

A Study and Analysis on Agricultural Drone

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Abstract: Drones can also be utilized in agriculture and it's far referred to as unnamed aerial vehicles (UAV). The agriculture, this was taking a lot of human time and effort. The use of drones in agriculture is extra beneficial than the use of traditional methods for the activities. Utilization of drones in agriculture presents a large advantage in phrases of economy and time due to their maximum magnificent features. On this paper, an in depth observe has been made on diverse varieties of agricultural drones based totally at the function, potential, range as well as value and the location of agriculture in which they healthy the maximum, and a statistical analysis about the use of the drones in the area of agriculture.

Keywords: Drones, UAV, analysis, applications.

1. Introduction

Agriculture is a big sector in the Indian economy, but it still lags behind western countries in terms of adopting new technology for increased farm productivity. To ensure that agriculture is profitable, we must minimize traditional approaches and embrace new technologies [11]. Farmers are now beginning the spraying pesticides with drones. Drones with mounted spray tanks that can store pesticide and spray it over the crop are available. The drones fly at an appropriate altitude, allowing the pesticide to penetrate perfectly on the crop. Spraying paddy, orchards, and dense crop fields is easy [1]. Pesticides and fertilizers have a variety of effects on human health, including the development of skin and neurological diseases. Pesticides and fertilizers impact thousands of farmers and employees or workers every year [10], [5]. Agricultural UAVs reduce labour requirements while also lowering time, production costs and facilitating effective pesticide spraying, ensuring the protection of farmers, agricultural products, and the environment while also lowering the risks associated with chemical pesticide use [3]. Livestock management

DJI, Parrot, Precision Hawk, AG Eagle, and Trimble Navigation are all major UAV manufacturers. While a variety of unmanned aerial vehicles (UAVs) have been developed and commercialized [4]. Drones like the DJI Agras MG-1 are designed to spray liquid pesticides, fertilizers, and herbicides at precise variable rates. The propulsion technology of the MG-1

allows it to carry up to 10 kg of liquid payloads, such as insecticides and fertilizers, and spray an area of 4,000-6,000 m² within just 10 minutes, which is 40 to 60 times faster than traditional spraying. [7]. Some of the reputed organizations agricultural drones are shown in the below table 1.

Table 1
Manufacturing organizations of different countries [4]

Manufacturing Organizations	Country
Ag Eagle	United States American
Robotics	United States
DJI (Da-Jiang Innovations)	Hong Kong
Precision Hawk	United States
Sensefly (Parrot)	Switzerland
Senterra	United States

2. Parametric Study

A. Types of UAV system for agriculture

Multicopter UAVs are highly realistic to perform tasks due to their solid construction. It is more reliable because there are fewer moving pieces. The types of UAV are as shown in fig. 1.

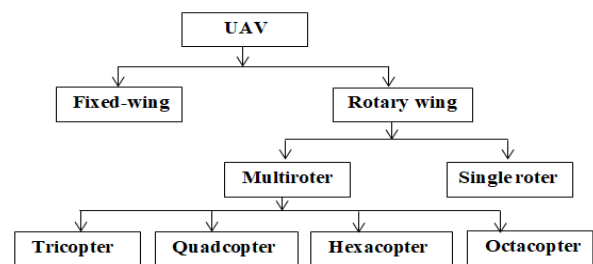


Fig. 1. Types of UAV

Fixed-wing aircraft, single-rotor helicopters, and multicopter UAVs are the three types of UAVs available. According to [9], the selection of a UAV type is based on four types of performance parameters.




When it comes to functioning, each type of drone has its own distinct characteristics. Drones are ideally suited in agriculture as a tool for researching, evaluating, and monitoring the

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surroundings, temperatures, and humidity of agricultural land because they are little flying machines and agriculture will be done across broad distances. Addition to the above-mentioned criteria, agriculture is dependent on several other conditions in order to harvest crops successfully. Depending on the features of the drones, many types of drowns may be utilized in the agriculture process for various uses [2].

Table 2

Comparison of user experiences of three types of small aircraft [9]

Performance factors	Fixed wing	Single rotor	Multirotor
			
Ease of use	***	**	*
Reliability	***	**	*
Maintainability	***	**	*
Time of endurance	*	***	**

Some of the agricultural UAVs with their potential application and nominal coverage are include in table 3 with different UAV types. In table 3 potential application of some agricultural UAVs are explained.

Agricultural drones are produced by a variety of enterprises in India as well as other nations such as the United States, Canada, South Africa, and Australia. Adopting this type of agriculture in India is a hurdle. These modern farming technologies are only partially applied due to a variety of problems. The following are some of the challenges India faces in adopting new and advanced agricultural techniques.

