MARUMEGH
Kisaan E- Patrika
Available online at www.marumegh.com

ISSN : 2456-2904

Received: 07-06-2022
Accepted: 08-07-2022

DRONE APPLICATION IN AGRICULTURE SCIENCE

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Abstract:

Agriculture is the most potential sector, despite the fact that it is currently troubled by a number of issues, one of which is a labour shortage in the farming business. Other obstacles or challenges include harsh weather, insufficient chemical fertilizer, infection, diseases, allergies and other health problems induced by chemical application (fungicide, pesticide, insecticide, etc.) or insect/animal bite. FAO and ITU have been employing sustainable ICTs to address similar difficulties in agriculture, in collaboration with partners. Unmanned aircraft have proven to be one of the most effective means for swiftly and non-destructively analysing air quality, soil component physical qualities and crop growth. Farmers today are faced with a lot of complex elements that influence their operations' success. As a result, farmers are turning to high-tech drones to help them solve these issues and find quick and effective solutions. Drones can collect data on crop yields, livestock health, soil quality, nutrient assessments, weather and rainfall patterns, among other things. This information can then be utilised to produce a more exact map of any current issues, as well as remedies based on highly dependable data.

Introduction:

By 2050, the world's population is expected to exceed 9 billion people, increasing agricultural consumption. The impact of climate change on food security is significant. Over 815 million people are chronically hungry, with Asia accounting for 64% of the global total. To feed a population of 9 billion people, food production must increase by about 50% by 2050, yet resources such as land and water are becoming increasingly rare. Agriculture is the most promising sector, despite the fact that it is now beset by a number of issues, one of which is a labour shortage in the farming sector. Insufficient chemical fertilizer, infection, infections, allergies, and other health difficulties caused by chemical application (fungicide, pesticide, insecticide, and so on) or insect/animal bite are some of the additional concerns or challenges.

Drone :

A drone, also known as a UAV (Unmanned Aerial Vehicle), is a flying ROBOT (The air vehicles that do not carry a human operator). The aircraft can be controlled remotely or autonomously using software-controlled flight plans, sensing devices and a global positioning system as part of their integrated system (GPS).

Benefits of drones :

- Obtaining exceptionally accurate 3D maps is possible.
- However, you must have complete control over when, how, and where the photographs are taken.
- Effortless, quick and versatile.
- Extremely beneficial in dangerous and hard-to-reach locations.
- Detect a quicker reaction to disease or concerns.
- Reduces water, chemical, and other input waste.
- It's easy to find and use, as well as being naturally safe.

Applications of drones in agriculture :

1. **Soil and field analysis :** Field and soil inspections can be done with drones. They can be used to create precise 3-D maps of soil characteristics, moisture content, and erosion for early soil research. This is crucial when it comes to seed planting patterns. Drone-assisted soil analysis provides data for irrigation and nitrogen management in the soil even after it has been planted.

2. **Planting :** Machines that can fire pods with seeds and plant nutrients into already prepared soil have been developed by a number of companies, although they are not widely used yet. Planting costs will be reduced by 85 percent with these drone-planting devices.

3. **Crop spraying :** Drones equipped with distance sensors such as ultrasonic echoes and lasers can adjust their altitude in response to changes in topography and geography. They can spray the exact amount of liquid evenly in real time because they can monitor and adjust their distance from the ground. As a result, efficiency has improved while chemical levels in groundwater have dropped. Spraying with drones is expected to be 5 times faster than traditional methods, according to experts.

4. **Crop monitoring :** Inefficient crop monitoring in large areas is one of the most serious concerns in farming. The rise in unpredictable weather patterns has increased risk and maintenance expenses. Satellite photography was previously the most advanced kind of surveillance. There were, however, certain disadvantages.

5. **Irrigation :** Drones equipped with hyper spectral, multispectral or thermal sensors may determine which portions of a field are dry, allowing water resources to be distributed more efficiently, with more water going to dry areas and less going to wet areas. Drones can determine the vegetation index, which reflects the crop's relative density and health, and expose the crop's heat signature, which is the amount of energy or heat released by the crop.

6. **Health assessment :** It's critical to keep an eye on crop health and check trees for bacterial or fungal infestations. Drone-borne technology can determine which plants reflect different quantities of green light and near-infrared light by scanning a crop with both visible and near-infrared light. This data can be used to create multispectral images that demonstrate how plants change over time and their overall health. An immediate approach could save an entire orchard. Furthermore, once a disease has been identified, farmers may more accurately apply and monitor treatments.

7. **Mid-field weed identification :** We can construct weed maps using NDVI sensor data and post-flight photo data to help farmers distinguish between high weed intensity areas and healthy crop areas growing beside them.

8. Cattle herd monitoring :

Drones equipped with thermal sensors are an excellent way to monitor animals from above; they can detect animals that are missing, injured, or giving birth. As a result, drones provide livestock farmers with a new means to keep an eye on their animals at all times, resulting in increased profitability.

9. Crop insurance :

Aerial photography can easily distinguish between cultivated and uncultivated land, as well as estimate the severity of natural disaster damage. Drone photography is advantageous to crop insurers and insurance policyholders since it is inexpensive and repeatable. Indian insurers will utilise unmanned aerial vehicles (UAVs) to analyse crop losses during natural catastrophes, allowing them to calculate claims more accurately and quickly. They can utilise the same information to build statistical risk management models based on previous yield, pest, and weather data. Drone data could aid farmers in early detection and prediction of pest infestations, and insurance firms could share this information with them. Finally, drone data can be used to detect insurance fraud, stopping criminals from repeatedly insuring the same piece of property or claiming damage that does not exist.

Conclusion :

Drones have been used in farming on an increasing number of occasions during the last decade. However, a number of significant barriers to drone adoption remain, including high startup costs, sensor capability, strict flying laws and farmer scepticism. As a result, it's evident that the use of drones in agriculture is still in its infancy, with lots of space for technological and application growth. Improved image processing techniques, decreased costs and the ability for drones to hover like tractors on future farms are all projected to arise from drone technical breakthroughs.

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