Drone Technology in Indian Agriculture

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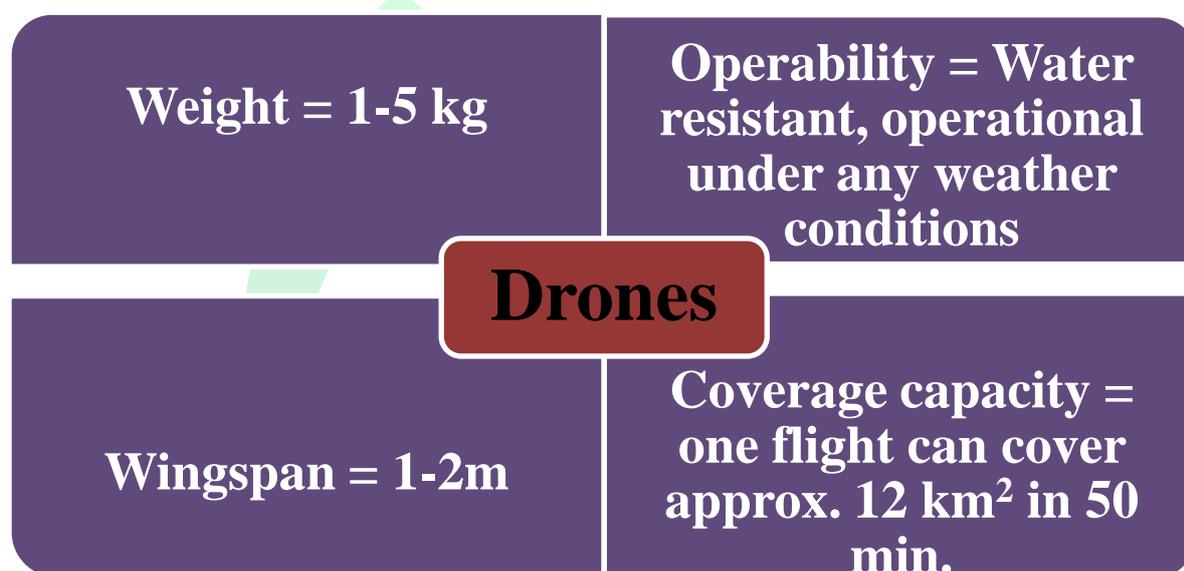[2]Ph.D. Research Scholar, Department of Soil Science and Agricultural Chemistry, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) 492012.

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Introduction

India's economy is primarily based on agriculture. Agriculture continues to be the primary source of income for a majority of rural households. India's economy also heavily relies on agricultural products, which account for a large portion of India's exports.18% of India's GDP is contributed by the country's agricultural industry (Gross Domestic Product).As of 2019, the Indian agriculture, forestry, and fisheries sectors generate a Gross Added Value of roughly Rs 18.55 lakh crore (US$265.51 billion). With parallel industries, the agricultural sector is growing at a rate of 2.1%. (2019-20).Despite the contribution of Indian agriculture to GDP, our nation still needs to increase productivity and efficiency in the industry to the fullest extent possible. There are a number of aspects and issues that need to be recognized, supported, and addressed with solutions. Currently, inappropriate techniques are used for a variety of essential farming tasks, including crop monitoring, water irrigation, pesticide application, and many others. The Return on Investment frequently declines because resources are insufficient, are not allocated according to weather conditions, or are not fully utilized (ROI).Multiple opportunities for technological advancement have been made possible by these obstacles. Since its inception, technology has always had a positive impact on the agricultural industry. Drone technology, the use of drones i.e., unmanned aerial vehicles (UAVs) has received the most attention in the industry due to its versatility and potential for the agricultural community. They were initially used by the military. Other industries, however, embraced unmanned aerial vehicles (UAVs) after learning about their widespread applications. What role do drones play in Indian agriculture? Drones encourage farmers to overcome other obstacles and profit greatly from precision agriculture in addition to improving overall performance. The market for agricultural drones has grown to a staggering $1.3 billion, and UAVs (unmanned aerial vehicles) fill the gaps left by traditional

farming systems' human error and inefficiency. Drone technology is being used to eliminate all ambiguity and guesswork and instead concentrate on precise and trustworthy information. Weather, soil conditions, and temperature are all important factors in farming. Agriculture drones enable farmers to adapt to specific environments and make informed decisions. The information gathered aids in crop health management, crop treatment, crop scouting, irrigation, field soil analysis, and crop damage assessments. The drone survey increases crop yields while reducing time and costs.

Weight = 1-5 kg	Operability = Water resistant, operational under any weather conditions
Wingspan = 1-2m	Coverage capacity = one flight can cover approx. 12 km² in 50 min.

Drones

**Fig. 1. The characteristics of drones**

How drones work?

After completely recognising the characteristics of drones (Fig.1), one can have full knowledge of the drones used in agriculture. Drones comprise of a navigation system, a global positioning system (GPS), and multiple sensors, cameras of high quality, programmable controllers and autonomous drone tools. One of the drones commonly used by the industry is the DJI. The process of how drones work is hereby given as:

1. **Analysis of the concerned area:** This designates the area under test. As a result, the first step entails establishing a boundary, analysing the area, and finally uploading the technical GPS data into the drone's navigation system.

2. **Utilizing autonomous drones:** Unmanned aerial vehicles (UAVs), which are autonomous, insert flight patterns into their pre-existing systems in order to gather the necessary data.

