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### MODERN AGROTECHNOLOGIES AS A KEY FACTOR IN IMPROVING THE EFFICIENCY OF AGRICULTURAL PRODUCTION

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#### Annotation:

The article analyzes the importance of introducing modern agrotechnologies in agriculture and its impact on productivity. The possibilities of technologies such as drones, drip irrigation, touch control and digital control are shown, and the problems and solutions in their implementation in the conditions of Karakalpakstan are highlighted.

**Keywords:** Agrotechnology, agriculture, efficiency, innovation, drip irrigation, digital farming, Karakalpakstan.

Agriculture is one of the strategically important sectors of the economy of any country. It plays a decisive role not only in providing the population with food, but also in increasing export potential, creating new jobs, expanding the sources of income of the rural population and sustainable development of territories. Especially in recent years, increasing the efficiency of the agrarian sector under global climate change, water scarcity and demographic pressure has become important not only in terms of ensuring economic, but also social and environmental sustainability.

In the conditions of Uzbekistan, agriculture is being developed as one of the main drivers of the national economy. In particular, in the Republic of Karakalpakstan, agriculture is one of the main directions of ensuring population employment, strengthening food supply and raising territorial economic activity. The area is mainly developed in the areas of agriculture, livestock, horticulture and horticulture, and the issue of effective use of Natural Resources is very relevant. But tensions in natural-climate conditions, limited water resources and high levels of land salinity have been decreasing the effect of traditional production methods [1].

In this regard, it is assumed to introduce modern agrotechnologies in the development of Agriculture in Karakalpakstan. Today in the world, technologies



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such as smart farming (smart farming), drip irrigation, drone technologies, GPS monitoring and selective cultivation of genetic resources are becoming an important tool in a significant increase in agricultural efficiency. The introduction of such technologies in Karakalpakstan serves not only to increase the volume of production and product quality, but also to economically use water resources, improve labor productivity and protect the natural environment.

Therefore, it is an important task to harmonize traditional approaches to achieving efficiency in agriculture with modern agrotechnologies, to put the achievements of science into practice and to develop innovative solutions suitable for local conditions. This article is aimed at analyzing exactly these issues.

The introduction of modern agrotechnologies in agriculture is manifested as an important factor in increasing production efficiency. First of all, through advanced technologies — drip irrigation, drones, sensors, GPS monitoring and intellectual control systems, the volume of product cultivation and its quality are significantly improved. High-yielding crops that have not been genetically modified, but are produced through selection and agrotechnical methods, allow farmers to offer competitive products on the market [2].

At the same time, automated techniques and digital controls provide the basis for the economical use of labor resources. That is, instead of attracting a large number of Labor to compensate for human labor, it is possible to effectively organize the production process through several high-tech devices. This increases productivity, reduces labor costs, and optimizes labor demand.

In addition, agrotechnologies ensure the stability of farms in conditions of climate change, drought, flooding, wind and other natural hazards. For example, with the help of air and soil sensors, it is possible to carry out real-time monitoring, detect pests early and take urgent agrotechnical measures. Risk pre-Management in this case minimizes production losses.

In general, agrotechnologies also serve to make rational use of resources. Water, mineral fertilizers, fuel, electricity and other resources are applied accurately and purposefully through automated systems. For example, spraying fertilizer and protective equipment with drones is considered 20-30 percent more economical than



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traditional methods. Such solutions will not only bring economic benefits, but will also be important in ensuring environmental sustainability [3].

In the process of fully applying modern agrotechnologies to agricultural production, there are a number of obstacles and problems that limit the efficiency in the field. First of all, the cost of advanced equipment and equipment is very high, and it is financially burdensome for farms, especially for representatives of small and medium-sized businesses, to buy or rent them. This situation limits the possibility of extensive use of innovational technologies.

The second important problem is the lack of specialist personnel with sufficient qualifications in the field. As a result of the low level of agrotechnical literacy in the agrarian sector, the insufficient experience of using digital technologies, many farmers are not able to take advantage of the available opportunities. In particular, the practical implementation of technologies such as drones, sensors, GPS monitoring and "smart farming" requires special knowledge and skills, which is not sufficiently reflected in the current existing personnel training system.

In addition, the insufficient development of infrastructure in some regions, including desert areas of the Republic of Karakalpakstan and water supply problem areas, is also a serious obstacle to the implementation of agrotechnologies. Interruptions in power supply, limited or absent Internet access, underdevelopment of the logistics system — create technical obstacles in the operation of innovative systems.

Another serious problem that should be paid attention to is the insufficient availability of scientific accompaniment in the introduction of agrotechnologies. In many cases, technologies developed in foreign countries may not work directly in local conditions. For example, a technique for a hot climate may not give the expected result in saline, water-scarce areas. Therefore, it is necessary to adapt to local soil-climatic, Water Resources and agrobiological characteristics. This can only be achieved through a scientific approach, agronomic research, testing and analysis. At the same time, regular training of farmers, preparing them for the use of modern technologies, providing them with scientific and practical advice in the production process-serves to ensure an inextricable connection between practice and science.



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Improving productivity in the agricultural sector is one of the main conditions for sustainable development, ensuring food security and improving the standard of living in rural areas. Today, at a time when traditional methods of Operation do not pay off enough, the introduction of modern agrotechnologies — as the most effective solution for farms and agro-industrial ones-is taking the field. Solutions such as drones, drip irrigation systems, touch controls, intellectual management platforms, and innovation seed technologies make it possible to increase production, improve quality, use resources sparingly, and reduce risks.

However, there are also a number of problems in putting these possibilities into practice. Among them are the high cost of techniques, the lack of agrotechnical knowledge and personnel, infrastructure problems and the weakness of scientific accompaniment. The insufficient organization of adaptation processes to adapt agrotechnologies developed abroad to local conditions is also an obstacle to the development of Agriculture.

Therefore, in order to effectively introduce agrotechnologies, subsidizing them in public policy, organizing practical training courses for farmers, improving infrastructure and supporting scientific research should become one of the priorities. Only then will it be possible to achieve high efficiency in agro-industry, increase competitiveness and form a stable agricultural system in regions such as Karakalpakstan.

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