

Research on the Application Status of UAV in Agriculture

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Abstract. UAVs are widely used in agriculture. Through high-resolution image and data collection, they help farmers carry out crop monitoring and evaluation, precision agriculture, plant protection and crop spraying. However, there are still challenges such as high cost, low degree of agricultural mechanization, laws and regulations and privacy protection. Future development trends include cost reduction, improvement of data processing and analysis technology, integration with other agricultural technologies, autonomous flight and intelligent technology. The application potential of UAV is huge, which can improve agricultural efficiency and quality, and achieve sustainable development. UAV technology should be popularized and applied, and relevant problems should be solved.

Keywords: UAV; Agriculture; Application status.

1. Preface

The application of UAV in agriculture is becoming a field of great concern. Relying on the continuous progress of technology, UAVs are more and more widely used in agriculture, including crop monitoring and evaluation, precision agriculture, plant protection and crop spraying. Through multispectral cameras and sensors, UAVs can obtain high-resolution images and data in real time to help farmers better manage crops.

Crop monitoring and evaluation is one of the important applications of UAV in agriculture. The UAV is equipped with multispectral and infrared cameras to obtain farmland image data [1] and accurately assess crop growth, disease and pest levels, soil nutrition and other information to provide support for precision agriculture decision-making.

Precision agriculture is another important application of UAV in agriculture. The UAV is equipped with GPS and sensors to monitor key parameters such as farmland soil temperature, humidity, pH value and meteorological information, realize management measures such as precision fertilization and precision irrigation, improve crop yield and quality, and promote sustainable agricultural development [2].

Plant protection is an important work in agricultural production [3], and UAV has significant application potential in its field. UAV equipped with spraying equipment can spray crops efficiently and accurately, reduce pesticide use, reduce environmental pollution, and improve work safety [4].

However, UAVs still face some problems and disputes in the field of agriculture. High costs limit the use of small farmers; The low degree of agricultural mechanization and unfamiliar technology limit the popularization and application of UAV; Laws and regulations and privacy protection need to be solved urgently.

2. The Application and Development of Drones in Agriculture

In the field of agriculture, the application status of UAV has attracted extensive attention and research. The application of UAV in agriculture mainly includes crop monitoring and evaluation, precision agriculture, plant protection and crop spraying. These applications can provide high-resolution images and data to help farmers improve crop management, yield and quality.

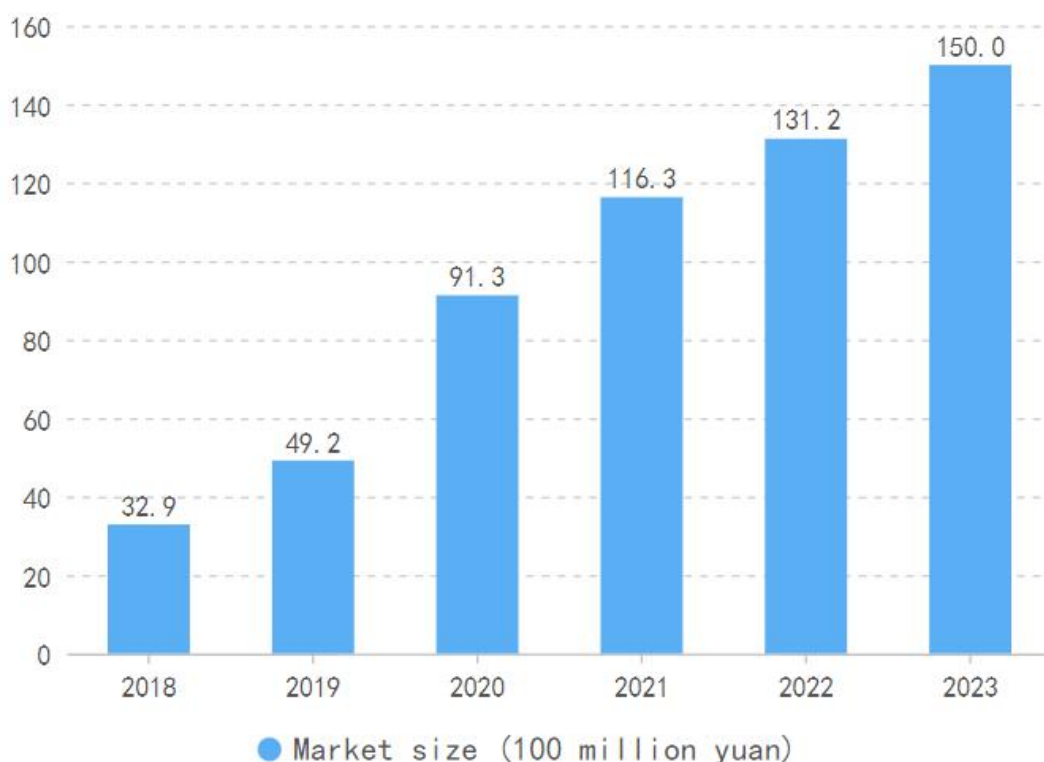


Fig. 1 Forecast of Agricultural Drone Market from 2018 to 2023

The histogram shows that the scale of the agricultural UAV market shows an upward trend from 2018 to 2023, and it is expected that the scale of the UAV market will reach 15billion yuan in 2023.

