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## USE OF DRONES IN THE AGRICULTURAL SECTOR OF THE KYRGYZ REPUBLIC: EXPERIENCE OF SOME COUNTRIES

**Abstract:** This article discusses current issues of the use of drones, hereinafter UAVs, in agriculture of the Kyrgyz Republic based on the experience of some countries. The advantages and possibilities of using drones in agriculture are analyzed, as well as the problems and limitations that agricultural enterprises face when introducing this technology. The article also discusses examples of the successful use of drones in the agricultural sector of other countries and offers recommendations for Kyrgyzstan.

**Key words:** agriculture, drone, UAV, foreign experience, government support, share of business entities.

**Language:** English

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### Introduction

Agriculture is an integral part of the economy and society of any country, including Kyrgyzstan. It is of great importance not only from an economic point of view, but also from a social and cultural one. Agriculture in Kyrgyzstan not only provides food security and economic development, but is also a traditional way of life for many rural residents. It determines the sociocultural identity of the local population and plays an important role in preserving traditions and customs. The majority of rural residents in Kyrgyzstan have been engaged in agriculture for more than one generation, passing on knowledge and

experience from parents to children. This helps to preserve rural culture and traditions, as well as strengthen ties in rural communities. In addition, agriculture in Kyrgyzstan plays a key role in rural development, providing residents with access to vital resources such as food, water and labor opportunities. Support and development of agriculture contributes to improving the quality of life of the rural population and sustainable development of these territories. Thus, agriculture in Kyrgyzstan is not only an economic sector, but also a sociocultural phenomenon that determines the way of life and the development of rural communities in the country.

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**Table 1 - Share of agriculture, forestry and fisheries of the Kyrgyz Republic in the economy, for 2019-2023.<sup>1</sup>**

	2019	2020	2021	2022	2023
Share of agriculture in GDP, %	10,4	12,2	12,4	11,0	9,7
Share of operating economic entities in agriculture, forestry and fish farming in the total volume of operating economic entities, %	63,0	62,8	63,0	63,0	62,8
are of people employed in agriculture, forestry and fishing in the total number of people employed in the economy, %	23,0	20,3	21,8	22,0	20,3

As the data in Table 1 shows, although the share of operating economic entities in agriculture, forestry and fish farming decreased during the period under review from 63.0% to 62.8% or by 0.2%, it (the share) remains high in the total volume of operating economic entities in country, i.e. more than half (62.8%) of business entities are engaged in agriculture.

In civilized countries, the successful development of this industry is often ensured by an effective combination of government regulation, self-regulation and sound financial and credit policy. Government regulation may include various instruments, such as subsidies, benefits, tax incentives, purchases of products at competitive prices, programs to support agricultural enterprises, etc. Government intervention may be particularly important to address issues related to market instability, crises, natural disasters, access to finance and other aspects. Self-regulation, that is, the actions of agricultural producers themselves or their associations, is also important. This may include the

creation of cooperatives, associations, production and trade associations that can provide cost reductions, increased competitiveness, improved product quality and access to new markets. Competent financial and credit policy also plays an important role in the development of agriculture. Providing affordable and long-term lending, developing insurance programs, investing in infrastructure, supporting innovation and developing sales markets - all this helps improve the financial condition of agricultural enterprises and stimulates their development. Thus, modern development of agriculture requires an integrated approach, including effective government regulation, self-regulation and sound financial and credit policy aimed at creating favorable conditions for the sustainable development of this important industry.

For the purpose of state support for agricultural producers, the Cabinet of Ministers of the Kyrgyz Republic provides assistance with preferential lending, so Table 2 shows the amounts of preferential lending for three sectors of agriculture in 2023.

**Table 2 – Volume of preferential lending to agricultural producers through commercial banks of the Kyrgyz Republic in 2023.**

Name of funding source	Crop production (thousand soms)		Livestock (thousand soms)		Agroprocessing (thousand soms)	
	Quantity of credits	amount of credits	Quantity of credits	amount of credits	Quantity of credits	amount of credits
OJSC "Aiyl Bank"	948	445464	1541	881562	79	191457
OJSC "RSK Bank"	1115	439260	1937	890900	42	120730
JSC "KICB"	200	74155	293	147235	14	61500
OJSC «Capital Bank»	53	10305	153	29297	2	1500
OJSC "CB Kyrgyzstan"	131	29090	195	45425	8	29445
OJSC "Kyrgyzkommertsbank"			2	4000		
<b>Total</b>	<b>2447</b>	<b>998274</b>	<b>4121</b>	<b>1998419</b>	<b>145</b>	<b>404632</b>

<sup>1</sup> According to materials from the website of the National Statistical Committee of the Kyrgyz Republic [Electronic resource]. - Access mode: <https://www.stat.kg/ru/opensdata/category/2314/>

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State support for agricultural producers, especially farmers in the form of preferential lending, goes towards creating favorable conditions for them by providing them with the necessary material and technical means, fuels and lubricants, fertilizers, agrochemicals, etc., but nowhere is there any mention of the purchase of new innovative (information) technologies.

