INTERVENTION OF DRONE TECHNOLOGY FOR SUSTAINABLE AGRICULTURE

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APPLICATION OF DRONE IN FARMING

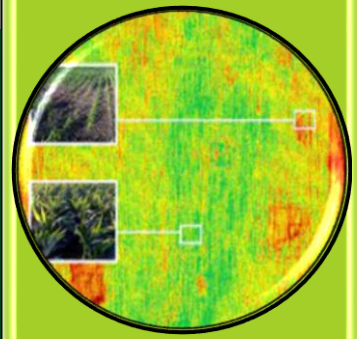
Agricultural Field Soil Analysis

Wide Spread Seed Planting

Crop Health Monitoring and Surveillance

Spraying of Inputs

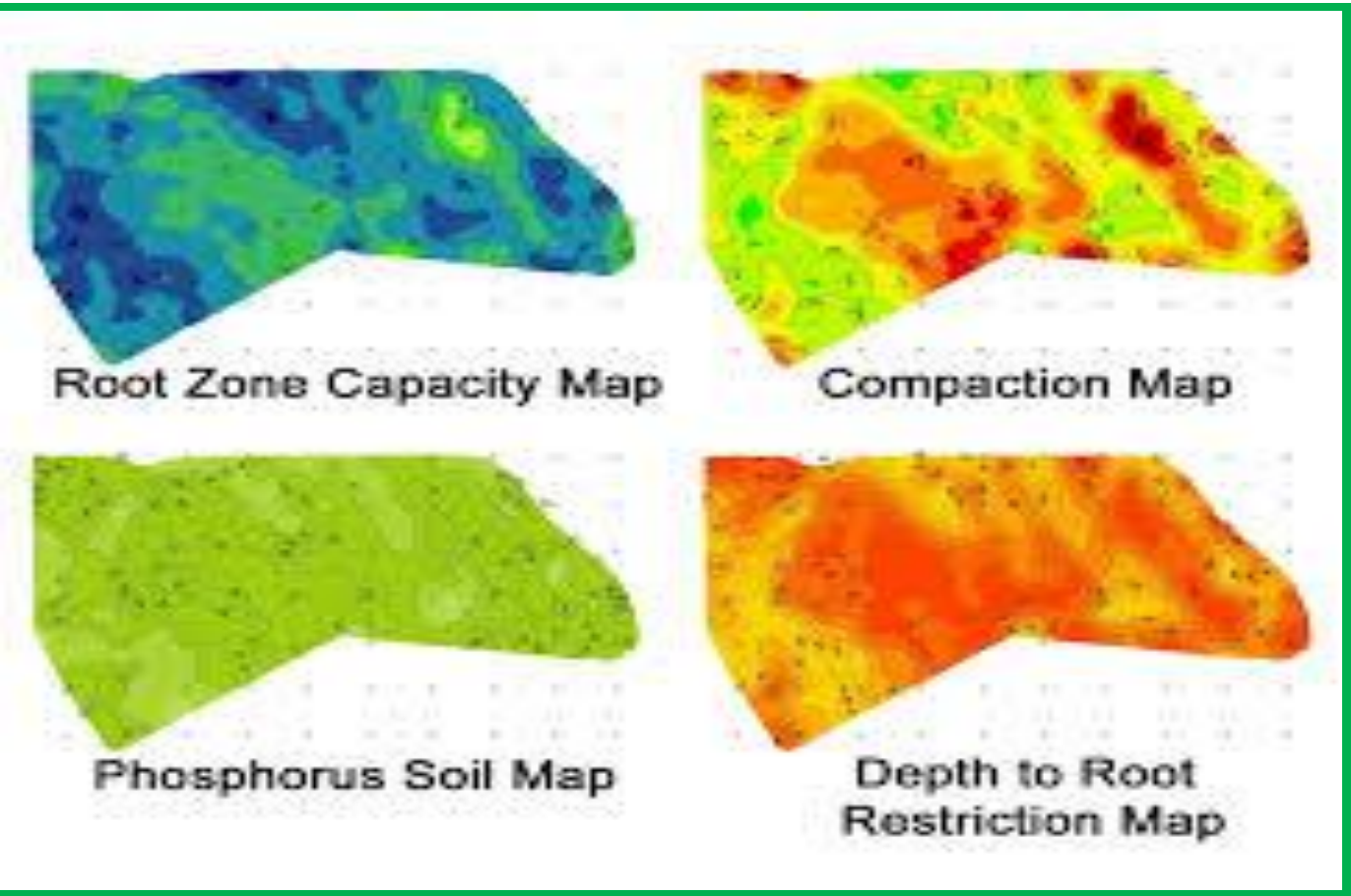
Irrigation and Monitoring



Crop Damage Assessment

Livestock tracking

AGRICULTURAL FIELD SOIL ANALYSIS



- 2D and 3D maps for early soil analysis, useful in planning seed planting patterns.

- After planting, drone-driven soil analysis provides data for irrigation and nitrogen and other nutrient level management

Crop Health Monitoring and Surveillance

Previously, Satellite Imagery offered the most advanced form of monitoring. But there were many drawbacks

Satellite images had to be ordered in advance, could be taken only once a day, Services were extremely costly and the images' quality typically suffered on certain days.

