Cropin

Redefining The Tea Value Chain
For One Of The Oldest Tea Producers In India

The Customer

The client is a 150-year-old corporation headquartered in Mumbai, India. The company has various tea plantations located in prime areas of Tamil Nadu (India), that cover over 2,500 hectares and produce over 10 million kgs of tea annually.

The Challenges

The monitoring of crop health and yield estimation at different stages has significance in sound planning, procurement, and policymaking for the client. Unavailability of a centralised system for effective plantation monitoring & data management has affected the smooth functioning of the client's business operations. Traditionally, yield estimation at various scales from plantation to region level was carried out by field staff using basic methods like surveys, harvest sample method, whole plot harvest, expert assessments, crop cards, and allometric methods, which led to data inconsistencies quite often.

Some of the specific challenges that the organisation faced in their day-to-day operations include:

Labour intensive and **ineffective crop yield estimation** process

Cumbersome and **cost-ineffective data capturing** process

Lack of a centralized standard platform for **real-time plot health monitoring**

Unavailability of alerting system to identify **weather-based insect or weed infestations**
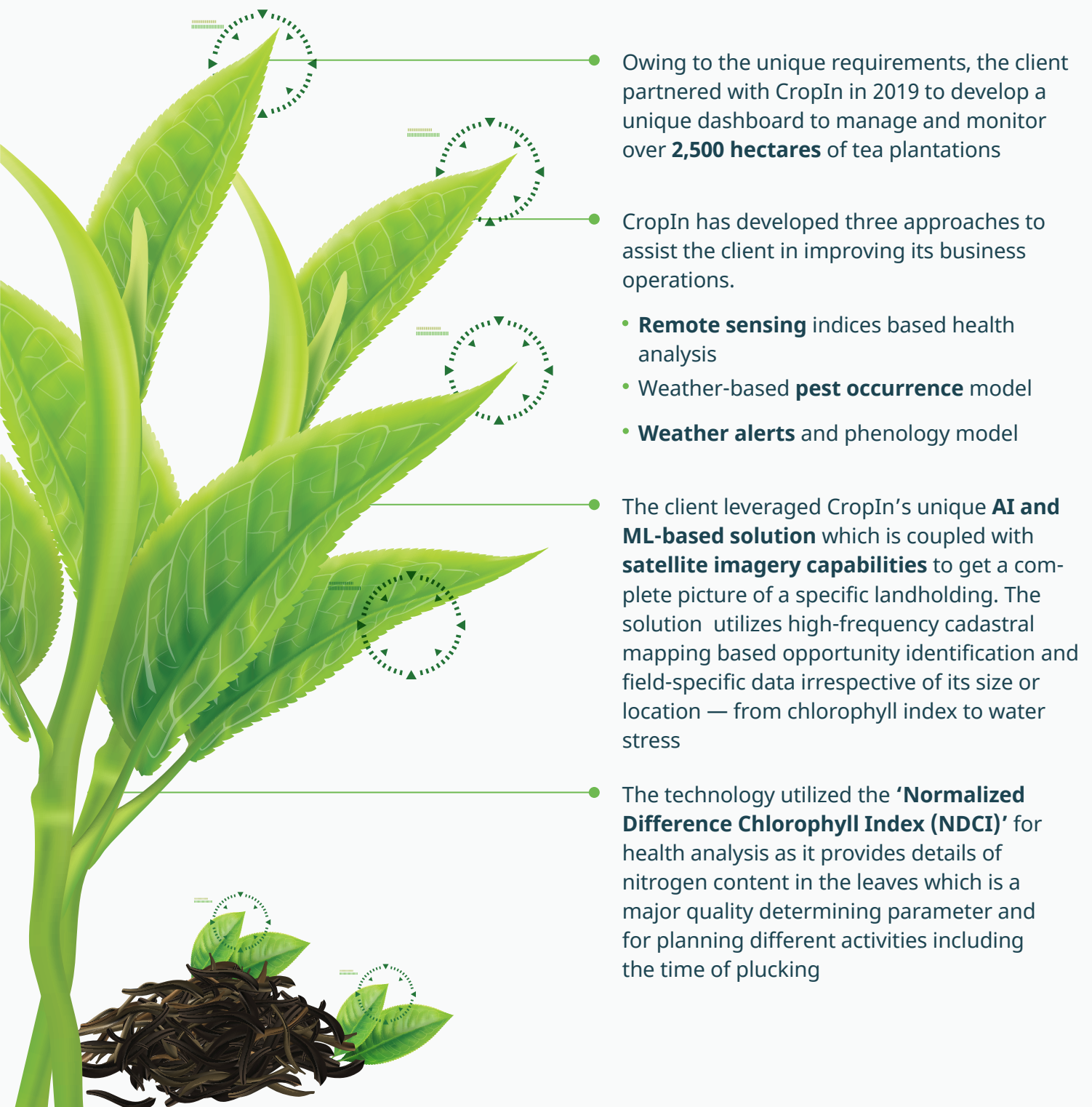
Lack of a system for sending **weather-based alerts**

The Objective

- To develop a **live dashboard** to understand the health status of the plantation in real-time using data from IoT sensors

- To provide **weather-based alerts** modeling in order to reduce damage in tea crop

- To provide a **weather-based pest occurrence model** for Red Spider Mite (RSM) and Tea Mosquito Bite (TMB)

CropIn's Innovation

Owing to the unique requirements, the client partnered with CropIn in 2019 to develop a unique dashboard to manage and monitor over **2,500 hectares** of tea plantations

CropIn has developed three approaches to assist the client in improving its business operations.

