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Use of Draft Flights and Monitoring Systems in Agriculture in the Fight Against Pests

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Abstract: The article provides an overview of existing monitoring systems in agriculture using advanced technologies such as small unmanned aerial vehicles (UAVs). Over the past year, agricultural reports on the level of locust damage in the southern and central zones of Central Asia, Tajikistan and Uzbekistan have been analyzed. Basic systems for monitoring the condition of plants in plants, the presence of fires, the appearance of wild animals and pests are considered. The main methods of pest control and their feasibility are discussed. An analysis of the unmanned vehicle market is presented and a forecast for its further development in the agricultural sector is developed. It was noted that the widespread use of these systems in the monitoring and protection of agricultural products in Uzbekistan from pests is important and effective.

Keywords: drones, monitoring, artificial intelligence, pests, locusts.

Introduction

Monitoring systems are becoming increasingly popular today because they allow the most accurate predictions to be made through data collection and analysis. Today, these systems are used to detect fires, monitor crop maturation, and protect the land from wildlife and insects.

The most pressing issue is the monitoring of various pests as they regularly cause great harm to farmers. The most common agricultural pests are the Colorado potato beetle and all kinds of locusts. Locusts often feed on cereals [2, 5].

The researchers observed in Rudaki, Shahrituz, Nosiri Khisrav, Khorasan, Kabodiyon districts of the neighboring Republic of Tajikistan, Khatlon region and adjacent districts of Uzun, Kumkurgan, Shurchi, Jarqorghan, Termez, Denau districts of Surkhandarya region. In addition, research has been conducted to study the species composition of locusts found in neutral areas between the banks of the Kofirnigon River, which flows hrough the border between the two countries.

According to the monitoring results, the Moroccan locust (Dociostaurus maroccanus Thunb) is widespread in the border areas of both countries, with an average of 100-200 species per 1 m2 in both countries. Small crustaceans (D kraussi nigrogeniculatus L) are widespread in the Republic of Tajikistan, with an average number of 15-25 per 1 m2. Locusts (C turanicus Tarb) are common in Uzbekistan, numbering 10-15 per 1 m2.

According to the results of the monitoring, locusts were found on 186,674 hectares of land in the border areas of the country with neighboring countries. Locust infestations on 315,778 hectares of land in the neighboring countries have been identified and are likely to fly. The greatest locust infestation is in the Jizzakh region, which borders the Sughd region of the Republic of Tajikistan, and the uneven location of the border makes it difficult to control locusts in these areas. The largest areas of cross-border locust infestation are Surkhandarya and Khatlon regions, Kashkadarya and Lebap regions [3].

This, it can be concluded that it is absolutely necessary to monitor the presence of pest larvae in the cultivated lands and to introduce new technologies to control them in order to prevent crop destruction.

Main Part

Unmanned aerial vehicles (UAVs) are now widely used in many fields. These include: defense, emergencies, construction, the oil and gas and security sectors, academia, agriculture, and so on.

The agricultural sector has a huge potential for the introduction of IT technologies. Currently, the following systems are developed in developed countries:

1. Technological complex for detection and extinguishing of fires using unmanned aerial vehicles (UAVs) [1].

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2. Monitoring system for protection of arable lands from wild animals. The system is based on the use of UAVs and was first used in Japan to help farmers protect their land. This system uses the following hardware:

1. Quadcopter;
2. IR touch camera;
3. A system with artificial intelligence.

A drone flying over the controlled area detects animals approaching the fields and scares them with a high-frequency signal or the sound of fireworks exploding. An infrared touch camera allows the drone to monitor animals both day and night.

In addition, a system based on artificial intelligence analyzes the material obtained by the quadcopter to predict the behavior of animals based on their habits and tracks [2].

3. A system for monitoring the maturation of cultivated plants in the fields. Thanks to infrared sensing cameras, farmers can monitor chlorophyll levels in plants. Its decrease is the first sign of the presence of pests or poor care [4].

