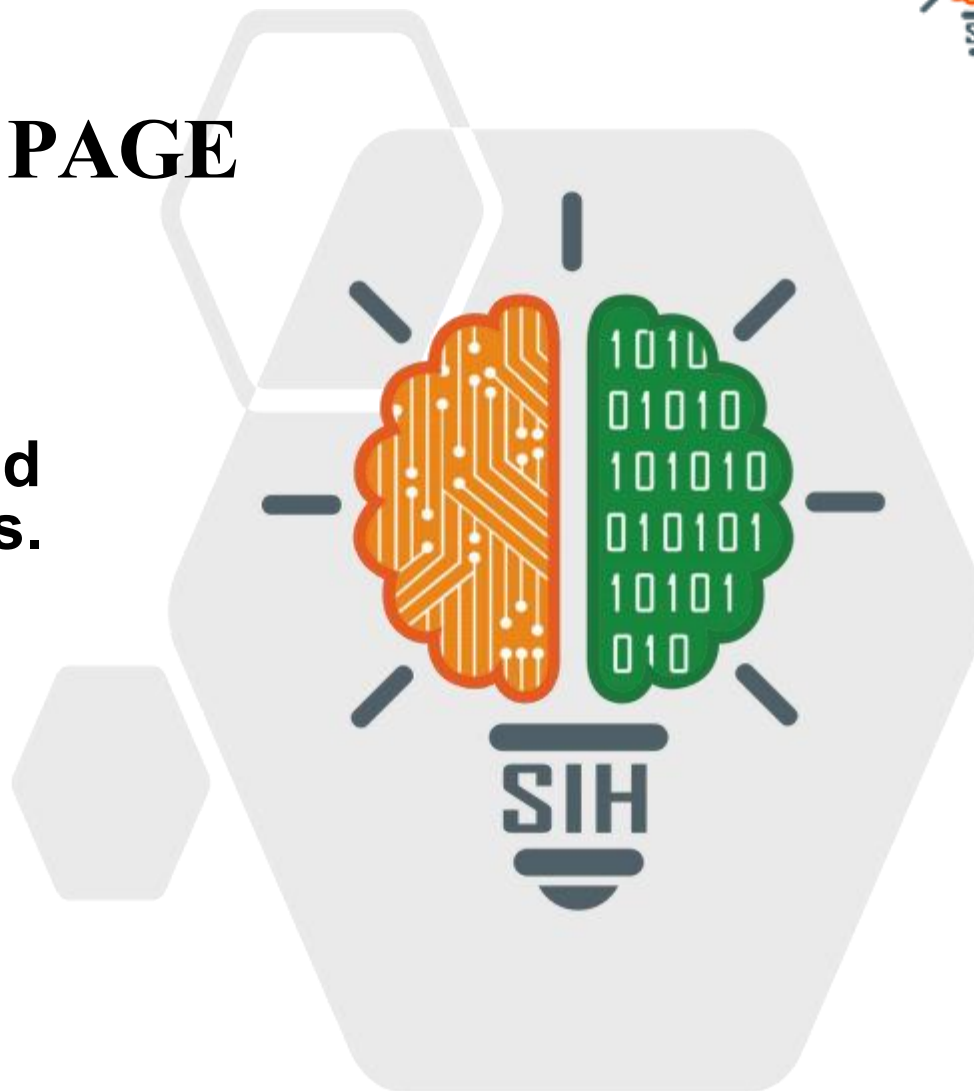


# SMART INDIA HACKATHON 2024



## TITLE PAGE

- Problem Statement ID –SIH25030
- Problem Statement Title- AI-Based Crop Recommendation for Farmers.
- Theme-Software
- PS Category- Software/Hardware
- Team ID-
- Team Name -Digital Dynamos



### Solution:

**Smart Data Integration:** Combines real-time soil, weather, and market data for personalized advice.

**AI-Driven Advice:** Uses machine learning to recommend profitable and sustainable crops, as well as forecasting yields.

