PRECISION AGRICULTURE CASE STUDY

AgBoost Tech Consultancy × Avalon Bio Energy Pvt. Ltd.

Project: Seed to Bio-Fuel: Moringa Smart Plantation
Location: Meena Farm 1 · Chhatargarh, Bikaner, Rajasthan, India (28°49'40" N 73°15'34" E)
Period: 2023–2024

SAT · NDVI · DRONE · IoT · VRA · AI · GIS

40	14	3,387	9
ACRES MONITORED	MONTHS COVERAGE	PLANTS TRACKED	ACTIONABLE INSIGHTS

THE CHALLENGE

Temperatures reaching 52°C, dust storms, high-salinity sandy soil, unreliable electricity for drip irrigation, animal intrusion, weed competition, and the impossibility of daily inspection across 40 remote desert acres.

PROJECT PARAMETERS

Parameter	Detail
Farm	Meena Farm 1 · Chhatargarh, Bikaner
Area	40 Acres · Semi-Arid Desert Sandy Loam
Crop	Moringa oleifera for Sustainable Bio-Fuel
Period	July 2023 – October 2024 (14 months)
Data	Planet Labs + Sentinel-2 (3m) · 5-band Drone
IoT	Fasal Platform + SAC-ISRO VEDAS Portal

THE SOLUTION

Integrated HD satellite overpasses, IoT sensors, SAC-ISRO real-time analytics, multispectral drone mapping, and NDVI-driven Variable Rate Application (VRA) zone maps — enabling full remote management and rapid data-driven response from any location.

Baseline 2023: Initial state of the 40-acre semi-arid desert terrain prior to full canopy establishment.

ANALYTICS & DRONE SURVEY

Spectral Index Analytics

Index	Application / Insight	Index	Application / Insight
NDVI	Overall canopy vigour	**MSAVI**	Sparse crop accuracy
NDMI	Water stress / moisture	**RECI**	Disease early warning
NDRE	Nutrient & chlorophyll	**INSAT**	Rainfall / SAC-ISRO

VRA Zone Map (12 Sep 2023)

Zone	Area (ha)	%	NDVI
Higher Veg.	0.27 ha	3.0%	0.21
Zone 2	1.23 ha	13.6%	0.14
Zone 3	2.36 ha	26.1%	0.10
Zone 4	1.67 ha	18.4%	0.07
Lower Veg.	3.52 ha	38.9%	0.04

Drone Survey Statistics (10 Oct 2024)

Metric	Value
Total Area	101,717 m²
Total Plants	3,387 GPS-tagged
Small < 40 cm	2,729 (80.6%)
Mature > 40 cm	658 (19.4%)
Mature Canopy	15,219 m²
NDVI Range	0.047 – 0.475

October 2024: Significant canopy growth and established Moringa plantation following data-driven interventions.

9 KEY LEARNINGS (14 MONTHS EO + IOT)

WATER STRESS — DRIP CHECK 01

NDMI detected stress → dripper misalignment found; solar pump installed during 45-day power outage.

VEGETATION STRESS — WEEDS 02

MSAVI revealed 0.33 ha bare soil; animal intrusion and Kapatwar weed suppression treated.

BIO NUTRIENTS VRA 03

VRA maps enabled zone-based nutrient management; targeted foliar spray across all 40 acres.

DISEASE EARLY WARNING 04

Spectral anomalies in NDVI/ MSAVI flagged disease 2–3 weeks early; spot treatment prevented spread.

VISIBLE FROM ORBIT 05

3m HD satellite delineated Moringa canopy from desert scrubland — reliable monitoring tool.

ANIMAL DAMAGE IN 48 HRS 06

Change detection: 0.14→0.87 ha in 2 days → emergency concrete post + barbed wire perimeter.

BOUNDARY REINFORCEMENT 07

Satellite directly triggered physical farm intervention; NDRE confirmed recovery post-action.

OPTICAL GROWTH JUL→NOV 08

Side-by-side satellite images proved bare desert → canopy within 4 months from space.

VRA-GUIDED HARVEST 09

NDRE zone maps enabled selective harvest; Zone 5 (4.05 ha / 44.7%) identified as primary block.

CHALLENGES RESOLVED & BUSINESS VALUE

Challenge	Technology	Resolution
Irrigation Management	EO + IoT	Solar pump installed · drip realigned · VRA scheduling
Dust & Sandstorms	EO-GIS	Multi-date composites · 3D terrain modelling planned
Soil Salinity	EO	VRA map created · ICAR soil maps integrated
Cloud Cover	EO	Planet Labs LEO constellation · 3m–50cm res managed
Temperature Extremes	EO + IoT	21.8–44.3°C logged · ISRO IMD seasonal profiles
Animal Intrusion	EO	0.14→0.87 ha in 48 hrs · concrete perimeter deployed

Business Value Delivered

- **Remote Management:** Full 40-acre farm managed remotely — no daily physical inspection required.
- **Rapid Response:** Crop stress response time reduced from weeks to 24–72 hours via satellite alert.
- **Damage Quantification:** Animal damage measured to 0.01 ha precision in near real-time.
- **Data-Driven Harvest:** First harvest guided by NDRE zone maps — selective zone-by-zone picking.
- **Plant Inventory:** 3,387 GPS-tagged plants with full canopy health classification from drone.
- **NDVI Baseline:** Multi-year NDVI 2019–2024 baseline established via ISRO Sentinel-2 archive.

Next Phase Technology Roadmap

- **Phase 2A:** Harvest Harmonic Sensors + Microtransmitter Technology — precision yield monitoring pilot.
- **Phase 2B:** 50cm resolution satellite imagery for individual crop-row and plant-level analysis.
- **Phase 3A:** AI predictive crop health model trained on the full 14-month satellite + IoT dataset.
- **Phase 3B:** 3D terrain modelling to correct sand-dune spectral interference in satellite data.

Powering a Greener Tomorrow: The ultimate vision of sustainable bio-fuel production from Moringa oleifera.

ABOUT AGBOOST TECH CONSULTANCY

India's precision agriculture technology leader specialising in satellite remote sensing, drone analytics, IoT integration, and AI-powered farm intelligence — enabling data-driven decisions at scale across India's diverse agricultural landscapes.

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