Features of the use of information technologies in agriculture

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Abstract. The article shows the features of the use of information technology in the agricultural sector of the economy. The main information technologies used for the innovative development of the country's agriculture in recent years are considered. It was revealed that one of the factors of effective agricultural production is the use of modern information technologies, and this is not only computer technologies (equipment and software) for the production and storage of information, but also technologies associated with the transfer of information. The questions of the use of resource-saving technologies in agriculture have been studied in details.

1. Rationale
In modern conditions the intensification of agro-industrial production is one of the main tasks of the priority development of agriculture (in terms of food issues and the need to increase competitiveness) in the country and the regions. The most effective way of developing the agro-industrial complex is to apply automation and comprehensive mechanization as well as develop the information technologies. These steps allow to obtain a larger quantity and variety of high-quality food products for each unit of used resources.

The innovative development of the agro-industrial complex is slowing down, due to the low level of technological equipment, largely determined by the technical and technological level of the industry and inadequate qualifications of personnel. While the world and European experience in agricultural work is already directly related to information technology, in Russia this area has not yet been practically opened. Several decades ago, the goal was not to achieve high performance at minimal cost, but to provide employment for the country's population. And today we have the market economy. The priorities have changed towards improving the efficiency of the agricultural sector. And it can be said that a technological revolution is currently taking place in the agriculture of Russia\footnote{1].

Information technology is an important resource for influencing the system of low-cost, sustainable production of food and raw materials for industry, improving the quality and safety of food, reducing the man-made load on the environment, and reducing losses in the production of agricultural products.
2. An overview of modern information technologies used in agriculture

The introduction of modern information technologies in agriculture presupposes the constant enrichment of information from various external sources (for example, via the Internet) from almost anywhere in the area at any time. Obtaining data on certain weather forecasts may be available to farmers throughout the day. This allows a more rational and effective use of various chemical plant protection products, and also significantly reduces the risk of environmental pollution [2].

In the modern information society, any farmer can access the global Internet from anywhere in the area using powerful wireless communication devices. Farmers can keep track of all aspects of the functioning of their homestead if they provide animals with miniature computers connected to the general Internet. In addition, after installation of various types of sensors in the right places on the farm, information can be read from them at any time.

Various developments in the field of information technologies for animal breeding are of the great interest. Miniature sensors can be implanted or attached to all animals. Herewith, a special software can have extensive knowledge about the location of animals in the global navigation system, as well as about the health and well-being of certain species (cows, sheep or goats). In case of unforeseen situations, the electronic shepherd can transmit information to the farmer via the Internet.

In the modern world, it would be very important to support the development of the market of environmentally friendly and safe products and technologies that are the most competitive and promising in terms of development of innovative technologies. The issues of the production of environmentally friendly products are coming to the fore today. In this regard, technologies that allow to increase the products purity are highly anticipated today. The use of modern technology also contributes to the improvement of product quality. And, of course, one of the priority areas was and remains everything related to increasing of goods productivity [2]. Innovations that allow harvesting several harvests of agricultural products per year successfully complement technologies of waste-free production and technologies of competent harvesting and preservation of crops.

Precision farming is becoming one of the relevant areas of use of information technology in agriculture. Precision farming provides a strategy for managing the crop yields using a global positioning system (GPS), geographic information systems (GIS) and technologies, and data from multiple sources about conditions for plant growth and development as well as the economic situation of each management unit within a particular field [3].

The lack of interest of agricultural producers in information technology is often attributed to the low level of education and age of farmers. It is believed that the main reasons for the reluctance to use information technology are economic. Basically, they use conventional (standardized) technological operations for growing agricultural products and relatively cheap plant protection products as the most effective ways to make a profit.

One of the signs of the use of information technology in farms is the presence of computers, as well as their connection to the Internet. Information technologies are used mainly for automation of agricultural processes and for accounting.

Agricultural management largely involves decision-making under conditions of uncertainty due to three main reasons: lack of current data on the state of nature; lack of knowledge about biological and physical systems; the random nature of the ongoing processes. The manufacturer uses the perception of the probabilities of future results, based on economically justified solutions, in accordance with the possible risks (the risks are reduced mainly by simplifying the production systems, using working capital and plant protection, fertilization, etc., with practically no restrictions). For example, they use chemicals in quantities that minimize the risk of major losses from malnutrition, disease and crop pests, but ignore the negative environmental impacts.

The ever-increasing speed and volume of information transmitted through various communication systems will ensure a stable supply of manufacturers with databases. These data must be integrated with the characteristics of biological and physical systems in order to gain useful knowledge about their current state and predict the results of possible solutions. The introduction of scientific developments
through the use of the Internet is extremely important for expanding the functionality of information systems.

The introduction of information technologies in agriculture involves the continuous receipt of information from external sources (via external Internet networks) at any time from any point in the area. For example, constant updates of weather forecasts may be available to farmers throughout the day. This makes it possible to increase the efficiency of the use of chemical plant protection products, and also reduces the environmental pollution [3].