Of course, issues of increasing productivity, quality of seed material, proper methods of tillage, soil water regime, application of fertilizers, control of pests and plant diseases, as well as weeds are key to the successful development of agriculture in Kyrgyzstan. Effective management of these aspects can significantly improve the productivity and economic performance of agricultural production. Crop yields, animal productivity, labor costs, product quality, land productivity, capital productivity, labor productivity - all these indicators play an important role in assessing the efficiency of agriculture. Increasing these indicators requires an integrated approach, including the introduction of modern technologies, training of agricultural workers, scientific research and innovation. In this regard, instead of purchasing expensive agricultural machinery (tractors, cultivators), it would be advisable to purchase new, high-tech, efficient technologies, such as unmanned aerial vehicles.

UAV, drone are different names for the same device - an unmanned aerial vehicle, which is controlled using a remote control or autonomously. The main difference between these terms is what type of aircraft they describe. UAV (unmanned aerial vehicle) is a general term that can be used to describe any unmanned aerial vehicle, regardless of its design or flight principle. This can be either a quadcopter or another type of drone. Drone is a narrower term that is usually used to describe an unmanned aerial vehicle with a multi-rotor design, such as a quadcopter or multicopter (tri-, quad-, hexacopter). A drone often has four or more rotors, which give it vertical takeoff and landing and control in all directions. A quadcopter is a specific type of drone that has four rotors and uses the principle of multi-rotor stabilization to fly. Quadcopters usually have a simple design and can be used for both recreational and professional purposes such as aerial photography or videography. So, all of these terms can be used interchangeably, but have some differences in how they describe an unmanned aerial vehicle.

In recent years, the use of such aircraft in various spheres of life has become widespread. One of the promising areas of application of this technology is the agricultural sector we are considering.

The history of using drones in agriculture begins relatively recently, but their use is becoming increasingly popular. In the early 2000s, drones began to be used in agriculture to monitor crops and harvests. They were used to produce high-quality aerial

photographs that helped farmers analyze crop health, determine yield levels and predict potential problems. Drone technology has advanced significantly in developed countries since 2010, leading to increased use in agriculture. Drones have begun to be equipped with specialized cameras and sensors that allow for more detailed and accurate monitoring of crops and harvests. They can detect plant diseases, determine soil moisture levels, analyze weather data and other parameters that help farmers make more informed decisions.

Drones have great potential to improve agricultural production efficiency, reduce costs and improve product quality. For example, let's look at the experience of some countries in using drones in the agricultural sector and evaluate its applicability in Kyrgyzstan.

*Advantages of using drones in the agricultural sector.*

The use of drones in agriculture can lead to significant cost efficiencies. Here are some reasons:

A). *Increased Productivity:* Drones can help agricultural businesses increase productivity. They can quickly and accurately carry out tasks such as monitoring crop areas, assessing plant health, determining yield levels, etc. This allows agricultural businesses to make more informed decisions and improve the efficiency of their operations.

B). *Reduced Costs:* The use of drones can reduce the costs of agricultural operations. For example, drones can help determine the optimal time to water, reducing water and energy costs. They can also be used to identify areas that require pesticide or fertilizer treatment, allowing agricultural operations to reduce costs for these materials.

C). *Increased accuracy and quality of work:* Drones can help improve the accuracy and quality of agricultural work. For example, they can be used to more accurately distribute fertilizers or pesticides, which can lead to increased yields and reduced risk of environmental damage.

D). *Risk Reduction:* Drones can help agricultural businesses reduce risks associated with weather conditions and plant diseases. They can be used for early detection of plant diseases or pests, which allows the necessary measures to be taken to eliminate them and prevent damage to the crop.

However, it is worth noting that the use of drones in agriculture also requires significant investment in equipment and personnel training. Therefore, to assess the cost-effectiveness of using drones in a specific agricultural enterprise, it is necessary to conduct an appropriate cost-benefit analysis.

*Experience of some countries.*

Statistics on drone use in agriculture by country:  
**USA:** According to the American Drone Association, agricultural drones make up about 22% of all registered drones in the United States. They are used

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to monitor crops, monitor crop condition, determine yield levels and predict weather conditions.

