SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID: SIH25044**
- **Problem Statement Title: AI-Powered Crop Yield Prediction and Optimization**
- **Theme: Agriculture, FoodTech & Rural Development**
- **PS Category: Software**
- **Team ID:25RBU058**
- **Team Name (Registered on Portal): Innovatrix**

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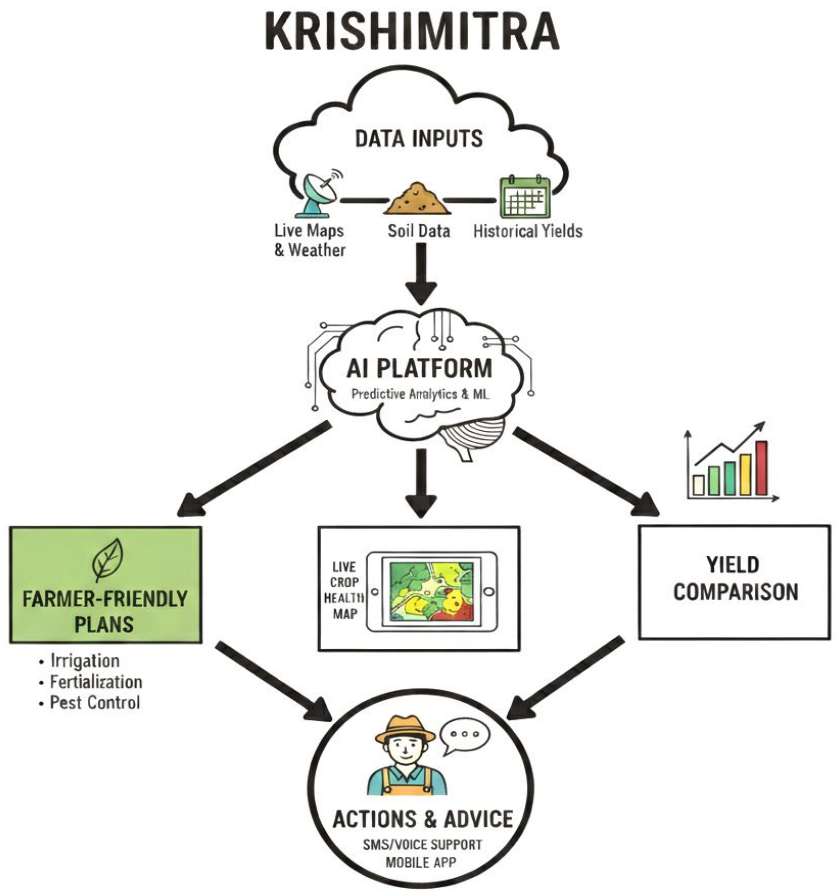
Proposed Solution :-

Solution Idea: A scalable AI-powered web & mobile platform that uses live maps, weather APIs, soil data, and historical yields to deliver weekly actionable plans (irrigation, fertilization, pest control)

tailored to each farmer's land and crop.



How It Solves the Problem:

- Predicts crop yield & growth using AI/ML models.
- Converts complex data (weather, soil, NDVI) into simple farmer-friendly steps.
- Provides regional language + voice support for inclusivity.
- Accessible via low-cost software app without hardware dependency.

Innovation & Uniqueness:

- 🌍 Live crop maps with growth/stress zones (green/yellow/red).
- 📊 Historical comparison of current vs. past yields.
- ⏳ Weekly AI planner → time-bound, personalized actions.
- 🗣️ Multilingual + SMS/IVR advisory → breaks literacy barriers.

TECHNICAL APPROACH

Frontend: Flutter (Mobile), React.js (Web), Leaflet/Mapbox (Maps), Speech-to-Text/TTS, Hive (offline).