The most common information technologies for crop production are geographic information systems (GIS). An example of such systems is the software of the KB Panorama CJSC designed to automate the management of an agricultural enterprise in the crop production industry. This software is one of the components of an integrated technology for the production of agricultural products based on GLONASS / GPS navigation of technical means [4].

GIS of the "Panorama" company (depending on the version) allows doing the following:

- maintain regulatory and reference information, as well as field passports with reference to the harvest year;
- create and edit electronic maps;
- make calculations on maps;
- control the movement of vehicles and special equipment;
- analyze indicators obtained from established on vehicles and special equipment of sensors;
- plan the movement of vehicles and special equipment;
- process the results of field measurements, remote sensing data;
- update maps of land areas;
- build thematic maps of individual indicators of land areas based on the information provided in field passports;
- plan and take into account technological operations in accordance with the established crop rotation;
- calculate the annual doses of fertilizers, generate statistical information and reports, including industry reports.

In addition, this GIS of the Panorama company provides the data exchange with external programs, in particular, with such software products as "1C: Management of the agricultural enterprise" "AgroHolding " software, developed on the basis of the standard configuration" Management of a production enterprise ". This makes it possible to successfully integrate the information system of complex resource management of the enterprise with the GIS used at the same agricultural enterprise.

Today, there are many IT systems in animal breeding that can facilitate the work of farmers and the work of agricultural workers. These systems are able to track the location of the animal, its physical condition, activity, as well as provide assistance in milking and feeding [5]:

- DeLaval AMR™ is the latest rotary milking technology;
- "Ovi-bovi" is the insemination technology;
- DeLavalOptimat™ is an automated feeding system for cows based on the DeLavalDelpro™ integrated farm management program.

Computer information and digital technologies of the Russian agro-industrial complex are an innovative way to increase exports and reduce production costs.

3. Problems of introduction of information technologies in agriculture and ways to solve them

In Russia, the innovative development of the agro-industrial complex has not yet reached the world level due to technical and technological lagging behind, insufficient qualifications of personnel. But in a
market economy, it is necessary to increase the efficiency of the agricultural sector, to switch to resource-saving innovative technologies and various information technologies.

The ongoing agricultural reforms are vocal about the need for the production and distribution of technical and informational means of modernizing agro-industrial enterprises. Modern information technologies allow farmers to receive advice, recommendations regardless of the time and place of their location. The farmer can describe his problems through ordinary and illustrate it with photographs or videos. In this case, the time and location of the farmer are determined automatically. Then he can send his materials to the supporting agricultural services via e-mail and receive a response after a while or solve his problem online directly via the Internet.

The degree of implementation of information technologies in agriculture is inextricably linked with the economic situation in the country. Political, technical and social conditions along with economic conditions are required in order to expand the scale of informatization. At the moment, the level of the Russian economy does not correspond to modern requirements: the formation of a stable market position is hampered by a low level of investment and a lack of financial resources allocated for the development of agriculture. To launch this process, the country needs to choose a real resource-saving path and effectively use information capital [6].

The progress of the process is slowed down by the existing problems of the country that are based on social, economic, psychological and other prerequisites. The introduction of large-scale machine production faced a number of contradictions caused by the need to use a colossal amount of information and the inability to process it using traditional technologies. The low threshold for informatization of society is explained by the psychological unpreparedness of the population for informatization, a low level of computer literacy, conservatism of the population and a lack of desire to accept innovations [7].

Experts agree that at the moment in Russia in production it is more profitable and rational to use traditional technologies than innovative ones. Investing in fields of activity designed for long-term prospects is considered by many to be inexpedient; the problem of information security (which is the main negative factor of general informatization) is acute [8,9]. An important principle of the functioning of economic activity is to increase the level of profit, reduce the level of costs: all costs shall be taken into account in details and low-efficiency ones shall be eliminated step by step, the market situation shall be continuously monitored in order to see its vulnerabilities [10]. Therefore, the use of information technology in agriculture should not only describe the current situation, but also give recommendations for the transformation of organization and management to achieve better results.

4. Findings
Modern information technologies can significantly change the process of making managerial decisions in agricultural enterprises. Recent advances in telecommunications and knowledge-based systems for computer decision support objectively contribute to the creation of fundamentally new software systems that can integrate the knowledge and experience of many specialists in the field of agronomy, biology, agriculture, economics and other related fields of activity. The widespread use of these systems and technologies in the industry leads to simplification of the processes of collecting data on the functioning of individual agricultural enterprises, their processing and generalization, as well as the use of the data obtained to build models and forecasts. Agriculture is an ideal environment for the application of information technology. In this regard, for the effective and sustainable functioning of the agrarian sector in the new conditions, it is necessary to use advanced information technologies that make it possible to identify its internal reserves, attract external investments, as well as restructure the organizational structures and re-engineer the management systems.

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