



DRONES: BOON TO AGRICULTURE PRACTICES IN HILL AREAS

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In recent years, there has been a growing interest in finding innovative and sustainable methods to meet the increasing demand for food production. As the global population continues to rise, traditional farming practices face numerous challenges such as limited land availability, water scarcity, and climate change. However, the emergence of drone technology offers a promising solution to these issues. Drones, unmanned aerial vehicles (UAVs) controlled remotely or autonomously, are revolutionizing agriculture by providing farmers with efficient and sustainable means to grow food.

Hill areas pose unique challenges for agriculture due to their rugged terrain, limited accessibility, and vulnerability to erosion and soil degradation. Farmers in these regions often face difficulties in implementing efficient and sustainable farming practices. However, the advent of drone technology has emerged as a game-changer, offering a plethora of benefits to agriculture in hill areas. In this article, we will explore how drones have become a boon to agriculture practices in these challenging landscapes, revolutionizing farming methods and empowering farmers.

One of the significant advantages of drones in hill agriculture is their ability to survey and map the land. Traditional land surveying methods are often labour-intensive and time-consuming, particularly in hilly terrains. Drones equipped with high-resolution cameras and mapping software can quickly and accurately survey large areas, generating detailed topographic maps and 3D models. This data provides invaluable information to farmers, enabling them to plan their cultivation activities effectively. By understanding the landscape, farmers can identify suitable areas for cultivation, plan irrigation channels, and prevent soil erosion by implementing appropriate terracing techniques.

Moreover, drones equipped with multispectral or hyperspectral sensors can capture data on crop health and nutrient deficiencies. In hill areas, where access to crops can be challenging, this aerial perspective allows farmers to monitor their crops without physically reaching every corner of the field. By analysing the data collected by drones,

farmers can detect early signs of pests, diseases, or nutrient imbalances. This early detection enables timely interventions, such as targeted pesticide application or nutrient supplementation, preventing the spread of diseases and minimizing crop losses.

In hill areas, irrigation management is crucial due to limited water availability and challenging terrain. Drones equipped with thermal sensors can identify areas of excess moisture or water stress in fields, aiding farmers in optimizing their irrigation practices. By identifying areas that require more or less water, farmers can reduce water wastage, improve water-use efficiency, and ensure the optimal health and growth of their crops. This precision irrigation approach not only conserves water resources but also contributes to sustainable farming practices.

In regions where the cultivation of high-value crops like fruits or flowers is common, drones play a vital role in pollination. Hill areas often lack sufficient natural pollinators, making manual pollination labour-intensive and time-consuming. However, drones equipped with specialized devices, such as brushes or sprayers, can mimic the pollination process. These drones can be programmed to fly autonomously, precisely transferring pollen from one flower to another. This innovative approach ensures successful pollination and maximizes crop yields, even in the absence of natural pollinators.

Another significant application of drones in hill agriculture is the aerial spraying of crops. The use of drones for aerial spraying in hill agriculture has revolutionized pest and disease control practices. Traditionally, farmers in



SOME SCHEMES FOR ENCOURAGING THE USE OF DRONE TECHNOLOGIES IN AGRICULTURE IN INDIA:

- Pradhan Mantri Kisan Drone Yojana (PM-Kisan Drone Yojana): This scheme was launched by the Government of India in 2021 to promote the use of drones in agriculture. The scheme provides financial assistance to farmers for the purchase of drones.
- Agriculture Drones and Precision Farming Promotion Scheme: This scheme was launched by the Ministry of Agriculture and Farmers Welfare in 2022 to promote the use of drones in agriculture. The scheme provides financial assistance to farmers for the purchase of drones and for training in drone-based agriculture.
- Drone-in-Agriculture Technology Challenge: This challenge was launched by the Government of India in 2022 to promote the development and use of drone-based technologies in agriculture. The challenge provides a platform for startups and innovators to develop and showcase their drone-based technologies for agriculture.
- Sub-Mission on Agricultural Mechanization” (SMAM) for Agriculture graduates establishing Custom Hiring Centres: Under this scheme Agri-graduates would be eligible to receive 50% of the basic cost of the drone and its attachments or up to Rs.5 lakhs in grant support for drone purchases. Rural entrepreneurs should have passed class tenth examination or its equivalent from a recognized Board; and should have remote pilot license from an Institute specified by the Director General of Civil Aviation (DGCA) or from any authorized remote pilot training organization.

