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# Application of Drones: An Advanced Technology for Future Agriculture

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**Abstract**

Now-a-days precision agriculture is gaining momentum for increasing the agricultural farm productivity in worldwide especially, in the developing countries like India, where 70% of the livelihood of rural people depends on agriculture. Generally farmers follow various types of sprayings by using agrochemicals like pesticides, insecticides etc, to enhance the crop quality, According to the WHO (World Health Organization), one million cases of ill effected when spraying the pesticides in the crop field manually. Drones have been widely used in precision farming which entail variable rate technology for seeding and fertilizer application, early warning system for pest and disease, spraying of agro-chemical and yield monitoring etc. Hence, the Unmanned aerial vehicle (UAV) – aircrafts are used to spray the pesticides to avoid the health problems of humans when they spray manually. In Indian context, Government is trying to popularize this advance technology through various policies and scheme in agriculture through SAUs, KVKs, government and private institutions and agri-industries.

**Keywords**: Drone, UAV, Input management, Future Agriculture

## Introduction

Climate change and environmental pollution are the major global issues of the current era and severely impacting agricultural productivity. The conventional agricultural practices along with other factors like deforestation, fossil fuel combustion, etc. also contribute towards amplification of global warming and related issues. In conventional agriculture systems, farmers generally apply fertilizers, pesticide, and other agrochemicals in heavy amounts indiscriminately. The higher dose of fertilizers is not utilized by crops properly, and thus unutilized fertilizers act as a source of pollution in the environment generating greenhouse gases. So, sustainable agriculture is one of the solutions to combat environmental

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pollution and reduction of greenhouse gas emissions, thereby offsetting the effect of climate change. Therefore, there is a need for advanced technologies to perform agricultural practices in a sustainable manner. In this context, DRONE or UAV comes into the picture. Drones have been widely used in precision farming which entail soil nutrient mapping, land levelling system, variable rate technology for seeding and fertilizer application, early warning system for pest and disease, spraying of agro-chemical and yield monitoring etc. (Bujang and Bakar, 2019). Furthermore, various issues in agriculture management come up due to climate change are crucial and there is immediate requirement for adoption of advanced technologies such as drones, image processing etc. At the same time, this technology may lead to increased crop production, productivity and its quality (Daponte *et al*., 2019). DRONE (Dynamic Remotely Operated Navigation Equipment), also known as Unmanned Aerial Vehicles (UAV), is a device which can fly either with the help of autopilot and GPS coordinates on the pre-set course or can be operated manually with radio signals using the remote control or smartphone app (Rani *et al*., 2019). With the availability of so many sensors, drones can detect the things which are beyond the visible range of human sight. Therefore, real-time, more accurate, reliable, and objective information can be derived from drones in greater detail and fewer errors. The potential of drones to become an element of the advanced technologies in the near future with vast utility in attaining sustainable agriculture cannot be undermined. In this context, drones are now-a-days emerging as a component of precision agriculture along with contributing to sustainable agriculture. In this article we mentioned application of drone technology in various filed operations and the problems/bottlenecks in using the drones in agriculture.

**Applications Of Drones In Agriculture**

There are numerous applications of drones in agriculture;

- **Soil and field analysis:** Drones can be used to mount sensors which are able to analyze the soil conditions, terrain conditions, moisture content, nutrients content and fertility levels of the soil.
- **Planting crops and trees:** Drones can be used to plant trees or crops in remote areas by throwing biodegradable seed pods or seed bombs. Thus, they can be used for the restoration of degraded lands by planting trees, and also for reforestation as well as afforestation activities.

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- **Crop monitoring and spraying:** Drones can be used for monitoring the conditions of crops throughout the crop season so that the need-based and timely action can be taken. The quick and appropriate action can prevent yield loss. Drones can be used to spray chemicals like fertilizers, pesticides, etc. based on the spatial variability of the crops and field. This ultimately increases the efficiency of the chemicals applied, thereby reducing their adverse impacts on the environment by decreasing the soil and water pollution.
- **Weed identification:** Drones can be used to identify the weeds present in the field. These weeds could be time rooted out from the field so weeds do not compete for resources with main crop.
- **Irrigation scheduling of crops:** Drones can be used to apply irrigation to the crops based on their requirement. This will prevent the wastage of water and will ensure the efficient utilization of irrigation water.
- **Crop health assessment:** By using different kinds of sensors pertaining to visible, NIR and thermal infrared rays, different multispectral indices can be computed based on thereflection pattern at different wavelengths. These indices can be used to assess the conditions of crops like water stress, insect-pest attack, diseases, etc.
- **Livestock management:** Drones having high-resolution infrared cameras can detect the diseased animals in the herds. The detected diseased animal can then be separated from their fellow animals, and the early treatment can be provided.
- **Controlling weed, insect, pest and diseases:** Apart from soil conditions, drones can also detect and inform farmers about field areas inflicted by weeds, disease and insect pests.
- **Scaring birds:** Birds are the major problem after sowing seeds of many crops. This needs labour to protect the field. A couple of drone flights can scare the birds away from field

**Problems and bottlenecks of using Drones in Agriculture**

- The cost of drones increases significantly with longer flight time.
- The initial cost is also proportional to the payload and flightduration capacities, apart from sensors and features included.
- Very limited unmanned aircraft operator's permit (UAOP) have been issued till date

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- Online coverage is mostly unavailable in the arable farms.
- Under windy or rainy conditions, flying drones is not easy and drones are weather dependent.
- The farmer has to acquire the skills and knowledge of software of image processing
- There is a chance of misuse to infringe the privacy of people

**Future Scope**:

UAVs in precision agriculture are still in its early stage and maybe a scope for further development in both the technology and the agriculture applications. Providentially, it is expended that with the development of UAV'S technology, improved image processing techniques, lower costs, flying times, batteries, new camera designs, low volume sprayers, and nozzle types. A significant number of experimental studies of UAV'S based remote sensing for agriculture application. It will be a more prominent advantage of these systems in precision agriculture and environmental monitoring.

**Conclusion**:

In the past decade latest technologies are included into the precision agriculture to improve the productivity of the crop. Drones technology implications in agriculture not only improve the crop production but also transforms the farmer to protected scenarios. According to the various reports and documents, in the Indian context, these technologies have very limited application. But this may be increased day by day for various application such as efficient water management, characterizing water bodies, planting, livestock monitoring, soil health monitoring, disease and pest control and vice versa, from farm to household for multiple uses. It has numerous advantages; save about 80% of operating time, 90% of water consumption, 50% of pesticide use, decreasing fertilizer costs and increasing yield, decrease planting costs by 85% and so on. In Indian context, Government is trying to popularize this advance technology through various policies and scheme in agriculture through SAUs, KVKs, government and private institutions and agri-industries.

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