Food and Agriculture Organization of the United Nations

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

DIGITAL AGRICULTURE IN ACTION
SELECTED CASE STUDIES FROM INDIA

FAO INVESTMENT CENTRE

COUNTRY INVESTMENT HIGHLIGHTS

TRITHI

STATES OPERATING IN INDIA
Karnataka, Himachal Pradesh, Maharashtra

TARGET BENEFICIARY
Farmers, co-operatives, plantation businesses

BUSINESS MODEL
B2F, B2B, B2G

WEB
www.3thi.com

PROBLEM

The Indian farmers usually spray high volumes of pesticide, fungicides, and other chemicals to protect their crops from pests and diseases. The quantum of chemicals to be sprayed is not calculated scientifically, as a result, farmers unintentionally end up using chemicals in higher doses than required. This increases the cultivation cost, endangers the sprayer's health and increases the presence of harmful chemicals in the environment and the agri-produce. Water and soil pollution and chemical residues in food products are some of the negative external factors linked to the excessive use of chemicals in agriculture. The spraying process is more complex in plantation crops such as coffee, oranges, apples, mango, sugarcane. This problem is due to the lack of understanding of the crops, climate, and pest and disease behaviour. Spraying needs to be done scientifically and practices should be based on scientific facts rather than intuition.

EXISTING SOLUTIONS

Chemical applications and spraying activities in agricultural fields are mostly manual and performed by untrained labour. Certain crops, however, pose more problems than others due to their physical traits. For instance, in plantations with tall trees the workers must climb the trees and manually apply chemicals to the infected areas. This is time-consuming and dangerous because proper safety measures are generally not followed. Recently, drone-based spraying service providers have been working in some pockets and clusters. However, most of these service providers lack the technical expertise to understand crops, climate pest behaviour, and climatic favourability of risk growth. Consequently, most of them do not demonstrate sufficient value to sensitivity of farming system.

SOLUTION

Trithi provides farm gate crop-care services through agricultural drones. It is an NPNT compliant drone manufacturer and offers drones as a service across different industry verticals. In the agriculture sector, two kinds of drones are in operation – monitoring drones and spraying drones. The imagery and sensor data from its drones are processed and analysed with software to generate the Normalized Difference Vegetation Index (NDVI), the Normalized Difference Water Index (NDWI), and indices. These indices can be interpreted to understand the crop growth stage, crop health, and crop stress. The spraying

drones can be programmed to autonomously spot spray the regions marked as stressed in the processed imagery. These images can also be processed to count the number of standing crops using the row-based counting method. The three main service lines in agriculture are:

i. The aerial surveying service accurately identifies a land parcel and generates 3D, GIS, DEM, and contour maps for crop planning and land preparation.
ii. The multispectral imagery with a five-band (RGB-Red edge and Infrared) sensor drone provides crop health analysis for more than 30 crops.
iii. Affordable on-demand crop spraying services use low or ultralow volume nozzles that reduce chemical usage by up to 50 percent. Also, they assist large farms and research institutes to test the efficacy of different spraying methods and chemicals for durations ranging from 3 to 18 months.

Trithi works directly with farmers, companies, or co-operatives to provide crop spraying services or crop monitoring services. It has an aerial fog sprayer system for forest crops and plantation crops. Fog spraying in large acreages of mango, areca nut, and orange reduces the risk of accidents and is 60 percent faster than traditional spraying methods. The Trithi drones can cover over 10 acres with an adjustable fog flow in 17 minutes.

Trithi's T6-25+ drone can carry 25 litres of any liquid at any given time. It has furthermore developed a hybrid fuel-based drone with a tank capacity of 2.5 litres and can fly for 30 minutes covering at least 4.5 ha. A spray swath of 8–10 m can be achieved by flying the drone 3–5 m above the crop canopy. The speed of the drone can also be adjusted from 1–7 m per second and can reach a maximum of 10 m per second. The drone is equipped for autonomous obstacle avoidance in addition to failsafe functions with LED indicators. It can continuously fly from to ten hours a day and requires inspection after 100 hours and maintenance after 300 hours of operation.

UNIQUE FEATURES

- compliant with the Directorate General of Civil Aviation's (DGCA) No-Permission No-Takeoff (NPNT) policy;
- fog spraying and custom nozzles;
- one country one price service model;
- provides spraying solutions for nearly 30+ crops;
- its drones can cover 6000 acres in a 20–day cycle.

SOLUTION IN PRACTICE

In India, Trithi operates through the agriprenuer model where it trains rural youth to operate, maintain; it offers various drone-based services to farmers. The staff who operate the drones receive 100+ hour training and are certified as drone pilots. They are trained to fly manual flights as well as to conduct autonomous flights, calibrate field parameters, adjust row sequencing, drone speed, flight height, and spray nozzles. Each drone team consists of two pilots and an assistant who surveys a farm plot and marks the farm boundaries on a mobile phone app. Once the boundaries are drawn, a survey drone first hovers over the land parcel to capture multispectral crop data to analyse stress levels and the status of the crop. After the data has been captured the spraying drones' tank is filled with a pesticide or micronutrient solution, and the spraying

nozzle size is selected as per the farmer's requirement. Farmers provide the chemicals for spraying and Trithi only offers the spraying service. Trithi also engages with local crop experts who recommend the appropriate chemical interventions based on the processed images from its drones. It only recommends chemical names to the farmers, leaving to their discretion the choice of the preferred brands they wish to buy. Based on the necessity of a farmer, the spraying drone can be flown in two modes (spot spraying and uniform spraying). In the spot spraying mode, precise spraying is done only in infected regions with an accuracy of 0.2 mm. In the uniform spraying mode, spraying is done uniformly across the field. Small farmers prefer the uniform spraying mode, as they do not want to risk the possibility of the disease spreading with spot spraying. Ideally, Trithi team flies a drone for only six hours per day, two to three hours in the early mornings, and two to three hours in the evening. This is the best timeframe for crop spraying as well. Trithi's drone can cover 72 to 90 hectares in low volume sprays or 125+ hectares in ultra-low volume sprays per day.

CHALLENGES OVERCOME

The blanket DGCA ban on drones grounded Trithi for a few years. With the new DGCA regulations, Trithi improvised its hardware to make its drones compliant with DGCA's NPNT policy. Also, in the recent past many small stand-alone drone spraying services have appeared on the scene and created confusion amongst farmers. To withstand the competition, Trithi specifically focussed on providing a simple spraying service to farmers without overwhelming them with data, software, and apps. This made it possible for them to cover over 30 000 acres of crop plantations.

HIGHLIGHTS

- winner of the Agriculture Grand Challenge – 2018 organized by the Ministry of Agriculture and Farmers Welfare, Government of India;
- received INR 10 million as a prize after winning the Atal Innovation Mission 2018 award from NITI Aayog GOI;
- 30 000 acres of crop spraying done to date.

ENABLING ECOSYSTEM ENTAILS

Different government functionaries have sent conflicting signals to the potential drone market. For example, on one hand, drone start-ups are awarded grant funds from the Ministry of Agriculture to develop indigenous technologies while on the other hand, there are sudden court orders claiming that using drones to spray for pesticide is illegal. This confusion sends mixed signals to investors who want to fund this space. Clear guidelines must be set and disseminated across all levels of the administrative bureaucracy involved in the regulations concerning agricultural activities and unmanned aerial vehicles.