**China:** China is one of the leading producers and consumers of agricultural drones. They are widely used in the country for monitoring crops, spraying fertilizers and pesticides, and watering fields.

**Brazil:** Brazil is also actively using drones in agriculture. They are used to monitor the condition of crops, determine yield levels and determine the need for fertilizers and pesticides. European Union: In the European Union, drones are used for crop monitoring, soil analysis and water control. They are also used to determine crop yield levels and predict weather conditions. Overall, the use of drones in agriculture continues to grow around the world. They help farmers increase their efficiency, improve crop quality and reduce production costs.

In January 2013, the Agricultural Aviation Industry Innovation Technology Alliance was established in Sanya City, Hainan Province (PRC) to create a technical exchange platform. This organization includes universities, research institutes and enterprises that are mainly engaged in research into related technologies and products to promote the comprehensive application of agricultural drones. A demonstration of the development and application of a spectral remote sensing platform for low-level crop imaging was created, and an application model based on low-altitude hyperspectral remote sensing information was developed. At the same time, a remote sensing spectrometer inversion model for disaster visualization was developed.

The Hohhot District Administration of Inner Mongolia and Northwestern A&F University worked with unmanned aerial vehicles to transport experimental equipment related to obtaining soil moisture and crop moisture information at two test sites. This made it possible to expand the possibilities of automation of irrigation zones and their directions.

In India, drones are used to monitor droughts and monitor water resources, which helps in efficient use of water and prevents the negative effects of drought. In a bid to make drones more accessible to farmers, India's Ministry of Agriculture has announced revised guidelines for the Sub-Mission for Agricultural Mechanization (SMAM) scheme. The guide will make this technology accessible through assistance in purchasing, leasing and demonstrating agricultural drones. The SMAM scheme was launched in 2014-15 with the aim of increasing access to agricultural mechanization for smallholder farmers as well as for regions where availability of agricultural energy is low.

In South Korea, "instead of farmers striding through rice fields with canisters of herbicide on their backs, people are now increasingly seeing drones circling the fields spraying fertilizer for the upcoming harvest," writes Chang Yoo Chun, Staff Writer for Korea.net. Access mode:

[<https://russian.korea.net/NewsFocus/Policies/view?articleId=137634>]

Agricultural drone inspection guidelines and standards have been set and announced by the Ministry of Agriculture, Food and Rural Development to encourage the use of drones in this area. In accordance with the issued guidelines and standards, agricultural drones will undergo various structural and functional tests, during which their performance will be verified. Basic metrics such as takeoff, landing and mid-air stops will also be tested.

Agricultural drones that pass the tests will be approved and receive support from the ministry. Farmers willing to purchase drones will receive a credit of up to 80% of the price.

### *Recommendations for Kyrgyzstan.*

However, despite all the advantages, the use of drones in the agricultural sector also faces a number of problems and limitations. First, the cost of purchasing and maintaining drones can be high, creating additional costs for agricultural businesses. Secondly, there is no legal framework regulating or encouraging the use of UAVs in agriculture. Third, there is a need to train personnel, and obtaining the appropriate permits and licenses to operate drones can be complex and time-consuming.

Based on the experience of other countries, a number of recommendations can be proposed for the introduction of drones into the agricultural sector of Kyrgyzstan.

a) It is necessary to analyze the economic efficiency of using drones and determine the specific benefits for agricultural enterprises.

b) It is necessary to develop training and certification programs for personnel to ensure qualified use of drones.

c) It is necessary to analyze the geographical features of Kyrgyzstan and determine the opportunities and limitations for the use of drones in various regions of the country.

d) And most importantly, the Ministry of Agriculture needs to develop a bill that regulates and encourages the use of UAVs by farmers.

### **Conclusion.**

The use of drones in the agricultural sector has great potential for increasing the efficiency of agricultural production and improving product quality. However, before introducing this technology in Kyrgyzstan, it is necessary to take into account the problems and limitations, as well as study the experience of other countries and develop appropriate recommendations.

Farmers across the country will be interested in drones due to their productivity, which reduces labor costs and pest control time. This is one of the reasons why the entire scientific world and farmers' representatives are increasingly demanding that the

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Kyrgyz government establish guidelines and standards for these mechanisms.

With the above information, it is not difficult to understand that drones play an important role in the development of the agricultural sector. At the same time, the application of UAVs in agriculture at home and abroad concentrates on crop protection and is

rarely used in other fields of agriculture, especially in scientific research, agricultural product quality assurance and e-commerce. In the future, the application of UAVs in agriculture is expected to inevitably expand to all types of agriculture, providing more beneficial technical support to the modern smart agriculture sector.

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