NEW ERA AGRICULTURE MAGAZINE

Farmer's adoption of Drone technology in current agriculture farming and its issues

Shyam Ji, Dr.N.R.Meena, Kapil Verma and Aman Verma

Abstract

The use of drones is now in vogue in India and its use is being carried out by the Agricultural University of India in collaboration with various aerospace technologies to various farmers, but due to the low literacy of the farmers of India, a problem is arising. In adopting this technology and how can we make it easier so that farmers can take advantage of this technology more easily

Introduction:

Drone technology has gotten most of the recognition in the industry because of its diversity and considered the future for the agrarian community. The military initially used them. However, other sectors quickly embraced unmanned aerial vehicles (UAVs) when they learned about its widespread applications. How can drones support Indian agriculture? Drones don't merely enhance overall performance but also encourage farmers to solve other assorted barriers and receive plenty of benefits through precision agriculture. With the market for agricultural drones reaching a whopping $1.3 billion, UAVs (unmanned aerial vehicles) fill the gap of human error and inefficiency by traditional farming methods. The purpose of adopting drone technology is to exclude any guesswork or ambiguity and instead focus on accurate and reliable information. External factors like weather, soil conditions, and temperature play a critical role in farming. Agriculture drone empowers the farmer to adapt to specific environments and make mindful choices accordingly. The gained data helps regulate crop health, crop treatment, crop scouting, irrigation, and carry out field soil analysis and crop damage assessments. The drone survey helps boost crop yields and minimize time and expenses.

According to experts, the predicted world population will be 9 billion by 2050. Agricultural consumption is also said to increase simultaneously by nearly 70%. Drone technology, equipped with artificial intelligence (AI), machine learning (ML), and

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remote sensing features, are rising in demand because of its advantages.

The central government has acknowledged the importance of unmanned aerial vehicles (UAVs), machine learning, and artificial intelligence with their 'Digital Sky Platform' online. Drone startups in India have used this opportunity to accomplish better technological capacities.

Methods:

Only after complete recognition of drones characteristics can one gain in-depth knowledge about agriculture drones. Typically, drones include a navigation system, GPS, multiple sensors, high-quality cameras, programmable controllers, and tools for autonomous drones. The DJI is one such familiar drone utilized by the industry. Most farmers currently use satellite imagery as an introductory guide for farm management. Furnished with modern technology, unmanned aerial vehicles (UAVs) can get more precise data than satellites for precision agriculture. They then process the data captured into Agri-tech software to produce beneficial knowledge Capturing data from agriculture drone takes place as in the following stages Analyzing the area: This identifies the territory being tested. Therefore, the first step includes establishing a boundary, analyses of the area, and then finally, uploading the technical GPS information into the drone's navigation system. DRONE TECHNOLOGY IN INDIAN AGRICULTURE, Photogrammetric, GIS

Data Processing:

Using Autonomous Drones: Since unmanned aerial vehicles (UAVs) are independent, they enter flight patterns into their already established system to collect required data. 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.

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.

How does drone technology work?

Drone Technology:

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Best drone practices:

Drone technology quickly re-establishes traditional agrarian practices and is subsequently accomplishing them as follows

Irrigation Monitoring:

CROPHEALTH, CROP DAMAGE ASSESSMENT, FIELD SOIL ANALYSIS, precision agriculture, remote sensing, artificial intelligence Drones, including hyperspectral, thermal, or multispectral sensors, recognize areas that are too dry or need improvement by the farmer. Drone survey helps improve water efficiency and disclose potential pooling/leaks in irrigation by providing Irrigation monitoring yields calculations of the vegetation index to help realize the health of crops and emitted heat/energy.

Crop Health Monitoring and Surveillance:

It is crucial to track the health of the vegetation and spot bacterial/fungal plagues in the early stages. Agriculture drones can see which plants reflect different amounts of green light and Near-infrared spectroscopy (NIRS) light. This data helps produce multispectral images to track crop health. Quick monitoring and discoveries of any defects can help save crops. In circumstances of crop failure, the farmer can also document the damages for accurate insurance claims.

