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Drone Technology in Smart Agriculture and Precision Farming

Nidhi Tewari
Department of Entomology, College of Agriculture, G.B. Pant University of Agriculture and Technology, Pantnagar 263 145

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Introduction:

Drone Technology can help revolutionise agriculture by optimizing agricultural operations. Agriculture in India constitutes more than 60% of occupation, and it serves to be the backbone of Indian economy. It is essential to improve the productivity and efficiency of agriculture by providing safe culture cultivation to the farmer. The various operations like spraying of pesticides and sprinkling fertilizers are harmful procedure for the farmer as it causes skin issues and respiratory problems. Drones can revolutionize agriculture by offering farmers major cost savings, enhanced efficiency and more profitability. Drones can help speedy surveys of vast stretches of land, map the cropping area, report on crop health and canimprove spraying accuracy and irrigation system. Hence use of drones could help farmers around the world to monitor their crops, fend off pests, and save time and money. The monitoring of the crops and the need for spraying pesticides and fertilizers at the correct moment and at the exact location of plants is an important parameter to increase the productivity of the crops that is an important component of precision farming. Unmanned Aerial Vehicle (UAV) or drones can be used in agricultural sectors which will reduce the time of operations and the hazardous effects that can be caused due to the spraying of pesticides and fertilizers.

According to the recent drone market report (2019-2024), the global drone market will grow from $14 billion in 2018 to over $43 billion in 2024 at a CAGR of 20.5%**.** (www.droneii.com)Top Drone Companies in India 2022 are Infoedge India, Zomato Ltd, Paras Defence and Space Technologies, Rattan India Enterprises and DCM Sriram Industries. (www.tradebrains.in) Drone technology captured the imagination of investors, entrepreneurs, and farming businesses alike as a means to replace certain tasks on the farm and play a role in "precision agriculture" – the modern farming technique aimed at making

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production more efficient through the precise application of inputs and machinery. (Burwood-Taylor, 2017).

Uses of agricultural drones:

1. Estimating soil condition:

Smart farming with the help of drones can save physical visits to a farm which is very time consuming and not so convenient. Equipped with agriculture smart sensors, drones can collect data faster and can deliver this data which can be quickly analysed and more accurate information can be retrieved in a much faster and more precise manner.

a. Planting Drone

b. Irrigation Drone

c. Soil Analysis Drone

d. Crop Monitoring Drone

e. Crop Spraying Drone

f. Health Assessment Drones

2. Planting future crops:

The soil gets prepared for planting and a drone can shoot seeds in it along with the nutrients, rather than using outdated planting techniques. Using drones for seed planting is new, yet some companies are experimenting with this approach. Seeding in hilly areas with the help of drone can be an effective solution where sowing is difficult and where tractors can't operate well.

3. Fighting infections and pests:

With the help of multispectral camera drone can also detect field areas inflicted by weeds, infections and pests. Based on this data, farmers can decide the exact amounts of chemicals needed to fight infestations. It can help reduce expenses and can help achieve better crop health.

4. Agriculture spraying:

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Smart farms also use drones for agriculture spraying, which helps limit human contact with fertilizers, pesticides and other harmful chemicals. Drones can handle this task faster and more efficiently than vehicles and airplanes; they are also a great alternative for farms that still use manual labour. Drones are also irreplaceable when it comes to spot treatment.

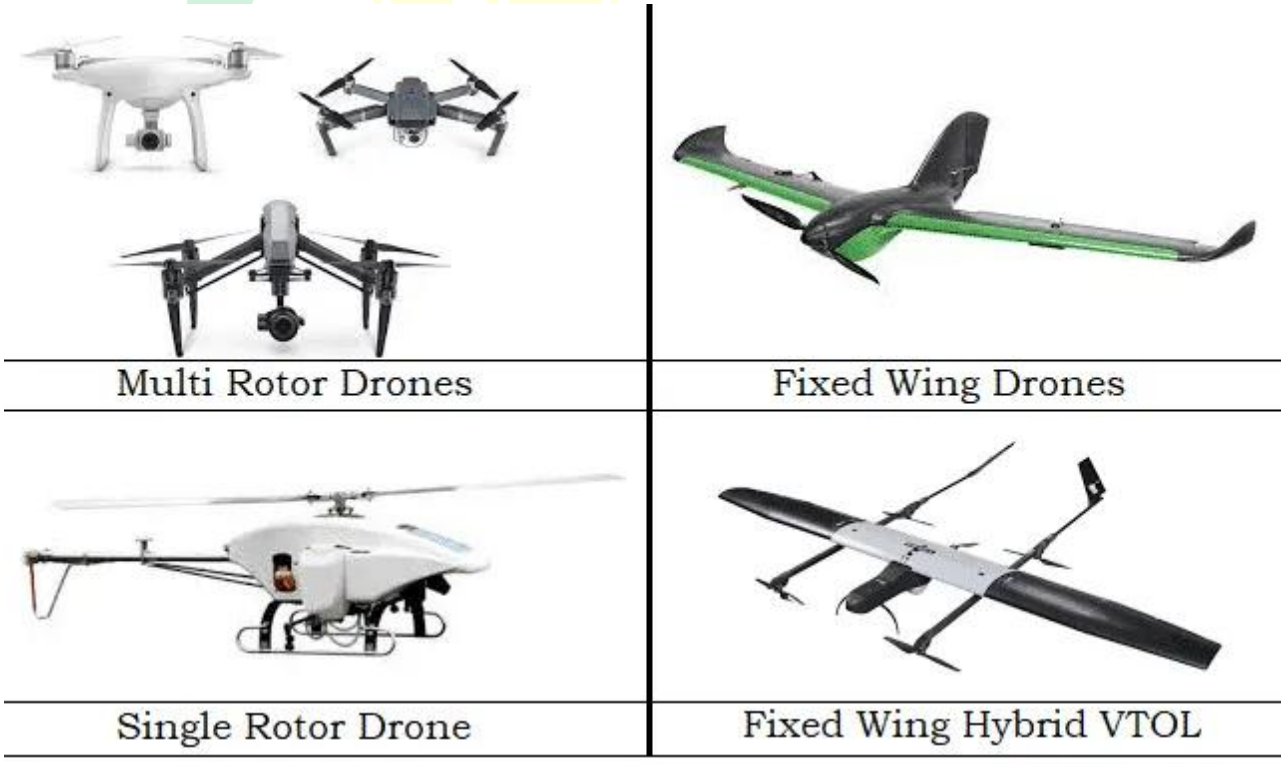
5. Crop surveillance:

