

## Use of Drones in Agriculture

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India's agriculture sector, despite being the backbone of the rural economy, suffers from technological stagnation, over-dependence on monsoons, and frequent crop failures due to pests and weather.

However, innovative solutions like agri-drones offer new hope. The Indian drone market for agriculture is still nascent but growing rapidly. For instance, under the 'NAMO Drone Didi' scheme, 93 out of 100 drones provided by IFFCO are already operational in Punjab. These drones, costing Rs 16 lakh each with 12-litre tanks, address key challenges such as labour shortages, wasteful pesticide use, and uneven spraying.

Studies show that farmers using drones have reduced per-acre cultivation costs by 6.04%. Equipped with GPS and advanced sensors, drones enable precise spraying, faster crop surveillance, and early failure detection without chemical exposure risks. By juxtaposing traditional farming methods with drone technology, Indian farmers can mitigate losses, improve crop quality, and reduce reliance on manual practices. As exploration of various drone types for

spraying and monitoring continues, the future of Indian agriculture appears more resilient and efficient.

Drones or uncrewed aerial vehicles (UAVs), have traditionally been used for surveillance in mining,



construction, military, and hobbyist sectors. However, this technology is now increasingly available for Indian agriculture. Although still nascent in the country, drone

adoption is growing as companies work to make these tools accessible to farmers. The goal is to enhance efficiency in agricultural production by offering solutions for crop monitoring, pest control, and resource optimization.

By deploying drones over farmland, growers can gather real-time data on crop health, irrigation needs, and pest infestations information that was previously difficult to obtain quickly. This shift from manual inspection to aerial surveillance allows for timely interventions, reducing the risk of large-scale crop failure. As more Indian startups and cooperatives introduce affordable UAVs tailored to local farming conditions, drones are poised to become a practical tool

for small and large farms alike. With continued innovation and government support, drones can help transform Indian agriculture from a traditional, monsoon-dependent practice into a more precise, data-driven, and resilient industry.

### Types of Drones Used in Agriculture

Agricultural drones in India are available in various types, each designed to meet specific farming needs such as spraying, monitoring, and mapping. Understanding these different categories helps farmers and agri-entrepreneurs choose the most suitable drone for their land and operations.

**1. Rotary-Wing Drones:** Rotary-wing drones operate using rotating blades, allowing them to take off vertically and hover in place. Their agility and ease of control make them highly suitable for spraying and monitoring small or irregularly shaped fields. The ability to hover ensures precise application, which is especially useful in Indian farming conditions.

**a) Quadcopters:** Quadcopters are equipped with four rotors and are widely preferred due to their balance of size, performance, and affordability. They are easy to operate and can carry light to moderate pesticide loads.

**b) Hexacopters:** Hexacopters have six rotors, offering greater power and stability compared to quadcopters. They can carry larger spray tanks and perform well in windy conditions, making them ideal for larger farms. These are among the most commonly used agricultural drones in India.

**c) Octocopters:** Octocopters feature eight rotors, providing maximum power and load-carrying capacity. They are best suited for large-scale farms requiring heavy spraying and longer operational durations.

**2. Fixed-Wing Drones:** Fixed-wing drones resemble small airplanes and rely on wings for flight. They are capable of covering large areas quickly but require open space or a runway for take-off and landing, which can limit their use on smaller farms.

**a) Standard Fixed-Wing Drones:** These drones are efficient for mapping and surveying large agricultural fields. They fly faster and cover more area in a single flight compared to rotary drones.

**b) Fixed-Wing Drones with VTOL:** These drones combine the efficiency of fixed-wing flight with vertical take-off and landing (VTOL) capability. This makes them suitable for farms without runway space.

**3. Hybrid Drones:** Hybrid drones integrate the advantages of both rotary-wing and fixed-wing systems. They can take off vertically like a helicopter and then transition into fixed-wing mode for faster and longer flights.

**a) Rotary-Wing/Fixed-Wing Hybrids:** These drones lift off vertically and switch to fixed-wing flight, making them ideal for large farms with limited open space.

**b) VTOL Hybrids:** VTOL hybrids offer both hovering and long-distance travel capabilities, making them versatile for spraying as well as large-area coverage.

**4. Fertilizer Spraying Drones:** These drones are specifically designed to spread fertilizers evenly across crops. They reduce manual labor and minimize chemical wastage through precise application systems.

**5. Crop Monitoring Drones:** Equipped with advanced cameras and sensors, these drones help farmers

monitor crop health, detect pests early, and manage irrigation effectively through aerial data.

**6. Multirotor Spraying Drones:** These drones use multiple rotors and are specially built for spraying pesticides and herbicides with high precision. Their stability ensures uniform coverage.

**7. Fixed-Wing Mapping Drones:** Designed for surveying and mapping large agricultural areas, these drones provide detailed data to support planning and resource management.

### 3. Applications of Drones in Agriculture

- Crop monitoring and health assessment
- Soil analysis and field mapping
- Irrigation management
- Spraying pesticides and fertilizers
- Seed planting

### Reference

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### 4. Benefits of Using Drones in Agriculture

- Increased efficiency and productivity
- Cost reduction
- Precision farming
- Time-saving advantages

### Conclusion

The use of drones in agriculture represents a paradigm shift from reactive, labor-intensive farming to proactive, data-driven precision agriculture. By providing real-time aerial insights for crop health monitoring, targeted spraying, irrigation management, and field analysis, drones significantly enhance resource efficiency, reduce chemical runoff, and boost crop yields. While challenges such as high initial costs, regulatory hurdles, and the need for technical training remain, the trajectory is clear.