Crop Damage Assessment:

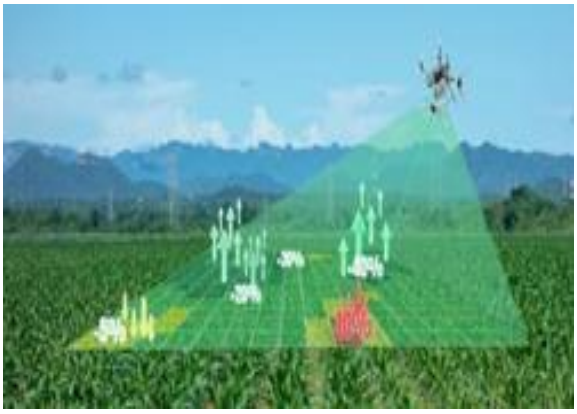
CROPHEALTH, FIELD SOIL ANALYSIS, precision agriculture, photogrammetry, 3d mapping CROP DAMAGE ASSESSMENT. Agricultural drones fitted along with multispectral sensors and RGB sensors also detect field areas inflicted by weeds, infections, and pests. According to this data, the exact amounts of chemicals needed to fight these infestations are known, and this helps diminish the costs inflicted by the farmer.

Field Soil Analysis

The drone survey allows farmers to obtain information about their land's soil conditions. Multispectral sensors allow seizing data useful for seed planting patterns, thorough field soil analysis, irrigation, and nitrogen-level management. Precise Photogrammetry/ 3D mapping permits farmers to analyze their soil conditions thoroughly.

Planting

Drone startups in India have invented drone-planting systems that allow drones to shoot pods, their seeds, and crucial nutrients into the soil. This technology doesn't only reduce costs by almost 85% but also increases consistency and efficiency.



Pesticides spraying:

Through drone crop spraying, human contact with such harmful chemicals is limited. Agri-drones can carry out this task much quicker than vehicles/airplanes. Drones with RGB sensors and multispectral sensors can precisely identify and treat problematic areas. Professionals say that aerial spraying is five times faster with drones when compared to other methods.

Livestock tracking:

The drone survey allows the farmers not to keep track of their crops only but also monitor the movements of their cattle. Thermal sensor technology helps find lost animals and detect an injury or sickness. Drones can carry out this function favourably, and this adds comprehensively to the production of vegetation.

Results:

Farmers can make crop surveillance of the field using infrared cameras and get real-time information about crop growth, infestation, and requirement of inputs. This helps farmers in responding to any problem sooner and takes active measures to nip it in the bud. Applications of drone technology can also be used for mapping water spread areas, pest infestation, and livestock farming besides assisting farmers in adopting good agricultural practices (GAP). Crops can be contamination-free, making them get good export prices.

Government support and encouragement for drones were evident when the Prime Minister of India inaugurated India's biggest Drone Festival – Bharat Drone Mahotsav in May 2022.

Prime Minister called the use of drones a "milestone" for Indian agriculture and expressed confidence it would create more opportunities. The government of India has extended huge subsidies to different agriculture-related instructors, farmer producer organizations' (FPO) and custom hiring centres (CHC) for purchasing and promoting drones under a new scheme of Kisan Drone. These drones are helpful for government agencies also as they can be used for crop assessment of production estimates or to process farm insurance, digitization of land records, and can expedite claim processing and bring transparency.

Many state governments have shown interest such as the Andhra Pradesh government has decided to procure 200 Kisan Drones, which would solve the problem of labour shortage and health hazards. As excessive rains flooded farms, Karnataka has decided to use drones for crop assessment to bring transparency. Tamil Nadu too has roped in drones as a part of the digital intervention to make agriculture and farming profitable and sustainable. Gujarat and Rajasthan too, have joined the journey of the digital revolution.

Drones were used in 2020 to ward off locus attacks, saving millions of hectares of farmland. Farmers are getting first-hand experience in operating drones and their usefulness such as testing the moisture of soil, which is not possible through traditional ways. State governments are confident that drones will be game-changer not only for farmers but for the entire agri economy. Despite knowing the importance of technology; our agriculture did not adopt it for years. However, we can see a gain in momentum now. Both Central and state governments are keen on embracing it. The involvement of agro startups, FPOs and CHCs in drone technology will allow farmers, especially those financially poor to try new technological solutions. As drones become affordable and easily accessible, more and more farmers will start using them. Moreover, drones can create employment opportunities in rural India, especially for the tech-savvy youth and bring them back to farms. As they say, artificial intelligence is set to transform the world; drones are going to change the face of farming in the 21st century.

Discussion:

PM's dream may look like an ambitious target, but it points to the importance the Indian government has given to the role of drones in agriculture. Budget 2022-23 mentioned ramping up the use of drone-based technologies in agriculture. More importantly, "Kian drones" will be used in assessing crops. High costs Adopting drones in Indian agriculture has its own pros and cons. A drone costs anywhere between Rs.10 lakh and Rs.12 lakh. An ordinary farmer will not be able to afford it. However, drones can be made available through a farm-as-a-service platform. Probably, economies of scale can help realize this dream. India's potential A recent study forecasts the Indian agriculture drones market to witness a four-fold increase by 2028, with a projected compound annual growth rate of over 25 per cent during 2022-2028. Initiatives to promote its inclusion.

