Drone – A New Technology in Indian Agriculture

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FIGURE 1: Technical GPS drone's navigation system.

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SUMMARY

Drones are a good contender for enhancing agricultural techniques at a low cost. Aside from the financial benefits, optimizing fertilizer, pesticide, and water usage in important areas has various ecological and environmental benefits that would not be feasible otherwise. Drones, for starters, are great for monitoring and sensing techniques because they can quickly cover territory to check crop development and soil health. Drones are mostly used for this purpose since their sensors can detect the absorbance of a specific wave length, resulting in a color contrast image that visibly reflects possibly problematic locations.

INTRODUCTION

Drone technology has gotten most of the recognition in the industry because of its diversity and considered the future for the agrarian community. The military initially used them. However, other sectors quickly embraced Unmanned Aerial Vehicles (UAVs) when they learned about its widespread applications. How can drones support Indian agriculture? Drones don't merely enhance overall performance but also encourage farmers to solve other assorted barriers and receive plenty of benefits through precision agriculture. With the market for agricultural drones reaching a whopping $1.3 billion, UAVs (Unmanned Aerial Vehicles) fill the gap of human error and inefficiency by traditional farming methods. The purpose of adopting drone technology is to exclude any guesswork or ambiguity and instead focus on accurate and reliable information.

External factors like weather, soil conditions, and temperature play a critical role in farming. Agriculture drone empowers the farmer to adapt to specific environments and make mindful choices accordingly. The gained data helps regulate crop health, crop treatment, crop scouting, irrigation, and carry out field soil analysis and crop damage assessments. The drone survey helps boost crop yields and minimize time and expenses. 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. The central government has acknowledged the importance of Unmanned Aerial Vehicles (UAVs), machine learning, and artificial intelligence with their *'Digital Sky Platform' online.* Drone startups in India have used this opportunity to accomplish better technological capacities.

Applications of Drone Technology in Agriculture

(a) Analyzing the area

This identifies the territory being tested. Therefore, the first step includes establishing a boundary, analyses of the area, and then finally, uploading the technical GPS information into the drone's navigation system.

(b) Using Autonomous Drones

Since Unmanned aerial vehicles (UAVs) are independent, they enter flight patterns into their already established system to collect required data.

(c) Uploading the data

After capturing all the required data through sensors such as the multispectral sensor/RGB sensor, it is processed through numerous software for further analysis and interpretation.

(d) Output

After collecting the data, they format it so that farmers can understand the data with no hassle, bringing them a step closer to precision farming. 3D mapping or Photogrammetry is popular methods to display extensive data collected.

(e) 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.

(f) 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. This data helps produce multispectral images to track crop health. Quick monitoring and discoveries of any defects can help save crops. In circumstances of crop failure, the farmer can also document the damages for accurate insurance claims.

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(g) 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.

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(h) Field 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. Precise Photogrammetry/ 3D mapping permit farmers to analyze their soil conditions thoroughly.

(i) Planting

Drone startups in India have invented drone-planting systems that allow drones to shoot pods, their seeds, and crucial nutrients into the soil. This technology doesn't only reduce costs by almost 85% but also increases consistency and efficiency.

(j) Agricultural spraying (Pesticide spraying/Insecticide/ Fertilizer)

Through drone crop spraying, human contact with such harmful chemicals is limited. Agri-drones can carry out this task much quicker than vehicles/airplanes. Drones with RGB sensors and multispectral sensors can precisely identify and treat problematic areas. Professionals say that aerial spraying is five times faster with drones when compared to other methods.

(k) Livestock tracking

The drone survey allows the farmers not to keep track of their crops only but also monitor the movements of their cattle. Thermal sensor technology helps find lost animals and detect an injury or sickness. Drones can carry out this function favorably, and this adds comprehensively to the production of vegetation.

FIGURE 2. Technical GPS drone's navigation system.

FIGURE 3. Agricultural spraying Drone system (Pesticide /Insecticide/ Fertilizer)

Benefits of drone technology

As innovators introduced new technologies, their commercial uses increase day by day. The government has been easing restrictions for drone usage and is supporting startups to come up with novel ideas. As drone surveys become more common, they also become more cost-effective. In agriculture, they have a plethora of advantages. Some are as follows:

(a) Enhanced Production: The farmer can improve production capabilities through comprehensive irrigation planning, adequate monitoring of crop health, increased knowledge about soil health, and adaptation to environmental changes.

(b) Effective and Adaptive Techniques: Drone usage results in regular updates to farmers about their crops and helps develop strengthened farming techniques. They can adapt to weather conditions and allocate resources without any wastage.

(c) Greater safety of farmers: It is safer and more convenient for farmers to use drones to spray pesticides in terrains challenging to reach, infected areas, taller crops, and power lines. It also helps farmers prevent spraying the crops, which leads to less pollution and chemicals in the soil.

(d) 10x faster data for quick decision: making- Drone surveys back farmers with accurate data processing that encourages them to make quick and mindful decisions without second-guessing, allowing farmers to save the time invested in crop scouting. Various sensors of the drone enable capturing and analyzing data from the entire field. The data can focus on problematic areas such as infected crops/unhealthy crops, different colored crops, moisture levels, etc. The drone can be fixed with several sensors for other crops, allowing a more accurate and diverse crop management system.

(e) Less wastage of resources: Agri-drones enables optimum usage of all resources such as fertilizer, water, seeds, and pesticides.

(f) 99% Accuracy rate: The drone survey helps farmers calculate the precise land size, segment the various crops, and indulge in soil mapping.

(g) Useful for Insurance claims: Farmers use the data captured through drones to claim crop insurance in case of any damages. They even calculate risks/losses associated with the land while being insured.

(h) Evidence for insurance companies: Agricultural insurance sectors use Agri-drones for efficient and trustworthy data. They capture the damages that have occurred for the right estimation of monetary payback to the farmers.

CONCLUSION

As mentioned before, agricultural drone technology is undoubtedly the future of the Indian agrarian community. It can transform traditional farming methods in uncountable ways. Even though this technology is more complex to be familiar with, it will yield its results in no time once learned. Farmers must understand the entire process. Determination of goals, creating equilibrium in the drone and software utilized, and being familiar with the principles of using such technology will stand as a challenge. The farmers will inevitably need comprehensive training or partnerships with third-party experts in the drone industry for the acquisition of reliable data. Drones have changed the course of obtaining data in almost every type of industry, and will only deem to become bigger and better in the coming years.

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