

# **A**FRO**B**eyondist**C**ivilization



## BEYONDIST Precision AGRICULTURE

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## ABSTRACT

The rising population is also increasing the demand of food. The traditional methods used by the farmers are unable to fulfil the requirements. This creates a demand for development of new automated technologies that can manage agriculture efficiently and increase the productivity. Precision agriculture merges the new technologies borne of the information age with a mature agricultural industry. It is an integrated crop management system that attempts to match the kind and amount of inputs with the actual crop needs for small areas within a farm field. Precision farming distinguishes itself from traditional agriculture by its level of management. Instead of managing whole fields as a single unit, management is customized for small areas *within* fields. This increased level of management emphasizes the need for sound agronomic practices. In this endeavour Drones, also known as Unmanned Aerial Vehicles (UAVs) can be highly beneficial. In general, UAVs are equipped with cameras and sensors for monitoring of crops and sprayers are used for spraying of fertilizers, weedicides, pesticides, etc. Drones can fly autonomously with dedicated software which allows making a flight plan and deploying the system with GPS and feed in various parameters such as speed, altitude, ROI (Region of Interest), geo-fence and fail-safe modes (Dutta and Goswami, 2020).

## TYPES OF DRONES USED IN AGRICULTURE

### **1. Harvesting Drones:**

Flying drones or fruit harvesting drones are able to pick over 90% of all fruit from trees. This enables the growers to increase tree heights for further production and thus generate additional yield. Besides, harvesting drones are able to differentiate between ripened and unripened fruits and accordingly harvest the produce with higher precision and minimal wastage.

### **2. Mapping drones:**

Drones are affixed with image sensing softwares which are used for generating maps for various purposes. Yield mapping, land mapping, soil nutrient mapping, water status mapping and others are few examples that are worth mentioning. This

helps to monitor crop and soil conditions and plan management practices for better productivity.

### **3. Spraying drones:**

Drones can be used to spray chemicals like fertilizers, pesticides, etc. based on the spatial variability of the crops and field. This not only ensures better fertilizer or any such chemical use efficiency but also curtails water use by almost 95%. They also reduce health hazards caused to farmers due to manual chemical spraying.

### **4. Sensing drones:**

Drones are equipped with advanced sensors, such as RGB and Multispectral Sensors, to procure precise data for weed management, disease detection, irrigation management, yield prediction, etc.

## **APPLICATION OF DRONES IN AGRICULTURE**

### **1. Soil and field analysis:**

Agricultural drones can be used to mount sensors to evaluate moisture content in the soil, soil erosion, nutrients content, and fertility of the soil.

### **2. Crop monitoring:**

This includes providing fertilizers at the right time, checking for pest attack, and monitoring the effect of weather conditions. Drones can inspect the field with infrared cameras and based on their real-time information, farmers can take active measures to improve the condition of plants.

### **3. Plantation:**

Drones can help in planting trees and crops. This will not only save labor but also help in saving fuels.

### **4. Livestock management:**

Drones can be used to monitor and manage huge livestock as their sensors have high-resolution infrared cameras.

**5. Crop spraying:**

Agri-drones can be used to spray chemicals to crops in very little time.

**6. Check crop health:**

Drones with infrared mapping can monitor the health of soil and crop in a matter of hours.

**7. Avoid overuse of chemicals:**

Drones are effective in reducing the overuse of pesticides, insecticides, and other chemicals. Drones can detect minute signs of pest attacks, and provide accurate data regarding the degree and range of the attack.

**8. Prepare for weather glitches:**

Drones can detect upcoming weather conditions. Advance notice of storms or lack of rain can be used to plan the crop.

**9. Monitor growth:**

Drones can provide accurate data about every stage of crop growth, and report any variations before they become a crisis. For example, stressed crops will reflect less near-infrared light as compared to healthy crops.

**10. Geofencing:**

The thermal cameras installed over drones can easily detect animals or human beings.

**BENEFITS OF USING DRONES**

**1. Fast data acquisition for accurate farm analysis:**

Drone photometry can create highly accurate maps and 3D models. With drone mapping software such as Pix4DFields, images captured can be used to get a topographical map of the farmland. This will help farmers make necessary adjustments for a healthy and productive land.

## **2. Time and cost saving:**

Drones are more time efficient than manned aircraft for mapping, surveillance, and crop spraying. Operations in drones are carried out through intelligent flight modes, they are semi-automated hence time efficient thus less time is spent on the field which saves farmers money on labour equipment.

## **3. Improved crop yields:**

Using remote sensing technology, farmers can easily identify areas of the field that are not producing healthy crops, and adopt required management practices. This will improve the overall quality of the crops, improve yield and save money in the long term.

## **4. Safer way to spray crops:**

Spraying chemicals manually pose health hazards. Using drones to treat infected plants is much safer and more efficient than manual labour and using land-based machinery.

## **5. Helping Fight Climate Change:**

Reduce the use of chemicals through data-driven targeted treatment and the need for fossil fuels as drones are powered by intelligent batteries. Drones can help reduce pollution, help the environment and help in the fight against climate change.

## **DISADVANTAGES**

### **1. Costly:**

A drone costs anywhere between ₹10 lakh and ₹12 lakh. An ordinary farmer will not be able to afford it.

## **2. Contamination:**

Aerial spraying may contaminate water bodies and affect small water streams. Animals can also become victims.

## **3. Unsuitability to all crops:**

Drones cannot be used for all crops e.g. they cannot be used for spraying on grapes whose leaves form a canopy making spraying difficult.

## **4. Vulnerable:**

Agriculture drones are more vulnerable to adverse weather conditions.

## **5. Federal laws:**

The use of agricultural drones is considered commercial. This means the farmer needs to undergo Federal Aviation Administration (FAA) operator training so as to acquire a remote pilot certificate or hire an operator with such qualifications.

## **CONCLUSION**

Drone technology is a boon to agriculture. It enables precise application of inputs, manage weeds, save water, reduce fertilizer misuses, thereby, improve resource use efficiencies. It also reduces the drudgery of farmers and ensures higher profitability and crop productivity. There are few limitations in agricultural drones which require further research.