The Indian arm of the Swiss-based firm launched a drone yare to cover 10,000 km across 13 States from Muncher near Pune in Maharashtra. Experts are of the opinion that drones help the Indian agriculture sector make a huge leap. A few firms such as Unnasty, an agri-tech start-up platform, have launched drone services. The firm plans to spray 20,000 acres of land by the end of 2022 and increase drones' spray capacity by 4 times next year. The Indian Government is popularizing the use of drones by offering various financial assistance to purchase drones for demonstrations. Drone purchases by custom hiring centres (CHCs) are given 40 percent assistance. The Centre is providing Rs.6,000 per hectare as a contingency fund to farmers to hire drones from CHCs. Gains over manual

spraying With the cost of manual spraying of pesticides increasing, drone spraying is seen as an effective alternative.

A farmer in Muncher costs Rs.500 an acre for manual spraying. It takes at least four hours to spray an acre and the costs are only going up. The cost of spraying insecticide using drones costs less and a drone can spray the pesticide on one acre in four minutes. Unnati says its drones can cover an acre in under 8 minutes.

Case Study-

Bengaluru-based General Aeronautics has come up with "Krishak" brand drones that weigh 49 kg. The drones have been tested on 10,000 acres in 14 States across 45 crops. It is providing its drones on a business-to-business basis to corporates such as Syngenta and Bayer Crop Science. A drone manufactured by General Aeronautics, being deployed by Syngenta India at its demonstration plot at Muncher, near Pune, in Maharashtra.

Battery problems:

A normal drone can cover six acres with a single battery charge in 25 minutes. The cost of batteries used in drones could be discouraging. The number of flights for spray could be high. It is 12-15 flights with the current concentration of chemicals. This leads to the major problem of higher battery utilization and subsequent draining of its efficiency and resulting in higher costs in drone application compared to manual spraying. In the case of GA, each battery could last 600 cycles and efforts are on to improve it to 6,000 cycles. But experts concede that battery life and replacement are currently a concern.

Issues with aerial spraying:

Drones help save 95 per cent of the water used for spraying pesticides or insecticides. It is enough if 150-200 ml of pesticide or insecticide is mixed in 8 liters of water. This is since different chemicals have now come up and they need less water for dilution, especially with the emergence of drones. Experts say since landholdings are small in India, it would be easy to monitor the functioning of drones, be it spraying fertilizers, insecticides or pesticides. But the small size could turn out to be a problem. There are some problems with aerial spraying. It could contaminate water bodies and can affect small water streams. Animals could become victims. Appropriate height, speed, wind and ground tactics are needed in view of safety and security. Standard operating procedure issued by the Centre covers this issue. It is possible to ensure safe spraying through geo-fencing and GPS for drones.

Transportation:

This is an issue that needs to be thoroughly studied and experimented with. One solution could be to produce an "ultra-low

volume pesticide or fungicide" that can be adjusted for each crop and disease. Transportation of drones by rail is difficult in view of the drone's width, even without fans. It has to be transported by bus or car. Agribot, probably India's first approved agricultural drone, can reportedly be carried in the carrier of a bicycle. It is better to transport drones by road in India since it will help reach the destination better.

Not all crops covered:

The pesticide or fungicide can be sprayed on the leaves to the required extent. A special nozzle is used for spraying. Most of the pests and insects reside below the leaves. When they turn upside down due to the air pressure of the fans, these pests and insects are exposed to the spray. This is very advantageous compared to manual spraying. But drones cannot be used for all crops e.g. they cannot be used for spraying on grapes whose leaves form a canopy making spraying difficult. Farmers in Maharashtra mount the insecticide or pesticide spray on a tractor and the chemicals are sprayed from the bottom.

Other positives:

The Centre is going all out to promote the domestic drone industry. Imports of drones are prohibited but components can be imported. This will help the domestic industry and boost investment. Drone technology is no longer a pipe dream, especially for the agriculture sector. Efforts from state governments Andhra Pradesh has plans to launch 10,000 drones in phases through its Rhythm Barossa Kendra. Uttar Pradesh, Punjab, Haryana, Karnataka and Tamil Nadu are also working with manufacturers, farmers' organizations and state agriculture universities to roll out drones this year. Way Forward If some of the problematic issues are addressed, drones in agriculture could become a model like Ola or Uber cab services. From district headquarters, young trained drone pilots could serve farmers through apps. Thus, the use of drones in agriculture may change the experience of farmers in a great way. It helps in enhancing efficiency apart from availing some comforts to the farmers.

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