Today, drones can show the precise development of a crop and reveal production inefficiencies, enabling better crop management.

Crop Health Monitoring and Surveillance

- Drones with hyperspectral, multispectral, or thermal sensors can identify which parts of a field are dry or need improvements.

- Additionally, once the crop is growing, drones allow the calculation of the **vegetation index,** which describes the relative density and health of the crop, and show the heat signature, the amount of energy or heat the crop emits and generate crop water stress index (CWSI).

SPRAYING OF INPUTS

- Conventional methods have several other shortcomings such as extra chemicals use, farm labor shortage, lower spray uniformity, environmental pollution, and less area coverage. These conventional methods cause a higher cost of pesticide application and are less effective in controlling pests and diseases.

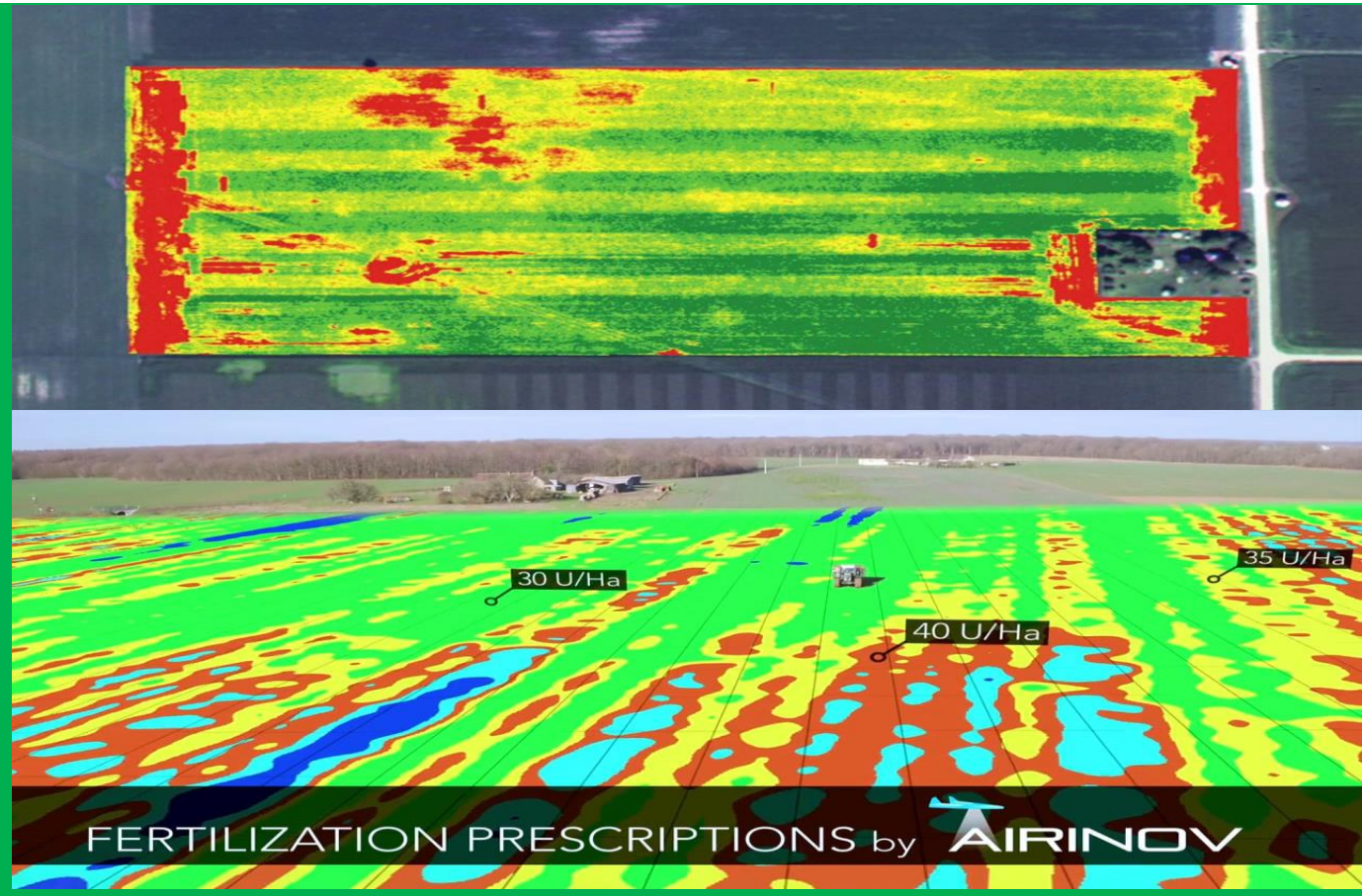
These shortcomings are overcome by Crop Spraying Drone

