

## INTRODUCTION:

Unmanned Aerial Vehicles (UAVs) is known as Drones that are regarded as pilotless aircraft techniques utilized in various areas such as Industrial monitoring system, shooting, battleground observation, space ambulance, product liberation and several more applications. In agriculture, there are various functions of drone tools like crop supervising, crop quantity and verve considerations, crop record, production of recommendation records, meticulousness drenching, and examination of farm infrastructure, high declaration mapping and examination of individual areas, crop scratch measurement & insurance claim forensics. This Imaging technique can help with overall field organization, giving results in real-time determining where precise crops may need much water, fertilizer, soil or pesticides. Agriculture in India constitutes more than 60% of occupation. It serves to be the backbone of Indian economy. It is very essential to improve the productivity and efficiency of agriculture by providing safe cultivation of the farmer. The various operations like spraying of pesticides and sprinkling fertilizer are very important. Though spraying of pesticides has become mandatory it also proves to be a harmful procedure for the farmers. Farmers especially when they spray urea, take to many precautions like wearing appropriate outfit masks and gloves. It will avoid any harmful effect on the farmers.



## WHY ADOPT DRONES TECHNOLOGY IN AGRICULTURE

Farming is facing many economic challenges in terms of productivity and cost effectiveness, and the increasing labour shortage partly due to the depopulation of rural areas, as well. Among such global challenges, it should be considered the population increase, the urbanization, an increasingly degraded environment, an increasing trend toward consumption of animal proteins changing in food preferences through aging population and migration. External factors like weather, soil conditions, and temperature play a critical role in farming. Agriculture drone

# DRONE TECHNOLOGY: WILL GIVE WINGS TO THE FARMERS

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empowers the farmer to adapt to specific environments and make mindful choices accordingly. According to experts, the predicted world population will be 9 billion by 2050. Agricultural consumption is also said to increase simultaneously by nearly 70%. Drone technology, equipped with artificial intelligence (AI), machine learning (ML), and remote sensing features, is rising in demand because of its advantages.



## HOW DOES DRONE TECHNOLOGY WORK?

The following stages are involved in capturing data from an agriculture drone

1. Analyzing the area
2. Using Autonomous Drones
3. Uploading the data
4. Output.

## BEST DRONE PRACTICES

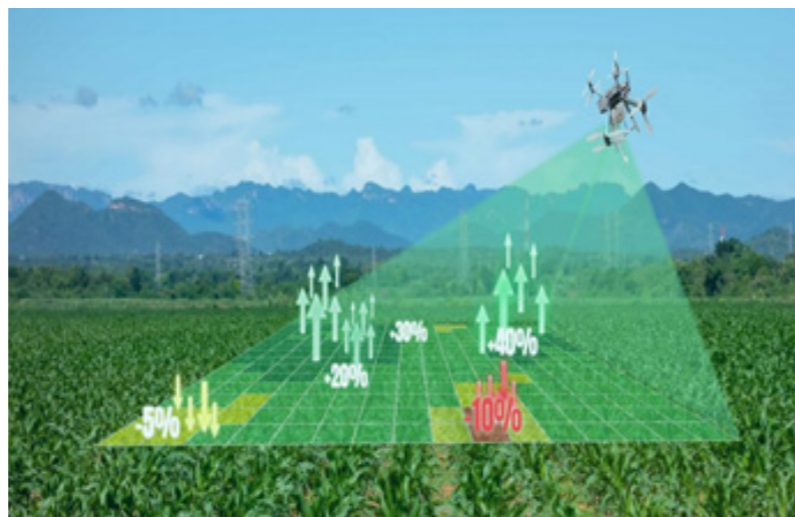
These are the best practices to be done through the drone are given below:

### I. Irrigation Monitoring:

Drones, including hyper spectral, thermal, or multispectral sensors, recognize areas that are too dry or need improvement by the farmer. Drone survey helps improve water efficiency and disclose potential pooling/leaks in irrigation by providing Irrigation monitoring yields calculations of the vegetation index to help realize the health of crops and emitted heat/energy.

### II. Crop health monitoring and surveillance:

It is crucial to track the health of the vegetation and spot bacterial/fungal plagues



in the early stages. Agriculture drones can see which plants reflect different amounts of green light and Near-infrared spectroscopy (NIRS) light.

### III. Crop Damage Assessment:

Agricultural drones fitted along with multispectral sensors and RGB sensors also detect field areas inflicted by weeds, infections, and pests. According to this data,

the exact amounts of chemicals needed to fight these infestations are known, and this helps diminish the costs inflicted by the farmer.

