

# Information technologies in the agricultural economy

*N R Makhmudova*<sup>1</sup>, *K K Ismailov*<sup>1</sup>, *N T Kodirova*<sup>1</sup>, *K K Shadmanov*<sup>1</sup>, and *D Z Narzullaev*<sup>2\*</sup>

<sup>1</sup>Institute of Pharmaceutical Education and Research, 19/46, Yunusabad, Tashkent, 100114, Uzbekistan

<sup>2</sup>Tashkent Pharmaceutical Institute, 45, Oybek street, Tashkent, 100015, Uzbekistan

**Abstract.** This article discusses not only the practical application of "precision agriculture" in the software of electronic equipment, the convenience of remote control and on-board sensors for moving automatic parts of machines and units, as well as the acceleration of solving problems of managing the agro-industrial complex using electronic equipment, increase in the amount of funding, but also training personnel capable of creating and applying information technologies in agriculture, including in "precision agriculture."

## 1 Introduction

The creation and functioning of information systems in economic management is closely related to the development of information technology - the main component of automated information systems [1, 2].

Automated information technology (AIT) - a set of methods and means of collecting, registering, processing, transmitting, accumulating, searching and protecting information based on the use of software, computers and communications, as well as a set of methods by which information is offered to customers [3-5].

The formation of a knowledge-based economy is the way to develop the information society, where the main focus is on the development of science, innovation, culture, the information industry and human capital [6]. Demand in market relations for information and information services has led to the fact that modern information processing technology is focused on the use of a wide range of technical means, computers, communications, as well as methods of data analysis and processing [7-19]. Computing systems and networks of various configurations are created on their basis in order to accumulate, store, process information, bring terminal devices as close as possible to the workplace of a specialist or decision maker [20, 21].

In modern conditions, the adoption of the optimal decision in any sphere of human activity is based on timely and on high-quality information. Computer technology is the means and tool for processing and storing electronic information. The use of computer technology is based on computer technology, which includes three elements: technology, programs and information. A set of interrelated information (data) stored on machine media

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\* Corresponding author: [davr1960@mail.ru](mailto:davr1960@mail.ru)

is a database, and information placed on information media (books, databases, etc.) is information resources.

## 2 Materials and methods

Research methods: analytical reviews, comparative analysis, experimental testing, data analysis methods. Implementation level of research results: on the theme of the research, the accumulated experience and publications in the field of information management in the farm management system both in our country and abroad were studied and analyzed. The first electronic information system "Farms of the Republic of Uzbekistan" was created. Scope of scientific research: the agricultural sector of the Republic of Uzbekistan.

## 3 Results

Information technology (IT) is a set of tools and methods of information processes (receiving, processing, storing, transmitting information using hardware and software). The purpose of the information and advisory service of the agro-industrial complex (AIC) is to achieve the competitiveness of the agricultural sector by assisting agricultural producers in improving the efficiency of production and marketing of products [22-26]. Information and consulting services assist producers of all forms of ownership in increasing the economic efficiency of production by means of:

- Selection and development of new technologies, new types of machinery, machinery and equipment, varieties of agricultural crops and animal breeds.
- Development of business plans for obtaining investment and short-term loans.
- determination of optimal programs for fodder production and use of fodder, preparation of optimal feeding rations for farm animals.
- Providing operational information on prices and suppliers of agricultural machinery, equipment, mineral fertilizers.
- Determining the need for fertilizers and optimizing their distribution by crops.
- Development of marketing programs and search for markets for agricultural products.
- Assistance in solving legal issues, taxation and accounting with elements of economic analysis.

The use of information technology increases the productivity and efficiency of managerial work, allowing you to solve many problems in a new way. For example, electronic equipment and information technology allow you to locate any object in space and time, which explains the possibility of their use in "precision (oriented) agriculture".

The optimization of production in order to obtain maximum profit; rational use of resources, including natural ones; environment protection are among the tasks of "precision agriculture". "Precision Agriculture" is seen as an integral part of resource-saving and environmentally friendly agriculture. It allows you to control agricultural operations (Figure 1).