In the field it enhanced the Coverage Ability, Increased the Chemical Effectiveness, Made the spraying job easier and faster. Nowadays, Drone is capable of carrying up to 20-liter pesticide tank and follow pre-mapped routes to spray crops according to the requirements

Drones are showing great potential in covering the fields with difficult access for tractors and aircraft.

CROP DAMAGE ASSESMENT

- By scanning a crop using both visible and near-infrared light, drone-carried devices can identify which plants reflect different amounts of green light and NIR light.
- This information can produce multispectral images that track changes in plants and indicate their health.

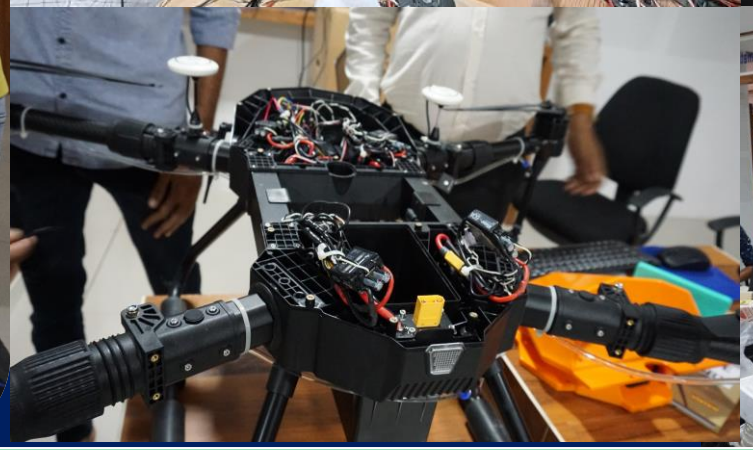


A speedy response can save an entire orchard!!

DRONES IN OPERATIONS AT
JUNAGADH AGRICULTURAL UNIVERSITY

DRONE DISMANTLING AND ASSEMBLING FACILITY FOR STUDENTS

ROBOTICS AND AUTOMATION LABORATORY



APPLICATION

Dedicated Laboratory is established for Students where they can Dismantle and Assemble different components of different Drones for learning and Practising purpose

DRONES IN OPERATIONS AT
JUNAGADH AGRICULTURAL UNIVERSITY

LAB SCALE DRONES

NANO Drone

Drone Kit for Lab Application

CROP SPRAYING DRONES

Hexacopter Crop Spraying Drone (Capacity 12 L)

Octacopter Crop Spraying Drone (Capacity 10 L)

Quadcopter Crop Spraying Drone (Capacity 5 L)

CROP SURVEYING DRONES

DJI Phantom 4 Drone
Sentera Double 4K NDVI / NDRE Sensor

Drone With visible and Multispectral Camera

LAB SCALE DRONES

Nano Drones

- Flight time:- 10 min
- Battery: 600 mAh Lithium Polymer (LiPo)
- Payload-15 g, Range: 60m
- Flight time: 10 min, Flying Height : 1 m
- Speed: 3m/s, Communication-WiFi (60m)
- Total 8 drives: 4 MOSFET drives + 4 H-Bridge drives
- Smartphone App controller available on both Andorid and ios

APPLICATION

Students can learn basics of Drone, Drone Flying Navigation etc.

