

IMPLEMENTATION OF DRONES IN AGRICULTURE

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ABSTRACT

The need for food is rising as a result of the enormous population growth. Farmers were utilizing traditional methods, but they were insufficient to meet these demands. New automated techniques (using drone technology) were consequently introduced. These innovative techniques supplied the world's food needs while simultaneously creating jobs for billions of people. The technology behind drones conserves excessive amounts of water, pesticides, and herbicides, maintains soil fertility, and aids in the effective use of labor, which raises production and improves quality. Reviewing drone use in agricultural applications is the goal of this research. Based on the literature, we discovered that a lot of agriculture applications can be carried out using drones. As for the methodology, We utilized a thorough analysis from a different study conducted in this field. This paper provides an overview of drone technology's current position for agricultural applications, including crop health monitoring and farm activities like weed control, evapotranspiration estimation, spraying, etc. The study's conclusion urges more farmers to use drone technology to increase the quality of their agricultural yields.

INTRODUCTION

Drones used in agriculture can gather data on soil differences, crop health, and crop growth stages. Agricultural drones employ multispectral sensors to capture electromagnetic radiation, such as near-infrared and short-wave infrared, that is not visible to the human eye.

Drone use is expanding quickly across practically all economic sectors, but it is particularly strong in the agricultural sector. The market for agricultural drones is predicted to increase from a \$1.2 billion (USD) sector in 2019 to a \$4.8 billion industry in 2024, according to certain projections. In a few years, drone use on big and small farms will be increasingly commonplace, from reconnaissance to security. Drone-based data collection on farms is part of a system known as "precision agriculture" and is frequently used to better inform agronomic decisions.

Dynamic Remotely Operated Navigation Equipment is referred to as a DRONE. Unmanned aerial vehicles, sometimes known as drones or UAVs, are essentially flying machines. It has two control options: a pilot on the ground or an autonomous operation. With so many sensors at their disposal, drones can find objects that are invisible to the human eye. Agriculture drones are drones that are used for agricultural purposes. As a result, real-time, more accurate, and dependable information can be obtained from drones with higher accuracy

Why are drones used in agriculture?

By the year 2050, the world's population is projected to reach 9 billion, and scientists predict that during that time, agricultural consumption would rise by over 70%. In conventional agriculture systems (CAS), fertilizers, insecticides, and other agrochemicals are used in larger amounts. The two most pressing global challenges of our day are climate change and environmental degradation, both of which hurt agricultural productivity. More than 815 million people worldwide suffer from chronic hunger, with Asia accounting for 64% of all cases. (FAO, 2018)

With the use of agricultural drones, farmers can keep an eye out for possible issues and improve field management by monitoring crop and animal conditions from the air. Farmers and other agribusiness owners can employ agricultural drone services for a variety of purposes, such as:

- Land imaging
- Surveying topography and boundaries
- Soil monitoring
- Livestock movement and counting
- Irrigation monitoring
- Spraying needs
- Collecting soil and water samples
- Troubleshooting

There are several ways in which many farmers, ranchers, and vineyard owners, large and small, are using drones to help optimize and streamline their agribusiness operations.

1. Save time

- Taking care of land, crops, stables, and livestock is hands-on work and can take a lot of time. Even smaller hobbyists can spend countless hours walking their land to spot potential problems before they become bigger. However, the foot can only see so much.
- Drone technology offers more comprehensive real-time results for agricultural businesses. With images collected by agricultural drones, farm owners can obtain high-definition photos, videos, and data in minutes.⁷ From a bird's eye view, it is easier to see the big picture and identify crop problems or potential safety issues. problems and act quickly.

2. Help Troubleshoot Potential Problems

- Drones can also help solve problems. Traditionally, monitoring involves looking for problems that you may not discover until it is too late to fix them. Instead, small farm owners can use action drones to monitor potential leaks or damage in critical areas, such as irrigation systems, before it becomes a serious damage problem. The US Department of Agriculture recently began using drones to test irrigation ponds for E. coli contamination.⁸ A harvest drone can help detect potentially dangerous chemicals or bacteria. This can help prevent farmers and ranchers from using contaminated water on crops and livestock, thereby reducing the risk to their assets and end users.

