cm or more, grain losses begin to increase. It was found that the completeness of separation of impurities can be significantly increased provided that small straw particles up to 1-2 cm in length are removed. For this purpose, it is recommended to use sections of the conveyor sieve with smaller hole sizes than during testing or to improve the conditions of the air flow effect on the grain heap processed during cleaning. This will allow achieving a purity of the bunker heap of 95% or more. It has been experimentally established that 40% by weight of the impurities remaining in the bunker heap after processing on the conveyor cleaning are weed seeds, 88.19% of which are removed from the harvested field by the conveyor cleaning. Thus, a combine equipped with a conveyor cleaning allows, in parallel with its main task, to a large extent to solve a very important environmental problem.

**Keywords:** combine, cleaning, heap, impurities, grain, completeness, separation, section, flow, content, purity, losses

UDK 620.22

### **Description of the molecular orientation of amorphous polymers in the framework of the cluster model**

**Zaira M. Zhirikova, Vladimir Z. Alov, Kantemir V. Alov**

**Abstract.** The article is devoted to the urgent problem of creating high-strength structural materials used in assemblies and parts of agricultural machinery. A successful way to solve this problem is to give a high degree of orientation to macromolecules. The degree of molecular weight is used as a characteristic of molecular orientation. To describe the molecular orientation, the cluster model of two macromolecular frameworks is used: molecular entanglements and molecular meshes. The important features of the cluster mesh of meshes in comparison with the mesh of entanglements are indicated. This goal is realized using the example of a simpler structure of the amorphous state of a polymer, polymethylmethacrylate, due to the lack of crystallinity in them. It is shown that information about the type and characteristics of the macromolecular framework involved in the orientation processes can be obtained from the results of measurements of birefringence from the degree of stretching. A comparison of the experimental and theoretical dependences of birefringence on the degree of extraction of amorphous polymethylmethacrylate showed a good agreement. It is shown that the parameters of the cluster mesh of meshes, determined by an independent method, allow a fairly accurate description of experimental data on the molecular orientation of polymethylmethacrylate. This, in turn, confirms the correctness of the structural model of the amorphous state of polymers.

**Keywords:** molecular orientation, cluster model, degree of stretching, cluster mesh, polymethylmethacrylate, Poisson's ratio, birefringence, glass temperature, rubber high elasticity.

UDK 631.3:632.9

### **Substantiation of the design and technological scheme of the herbicide plant for the treatment of trunk strips of fruit plantations in terraced gardening**

**Kantemir V. Mishkhozhev, Luan M. Khazhmetov**

**Abstract.** Weed control in gardens on terraced slopes is one of the problems faced by fruit growers. The main method of weed control used in intensive flat gardening is the chemical method with the introduction of herbicide into the near-trunk strips of fruit plantings. Experience in using machines for introducing herbicide into the near-trunk strips of fruit plantings has shown that for their

effective operation, two adjacent passes along the line of a row of fruit plantings are necessary. In the conditions of terrace gardening, an approach to the line of a row of fruit plantings is possible only from one side: from the side of the terrace canvas, the processing of the other side of the row is limited to the slope of the terrace. This circumstance reduces the effectiveness of the use of herbicide installations of domestic and foreign manufacture. In this regard, the proposed herbicide installation is equipped with an actuator made in the form of a vertical metal cylinder, inside which a pneumatic acoustic liquid sprayer is installed, and in the lower part a polymer disk with the ability to rotate in a horizontal plane is attached, on the outer cylindrical surface of the disk piles are attached, forming a cone-shaped elastic protective apron. Such a design of the herbicide installation allows for one pass along the row line to ensure effective processing of near-trunk strips of fruit plantings in terraced gardening.