LAB SCALE DRONES

Drone Kit for Lab Application

- Flight time:- 10 min
- Battery: 2200 mAh Lithium Polymer (LiPo)
- Payload-360 g
- Flying Height : 15 m
- Speed: 8 m/s
- Autopilot PIX 2.4.8 32 Bit Flight Controller

APPLICATION

Quadcopter Combo Kit With Flight Controller set is a complete combo of Frame, motors, propellers, ESCs, Flight Controller, APM Power Module, Students can learn different components of Drone, Drone Flying, Navigation etc.

CROP SPRAYING DRONE

Hexacopter Crop Spraying Drone

- Payload Capacity: 12 Ltrs
- Total weight with payload: 24 kg, Flying Height: 30 m (Max)
- Maximum Flight Speed: 8~12 m/s
- Battery Capacity : 22000 mAh x 2, Lithium based battery (LiPo)
- Work Efficiency: 5 Hectare/hour
- No Load Time: 15~20 min. Full Load Time: 11~15 min.
- Spray width: 4~6 m（4 nozzles, 1.5~3 M above the crops）

APPLICATION

Spraying of Agricultural Inputs i.e. Liquid Pesticides, Fertilizers and Herbicides Etc.

CROP SPRAYING DRONE

Octacopter Crop Spraying Drone

APPLICATION

Spraying of Agricultural Inputs i.e. Liquid Pesticides, Fertilizers and Herbicides Etc.

- Payload Capacity: 10 Ltrs
- Total weight with Payload: 24 kg, , Flying Height: 30 m (Max)
- Maximum Flight Speed: 8-12 m/s
- Work Efficiency: 5 Hectare/hour
- Battery Capacity: 22000 mAh x 2, Lithium based battery (LiPo)
- Full Load Time: 11~15 min.
- Spray width: 4~6 m （4 nozzles, 1.5~3 M above the crops）

CROP SPRAYING DRONE

Quadcopter Crop Spraying Drone

- Payload Capacity: 5 Ltrs.
- Total weight with payload: 14 kg, Flying Height: 30 m (Max)
- Spraying Speed: 2~9 m/s,
  Spraying time for one flight: About 4.5 min.
- Work Efficiency: 2 Hectare/hour
- Battery Capacity: 6000 mAh x 2, Lithium based battery (LiPo)
- Hovering Time: 16-20 min. Spraying Time: 11-13 min.
- Spray width: 2~4 mtr （4 nozzles),
  Flight mode: ATT/Spray work/GPS

APPLICATION

Spraying of Agricultural Inputs i.e. Liquid Pesticides, Fertilizers and Herbicides Etc.

CROP SURVEYING DRONE

DJI Phantom 4 Drone

Sentera Double 4K NDVI / NDRE Sensor

- Velocity range: 13-15 m/s
- Payload Capacity: 500 g, Effective pixels: 12.4 M
- Maximum Flight Time: 20 min, Flying Height: 500 m
- Battery Capacity: 6000 mAh, Lithium based battery (LiPo)
- Live view frequency 2.4 GHz, Live view Quality: 720P @ 30fps
- Obstacle Sensory Range: 2 ~49 feet (0.7 - 15 m)
- Gimbal: Pitch: -90° to +30°

APPLICATION

High-Tech Aerial Surveying drones equipped with advanced sensors, such as Sentera Double 4K NDVI / NDRE Sensor for precise data