3. **Data uploading:** The data, which is captured through sensors like multispectral/ RGB sensors, is taken for processing through various software's for interpretation of the analysis.

4. **Outcome:** The data collected is then presented to the farmers in such a way that they can understand it with no hassle, thus exposing them to precision farming. One such method to display the extensive data is through 3D mapping or photogrammetric.

Application of drones in agriculture:

1. **Field and soil analysis:** Agricultural drones can analyse soil and fields for effective field planning. They can be used to mount sensors that measure soil moisture, terrain, soil conditions, soil erosion, soil nutrient concentration, and soil fertility.

2. **Monitoring the crops:** Monitoring the condition of the plants and identifying bacterial/fungal diseases in the early stages of the crop are critical. Agriculture drones can detect which plants reflect various amounts of green and near-infrared spectroscopy (NIRS) light. This information is used to create multispectral images that track crop health. Monitoring quickly and discovering the defects can save the crops from failure. The drones which have multispectral or RGB sensors can help detect the areas in fields infested with weeds, diseases and pests. This information makes it possible to determine the precise quantities of chemicals required to combat these infestations, which lowers the costs incurred by the farmer.

3. **Monitoring irrigation:** Drones consisting of thermal, hyper spectral or multispectral sensors, help identify the areas which are torrid and needs the attention of farmers. This survey by drones helps in improving the water efficiency and disclosing the pooling/leaks in irrigation, calculates the vegetation index for realizing the crop health and heat/ energy emitted.

4. **Spraying of pesticides:** Human contact with the harmful chemicals gets limited by spraying pesticides through drones. Drones carry out this task much quickly.

5. **Tacking livestock:** The farmers can track not just their crops but also the movements of their cattle through drone survey. Animals can be located and illnesses or injuries can be found using thermal sensor technology. This task can be successfully performed by drones, which significantly boosts the growth of vegetation.
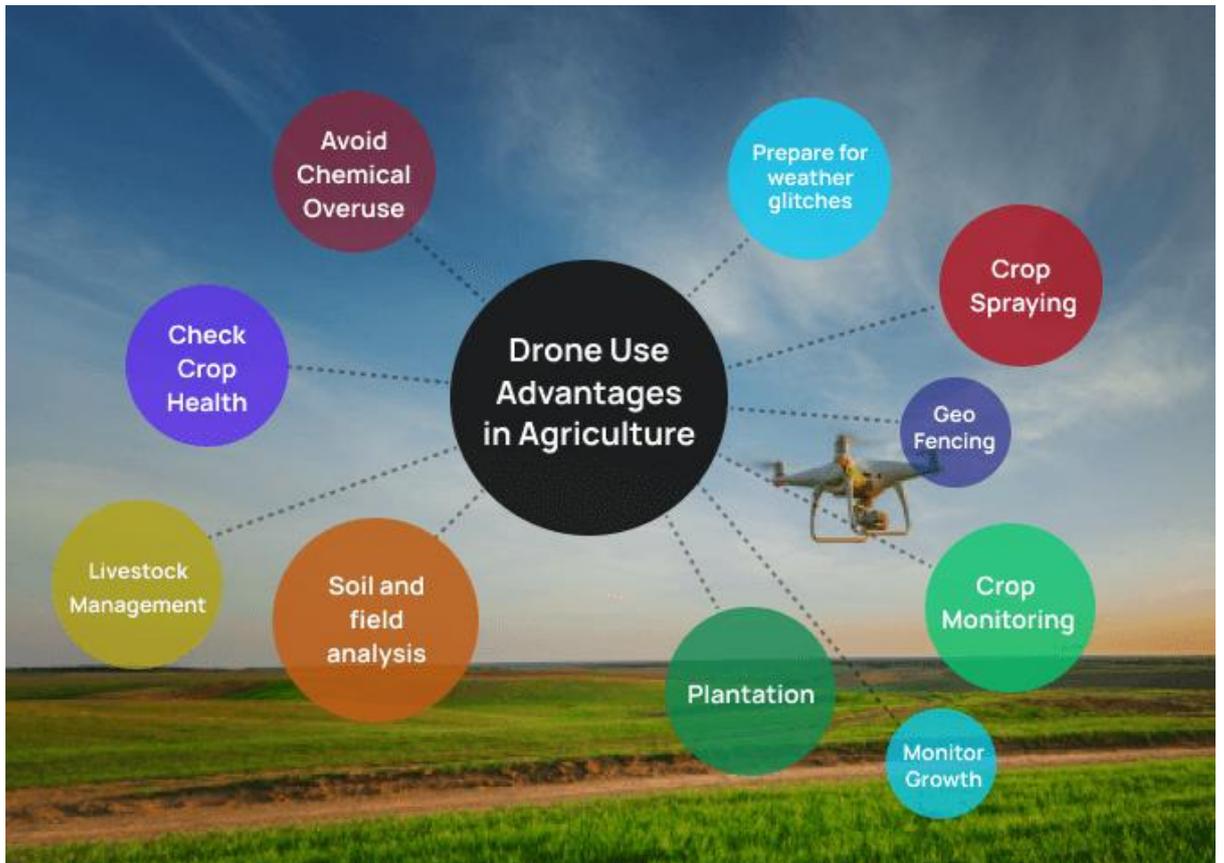
Fig.2. A depiction of the advantages of drone technology in agriculture.