4. Automated Farm Hand Free Hectare (UK).

An autonomous system for planting, irrigating and harvesting. This includes controlling operators from the control room. Drones with built-in multispectral sensors take pictures of the ground. Small agricultural machines take soil samples, evaluate them, and select the appropriate mineral fertilizers. Real-time cameras alert you to pests or weeds.

The Food and Agriculture Organization of the United Nations estimates that an average swarm of locusts could destroy crops that could feed 2,500 people a year.

The Food and Agriculture Organization of the United Nations (FAO) says that despite measures to combat locust infestation in 2020, these insects pose a greater threat to agriculture.

Taking measures against the spread of harmful locusts in all regions of the country requires the use of modern technologies. In collaboration with experts from the Ministry of Emergency Situations and the Ministry of Agriculture, the estimated crop areas in 2021 could be threatened by insects. This is almost 600,000 hectares of hilly land. In 2021, chemical treatments were carried out in areas where locusts may be prevalent. Examples are Khorezm, Jizzakh, Kashkadarya and Surkhandarya regions.

In this process, the uneven distribution of the territory of Jizzakh region bordering on the Sogd region of the Republic of Tajikistan or the different relief of other areas make it difficult to carry out chemical treatment in the regions.

Russia offers UAV systems for equipment monitoring, chemical processing and crop monitoring, agricultural land inventory, electronic field mapping, and more.

The distribution of pests in Western Siberia has been studied since 2007. Geophysical features, for example:

1. Surface temperature;
2. Vegetation index;
3. Soil moisture;
4. Observations at meteorological stations.

Based on these parameters, a mathematical model for calculating locust hazards based on satellite imagery was proposed [5].

At the beginning of 2021, the market of "agricultural" media is developing. According to experts, in the future, agriculture will become one of the largest segments of the quadcopter market. In 2016, the agricultural UAV market was valued at $ 864.4 million, and by 2022, annual steady growth is expected at 30% (up to $ 4.2 billion). According to "Markets and Markets" experts, the active growth of the market is facilitated by the gradual improvement of the regulatory environment currently observed in various countries around the world [4].

According to the analytical agency PWC, the market for "agricultural" drones (excluding aircraft-type drones) alone could be about $ 32.4 billion in a few decades. This growth is an integral part of the world's population growth - to feed everyone, to increase productivity without innovation in the agricultural industry.

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Among the countries where "agricultural" drones are actively used are the United States, China, Japan, Brazil, the European Union and others. AeroVironment Inc., AgEagle, DJI, Yamaha, and others are some of the largest agricultural payers in the global media market.

To help Chinese farmers increase the effectiveness of pesticide treatment of agricultural lands, China intends to further increase investment in the development of agricultural UAVs and train operators for them, according to China Daily [7, 8].

In November 2015, DJI launched its first MG-1 agricultural UAV, and in 2016, DJI expanded its range with a modification called the MG-1S, equipped with an advanced UAV control system, radar and sensors.

At the end of 2017, DJI introduced the more advanced MG-1S Advanced Agricultural UAV with improved radar, sprayer and dynamic systems that increase the efficiency and accuracy of the UAV. According to the company, this model allows operators to apply chemicals to about 40 hectares of crops every day.

The DJI sees great promise for agricultural media and plans to step up efforts to train more operators for them. In an interview with the publication, DJI Vice President Luo Zhenhua said that the demand for agricultural drones is high.

According to DJI, its MG series UAVs account for about 70% of agricultural UAV sales in China.

With the modernization of agriculture in the PRC, the market for advanced equipment for farmers is experiencing significant growth. By 2023, the penetration of unmanned aerial vehicles into China's agro-industrial complex is expected to exceed 40 percent, and sales of such devices will reach 16 billion yuan ($ 2.4 billion) in monetary terms.

Conclusion

From the above we can conclude that information technology is being actively introduced in all spheres of life. Monitoring using such systems leads to greater efficiency. The most common systems in agriculture are surveillance systems using UAVs. Today, these systems are widely used in Uzbekistan. Because the use of unmanned aerial vehicles is the most economical and efficient way to monitor plantations of all available methods.

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