CROP SURVEYING DRONE

DRONE WITH VISIBLE & MULTISPECTRAL CAMERA

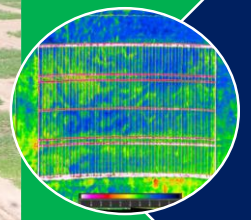
- Wheel base: 660 mm, Frame: 510 X 530 X 240 mm, Propeller: 4 no.s
- Payload Capacity : 500 g
- Maximum Flight Speed: 8-10 m/s
- Battery Capacity: 10000 mAh, Lithium based battery (LiPo)
- Flight Time: 20~25 Min, Flying Height: 100 m
- Visible Camera: 24.3 Megapixels, APS-C Type (23.5 x 15.6 mm) Exmor CMOS Sensor
- Multispectral Sensor + RGB camera, Multispectral sensor: 4-Band, Resolution: 16 MP, 4608 x 3456 px

APPLICATION

High-Tech Aerial Surveying drones equipped with advanced sensors, such as RGB and Multispectral Sensors for precise data

JAU DRONE UTILIZATION

APPLICATION OF UAV/ DRONE FOR CROP STRESS MONITORING



Name of UG Students

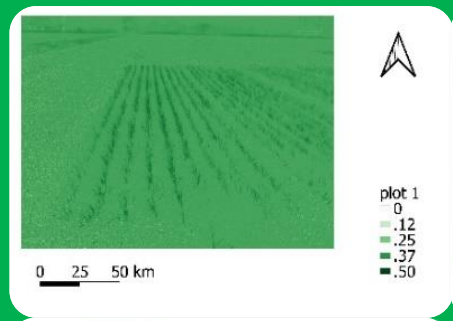
- Chaudhari Radhika
- Asmita Bhogesara
- Ashutosh Meena
- Vatsal Vishwakarma

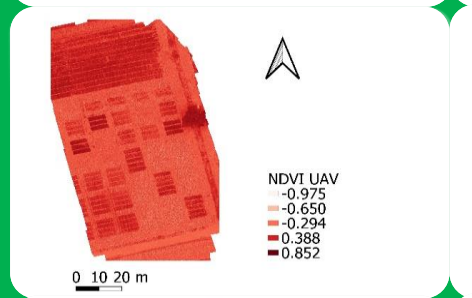
The ongoing experiment is on analysing crop stress monitoring of different agricultural crops through Crop Surveying Drone.

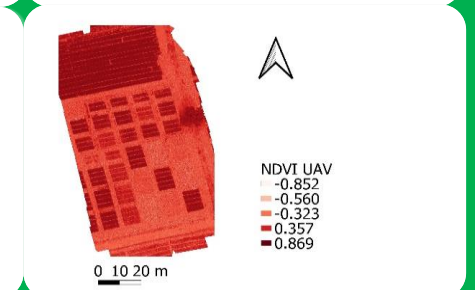
JAU DRONE UTILIZATION

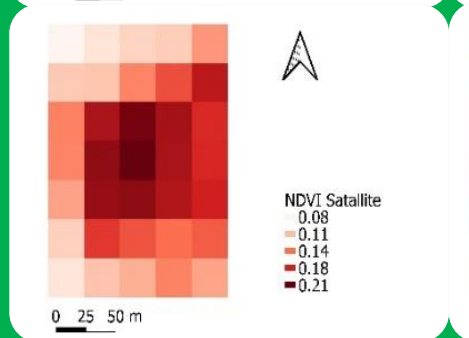
CROP MONITORING USING NEAR SURFACE REMOTE SENSING APPROACH

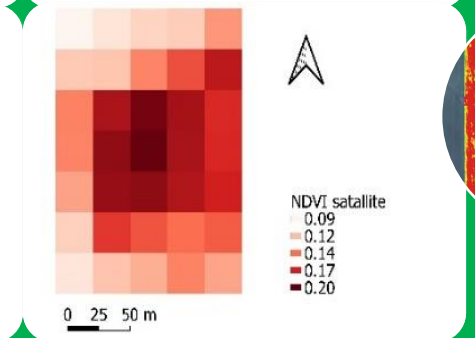
Phantom 4









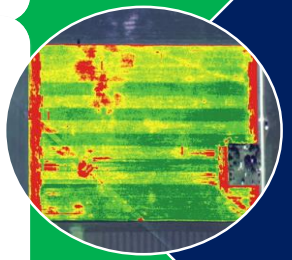


Name of UG Students

Vyas Vaibhav

Saurabh K. Radadiya

Gadhiya Renish B.