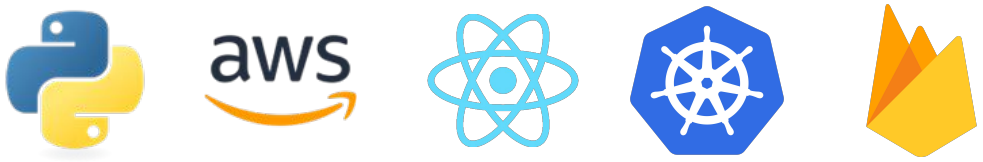
Backend: Node.js/FastAPI, PostgreSQL + PostGIS, MongoDB, AWS S3, JWT Security.

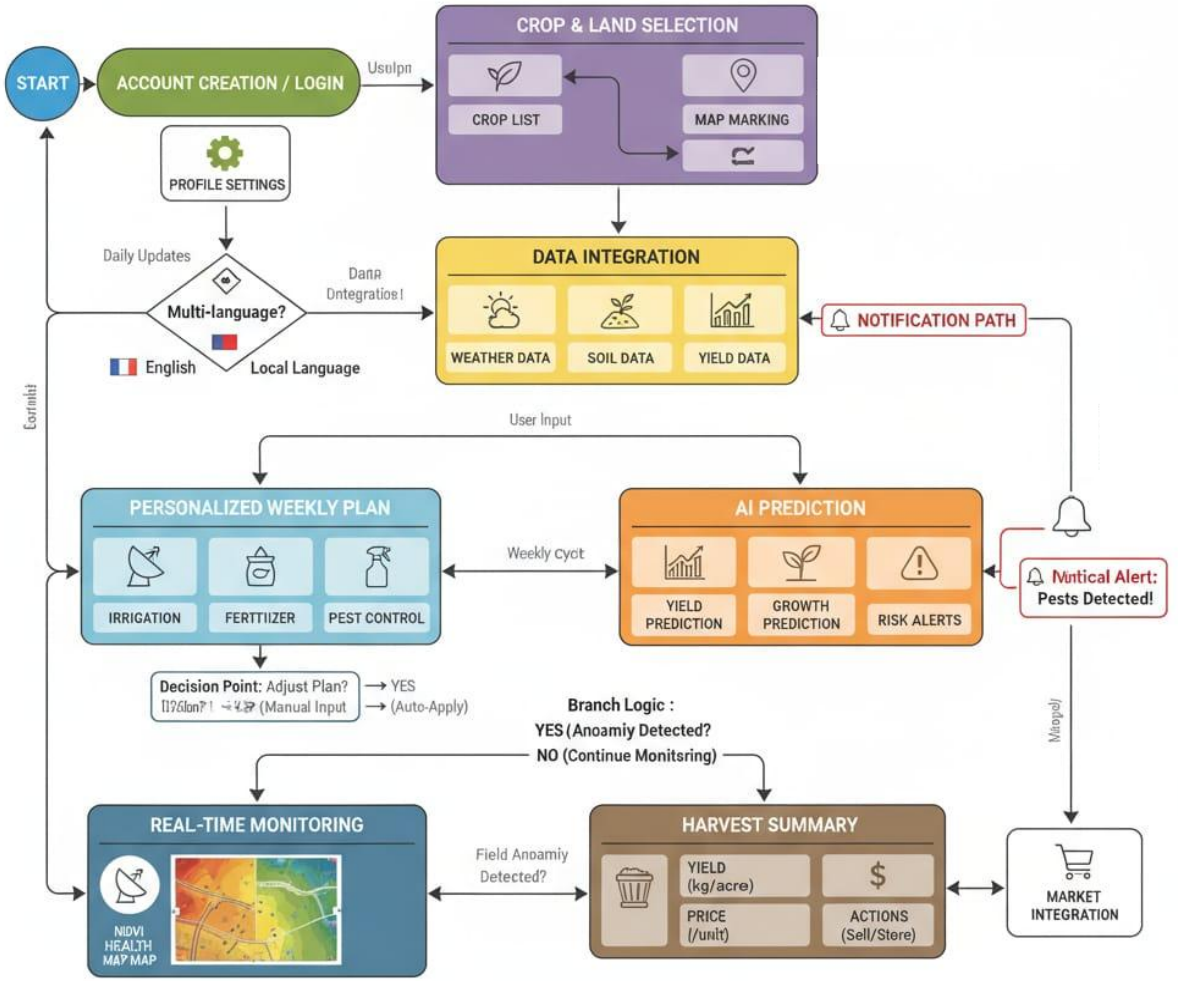
AI/ML: Python (TensorFlow, Scikit-learn), CNN (crop health), LSTM/Regression (yield & weather), FastAPI/Flask.