2.1 Application in agriculture

Crop monitoring and evaluation is one of the important applications of UAV in agriculture. By carrying multispectral and infrared cameras, UAVs can obtain high-resolution image data of farmland, and accurately assess the growth of crops, the degree of pests and diseases, and the status of soil nutrition by using image processing and analysis technology. These data are critical for agricultural decision-making, and can help farmers formulate reasonable fertilization, irrigation and pest control programs.

Precision agriculture is another important application of UAV in agriculture. Intelligent unmanned remote sensing system is the application of intelligent unmanned aerial vehicle with the cooperation of remote sensing system. As an earth observation technology, remote sensing technology uses electromagnetic wave technology. It uses the radiation emitted by the sensor instrument, and then receives the electromagnetic wave information reflected by the radiation of crops, which will be imaged on the screen, so as to visually observe the growth and planting of

crops. It can greatly facilitate farmers' observation and care of crops; The UAV equipped with remote sensing system can accurately diagnose crop diseases, generate water utilization images, and identify the impact of soil erosion characteristics and pests, so as to improve the nursing mechanism of crops [5].

Plant protection is an important link in agricultural production [6], and UAV plays an important role in this regard. By carrying spraying equipment, UAVs can achieve efficient and accurate crop spraying. Compared with the traditional spraying method, UAV can avoid cross pollution between crops, reduce the use of pesticides and reduce the impact on the environment. In addition, the operation speed of UAV is faster, which can improve the operation efficiency and reduce the labor burden of farmers.