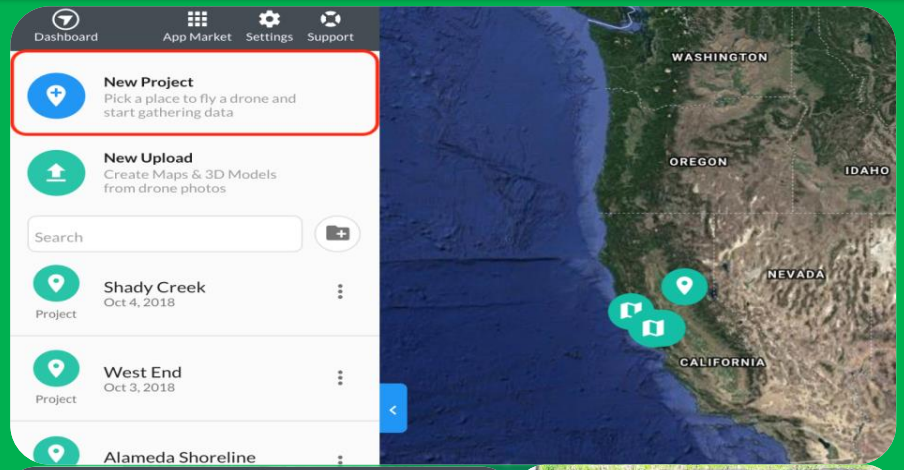


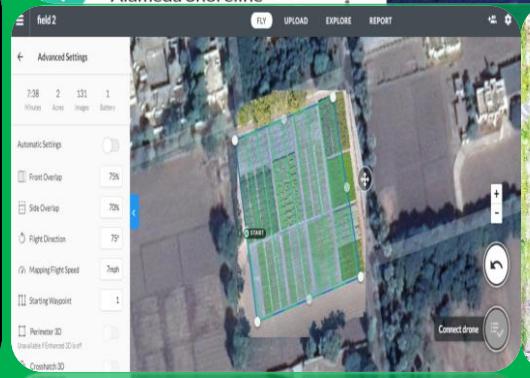
The study investigate the near surface remote sensing based Green Chromatic Coordinate (Gcc) and Normalized Difference Vegetation Index (NDVI) using Crop Surveying Drone and Sentinel 2 images estimated with QGIS 3.8 software for wheat field of Junagadh agricultural university of Junagadh region of Gujarat state, India.

JAU DRONE UTILIZATION

CROP MONITORING AND CLASSIFICATION USING MACHINE LEARNING ALGORITHMS

Phantom 4





Name of UG Students

- Dadhaniya Himanshu
- Akbari Pratik
- Jethva Brijesh

The study investigates the application of Remote Sensing (RS) and Computer programming language (Python) using Crop Surveying Drone technology for analysing the land use/land cover mapping for Junagadh region of Gujarat, India. Single date, cloud free Airborne data through DJI Phantom 4 was used for supervised classification on training set for.

JAU DRONE FUTURE PROJECT

USE OF DRONES TO RELEASE EGGS OF *Trichogramma* AND CHRYSOPA FOR THE MANAGEMENT OF INSECT PESTS

The egg parasitoid ***Trichogramma* spp.** and predator, ***Chrysoperla carnea*** is a widely used biocontrol agent **against lepidopteran pests**.

Historically, the eggs of these biocontrol agents were deployed in the field **manually by using cards is particularly time consuming.**

The use of unmanned aircraft systems (UAS or drones) is **found to be prominent** for the release the eggs of parasitoids and predators in the field.

