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Drone Based Technology in Horticulture Crops

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Abstract

The population is increasing tremendously and with this increase the demand of food. The traditional methods which were used by the farmers were not sufficient enough to fulfill these requirements. Thus, new automated methods (Drone technology) were introduced. These new methods satisfied the food requirements and also provided employment opportunities to billions of people. Drones technologies saves the excess use of water, pesticides, and herbicides, maintains the fertility of the soil, also helps in the efficient use of man power and elevate the productivity and improve the quality. The objective of this paper is to review the usage of Drones in agriculture applications. Based on the literature, we found that a lot of agriculture applications can be done by using Drone. In the methodology, we used a comprehensive review from other researches in this world. This paper summarizes the current state of drone technology for agricultural uses, including crop health monitoring and farm operations like weed management, Evapotranspiration estimation, spraying etc. The research article concludes by recommending that more farmers invest in drone technology to better their agricultural outputs

Keywords: Drone ,Crop health monitoring ,evapotranspiration ,spraying.

Introduction

An industry of value, Agriculture sets the livelihood of 65% of the population of India, directly or indirectly. The vitality of the Agricultural Industry is so deep-rooted in our systems that its growth heavily affects the Gross Domestic Product (GDP) of our country by about 17%. Heightening this growth factor has become ever-so-crucial to generate more revenue, income, and employment. The dynamic and speedy nature of technology brings convenience and advancement to its applied industries. Drone technology and the use of Unmanned Aerial Vehicles (UAVs) in such applications has brought about incremental progress, saving time and cost. As a part of the agricultural industry, drones are being employed for various operations in aerial surveillance, mapping, land inspection, monitoring, spraying fertilizers, checking for diseased or rotting crops, and much more. The diverse kinds of drones are being tested to determine the most creative space in agriculture, horticulture, and farming. For crop fertilization, drones such as quad copters prove to be the most favorable owing to their multi-rotors. Fixed-wing drones suit the purpose of crop fertilization, albeit their large structure requiring a large space for take-off and landing comes in the way.

DRONE (Dynamic Remotely Operated Navigation Equipment), also known as 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. 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. Presently, farmers are facing many problems like unavailability or high cost of labours, health problems by coming in contact with chemicals (fertilizers, pesticides, etc.) while applying them in the field, bite by insects or animals, etc. In this context, drones can also help farmers in avoiding these troubles in conjunction with the benefits of being a green technology. Drones are nowadays emerging as a component of precision agriculture along with contributing to sustainable agriculture

Drone-Based Technology

This technology is providing new ways of enhancing crop yields through in-depth field analysis, long-distance crop spraying and high-efficiency crop monitoring and is quickly becoming invaluable for farmers. Drones monitor the condition of the soil and determine whether it requires watering or planting.

Various sensors are used in the drones based upon the purpose. Mostly the sensors sensitive to the following bands of electromagnetic waves are used in horticulture:

1. Red, Green, and Blue (RGB) bands: These bands are used for counting the number of plants, for modeling elevation, and visual inspection of the crop field.
2. Near Infra-Red (NIR) band: This band is used for water management, erosion analysis, plant counting, soil moisture analysis, and assessment of crop health.
3. Red Edge band (RE): It is used for plant counting, water management, and crop health assessment.
4. Thermal Infra-Red band: This band has applicability in irrigation scheduling, analyzing plant physiology, and yield forecasting.

There are two kinds of UAVs based on their structure – Fixed wing and multirotor. Fixed wing UAVs are ideal for aerial surveys, capturing high – resolution aerial photos, mapping and land surveying whereas multirotor UAVs are best for surveillance, and detection of crop pests, diseases and weeds.

Drones and the Indian horticulture industry

Drones are unscrewed aerial vehicles (also known as UAVs), which are used for surveillance in various industries. Till now, they were primarily used by companies working in industrial sectors such as mining and construction, army, and hobbyists. But now, drone technology is increasingly available for use in various sectors of horticulture as well. Though the technology is still nascent in India, many companies are trying so that it is easily available to Indian farmers and ready to be used to increase efficiency in agricultural production.