**Keywords:** terraced gardening, fruit plantations, trunk strip, weeds, herbicide, herbicide plant

## Пищевые системы

### Food Systems

UDK 574.52:57.014

#### **Evaluation of oxidation-reduction properties and diffusion mechanisms of extracts containing alginic biogels**

**Anna T. Vasyukova, Marina D. Vedenyapina, Evgeny Yu. Latyshev**

**Abstract.** The results of the oxidation-reduction state of various media (algin biogels, aquatic ecosystems, colloidal dispersed and emulsion systems) obtained in numerous studies allow us to better evaluate the mechanisms and identify the features of their stability. The dispersion of stabilized emulsions depends on the particle size, the energy of their adsorption on the interfacial surface. Molecules of surfactants, nanoparticles, can both be adsorbed on the interphase surface and desorbed. Nanoparticles of deamidated gliadin and tannic acid stabilize an emulsion with a high content of the internal phase. Dependences of invert emulsions on a polar liquid (water) are revealed. Stability of emulsions obtained using synthesized emulsifiers is established. Alginic biogels stabilize the structure of jellies and increase the viscosity of these systems. The use of biogels in emulsion media imparts stability and non-separation to them for a long period. Obtaining microparticles of this gel in the structure of jelly or emulsion is insignificant, since the concentration of the used Na-alginate remains constant. The aim of the work was to study the oxidation-reduction properties and diffusion mechanisms of extracts containing alginic biogels. Materials and methods of research: Working solutions were prepared in distilled water. Aqueous and alcoholic ultrasonic extracts of algae (fucus, laminaria, chlorella) were used for the studies. The electrochemical properties of the analyzed substance in solution were determined by cyclic voltammetry (CVA). The dry matter content was determined by refractometric method on an IRF-454 B2M refractometer. The oxidation-reduction properties, charge-discharge mechanisms and electrochemical stability of extracts containing alginic biogels were estimated. It was found that the use of various algae (fucus, laminaria, chlorella) containing Na-alginate allows obtaining alcohol and water extracts of varying saturation with food and biologically active substances. The most effective method was ultrasonic extraction, allowing saturated extracts of three algae species to be obtained within 30 minutes. The concentration of dry substances in all samples obtained by ultrasonic extraction exceeds that of samples with water extraction. The same dependence is noted in the color intensity of all samples. The CVA method revealed oxidative instability of organic compounds in the studied aqueous extracts.

**Keywords:** ultrasonic extract, algae, redox properties, cyclic voltammetry, biogels

## **Development of technology for a non-alcoholic drink for dietary and preventive purposes**

**Amina S. Dzhaboeva, Zalina S. Dumanisheva,  
Jamilya R. Sozaeva, Alia A. Zokaeva**

**Abstract.** The justification of the use of everbearing raspberry varieties in the production of specialized products requires a study of the content of biologically active components in them in relation to the soil and climatic conditions of crop growth. The aim of the work was to determine the antioxidant potential of the berries of the everbearing raspberry variety "Poklon Kazakovu" grown in the Kabardino-Balkarian Republic, and to develop a technology for a non-alcoholic drink for dietary prophylactic purposes. The work used generally accepted and special physicochemical and biochemical research methods. It was found that the berries of the everbearing raspberry variety "Poklon Kazakovu" contain a complex of water- and fat-soluble vitamins, including antioxidants. The degree of satisfaction of the human body's needs when consuming 100 g of raspberries is covered in vitamin C by 30.2-100.7%; in folates and vitamin K – 1.7-4.6 and 3.0-12.0 times more than the daily requirement, respectively. The content of P-active compounds in raspberries of the Poklon Kazakovu variety was 552.7 mg/100 g. Based on the research results, a technology was developed for the production of a non-alcoholic drink for dietary prophylactic purposes using puree from everbearing raspberries of the Poklon Kazakovu variety, pectin extract from green pea pods, erythritol sweetener and Abiflor biocorrector. It was shown that the new drink is characterized by a high concentration of antioxidant substances – polyphenols (330.7 mg/100 cm<sup>3</sup>) and vitamin C (16 mg/100 cm<sup>3</sup>). It contains pectins in the amount of 1.12 g/100 cm<sup>3</sup>. 200 cm<sup>3</sup> of the developed drink covers the human body's need for P-active substances, ascorbic acid and pectin by more than 15% of the recommended daily intake.