hill areas had to rely on manual spraying, which was not only time-consuming but also posed risks to their health and safety. Drones equipped with spraying systems offer a safer and more efficient alternative. With their ability to navigate through challenging terrain and reach inaccessible areas, drones can effectively spray pesticides or biocontrol agents, targeting specific crop areas that require treatment. This targeted spraying approach minimizes the use of chemicals, reduces environmental contamination, and ensures the health and quality of the crops.

Furthermore, drones have become instrumental in crop monitoring and yield estimation in hill agriculture. With their advanced imaging capabilities, drones can capture detailed data on crop health, growth patterns, and maturity stages. This information allows farmers to make informed decisions regarding harvest timing, resource allocation, and post-harvest management. By analysing the data collected by drones, farmers can optimize their crop management strategies, minimize wastage, and improve overall productivity. This technology empowers farmers in hill areas to make data-driven decisions, maximizing their yields and profitability.

The benefits of drone technology in hill agriculture are not limited to individual

farmers. Drones can also be employed at the community or regional level to collect data and provide valuable insights for agricultural planning and resource management. For instance, drones can be used to monitor land use changes, identify areas prone to soil erosion or landslides, and assess the impact of climate change on agriculture. This information can be used by policymakers, researchers, and agricultural extension agencies to develop targeted interventions and strategies to mitigate the challenges faced by farmers in hill areas.

Several real-world examples highlight the successful integration of drones in hill agriculture. In the hilly regions of Himachal Pradesh, India, drones have been employed to survey land and assess soil erosion in order to implement effective soil conservation measures. The data collected by drones has helped farmers in these areas to adopt contour ploughing and terracing techniques, reducing soil erosion and improving soil fertility. Similarly, in the steep terrains of Taiwan, drones have been used for crop monitoring, pest control, and aerial spraying, improving the efficiency and sustainability of farming practices.



These are just a few of the schemes that are available to encourage the use of drone technologies in agriculture in India. The government is committed to promoting the use of drones in agriculture, and these schemes are a step in the right direction. In addition to these schemes, there are several private companies that are also offering drone-based solutions for agriculture. These companies offer a variety of services, including:

- Crop scouting: Drones can be used to survey large areas of crops quickly and easily, looking for signs of pests, diseases, or nutrient deficiencies. This can help farmers to identify and address problems early, before they cause significant damage to crops.
- Precision spraying: Drones can be used to apply pesticides and fertilizers with great precision, targeting only the areas that need treatment. This can help to reduce the amount of chemicals used, which can benefit the environment and save farmers money.
- Seeding and planting: Drones can be used to sow seeds and plant seedlings in difficult-to-reach areas, such as steep slopes. This can help farmers to improve crop yields and reduce labour costs.
- Harvesting: Drones can be used to harvest crops in a variety of ways, including picking fruit, collecting nuts, and threshing grain. This can help farmers to save time and money, and to improve the quality of their crops.

In conclusion, drones have emerged as a boon to agriculture practices in hill areas. Their ability to survey and map land, monitor crop health, optimize irrigation, facilitate pollination, and enhance pest control has revolutionized farming methods and empowered farmers in challenging terrains. Drones provide valuable insights and enable precision agriculture, contributing to sustainable and efficient food production in hilly regions. The use of drones in agriculture is still in its early stages, but it has the potential to revolutionize the way that farmers produce food. Drones can help farmers to increase yields, reduce costs, and improve the quality of their products. As drone technology continues to advance, it is expected that their role in hill agriculture will further expand, addressing the unique challenges faced by farmers and promoting sustainable farming practices in these areas.