Benefits of Horti-drones

1. Security: The drones are operated by trained drone pilots. So, there are no chances of their misuse.
2. High efficiency: Drones do not have any operational delays and can work double the speed of human labor
3. Water-saving: In comparison to traditional spraying methods, agricultural drones use ultra-low volume (ULV) spraying technology, thus saving more water.
4. Low cost and easy to maintain: Agri drones are sturdy, low in cost, and require minimum maintenance. Some of the key features include a detachable container, low –coast frame precise spraying of pesticides.

Limitations of drones

1. Connectivity issue: often, online coverage is unavailable in rural areas. Under such circumstances, a farmer needs to invest in internet connectivity, which can turn into a recurring expense.

2. Weather dependent: Drones are heavily dependent on good weather conditions. Under rainy or windy weather conditions, it is not advisable to fly drones.
3. Knowledge and Skill: Using new technology is a welcoming change but using it daily requires the right skillset and adequate knowledge. An average farmer may struggle to understand drone functions. Either he must acquire the knowledge or remain dependent on an experienced person.

What are some other agricultural applications for drones

1. 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 wavelength, resulting in a color contrast image that visibly reflects possibly problematic locations. Ranchers have also employed drones to track livestock on ranches and check for any damaged fences, demonstrating that this monitoring capability not only provides for rapid processing of spatiotemporal information. Rangers have also employed night cameras and thermal imagers to locate any animals disturbing or attacking herds to better monitor cattle.
2. The second major use of drones in agriculture is to keep crops healthy by dispersing water, fertilizer, and pesticides. Drones coupled with spectroscopic and thermography technology can detect dry areas and address problems that traditional watering equipment may have missed. Drones, on the other hand, can detect equipment leaks and irrigation problems. Drones can stitch thermographic photos together over time to detect the direction of water flow and locate geographical features that may affect water dispersion. Drones' accuracy and speed allow fertilizer to be delivered to precise locations if crops aren't growing well enough, as well as the elimination of pests and pathogens by spraying pesticides from the drones themselves.
3. A third significant benefit of drones is that they can operate as mechanical pollinators. Although insect vectors are still the most important pollinators, drones may one day replace bees as the most essential pollinators. Although further research is needed in this area, researchers are optimistic that drones will be able to transport and disseminate pollen seeds in orchards and fields.
4. Another important aspect of drone application is the use of drones for agricultural research. Drones can cover broad areas damaged by natural catastrophes to find the reasons and implications of incidents, from infections to insurance claims. Drones are already being used to confirm claims in agricultural insurance surveys, and the quick response paired with high-resolution imaging allows for the collection of data on huge scales, which is difficult, if not impossible, to do on the same timescale with manual labor. Drones are a good contender for enhancing agricultural techniques at a low cost because of these advantages. 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.

Conclusion

Drones have great potential to transform Indian Horticulture. With the advancement of technology in the future, the production of drones is expected to become economical. The modern youth are not attracted towards farming due to hard work and drudgery involved in it. Drones provide real time and high-quality aerial imagery compared to satellite imagery over agricultural areas. Also, applications for localizing weeds and diseases, determining soil properties, detecting vegetation differences and the production of an accurate elevation models are currently possible with the help of drones. Drones will enable farmers to know

more about their fields. Therefore, farmers will be assisted with producing more food while using fewer chemicals. Nearly all farmers who have made use of drones have achieved some form of benefit. They can make more efficient use of their land, exterminate pests before they destroy entire crops, adjust the soil quality to improve growth in problem areas, improve irrigation to plants suffering from heat stress and track fires before they get out of control. Therefore, drones may become part and parcel of agriculture in the future by helping farmers in managing their fields and resources in a better and sustainable way

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