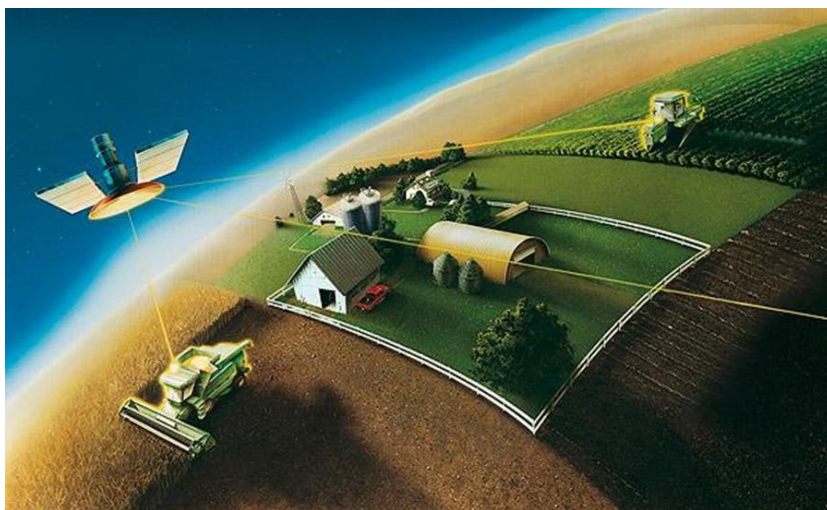
The basis of "precision agriculture" is the measurement and understanding of the probabilities that affect plant growth. "Precision agriculture" is the efficient, or rational, management of plant growth processes in accordance with their nutrient requirements and growing conditions.



**Fig. 1.** Precision farming technologies.

To conduct “precision agriculture”, it is necessary to use special devices and technologies, such as:

Receiver-antennas of global position systems (GPS - GPS or GLONAS) installed on any object (machine, unit, etc.). They take direction finding signals from satellites located in the information reception area. To accurately determine the location of an object in space and time, it is enough to receive signals from 3-4 out of 24 satellites orbiting the globe (Figure 2).



**Fig. 2.** The principle of operation of the system of satellite navigation devices (GPS).

The accuracy of determining the location of the object in this case is in the range from several meters to one centimeter; geographic information system (GIS) is a software that allows you to process and display spatial information, computerize and compile electronic maps. The geographic information system allows you to process and analyze various spatial data integrated in digital form; sensors for remote measurements and on-board sensors for actuating the executive parts of the machine unit.

Remote sensors are used to measure the temperature and moisture of the soil, determine the condition of plants (presence of weeds, diseases and pests), crop yields, etc. The action of remote sensors is based on the use of laser-radar, ultrasonic, electromagnetic

installations, the use of infrared waves, spectrophotometers, visual television cameras, atomic resonators, etc. (Figure 3).

On-board sensors are used to monitor the crop, determine the seeding rate, apply fertilizers, pesticides, water, lime; location and speed of movement of equipment; measuring the technical parameters of the movement of machines (slippage, traction, etc.).

Thus, the first Massey-Ferguson combines were equipped with antenna receivers that receive signals from satellites, an automatic device for monitoring yields. Combining information about the location of the combine unit and monitoring yields, you can find out the yield anywhere in the field at any time.



**Fig. 3.** Smart agriculture sensors.

## 4 Discussion

The yield of an agricultural crop in different parts of the same field is not the same. The yield value is influenced by such factors as: soil quality (fertility, acidity, mechanical composition); doses and types of applied fertilizers; topography of the area; the presence of forest belts; sowing technology, crop care, harvesting; seed quality; diseases, pests of agricultural plants; weather conditions and more.

By comparing certain characteristics of fields with yield maps, farm specialists can identify the causes of uneven crop yields on the field (certain parts of the field are more productive than others).

Decisions, for example, on the need for additional fertilization in a particular area of the field will be based on information obtained through the global position and geographic information systems, traditional sources, as well as on the basis of expert judgment from practitioners and consultants. Knowing the yield maps, soil and other characteristics of the fields, using the global positional and geographic information systems, sensors, automatic actuators of the working parts of the machines, it is possible to draw up a program for the subsequent movement of the machine unit (for example, for the purpose of fertilizing) and, according to the given programs, apply to a specific area fields an appropriate amount of fertilizer with a combination of nitrogen, phosphorus and potassium in the required proportions.

## 5 Conclusion

The accumulated knowledge in agricultural research over the years should be applied to obtain practically useful information by processing databases. This means that IT is an indispensable source for the implementation of research and development.

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