APIs: OpenWeather (weather), Sentinel Hub/GEE (satellite), SoilGrids (soil), Twilio (SMS/IVR).

Alerts & Analytics: Firebase, Twilio, Pandas, Chart.js.

Deployment: Docker, Kubernetes, AWS/GCP/Azure.





FEASIBILITY AND VIABILITY

✅ Feasibility

- Uses open datasets & APIs (weather, soil, satellite) → technically achievable.
- AI/ML models (Regression, LSTM, CNN) are proven for yield & crop health prediction.
- Cloud-based software → scalable, affordable, no mandatory hardware.
- Mobile + regional language support → accessible for small farmers.

⚠️ Potential Challenges & Risks

- Limited ground-truth data in rural areas.
- Connectivity issues in low-network villages.
- Farmers' reluctance to trust AI over traditional methods.
- Train region-specific AI models and update regularly with feedback.

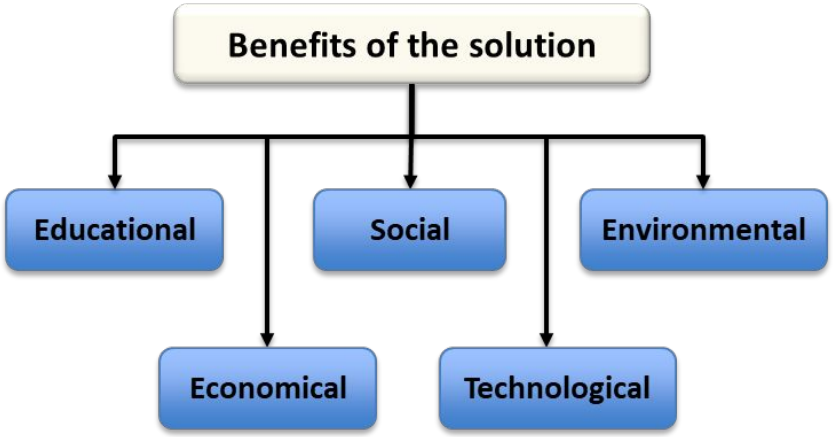
💡 Strategies for Overcoming These Challenges

- Collaborate with govt agencies & FPOs to enrich datasets.
- Provide offline mode + SMS/IVR alerts for low-internet areas.
- Use explainable AI with clear, farmer-friendly reasoning.
- Train region-specific AI models and update regularly with feedback.

IMPACT AND BENEFITS

🌍 Potential Impact on Target Audience

- Empowered Decisions → Farmers get clear, data-driven weekly actions.
- Reduced Losses → Early alerts for weather, pests, and crop stress.
- Increased Productivity & Income → Optimized yields, better planning.
- Inclusivity → Regional language + voice/SMS support for smallholders.



✅ Benefits

- Social: Improves farmer confidence, reduces dependency on middlemen, promotes digital literacy.
- Economic: 10–15% higher productivity, reduced fertilizer & water costs, better price planning.
- Environmental: Promotes climate-smart farming, reduces soil degradation, prevents overuse of chemicals.
- Technological: Leverages AI/ML, live maps, and APIs to bring cutting-edge tech to rural farming.

RESEARCH AND REFERENCES

Technological References:

- Plant disease detection (CNN, NDVI studies).
- Weather forecasting with LSTM (IEEE, Springer papers).
- Cloud services: AWS, **https://aws.amazon.com/**

Agricultural References:

- FAOSTAT & India Agricultural Statistics.
- ICAR reports on soil & crop productivity.
- Annual Market Report :- Document

API References:

- OpenWeatherMap, Sentinel Hub, SoilGrids (ISRIC).