



Utility of Drones in Agriculture

*Tarun Kumar Maheshwari¹, Deepali Mudgal², Khushboo Gupta³ and Vivekanand Singh⁴

¹Associate Professor, Dr. B. R. A. College of Agricultural Engineering and Technology, Etawah, Uttar Pradesh, India

²Assistant Professor, Department of Food Process Technology, SVPUAT, Meerut, Uttar Pradesh, India

³Teaching Associate, Department of Processing & Agriculture Structure, Dr. B. R. A., College of Agricultural Engineering and Technology, Etawah, U.P., India

⁴Research Associate, Climate Resilient Agriculture Programme, Dr. Rajendra Prasad Central Agricultural University, Samastipur, India

*Corresponding Author's email: maheshwari_tk@yahoo.com

As can be seen, current conditions are not favorable for Indian agriculture; first the coronavirus pandemic and now the locust swarm outbreak is evident. During the coronavirus pandemic, working in crowded and remote areas is a difficult task. Considering these situations, the need to bring advanced changes in agriculture is becoming essential. The continuous growth of technology in agriculture should be seen as a positive trend, as it can prove to be a useful solution for feeding the rapidly increasing population. Food security is a big question for Indian agriculture, which should be viewed in the context of environmental degradation, pollution, and water scarcity, and finding an effective solution must be a high priority. This is precisely where the use of drones can guarantee a sustainable solution. Drone technology in the agricultural sector is an unprecedented innovation that will have long-term effects on agriculture, transforming our traditional farming methods and business practices. High-tech drones help farmers and drone pilots improve certain aspects of the farming process and increase agricultural efficiency. Drone technology is used for crop monitoring, planting, livestock management, pesticide and fertilizer spraying, irrigation, and geo-mapping.

Drones or Unmanned Aerial Vehicles (UAVs): An unmanned aerial vehicle (UAV) is a flying device that can fly using pre-determined instructions with the help of an autopilot and GPS coordinates. Sometimes the term UAV is used to refer to the complete system, including the ground station and video system.

Major Parts of a Drone: 1. Main frame 2. Propeller or blades 3. Motor 4. Battery 5. Sensors (GPS) 6. Flight controller 7. Signal receiver. Certain ground setups such as a communication box, remote controller, and laptop are also required to operate a drone.

Major Application Areas of Drones: 1. Defense sector 2. Agriculture 3. Search and rescue 4. Entertainment and filmmaking 5. Wild life assessment 6. Health security 7. Disaster management 8. Security and law enforcement.

Drone Applications in Agriculture: Using drones to increase efficiency in the agriculture sector can lay the foundation for major improvements. Drone technology can also serve as an alternative to skilled human resources and other heavy machinery and equipment. To some extent, it is an affordable and efficient way of managing agriculture. Drones use near-infrared sensors and multispectral cameras to collect high quality data. During post-processing, geo-

referenced reflection maps, elevation maps, and vegetation indices are created. For those seeking technical improvement and participation in agriculture, this can be a great opportunity for smart farming. The collected high-quality data can be used for plant health monitoring, pesticide spraying, plant counting, scheduling, seeding, and harvesting.

Some Important Applications

1. Irrigation Monitoring and Management: Drones equipped with hyperspectral, multispectral and thermal sensors can identify which part of a field is dry or needs water. Additionally, once the crop grows, drones can calculate vegetation index, crop density, crop health, and the amount of heat emission. Based on this information, drainage for sensitive crops can be optimized, and water logging can be prevented.

2. Crop Mapping and Surveying: Using NIR drone sensors, plant health can be assessed based on light absorption, providing an overall view of land health.

3. Soil and Field Analysis: Drones can be used at the beginning of the crop cycle. They create accurate 3-D maps for early soil analysis and provide useful patterns for planning seed planting. After planting, soil analysis data from drones assist in irrigation and nitrogen-level management. Continuous monitoring helps in better utilization of water resources and more effective management of crop nutrient levels.

4. Spraying: Drones scan the ground and spray the correct amount of liquid on crops. Spraying is done in real time at an accurate distance and coverage synchronized with GPS. As a result, efficiency increases while the leaching of chemicals into the soil an indirect harmful effect decreases. Experts believe that drone aerial spraying is five times more efficient than traditional machinery. In the present time, new and innovative agricultural experiments need to be conducted at a smaller scale. According to the needs of modern times, the use of drones in agriculture should be promoted. Therefore, it is essential that the government spread awareness among farmers and people about drones and digital technology in India. Yes, financial constraints are a major issue for Indian farmers, but this problem can be addressed with possible government assistance. Awareness initiatives can be carried out through farmer fairs, agricultural universities, and Krishi Vigyan Kendras. Agricultural drones help increase farmers' monitoring capabilities and make the management of remote agricultural operations possible. Ultimately, it can be said that technology that was once developed for military use is now ready to contribute to development across various sectors as green technology.