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Importance of Drone in Modern Agriculture

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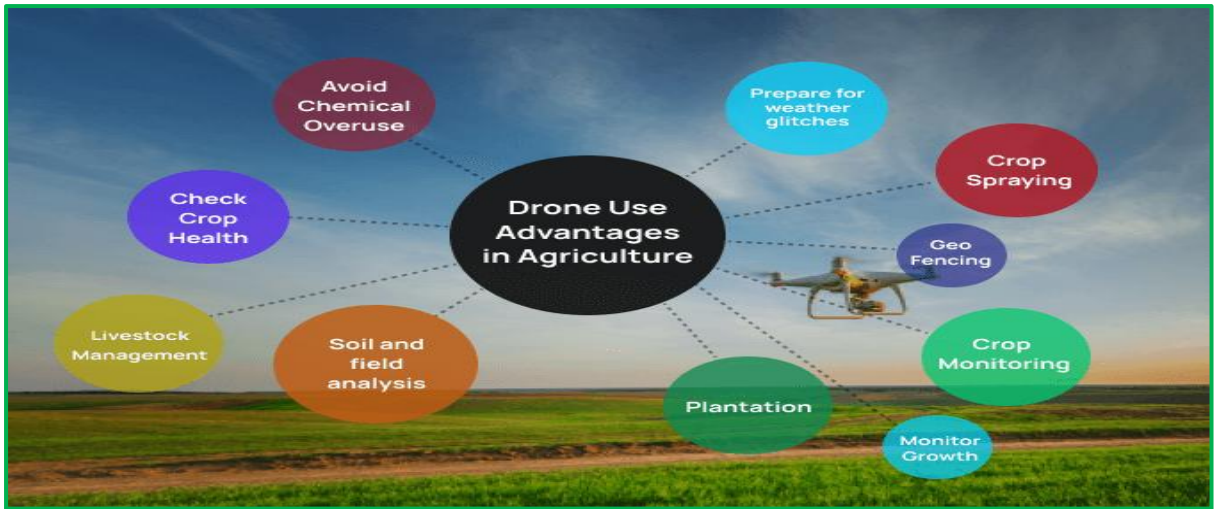
DRONE (Dynamic Remotely Operated Navigation Equipment). Drones are formally known as unmanned aerial vehicle (UAV) which is essentially flying robot. It can be controlled either by pilot from the ground or it can be autonomous. With the availability of so many sensors, drones can detect the things which are beyond the visible range of human sight. The drones which are used for agriculture purpose are called as agriculture drone. Therefore, real-time, more accurate, reliable and information can be derived from drones in greater detail and fewer errors.

On 23rd January 2022, to promote the use of drones for agricultural purposes and reduce the labour burden on the farmers, the government of India has recently offered, a 100% subsidy or 10 lakhs, whichever is less, up to March 2023 to the Farm Machinery Training and Testing Institutes, ICAR Institutes, Krishi Vigyan Kendras & State Agriculture Universities.

Need of Drones

With the world's population to reach 9 billion people by 2050, experts expect agricultural consumption to increase by nearly70 per cent over the same time period. Conventional agriculture systems (CAS) higher doses of fertilizers, pesticides and other agrochemicals. Climate change and environmental pollution are the major global issues of the current era and severely impacting agricultural productivity. More than 815 million people are chronically hungry and 64 percent of the chronically hungry in Asia. (FAO, 2018).



Bands of Electromagnetic Waves

- **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.
- **Near Infra-Red (NIR) band:** This band issued for water management, erosion analysis, plant counting, soil moisture analysis, and assessment of crop health.
- **Red Edge band (RE):** It is used for plant counting, water management, and crop health assessment.
- **Thermal Infra-Red band:** This band has applicability in irrigation scheduling, analyzing plant physiology, and yield forecasting.

Drones are currently used in two standard agricultural applications — tracking and distribution.

Tracking (and subsequent analysis) is used in both plant and livestock agriculture and helps farmers understand the status, resources, and productivity of their farms.
Distribution using drones involves physically moving resources across a farm, including spreading agricultural chemicals such as pesticides, fungicides, and fertilizer.

Uses of Drones in Agriculture

Soil and field analysis: After getting precise 3D maps for soil, planting can be planned and nutrient status can be analyzed for further operations.
Seed sowing and planting trees: UAS shoot seeds and planting tree by throwing biodegradable seed pods or seed bombs with nutrients in the soil with an average uptake of 75 percent, thus bringing down costs for planting.
Crop spraying: Drones can scan the ground and spray the correct amount of liquid, modulating distance from the ground and spraying in real time for even coverage. 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.
Crop Health Monitoring and Surveillance: By scanning a crop using both visible and near-infrared light, drone-carried devices can identify which plants reflect different amounts of green light and NIR light. This information can produce multispectral images that track changes in plants and indicate their health.
Weed identification: Drones can be used to identify the weeds present in the field. These weeds could be timely rooted out from the field so that they do not compete for resources with the main crop.

Water Management: Irrigation system is one of the most common features of any farm or agricultural site. In order to optimize irrigation system, farmers could access data collected from remote sensors and use it to analyze where their water resources should directed, in what kind of volume and for how long, and all from their connected laptop tablet or smart phone.

Fertigation: Fertigation is defined as the injection of fertilizers, soil amendments and other products typically needed by farmers into soil. With an IoT enabled fertigation solution, farmers could remotely control how many fertilizers are injected and within what volumes. It would also enable them to monitor fertilizer concentrations and other environmental condition, such as pH, in the soil using remote sensors and adjust to the required levels if necessary.

Crop insurance: In circumstances of crop failure, the farmer can also document the damages for accurate insurance claims. This technology has great potential in accurate and effective implementation of crop insurance scheme, namely **Pradhan Mantri Fasal Bima Yojana** in India without any bias.

Livestock Safety and Maturity Monitoring: Anyone who, even worked on a livestock farm will tell you that, sometimes, animals tend to wander off. With IoT- enable sensors producing real time biomedical data on livestock such as body temperature, pulse and even tissue resistivity. As innovators introduce new technologies, their commercial uses increase day by day. Some are as follows:

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.

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.

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.

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

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.

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.

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. It will save 90%water and 30%-40% pesticide. Small droplet diameter makes the pesticide more well-distribute and improve the effect. At the same time, it will make the people far away from the pesticide and reduce the pesticide remain of the crop.