SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID – SIH25099**
- **Problem Statement Title-** AI-powered monitoring of crop health, soil condition, and pest risks using multispectral/hyperspectral imaging and sensor data.
- **Theme- Agriculture, FoodTech & Rural Development**
- **PS Category- Software**
- **Team ID-**
- **Team Name- Zero Degree**

IDEA TITLE

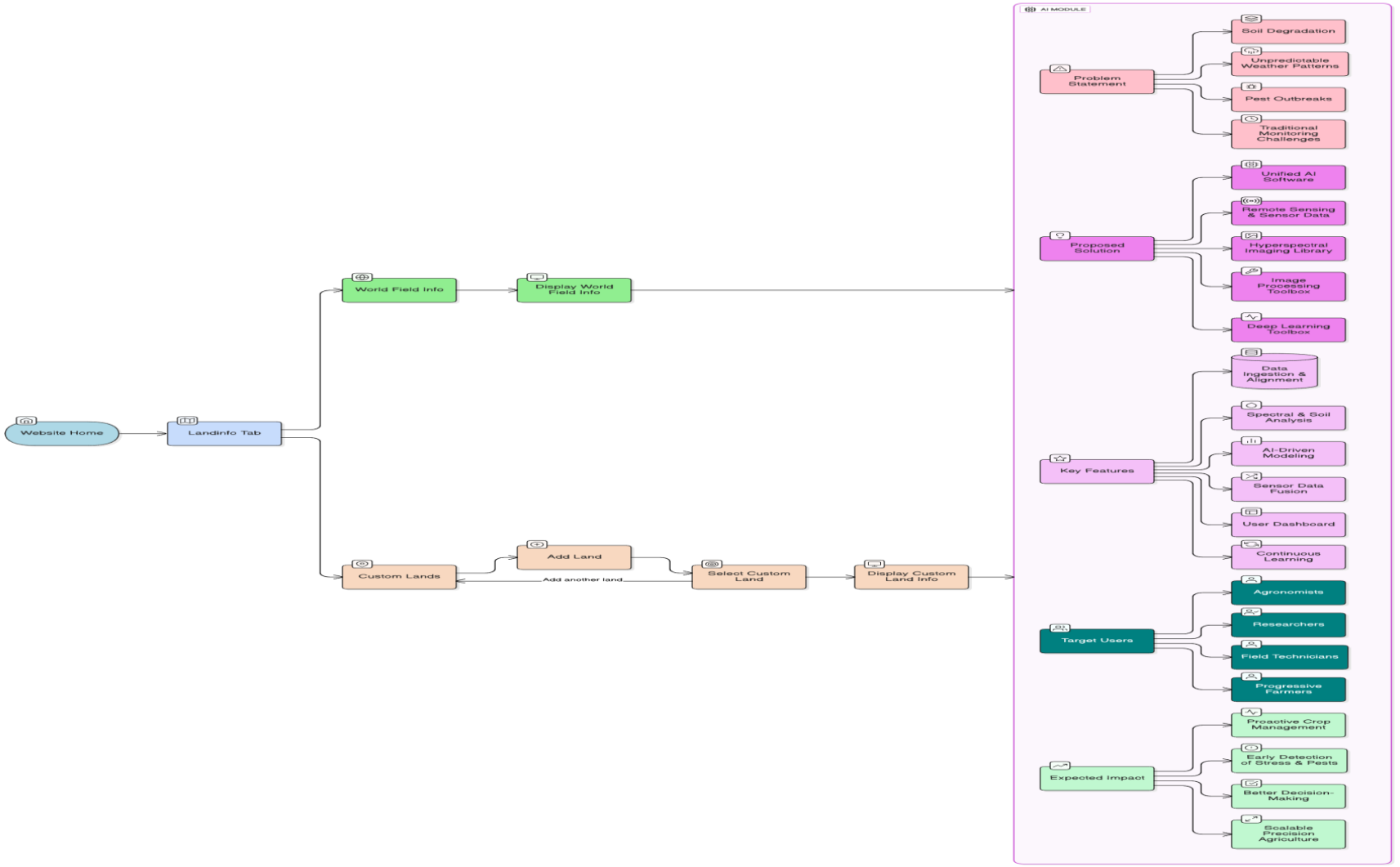
AgriAI is an **AI-powered precision agriculture platform** that provides real-time insights for both **global fields** and **custom user-selected lands** (via latitude & longitude). It integrates **remote sensing, environmental sensors, and AI models** to detect soil degradation, weather risks, and pest outbreaks early.

❖Proposed Solution

Image & Spectral Processing
Hyperspectral Imaging Library
MATLAB Image Processing Toolbox
OpenCV
AI & Modeling
MATLAB Deep Learning Toolbox
YOLO v12
CNN (image analysis)
LSTM (time-series prediction)
Sensor & Data Fusion
IoT sensors (soil moisture, temp, humidity, leaf wetness)
Data integration APIs

Backend & Storage
•Python And Node Js. (Flask, Express Js.)
•SQL databases (MySQL)
•Cloud services (AWS/Azure)
Frontend / Dashboard
•React.js
•TailwindCSS
•Interactive maps & plots (Leaflet Js.)
Deployment
•Docker, Kubernetes
•Mobile-friendly notifications (Firebase, Twilio)
•Vercel

TECHNICAL APPROACH



FEASIBILITY AND VIABILITY

Feasibility:

- Technically possible with hyperspectral/multispectral imaging, IoT sensors, AI/ML (CNN, LSTM), and cloud processing.
- Integration-ready with existing farm machinery, drones, and satellite data, making deployment seamless without major infrastructure changes.
- Adoption is realistic, since farmers, agronomists, and researchers already use mobile apps and dashboards for crop management.

Challenges:

- Competition from existing agri-tech platforms (e.g., CropIn, SatSure, Plantix).
- Scalability issues with large-scale image/sensor data processing.
- Data privacy & security risks, especially with farm-level and geolocation data.
- Connectivity gaps in rural areas (low bandwidth, poor internet access).

Strategies:

- AI-driven stress/pest prediction, spectral anomaly alerts and real-time dashboards.
- Use cloud scaling & edge processing to handle large datasets efficiently.
- Ensure data security & compliance (end-to-end encryption, secure cloud storage, farmer data ownership).
- Offline/low-bandwidth modes with SMS/USSD or lightweight mobile notifications for rural users.

IMPACT AND BENEFITS

Potential Impact on Target Audience

- **Farmers:** The platform enables early problem detection, boosts yields, cuts input costs, supports proactive decisions, and delivers insights through an easy-to-use mobile dashboard.
- **Researcher:** The platform fuses spectral, sensor, and historical data with AI models for scalable, evolving crop and soil health insights.
- **Agronomist:** The platform delivers precise, data-backed, and localized crop insights, replacing labor-intensive monitoring with fast, automated analysis.

Benefits of the Solution

- **Social Benefits**: Enhances management, supports remote learning, and enables inclusive participation.
- **Environmental Benefits:** Reduces chemical overuse, conserves water, and preserves soil health, promoting sustainable and eco-friendly farming.
- **Economic Benefits**: Reduces travel costs, saves time, and creates opportunities for digital businesses.
- **Technological Benefits**: Promotes innovation through AI integration, real-time translation, and secure collaboration.

RESEARCH AND REFERENCES

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