JAU DRONE FUTURE PROJECT

USE OF DRONES TO RELEASE EGGS OF *Trichogramma* AND CHRYSOPA FOR THE MANAGEMENT OF INSECT PESTS

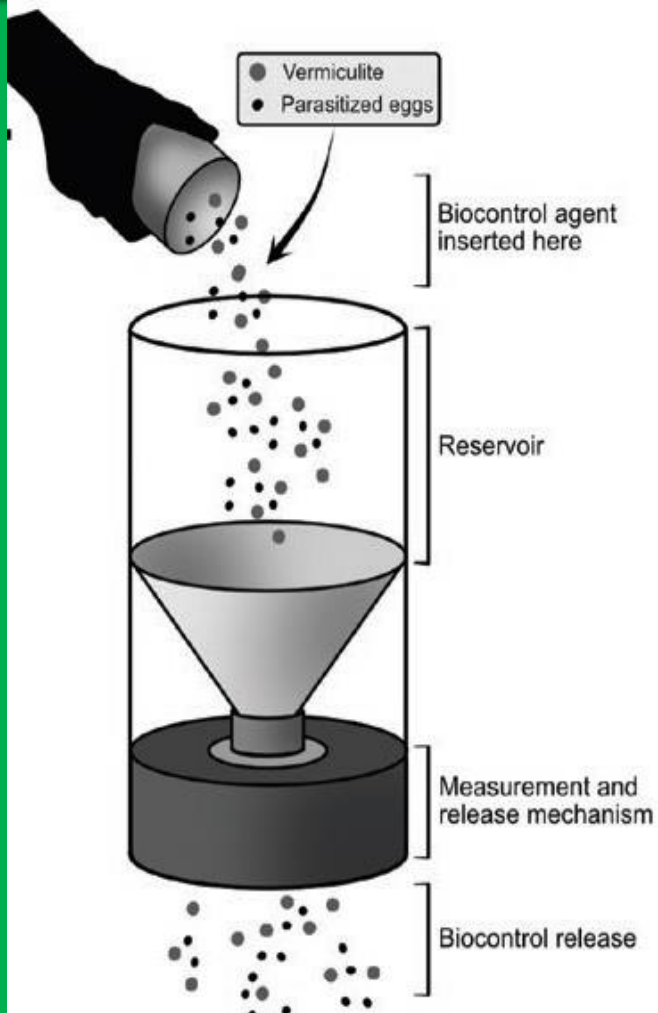
The drone is modified for the specific task of spreading eggs of these biocontrol agents.

In which, the biocontrol agent's spreader attaches to the bottom of the drone.

It included a reservoir to hold the eggs, a measuring mechanism to regulate the release of eggs, and a gravity-assisted release system.

The eggs are poured in the reservoir with a carrier like vermiculate or saw dust

During the drone flight, the mechanism of adjustable cups in a rotating disk of the spreader releases the eggs in bulk quantities



JAU DRONE UTILIZATION

CAPACITY BUILDING PROGRAMME

"Agricultural Spraying Drones"

TOPICS COVERED

- Different types of Drones and its Classification
- Working Principles of Drone
- Calibrations of Drones
- Drone Regulatory Guidelines
- Troubleshooting & error rectification in Drone
- Drone Maintenance

OUTPUT

- Students assembled Hexacopter and Octacopter Crop Spraying Drones
- Flying, Navigation of Crop Spraying Drones in the field
- Application of Pesticides/Insecticides in the agricultural farm.

Total Beneficiaries

58

JAU DRONE UTILIZATION

DEMONSTRATIONS OF DIFFERENT DRONES

THANK YOU

CORRESPONDENCE

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JAU DRONE DETAILS

Sr. No.	Name of Drone	Vendor	Unit Price Rs.
1.	Nano Drone (Pluto X)	Royal Electronics Sales and Services, Baroda, Gujarat	11,000/-
2.	Drone Kit for Lab Application	Royal Electronics Sales and Services, Baroda, Gujarat	48,750/-
3.	Hexacopter Crop Spraying Drone (Capacity 12 L)	Predator IND LLP, Nashik, Maharashtra	5,28,230/-
4.	Octacopter Crop Spraying Drone (Capacity 10 L)	Predator IND LLP, Nashik, Maharashtra	4,88,102/-
5.	Quadcopter Crop Spraying Drone (Capacity 5 L)	Royal Electronics Sales and Services, Baroda, Gujarat	6,15,000/-
6.	DJI Phantom 4 Drone Sentera Double 4K NDVI / NDRE Sensor	Royal Electronics Sales and Services, Baroda, Gujarat	9,29,500/-
7.	Drone With visible and Multispectral Camera	ASAP AgriTech LLP, Nashik, Maharashtra	4,96,267/-