### IV. Soil analysis:

The drone survey allows farmers to obtain information about their land's soil conditions. Multispectral sensors allow seizing data useful for seed planting patterns, thorough field soil analysis, irrigation, and nitrogen-level management.



### V. Monitoring Field Conditions:

Drone field monitoring is also being used to monitor the health of soil and field conditions. Drones can provide accurate field mapping including elevation information that allow growers to find any irregularities in the field. This allows for precise application of fertilizers, eliminating poor growing spots and improving soil health for years to come.

### VI. Planting & Seeding:

Drone planting is a newer technology and not as widely used, but some firms are experimenting with drone planting. Planting

with drones means very hard to reach areas can be replanted without endangering workers. They are also able to plant much more efficiently with a team of two operators and ten drones capable of planting 400,000 trees a day.

### VII. Drone Pollination:

Some of the newer uses for drone use in agriculture are still in testing and development. One of the most publicized (and often fictionalized) uses is pollinating drone technology. The next step is to create autonomous pollinating drones that will work and monitor crop health without constant instruction from operators.

### VIII. Agricultural crop spraying and spot spraying:

Through drone crop spraying, human contact with such harmful chemicals is limited. Professionals say that aerial spraying is five times faster with drones when compared to other methods. Crops require regular fertilization and spraying in order to maintain high yields. Using drones for crop spraying is much safer and cost-effective.

### IX. Security:

Drone security is a fast growing industry apart from agriculture but is also extremely useful to farm management. Using drones to monitor the far reaches of a farm without having to get there saves valuable time and allows for more frequent monitoring of hard to reach areas.



## ADVANTAGES OF USING DRONE IN AGRICULTURE:

Drones can help farmers to optimize the use of inputs (seed, fertilizers, water), to react more quickly to threats (weeds, pests, fungi), to save time crop scouting (validate treatment/actions taken), to improve variable rate prescriptions in real time and estimate yield from a field. Intensive agriculture has several negative impacts on the environment. It adds significant and environmentally detrimental amounts of nitrogen and phosphorus to terrestrial ecosystems. Also, excessive fertilizers application can cause pollution risks for the environment, whereas insufficient fertilizer used to replace nitrogen and phosphorus lost through intensive cropping can lead to soil degradation and loss of fertility. In such a context, the use of drones in agriculture has recently been introduced for big areas inspection and smart

targeted irrigation and fertilization Current agriculture drones applications are:

- ✓ More accuracy rate
- ✓ Useful for Insurance claims
- ✓ Evidence for insurance companies
- ✓ Locust swarms
- ✓ Biomasses, crop growth and food quality monitoring and Harvesting
- ✓ Precision farming, such as to determine the degree of weeds for site-specific herbicide applications
- ✓ Estimate yield
- ✓ Precisely calculate field characteristics
- ✓ Save time crop scouting
- ✓ React faster to threats
- ✓ Optimize inputs
- ✓ Improve Variable Rates Application
- ✓ Real time mapping

## LIMITATIONS OF AGRICULTURE DRONES:

Drones are opening up the skies to farmers who want better ways to monitor their crops. Although flying a drone over a field is less labor-intensive than walking through one, use of drone in precision agriculture still take too much time and effort for farmers to use. Following are the drawbacks or disadvantages of Agriculture Drones:

1. It requires basic knowledge and skills to operate the agriculture drones
2. Most of the drones have less flight time and covers less area. Drones having long flight time and long range are costlier
3. Drone having more features are also more expensive
4. Need to obtain government clearance in order to use it
5. It uses same air space as commercial aircrafts and hence may interfere with manned aircrafts if it comes in their flight path
6. It is difficult to fly them in extreme conditions
7. Flight Time and Flight Area
8. Heavy Cost for Good Feature Drones
9. Federal Laws
10. Weather Dependent

## BEST DRONE PRACTICES

Drone technology in agriculture offers a wealth of benefits, including improved crop analysis, better management practices, and increased efficiency. While there are challenges and limitations, including privacy concerns and regulation, the potential of this technology is immense. Future trends in this research field go toward the use of cheap commercial mini or micro drones. However, in doing so, the measurement accuracy specifications are challenging to be addressed and several problems arise. Agricultural drone technology, as previously stated, is undoubtedly the future of the Indian agrarian sector. It has the potential to change traditional farming processes in numerous other ways. Even though this technology is more difficult to grasp at first, once taught, it will produce results in no time. Farmers must be aware of the full procedure.