- **Remote sensing** indices based health analysis
- Weather-based **pest occurrence** model
- **Weather alerts** and phenology model

The client leveraged CropIn's unique **AI and ML-based solution** which is coupled with **satellite imagery capabilities** to get a complete picture of a specific landholding. The solution utilizes high-frequency cadastral mapping based opportunity identification and field-specific data irrespective of its size or location — from chlorophyll index to water stress

The technology utilized the **'Normalized Difference Chlorophyll Index (NDCI)'** for health analysis as it provides details of nitrogen content in the leaves which is a major quality determining parameter and for planning different activities including the time of plucking

The Result

CropIn developed a unique dashboard for the client to manage and monitor over **2,500 hectares of tea plantation estates in Tamil Nadu, India**. The solution was implemented in **50 plantations through three models** catering to the client's unique requirements.

CropIn provided the **weather-based pest occurrence model** for red spider mite and tea mosquito bite pests, Normalized Difference Chlorophyll Index (NDCI) based **health assessment, and weather alerts based on temperature, precipitation, wind alerts, and relative humidity.**

Health Monitoring Model
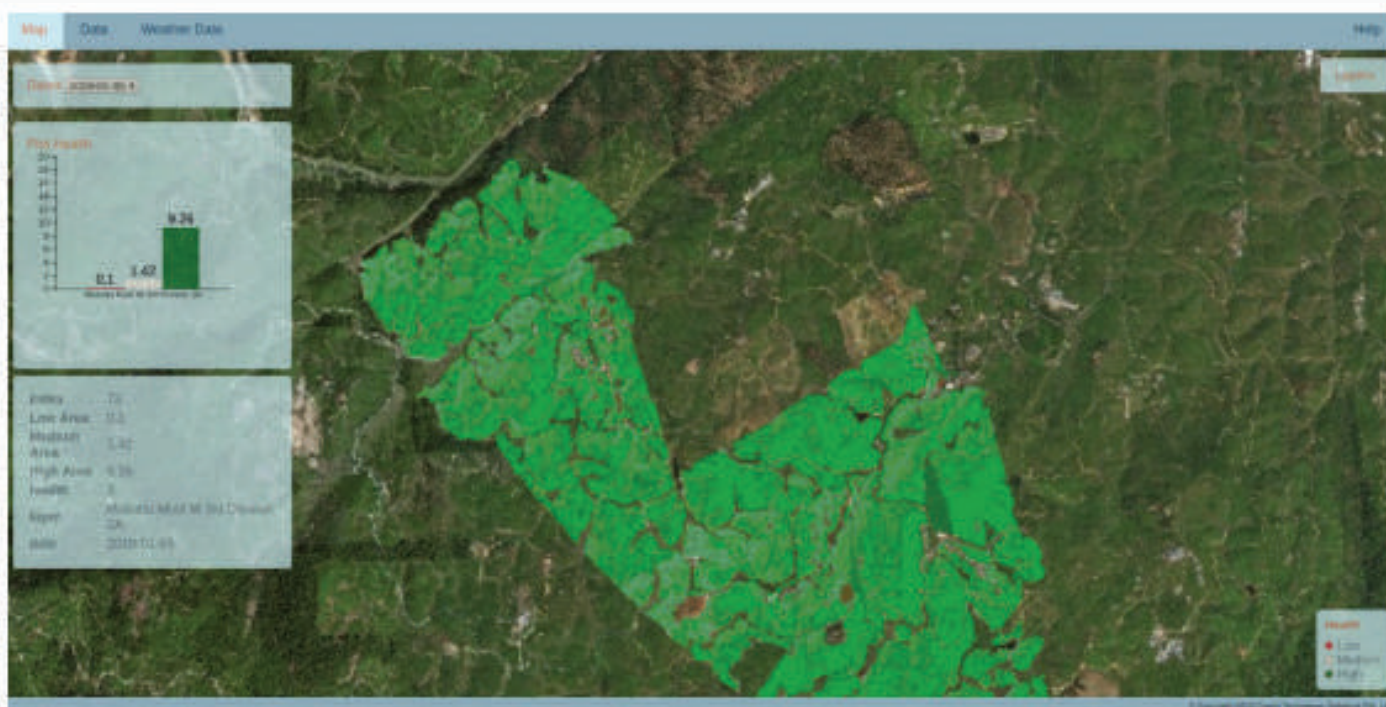
- The technology used **NDCI for the health analysis** as it provides details of nitrogen content (Chlorophyll) in the leaves indicating the health of crops