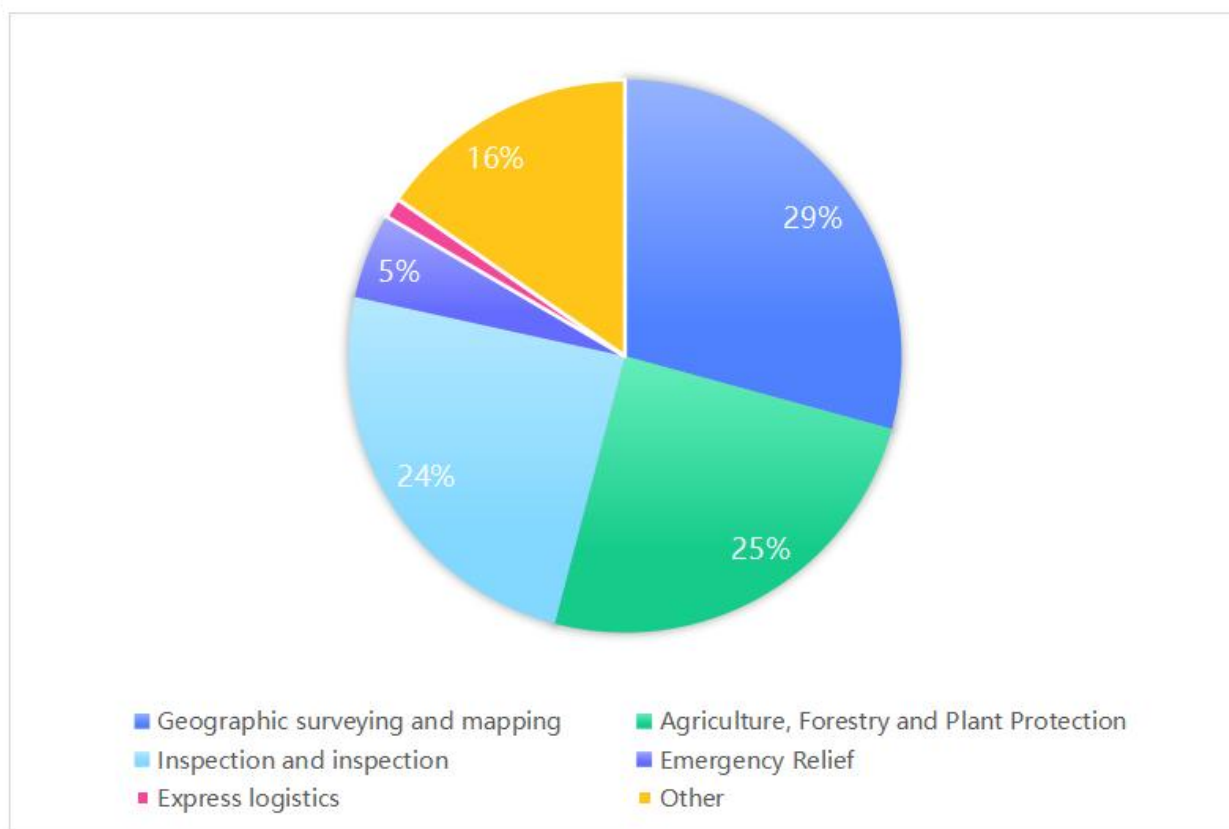


Fig. 2 Proportion of industrial drone

The pie chart shows the proportion of UAV applications, in which agriculture, forestry and plant protection accounted for only 24.9%, while the proportion of industrial fields reached 59.7%.

2.2 Debate and challenge

However, the application of UAV in agriculture also faces some challenges and controversies. First, cost is an important issue. The price of high-quality UAVs is high. For small farmers, the cost of purchasing and maintaining UAVs may be a burden. Secondly, the promotion and training of technology is also a challenge. Farmers need to master UAV operation skills and data analysis technology, which requires corresponding training and support. In addition, the laws and regulations and privacy protection of UAVs in the field of agriculture also need to be solved.

2.3 Development prospects

In the future, the development direction of UAV application in agriculture mainly includes the following aspects. First of all, continuous technological innovation and cost reduction will promote the popularity of UAVs. With the development of technology, the price of UAV will fall, and more farmers will be able to purchase and apply this technology. Secondly, the development of data processing and analysis technology will improve the application value of UAV in agriculture. A large number of data obtained by UAV need to be processed and analyzed, and transformed into reliable decision support information. In addition, the integration of UAV and other agricultural technologies will also become the future development direction. For example, combined with artificial intelligence and big data analysis technology, the data collected by UAV and other data of agricultural production are comprehensively analyzed to achieve more accurate agricultural management and decision-making.

In addition, the autonomous flight and intelligent technology of UAV are also the focus of future development. With the development of autonomous flight and obstacle avoidance technology, UAV can operate more flexibly and avoid obstacles in complex farmland environment. In addition, the improvement of autonomous decision-making and automatic control ability of UAV will also improve its application efficiency and reliability in agricultural production.

In solving the existing problems, the government and relevant institutions should strengthen the formulation of policies and laws and regulations, and create a good environment and conditions to promote the application of UAVs in agriculture. At the same time, farmers and agricultural practitioners need to strengthen the training and learning of UAV technology to improve their technical level and operation ability.

3. Summarize

3.1 Analysis of survey results

The research on the application status of UAV in agriculture shows that it plays an important role in crop monitoring and evaluation, precision agriculture, plant protection and crop spraying. By carrying multispectral and infrared cameras, UAVs can obtain high-resolution images and data to help farmers improve crop management, yield and quality.

However, the application of UAV in agriculture still faces some challenges. The first is the cost limit. The price of high-quality UAVs is high. For small farmers, the cost of purchasing and maintaining UAVs may be a burden. Secondly, the promotion and training of technology is also a challenge. Farmers need to master the operation skills and data analysis technology of UAV, which requires corresponding training and support. In addition, the laws and regulations and privacy protection of UAVs in the field of agriculture also need to be solved.

3.2 Trends

Future development trends and directions include continuous technological innovation and cost reduction to promote the popularity of UAVs. With the development of technology, the price of UAV will fall, and more farmers will be able to purchase and apply this technology. At the same time, the development of data processing and analysis technology will improve the application value of UAV in agriculture. A large number of data obtained by UAV need to be processed and analyzed, and transformed into reliable decision support information. In addition, the integration of

UAV and other agricultural technologies will also become the focus of future development. By combining artificial intelligence and big data analysis technology, the data collected by UAV and other data of agricultural production are comprehensively analyzed to achieve more accurate agricultural management and decision-making.

The application of UAV in agriculture has great potential, which can greatly improve the efficiency and quality of agricultural production. Through accurate monitoring and management, farmers can better cope with the challenges of climate change, pests and diseases, reduce resource waste and achieve sustainable development. Therefore, I support the further promotion and application of UAV technology, and encourage the government, agricultural institutions and farmers to work together to solve the existing problems and promote the development of UAVs in the field of agriculture.

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