Aapah Innovations

CASE STUDY

Client: Remote Sensing & Agricultural Development Agency

Location: India

INTRODUCTION

The client sought support for data-driven analysis of agricultural water management and crop health monitoring using satellite imagery and UAV (drone) data. The goal was to validate regional crop and soil parameters, monitor irrigation efficiency, and demonstrate how integrated remote sensing could support sustainable water resource planning.
The project aimed to showcase how modern Earth Observation (EO) and drone technologies could create a real-time decision support system for resource optimization.

Data Software: Pix4D, QGIS, SNAP (ESA), and Python-based image analysis tools.

Satellite Sources: Sentinel-2 and Landsat-8 imagery for correlation.

Deliverables: Geo-referenced maps, data layers, and integrated analysis reports.

Aapah Innovations demonstrated that technical precision and applied expertise can make advanced satellite and drone integration possible without massive infrastructure.

TECH. COMPLIANCES

Aapah Innovations (AIPL) was engaged as a technical execution partner to provide data acquisition, ground validation, and drone-based surveys for a pilot project combining satellite imagery with high-resolution aerial data.

Drone Platform: Quadrotor UAV with RGB + multispectral payload (5-band sensor).

Flight Altitude: 100 m AGL, achieving ~4 cm/pixel ground resolution.

VERIFICATION AND TESTING

The scope covered:

-Acquire drone-based multispectral imagery over selected agricultural plots.

-Process and align UAV data with satellite-based indices for validation.

-Generate insights on soil moisture, vegetation health, and irrigation distribution.

-Provide actionable maps and analytics for decision-makers.

Ortho mosaic Creation: Processed UAV images to create high-resolution, geo-referenced field maps.
Vegetation Indices: Calculated NDVI (Normalized Difference Vegetation Index) and EVI (Enhanced Vegetation Index) for crop health assessment.
Soil Moisture & Water Indexing: Derived NDWI (Normalized Difference Water Index) from multispectral data to detect over-irrigated and water-stressed zones.
Anomaly Detection: Identified crop stress and irregular water usage areas for early intervention.

CHALLENGES

-Data synchronization between drone flight schedules and satellite pass timings.

-Limited local internet bandwidth for transferring large imagery datasets.

-Weather-related flight delays during the field season.

APPROACH

Activity	Technical Execution	Outcome / Benefit
Pre-Flight Planning	Site reconnaissance, flight path design, and identification of ground control points (GCPs).	Ensured complete and accurate coverage of selected plots.
Drone Survey Execution	Acquired aerial data using UAVs equipped with RGB and multispectral sensors under optimal weather conditions.	Captured high-resolution imagery aligned with satellite observation timelines.
Data Processing	Performed Ortho mosaic generation, image stitching, and NDVI/NDWI index calculation using open-source and commercial software.	Generated precise vegetation and moisture maps validated against satellite data.
Analysis & Reporting	Combined drone and satellite layers for integrated analysis; extracted irrigation zones and stress patterns.	Provided actionable insights for optimizing water use and crop management.
Collaboration & Handover	Worked with the client's research and GIS teams for calibration and data validation.	Delivered ready-to-use datasets and maps compatible with the client's GIS systems.

FINAL DELIVERABLES

Aapah Innovations successfully demonstrated the value of combining satellite data and drone imagery to generate near-real-time insights for agricultural water management.

-High-resolution NDVI/NDWI maps (GeoTIFF and PDF).
-Drone survey report with metadata and field conditions.
-Satellite–Drone correlation summary.
-Recommendations for scaling data integration and AI-based prediction models.