**Keywords:** remontant raspberry variety, biochemistry, antioxidant vitamins, P-active compounds, soft drinks, technology, dietary preventive nutrition

## **The use of juniper cone extract to improve the microbiological safety and quality of grain bread from triticale**

**Elena A. Kuznetsova, Vera A. Gavrulina, Elena A. Kuznetsova,  
Natalia V. Dzhanchatova**

**Abstract.** Extract from the cones of juniper berries was used to soak grain in preparation for the production of grain bread. It has been established that the extract contains biologically active substances with antimicrobial and antioxidant properties. Experiments conducted on pure cultures of microorganisms have shown that the most effective inhibitory effect of the extract was found for strains of fungi *Mucor mucedo*, *Aspergillus candida*, *Aspergillus flavus*. The effect of the extract was weak against the fungi *Rhizopus stolonifer* and *Penicillium expansion*. The extract had an average effect on the growth of the bacterium *Bacillus subtilis*. A study of triticale grain after soaking in the extract showed that the number of mesophilic aerobic and facultative anaerobic microorganisms decreased by 72.64%, yeast and mold – by 96.65%, and spore-forming bacteria – by 96.55% compared with the control in which the grain was soaked in water. Technological solutions have been developed for the production of grain bread from whole grain triticale in a safe way, including the addition of 5% wheat gluten powder. The resulting bread can expand the range of bakery products with improved quality and antioxidant activity.

**Keywords:** extract, cones, juniper berries, microbiological safety, grain bread, triticale

UDK 663.52

## **The influence of wort pasteurization on the mash parameters and the yeast generation process**

**Madina B. Khokonova, Zalina M. Kardanova**

**Abstract.** This work is devoted to the study of the physicochemical parameters of alcohol wort before and after pasteurization and the identification of mash parameters depending on yeast generation. The studies were carried out at Premium LLC and at the Department of Technology of Production and Processing of Agricultural Products of the Kabardino-Balkarian State Agrarian University in 2023-2024. The objects of research were saccharified wort before and after pasteurization, mash, wheat malt, and *Asp. Oryzae* culture. Biotin calculations were carried out per 100 ml of the test medium before and after pasteurization. Wheat mashes prepared for fermentation into alcohol were studied. The unchangeable biotin content in the wort before and after pasteurization confirms that heat treatment of the medium does not inactivate biotin and does not reduce its content in it. It was established that the optimal pasteurization conditions are a temperature of 75°C and a duration of 30 minutes, at which the maximum amount of reducing sugars, dry and reducing substances is observed. Insufficient yeast cell content in the yeast of the first four generations did not affect the number of yeast cells in the daily mash. The yeast cell content is sufficient for fermentation, which is 86-102 million/ml. Better results are shown by the mash from the 6th-10th yeast generations than by the 1st-5th generation, in terms of reducing substances by 0.14 mg/ml and reducing sugars by 0.11 mg/ml. It has been determined that mashes prepared with yeast and pasteurized wort have good technological indicators, and fermentation takes place in more sterile conditions with normal reproduction of yeast cells during fermentation. The final indicators of the finished mashes differ insignificant values for fermentation, acidity and residual starch.

**Keywords:** weight, wort, yeast fermentation capacity, fermentation duration, pasteurization, mash

## **ECONOMY**

### **Regional and Sectoral Economy**

UDK 338.43

## **Regional differences in agricultural food prices as a factor in the dynamics and stability of national agriculture**

**Natella M. Duguzheva, Madina N. Eneeva, Khadis M. Rakhaev**

**Abstract.** Among the many factors and conditions that influence the state and dynamics of prices, the phenomenon of spatial differences has remained poorly studied until recently. The latter determine the flow of capital, technology, labor, and goods between industries and types of activity and, ultimately, lead to price stabilization. Although in some cases these same differences serve as the basis for dynamic fluctuations in the price trajectory and industry development. Until recently, the issue of spatial differences in prices (as well as the ongoing equalization) was considered as the cause of resource differences (the concentration of various resources in regional markets), accordingly, it was solved by targeted (as in directive economies) or spontaneous/opportunistic (as in market economies) injections of resources into regions with high prices. On the other hand, the state and other institutional actors purposefully injected



resources into territories with low prices in order to "revive" economic life in the latter. However, a closer examination shows that the so-called alignment (and therefore movement) of prices occurs long before the movement of goods, materials, labor, and financial resources begins. We are talking about expectations and "looking over one's shoulders". The latter create a specific state of psychology of economic agents, stimulating them to take various risks, and thus "heating up" the market situation. The present study is devoted to identifying this phenomenon in the dynamics of prices of agricultural products.