3. Provide Better Data and Cost Savings from Better Images

- Before ag drone technology, many farmers used USDA satellite images of their property to take aerial photos. Although these images are of high quality, they usually only zoomed in so far and could take weeks to acquire. were visible

- Today, basic drones can scan large tracts of land in less time than large, manned aircraft, often in a single flight.¹¹ In addition, drones can be flown more easily and economically multiple times during a season.
- High-resolution drone imagery provides more insights than more pixelated satellite photographs, in addition to saving time.¹² To better understand crop growth, health, and soil moisture, farmers and ranchers may aggregate data from drones. This will allow them to make more educated decisions.¹³ Getting better knowledge while saving money might be beneficial to your organization when every dollar matters.

4. Improve Health and Safety

- For agriculture, safety is frequently a top priority, and ag drones can significantly enhance this. Drones can be used to map agricultural land instead of sending personnel or surveyors, for instance, if the location is potentially hazardous or challenging to access. Agribusiness owners may also utilize drones to quickly examine wind, fire, or hail damage following a disaster, preserving worker safety and accelerating the claims process.
- The same holds for keeping an eye on cattle. Drones, for instance, can help you follow the movement of your livestock and perhaps identify sluggish animals that may require assistance if you fear that part of your livestock is ill or wounded.¹⁴ Thermal imaging drones may be used to monitor cattle temperatures, which can reveal disease or infection in the herd.



Agricultural spraying

How can drones support Indian agriculture?

➤ Soil and field analysis

Planning for planting and analyzing nutrient status for subsequent operations can be done after receiving accurate 3D maps of the soil.

➤ Seed sowing and planting trees

With an average absorption of 75%, UAS grows trees by dispersing biodegradable seed bombs or pods with nutrients in the soil. This lowers the cost of planting.

➤ **Crop spraying**

Drones can scan the ground and accurately dispense liquid while varying their altitude from it and spraying in real time to ensure even coverage. Human exposure to these dangerous substances is minimized through drone agricultural spraying. When compared to cars or airplanes, Agri-drones can complete this duty significantly more quickly. The exact identification and remediation of problem regions are made possible by drones equipped with multispectral and RGB sensors. Compared to previous approaches, experts claim that using drones for aerial spraying is five times faster.

➤ **Crop Health Monitoring and Surveillance**

Drone-borne equipment can distinguish which plants reflect various quantities of green light and NIR light by scanning a crop using both visible and near-infrared light. Multispectral images that track plant changes and reflect plant health can be created using this data.

➤ **Water Management**

Irrigation systems are one of the most common Systems. Characteristics of a farm or farm site. to optimize Farmers in irrigation systems, have access to collected data, and Use remote sensors to analyze where your water is To what extent and how should re-source be directed? Everything from long-lasting, connected laptops, tablets, or smarts phone.

➤ **Fertigation**

Fertigation is defined as the injection of fertilizer Modifications and other products are typically required by farmers in the ground. With IoT-enabled fertigation solutions, farmers can remotely control the number of fertilizers to be injected at what volume. You can also monitor fertilizer concentration and other environmental conditions, adapt to pH, etc. in the soil using remote sensors, The level you want, if you want.

➤ **Crop insurance**

In the event of crop failure, farmers can also record damage for accurate insurance expectations. This technology has great potential for accurate and effective implementation of crop insurance Schema, or unbiased Indian Pradhan Mantri Fasal Bhima Yojana.

➤ **Livestock Safety and Maturity Monitoring**

Anyone who has worked on a cattle ranch will tell you that animals tend to roam sometimes. From Sensors that use IoT to generate real-time biomedical data on livestock. B. body temperature, Pulse, and tissue resistance. As innovators introduce new technologies, their commercial use increases every day. Some are:

➤ **Enhanced Production**

Farmers can appropriately increase production capacity through comprehensive irrigation planning monitoring plant health, improving knowledge of soil health, and adapting to environmental change.

➤ **Effective and Adaptive Techniques**

The use of drones means farmers are regularly informed about their crops and help develop them more powerfully. agricultural technology. It can adapt to weather conditions and allocate resources without waste.

➤ **Greater safety for farmers**

It is safer and more convenient for farmers to use drones to spray pesticides in difficult terrain ranges, infected areas, tall plants, and power lines. It also helps farmers prevent crop spraying which leads to less pollution and chemicals in the soil.

