

Precision Quadcopters in Agriculture

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Introduction

Drones are boon to Agriculture Industry to boost the Indian Powerhouse. To uplift the status of Agriculture Sector in the country it is necessary to adopt strategic technologies like use of Drones in Farming. Drones can enhance the efficiency of Agricultural activities in one and many ways (Fig.-1) that will directly improve the production rate, standard of living of farmers, Soil Fertility and Sustainability. Unmanned Aerial Vehicles provide realistic approach that helps agronomists, agricultural engineers and agriculture professionals to manage their operations and look into crucial insights of their crops through good data analytics. Drones have become a crucial tool for the rapid transformation of the agriculture sector worldwide and in India it's adoption is increasing day by day . The adoption of drone technology is a key component of the Central government's mission of promoting digital agriculture to strengthen the farming sector.

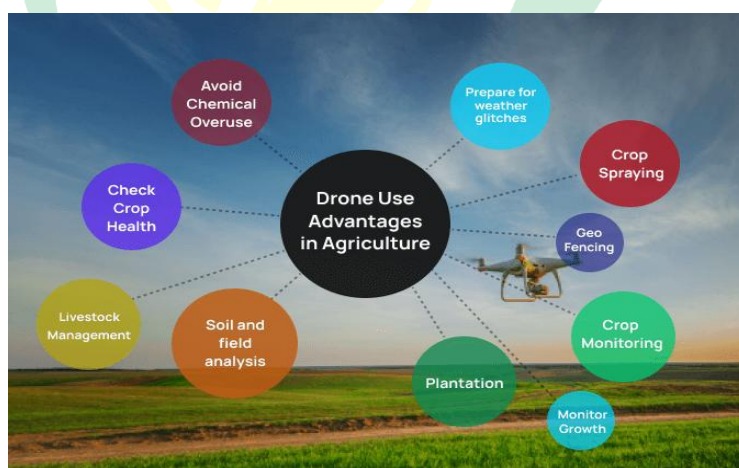


Fig.1. Significance of Drone in Farming

Precision Quad copters combines sensor data and imaging with real time data analytics to improve farm productivity by aerial surveillance , scanning soil and crop health that help the farmers in making decisions about the use of fertilizers, pesticides, and other inputs. This can lead to more efficient use of resources and increased yields. Assisting in

planning of irrigation schedules drones can be used to monitor soil moisture levels and identify areas that require more or less irrigation. This can help farmers optimize water use and reduce waste.

Spraying of liquid fertilizers, pesticides and herbicides can be efficiently performed with the help of drones equipped with sprayers to apply fertilizers, pesticides, and other chemicals to crops (Fig.-2). This can reduce the risk of exposure to harmful chemicals for workers and minimize the amount of chemicals used. Monitoring of crop growth and crop production can be done by Drones equipped with cameras that can capture high-resolution images of crops, allowing farmers to identify areas that require attention, such as those affected by pests or diseases. Drones increase precision in Farming as drones can be used to plant seeds in difficult-to-reach areas or in precise patterns, improving efficiency and accuracy. Livestock monitoring, drones can be used to monitor livestock, helping farmers to identify animals that require attention, such as those that are sick or injured.



Fig.2. Spraying of Chemicals from Drone

Drones help farmers in one and many ways, there are several of drones present in market and best drone for agriculture will depend on the specific needs of the farmer and the crops being grown. Some of the most suitable drones for agriculture sector are DJI Agras MG-1 , DJI Mavic 2 Pro , DJI Phantom 4 , DJI Mavic Pro , DJI Mavic Mini , Yamaha RMAX , Precision Hawk Lancaster 5 , Parrot Disco-Pro AG , AgEagle RX60 , Aerialtronics Altura Zenith , Parrot Bluegrass Fields , DJI FPV, DJI Mavic 3 Cine Premium Bundle , Parrot Anafi , Potensic T25 and DJI Inspire 2 .



- ✚ **DJI Agras MG-1** this is the best drone for farmers, designed for crop spraying. The MG-1 has a sealed body and an integrated centrifugal cooling system that is both efficient and effective. It has a MG-1 powerful propulsion engine that can carry payload capacity of 10 kg and can cover up to 10 acres per hour. It has clever spraying system that adjusts its spray according to the aircraft's speed, ensuring that an even spray is applied at all times. By spraying of pesticides, fertilizers and other chemicals in this way the dose of pesticide or fertilizer used is accurately controlled to prevent pollution and save money.
- ✚ **Yamaha RMAX** this drone is used for crop spraying and has a payload capacity of 28 kg. It is known for its reliability and has been used in Japan for over 20 years.
- ✚ **Precision Hawk Lancaster 5** this drone is equipped with a variety of sensors, including cameras and multispectral imaging sensors. It is designed to provide farmers with detailed information about crop health and soil conditions.
- ✚ **DJI Mavic 2 Pro** has a range of 18 kilometers and a flight time of 31 minutes. The drone is powerful as it has a longer flight time, a long range, and a top speed of 45 mph, that allows farmers to get to more areas in less time. This drone is equipped with four separate sensors that give exceptional stability when in use, ensuring that there are no crashes or damage throughout the flight.
- ✚ **DJI Phantom 4** is one of the best drones for farmers for crop monitoring. The water system, soil system, pests, diseases and fungal infections all are covered by this drone. This drone's crop photographs contain infrared and visual spectral ranges information. This drones obstacle avoidance sensors make this drone safest in sky.
- ✚ **Parrot Disco-Pro AG** is a fixed-wing drone designed for mapping and surveying large areas. It has a flight time of up to 45 minutes and can cover up to 200 hectares in a single flight . **AgEagle RX60** this drone is designed for precision agriculture and has a variety of sensors, including high-resolution cameras and multispectral sensors. It can provide farmers with detailed information about crop health and yield potential.
- ✚ **Aerialtronics Altura Zenith** this drone is designed for inspection and monitoring of crops and livestock. It is equipped with a high-resolution camera and can be used to detect changes in plant health and animal behavior.



✚ **Parrot Bluegrass Fields** this drone is designed for crop mapping and analysis. It is equipped with an RGB camera and multispectral sensor, and has a range of up to 25 minutes.

The Government of India is actively promoting the use of drones in agriculture and has taken several steps to support the adoption and awareness of this technology specially among farmers. Prime Minister of India inaugurated India's biggest Drone Festival – Bharat Drone Mahotsav in May 2022. Government is providing huge subsidies to Farm Machinery Training Institutes, Krishi Vigyan Kendra, Central Inland Agricultural Research Institute, and agriculture universities to promote application of drones in Agriculture. For example, the Indian Council of Agricultural Research (ICAR) has launched a project to develop drones for pesticide spraying and crop monitoring.

The Indian government has established a regulatory framework for the use of drones in agriculture, which includes guidelines and regulations issued by the Directorate General of Civil Aviation (DGCA). The Indian government has been collaborating with private companies and research organizations to promote the development and adoption of drone technology in agriculture. For example, the government has partnered with the World Bank to launch a project aimed at improving agricultural productivity through the use of drones.

Prime Minister called the use of drones a “milestone” for Indian agriculture and expressed confidence that it would create more opportunities in future and will change the face of Indian Farming. Many Indian startups are showing interest in this industry and aiming to invest in low-cost drones, which can help farmers without burning a hole in their pocket and simultaneously create employment opportunities for the rural youth, enhance the knowledge of farmers as and to increase the efficiency and productivity of Agriculture Sector. Advancement in Agriculture Sector by Strategic and Sustainable use of Technology will directly proliferate Agrarian economy.