- Lack of knowledge.
- Tight Bonding with Traditional Techniques.
- Economic Factors.
- Labor Issues
- Varying Climate Conditions - at times.

3. Best Practices and Applications

Drones are becoming increasingly popular in the agriculture sector as a result of their precision and speed in gathering data. Drones' popularity is further aided by the software and hardware instruments that are employed in them. Drone performance has considerably improved as the software and hardware of the drones have evolved. In the subsections below, some of the best practices and applications of drones are described.

A. Applications of drone in agriculture are as following

1) Soil and field analysis

One of the most common uses of drones is to inspect the state of the soil. Agricultural drones can be used for soil and field analysis to help in field planning. They can be used to mount sensors that measure moisture content in the soil, nutrient content, and soil fertility.

2) Fighting infections and pests

Another maximum essential class of agriculture is the identification of infections and pests inside the farming region. Agricultural drones also can help in identification of infections and pests, and the quantity of inflammation can also be diagnosed, and spraying appropriate quantity of drugs at the plants which were given infected, thereby lowering the human effort.

3) Crop spraying

On the grounds that drones are the flying machines, to use those drones in agriculture certainly for smart farming, spraying technique can be adopted. Agri-drones may be used to spray chemical substances.

4) Health assessment

Inside the system of agriculture, monitoring the health of the crops is essential. If the rural lands are big, tracking all the plants on daily basis is a completely hard undertaking for the farmers, in such instances drones are more capable of visiting all the lands and thereby monitors the plants and information can be maintained periodically.

5) Geofencing

The thermal cameras mounted over drone scan without problems locate animals or humans. So, drones can guard the fields from external damage because of animals, in particular at night time.

6) Crop monitoring

Crop surveillance is the supervision of crop development from the time seeds are sown to the time for harvest. Crop surveillance is the only way that a farmer can make certain a well-timed harvest, in particular dealing with seasonal crops.

7) Livestock management

Drones are not only used in agriculture but also helpful in harvesting animals.

A comparative analysis of drones, which specifies, the place in which the sort of drone is powerful in use, based on quality practices is as proven in table 4 below. In table 4, the notations used to specify suitability of the drones are given through good, moderate, and poor, in which good stands for great suitability,

Table 3

Some of the agricultural UAVs [6], [8]

Agriculture UAVs	Potential Application	Nominal Coverage	UAV Type
eBee SQ	RGB imagery, spanning vast areas of every flight, soil temperature	500 acres	Fixed wing
Sentera PHX	Weed management, pest management, crop health monitoring	700 acres	Fixed wing
Lancaster 5	Plants counting and number, assessing plant quality, creating prescription maps	300 acres	Fixed wing
Honey Comb	Navigating, surveillance, soil H ₂ O levels, air pressure	600 acres	Fixed wing
AgEagle RX-60	Aerial imaging, crop health monitoring, maps prescription	400 acres	Fixed wing
DJI Matrice 100	Aerial Imaging, crop health monitoring, maps	400 acres	Fixed wing
Dji matrices 600 Pro	Plants counting, Navigating, aerial photography	50 to 100 acres	Multi rotor
Dji matrices 210	Firefighting, pipeline Inspection	50 to 100 acres	Multi rotor
Sentera NDVI	Crop health monitoring, Plants counting	50 acres	Multi rotor
AgBot	Plant height, assessing plant quality	75 acres	Multi rotor
Agras MG-1-DJI	Aerial imaging, spraying, maps	7-10 acres	Multi rotor

moderate for average, and poor for less suitability.

Table 4
Comparative analysis of drones on best practices [2]

Basic practices in agriculture	Drones		
	Fixed wing	Single rotor	Multirotor
Livestock monitoring	Moderate	Moderate	Moderate
Agriculture spraying	Moderate	Poor	Good
Crop surveillance	Bad	Good	Good
Estimating soil condition	Moderate	Good	Good

4. Conclusions and Discussions

On this paper, wide classes about agricultural drones are discussed. Exclusive classes of Agricultural drones are mentioned based totally on functions, nature of work, cost, and requirement. It's far determined out that, many kinds drones are suitable in agricultural fields for performing various activities. Along with agriculture there are many associated activities which includes, hen, sericulture, fisheries and many others. In these fields additionally drones play major roles for performing some critical and key sports. Majorly in agriculture, the drones are used in statistics amassing, providing reports, some physical sports, animal surveillance, crop records, spraying insecticides and so on. Completely, using drones in agriculture and different related industries opens the door for smart farming. If drones are applied in all the activities of agriculture and associated industries, then there's no question that the United States of America will advantage huge GDP (Gross home Product) from agriculture.

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