- NDCI is used to separate green vegetation from soil background and **identifies the health of each plot on the scale of High, Medium or Low**

- This data aided the client to monitor and identify crops that are **too dry or wet, affected by insect, weed or fungal infestations or weather-related damage**, and take timely preventive measures to overcome these challenges

- Health parameters also helped the client to determine **quality parameters of tea and plan for field activities** such as the time of plucking

- A major challenge in **remote sensing-based health index was the cloud cover** over the area. So, CropIn also presented cloud mask data in the solution to show the affected regions that helped the client in accurate decision making

- **Weather-based phenology models called Shoot Development and Growing Degree Days (GDD)** are implemented to get insights on the crop conditions helping the client to determine a better time of plucking, pruning, and other crop management practices

Weather Alerts Model

- In this project, the weather alerts such as relative humidity, wind, temperature, and extreme rainfall have been modeled with threshold conditions

- Alerts were sent on a daily basis with forecast for the next fortnight

- The climatic parameters were used to map the extreme conditions such as windy time in a day in order to plan the plucking process and also management practices at the ground level

Pest Occurrence Model
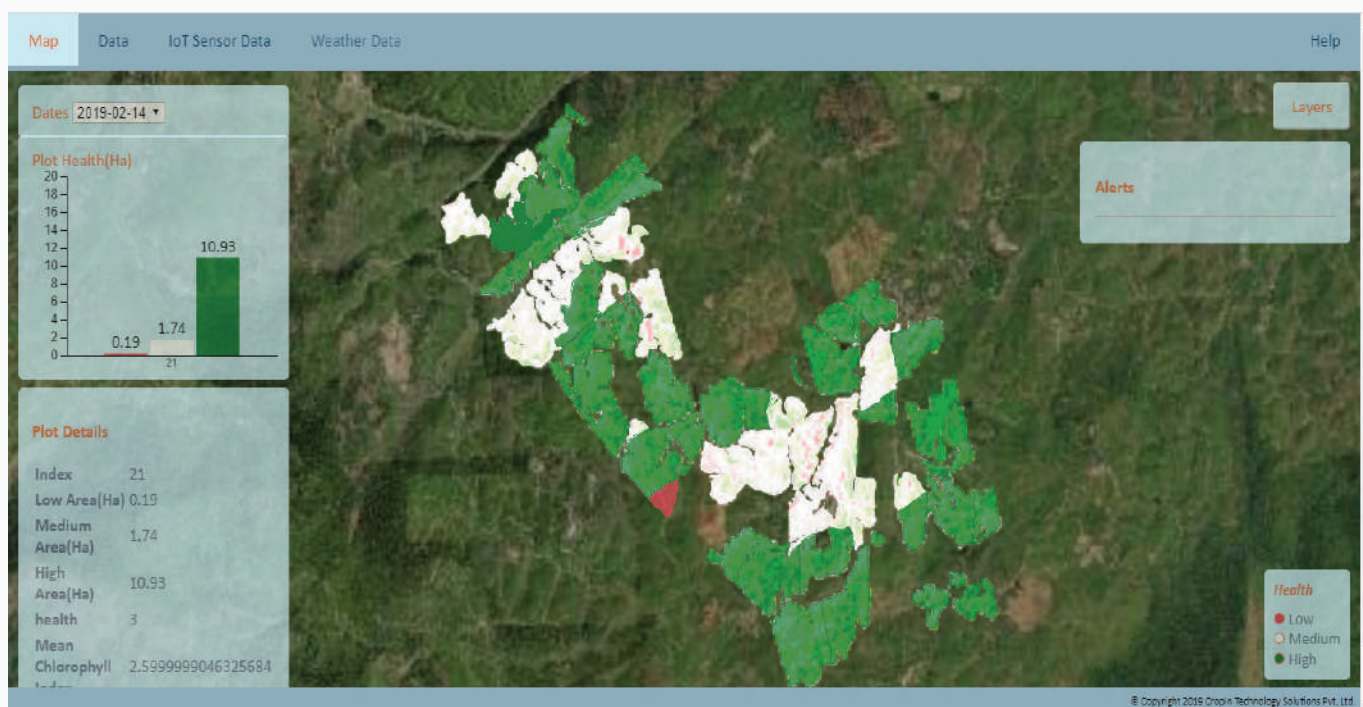
- **Pest occurrence model** is highly useful and reliable **forewarning system for pest and diseases**

- In this project, CropIn utilized a rule-based clustering approach for modeling **two pests in tea plantations - RSM and TMB**

- The rule-based model includes weather parameters such as **fortnightly conditions, extreme rainfall conditions, wet spell, min and max temperature, relative humidity, and sunshine hours data**

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