Agricultural fields occupy very large areas and it is often impossible to estimate the overall state of crops. By using drones for agriculture mapping, farmers can stay updated on the health of plants in a particular area and indicate which field areas require attention.

6. Livestock monitoring and bird monitoring:

In livestock farming, drones can keep an eye on the cattle as it grazes on pastures, reducing the need for human workforce on horseback and trucks. Using thermal sensor technology, drones can detect injured or sick animal, find lost cattle and calculate their exact numbers.

Type of UAVs / Aerial Vehicles in Agriculture:



1. **Multi Rotor UAVs:** These UAVs are mostly used for applications like aerial surveillance, photography, spraying and planting. Some of the limitations are limited flying time of 30 minutes, limited speed, so they are not suitable for projects such as long-distance surveillance and aerial mapping.

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2. **Fixed wing UAVs:** These UAVs are controlled autonomously without a human pilot on-board. They have average flying time of 2 hours and some of the recent Fixed Wing UAVs can fly upto 16 hours. They are ideal for long distance operations. Some of the limitations are high costs and highly skilled training to operate. They need runway for launching.
3. **Single Rotor UAVs:** These categories of UAVs look similar to the helicopters. These UAVs have only one huge rotor and a smaller one near the tail of the UAV. They can fly for higher number of times compared to multi-rotor UAVs. Some of the limitations are more complex and prone to operational risks and higher costs.
4. **Hybrid Vertical Take-off and Landing (VTOL):** These UAVs are a hybrid of fixed wing UAVs and rotor-based models. These UAVs are equipped with sensors and can be controlled.

How does drone technology works?

Capturing data from agriculture drone takes place in the following stages:

1. **Analysing the area:** This identifies the territory being tested. Therefore, the first step includes establishing a boundary, analysis of the area, and then finally, uploading the technical GPS information into the drone's navigation system.
2. **Using Autonomous Drones:** Since UAVs are independent, they enter flight patterns into their already established system to collect required data.
3. **Uploading the data:** After capturing all the required data through sensors such as the multispectral sensor/RGB sensor, it is processed through numerous software for further analysis and interpretation.
4. **Output:** After collecting the data, they format it so that farmers can understand the data with no hassle, bringing them a step closer to precision farming. 3D mapping or Photogrammetry are popular methods to display extensive data collected.

Deploying Drone Technology in Agriculture in India:

The drone technology in India is still in nascent stage but the demands are increasing. Some start-ups are ASAP Agritech,ThanosTechnologies and General Aeronautics, they are developing and improving drones before the Ministry of Aviation and had developed many quad copters. With the development of more advanced farm management techniques, such as precision agriculture, industry professionals now have more tools than ever to improve the

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accuracy and efficiency of processes. The cost of drones equipped with accessories for spray can range from 3 to 7 lakhs depending on make and capacity of spray tank. The DGCA (Director General Civil Aviation, GOI) has made flying drones legal and several rules and regulations have been released.

Conclusion:

The drones help achieve and enhance precision agriculture which stands to be the most in demand. The extraction of the farm intelligence data collected with the help of drones help in better farm planning, monitoring, better decision making and providing individual treatments to crops and livestock. With the adoption of these technological developments the agricultural sector is likely to experience a paradigm shift in terms of productivity and efficiency and will also reduce manual labour. There are several challenges in implementing of UAVs which are needed to be addressed while deployment in India such as legal aspects of using UAVs, acceptability by farmers, flight time and flight range, initial purchase cost, interference with airspaces, proper internet connectivity during fields assessment operations and weather dependency, can't operate in rainy and windy conditions.

References:

- Burwood-Taylor, L. (2017). The next generation of drone technologies for agriculture. Agfunder News, 16March [online]. [Cited 22 July 2017]. https://agfundernews.com/the-next-generation-of-dronetechnologies-for-agriculture.htm
- Drone Powered Solutions. (2016). Clarity from above. PwC global report on the commercial applications of drone technology. Warsaw, PwC.
- FAO. (2016). Google and FAO partner to make remote sensing data more efficient and effective. News Article, 1 December [online]. [Cited 23 September 2017]. http://www.fao.org/news/story/en/item/ 350761/icode/
- PwC. (2016). Clarity from above: PwC global report on the commercial applications of drone technology. May [online]. [Cited 21 September 2017]. https://www.pwc.pl/pl/pdf/clarity-from-above-pwc.pdf
- Agricultural Drones - Application of Drones in Agriculture in India (2022) | TropoGo
- Drones in Agriculture: Can UAVs Make Farming More Efficient In India? - TropoGo
- Agricultural drones in India - Challenges and bottlenecks (roboticsbiz.com)

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- India Drone Market Report 2019-2024 – Drone Industry Insights (droneii.com)
- Top Drone Companies in India - Stocks to Watch in 2022 (tradebrains.in)