➤ **Less wastage of resources**

Agri drone enables optimal utilization of all resources such as fertilizers, water, seeds, and pesticides

➤ **Useful for Insurance claims**

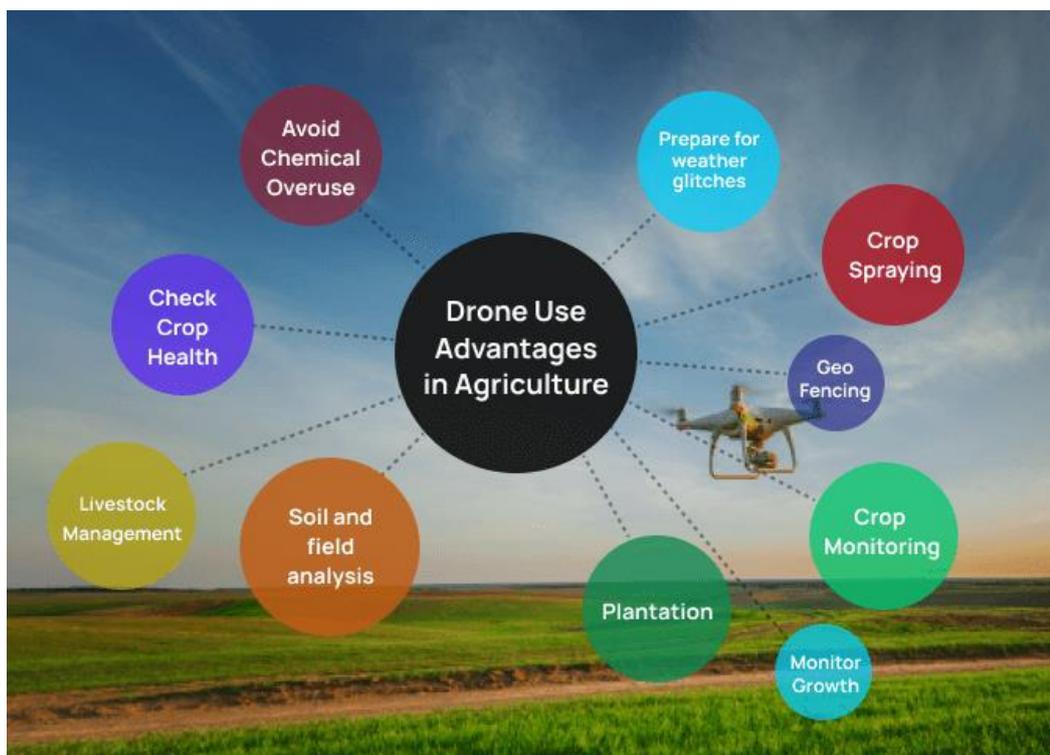
Farmers use data collected by drones to claim crop insurance in the event of damage. she can even calculate the risk/loss associated with the country while insured

➤ **10x faster data for quick decision-making**

Drone Surveys Support Farmers with Accurate Data Processing, Faster and More Successful wise decision, and saves farmers time spent on crop discovery. Various sensors on the drone enable the collection and analysis of data from across the field. data can be centralized on problem areas such as infected/diseased plants, different colored plants, and moisture levels. Drones can be equipped with multiple sensors for other crops, allowing for a more accurate and diverse harvesting management system.

➤ **Evidence for insurance companies**

The agricultural insurance sector uses agricultural drones to obtain efficient and reliable data Damages suffered due to accurate valuation of monetary amortization to farmers. Saves 90D44 water and 30%-40% pesticides. Due to the small diameter of the droplets, the pesticide distribution is improved and improved. Effect. At the same time, keep people away from pesticides and use less pesticides. Remnants of the harvest.



Advantages of Drones in Agriculture

Conclusion

The use of drones in agriculture has already had a big impact and will only get bigger in the years to come. Drones are becoming more beneficial for smallholder farmers, but there is still a long way to go before they are on every farmer's list of necessary equipment, particularly in developing nations. Many nations need to update their laws on drone use, and more study is needed to see whether they are beneficial for carrying out certain activities like applying and spraying pesticides. Drones can help farmers in a variety of ways, but it's crucial to understand their capabilities and limits before spending money on pricey equipment. An agricultural drone provider and programming firm, Drone Deploy, advises beginning small and incorporating drone data into your business gradually for the greatest outcomes.

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