**Keywords:** price, food and agricultural raw materials, per capita cash income, per capita cash expenditure, neighborhood effect, price elasticity

UDK 338.436.33:658

## **Inventory management at agro-industrial enterprises based on the Harris – Wilson model**

**Anzhelika R. Mirzoeva**

**Abstract.** This article is devoted to the analysis of inventory management tools in the context of supply activities of enterprises of the agro-industrial complex. The article analyzes the application of the classic inventory optimization tool – the Harris – Wilson model in the specific conditions of the agro-industrial complex. The study focuses on the features of the model use due to the seasonality of production and consumption, price instability and limited shelf life of agricultural products. A detailed analysis of the factors influencing the choice of the optimal order size is carried out. These include storage costs, delivery costs, product turnover rate, seasonal fluctuations in demand, risk of spoilage and price instability. The practical part of the article presents an algorithm for applying the Harris – Wilson model using the example of a specific enterprise of the agro-industrial complex. The results of the study demonstrate that the Harris – Wilson model can be successfully adapted to optimize the inventory management system in the agro-industrial complex, allowing to reduce storage and purchasing costs, minimize risks associated with price fluctuations and, ultimately, improve production efficiency. This article will be useful for specialists in the field of inventory management, managers of agricultural enterprises, as well as students studying logistics and supply chain management.

**Keywords:** stocks, supply, agro-industrial complex, agriculture, management, Harris – Wilson model, order optimization

UDK 338.436.33:004.9

## **Current state of technological and digital support of the enterprise of the agro-industrial complex**

**Fatima I. Pilova**

**Abstract.** The article is devoted to the problems of digitalization of enterprises of the agro-industrial complex of Russia. The necessity is proved and the main directions of using digital technologies in the functioning of enterprises of the agro-industrial complex are described. This will allow agriculture to become a developed sector of the economy, characterized by high labor productivity and reduced unproductive costs. In recent years, the use of digital technologies in agricultural enterprises has become an indispensable condition for survival and dynamic

development in a competitive environment. Such technologies are increasingly used to analyze the external environment, optimize business processes and conduct strategic and operational planning. Digitalization gives businesses the opportunity to strengthen their key competencies, improve the efficiency of management of all functional areas, and create effective risk management mechanisms. The article analyzes the technological and digital development of enterprises, which must be carried out in combination with modern trends in industrial development at the macro and micro levels, and also assesses the potential of production capacities for making an objective management decision in the direction of further stimulating the growth of the level of technological development of the agro-industrial complex. It is noted that the use of imperfect technologies can lead to an increase in financial and labor resources to ensure the production process and equipment maintenance.

**Keywords:** agro-industrial complex, enterprise, digitalization, digital technologies, digital transformation

UDK 338.436.33:004.9(470+571)

## **Modern trends in digitalization of the Russian agro-industrial complex**

**Rameta E. Shokumova**

**Abstract.** In modern conditions, the processes of digitalization of the economy are actively developing, which, ultimately, led to the digital transformation of economic sectors. These changes were facilitated by the creation of state digital systems, the launch of departmental projects, the growth of demand for import substitution, the introduction of technologies using artificial intelligence, the use of unmanned aerial vehicles on the territory of farms. Digital transformation of the agro-industrial complex involves the integration of digital technologies into all areas of agriculture and the transition from mechanical operations to digital processes. The article discusses the main areas of development of the Digital Agriculture project, the implementation of which is designed until 2024 and provides digital technologies that will be scaled in the agricultural sector. In this regard, we conducted a dynamic analysis of the use of ICT in agriculture, considered electronic sales channels and identified a trend in their use. Digitalization of the agricultural sector is held back by insufficient technological competencies and a shortage of IT personnel, based on this, the number of jobs replaced by robotics in organizations of the Russian Federation and by federal districts was analyzed. The use of robotics will further optimize costs and improve the quality of manufactured products by reducing the influence of the human factor. One of the important areas of reforming the economic system in terms of digitalization of the Russian economy is innovation. In this aspect, we examined the level of innovation activity by types of economic activity in agriculture and identified the need to intensify innovation as a parameter of the country's competitiveness. We also analyze the focus of Russian IT companies on the agricultural sector with proposals to automate business processes, taking into account the specifics of agriculture and the determinants that slow down the process of digitalization at all stages of the economic chain. Since business entities in the agricultural sector see the goal of digitalization in optimizing energy and labor costs, reducing the risk of unforeseen breakdowns and optimizing processes in production and logistics.

**Keywords:** digitalization, transformation, agro-industrial complex, trend, agriculture, innovation, digital tools