



## Beyond the Horizon: The Role of Drones in Precision Agriculture

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India is one of the major agricultural players worldwide, which is also the primary source of livelihood for 55 per cent of the population. Recently, food grain production in India crossed 330.5 million tonnes (mt) in FY23, according to IBEF. Moreover, as per data released by the Ministry of Statistics and Programme Implementation (Mo SPI), the total share of the gross added value of agriculture and allied sectors in the economy was 18.3 per cent in FY23.

Despite these achievements, the agriculture sector in India is plagued by low productivity, uneconomic land holding size, high biotic losses and a low level of mechanisation. This is due to several reasons, including traditional farming practices, which use uniform treatment of fields. This contributes to the overutilisation of vital resources such as water, fertilisers, and pesticides. This also leads to the wastage of precious inputs, poses a threat to the environment, and causes habitat destruction.

Now, as the nation's population is expected to surge in the coming years, there will be a huge demand for food and fibre production. Therefore, the nation needs to address these challenges and stay prepared to upscale its food production. This is where precision agriculture has a vital role to play.

### Why the need

One of the critical challenges farmers have faced is the absence of data-driven decision-making. Furthermore, the rising cost of foodgrain production makes it daunting for the farmers to sustain the profits, which ultimately impacts their livelihood. The limitations of financial rewards also lead to a struggle to attract talented minds. The diverse food habits of the nation and the fragmented land holdings further add complexity to the sector.

In a bid to address these challenges, a new approach is the need of the hour. The sector needs to evolve from a one-size-fits-all approach to producing the right crop at the right time, tailored to specific soil conditions and the environment. In this context, precision agriculture can aid farmers in using crop inputs more efficiently. This effective utilisation will result in increased crop yield and quality. Furthermore, it will also lead to sustainable agricultural practices.

In precision agriculture, drones can also play a major role by offering solutions to the challenges that the sector faces. It tends to help farmers foster innovative practices, enhance productivity, lower costs, and improve environmental sustainability. Let us delve deeper into how drones can be leveraged for precision agriculture.

### Application of drones in precision agriculture

Drone technology got most of its recognition due to its diverse applications. Initially, they were used by the military; however, later, they quickly gained ground in several sectors, and

agriculture is not an exception. The drones fill the gap for human error and address the inefficiencies of traditional farming methods. They can be leveraged for several applications, and a few of them are listed below:

**Crop monitoring:** Drones are equipped with sensors and cameras that facilitate real-time imagery and data on crop health. This key information allows the farmers to identify stress areas, pest infestations, disease, and more.

**Irrigation management:** The drones can be used for monitoring the soil moisture levels across the fields, which ensures efficient and precise irrigation. It aids in conserving water as well as optimising crop growth.

**Disaster management:** In case of a natural disaster, drones can be deployed to measure the damage and impact of it on agricultural land. This in turn helps in planning the recovery efforts.

**Geo-fencing:** With drones, the farmers are able to create a virtual boundary, which helps keep the livestock from straying into the restricted areas.

**Calculating crop biomass:** Drones can help in calculating the crop biomass as well as estimating the yield. As a result, the farmers can plan the harvest with efficacy.

**Locust control:** The locust swarms can feed on crops, trees, and other types of plants. This can lead to the destruction of crops planted, causing a huge impact on the livelihood of farmers. In this regard, drones can be used for targeted spraying in areas where it is hard to reach with traditional methods.

**Spraying management:** UAVs use drones with RGB sensors and multispectral sensors to locate the areas where nutrients are needed, allowing them to be applied to only those particular regions. This is the reason why they can be leveraged as effective sprayers.

All these applications of drones in precision agriculture provide numerous benefits to farmers.

### Benefits of drones

**Enhanced production:** With drones, farmers can enhance their production capabilities via comprehensive irrigation planning, monitoring crop health, and adapting to environmental changes.

**Effective and adaptive techniques:** The drones provide regular updates to the farmers about the crops and help them adapt to the dynamic weather conditions. As a result, they are able to allocate resources efficiently.

**Greater safety for farmers:** Drones increase safety for farmers as they are able to use them to spray pesticides in challenging terrain, taller crops, infected areas, and more.

**Increased accuracy rate:** With drones, the farmers are able to calculate the size of the land precisely. Moreover, they are also able to segment various crops and indulge in soil mapping, which leads to higher accuracy rates.

### All things considered

Agricultural drones are undoubtedly the future of the agrarian community in India, as they can transform traditional farming in uncountable ways. This cutting-edge technology can be leveraged for several applications, such as crop monitoring, irrigation management, disaster management, locust control, geo-fencing, spraying management, and more. This in turn will aid the farmers in improving production, adapting to dynamic weather conditions, enhancing safety, and increasing accuracy rates. In conclusion, drones, and precision farming have boded well for betterment of Indian agriculture. With the help of these technologies, India's agriculture industry is likely to become more prosperous, productive, and sustainable.