**Visual Diagnosis:** An image-based system instantly identifies crop diseases and nutrient issues from photos.

**Multilingual Voice Chatbot:** Provides voice-based communication in local languages to overcome barriers.

**Offline Functionality:** Built with an offline-first architecture to provide continuous support in remote areas.

**User-Centric Design:** A simple, voice-enabled, and image-based interface makes the technology accessible to all farmers.

### Problems :

- Farmers lack timely, personal help.
- They often don't have enough technical knowledge.
- Language differences create communication problems.
- Farmers can't get real-time data on soil or weather.
- This leads to using resources poorly.
- They don't know market prices, which hurts their profits.
- Existing help doesn't reach them well in rural areas.
- Low internet in farms makes it hard to use online solutions.

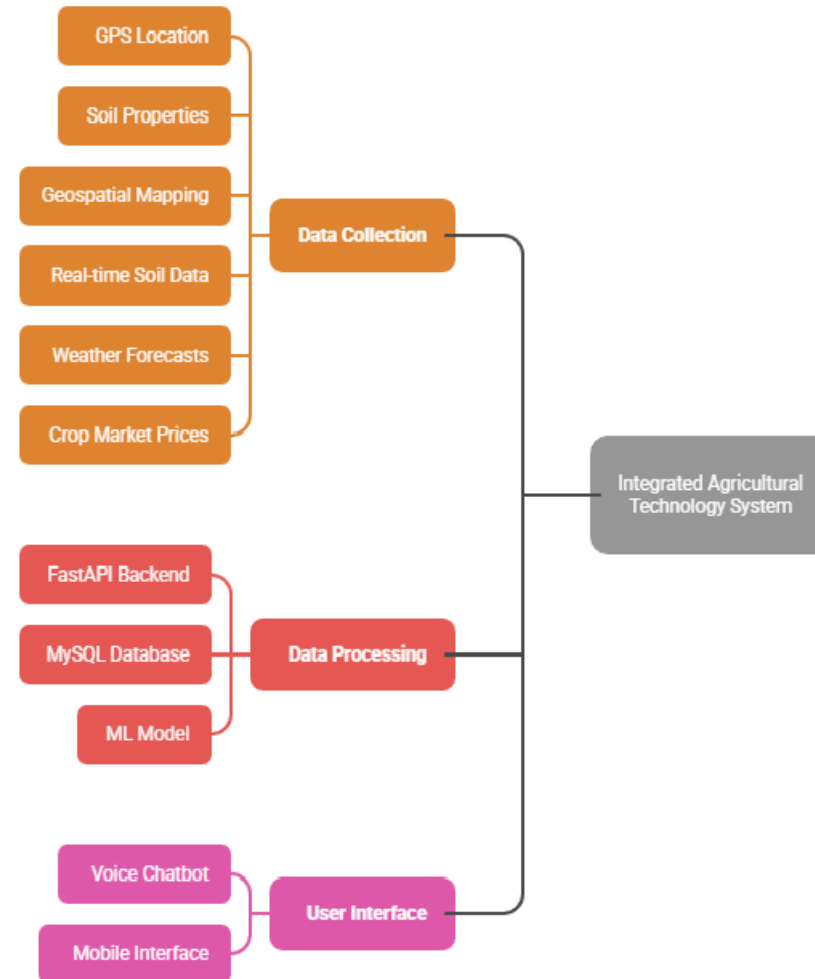
### Uniqueness:

- Combines real-time soil, weather, and market data for personalized advice.
- Uses machine learning to recommend profitable and sustainable crops, as well as forecasting yields.
- An image-based system instantly identifies crop diseases and nutrient issues from photos.
- Provides voice-based communication in local languages to overcome barriers.
- Built with an offline-first architecture to provide continuous support in remote areas.
- A simple, voice-enabled, and image-based interface makes the technology accessible to all farmers.

### Technical stack:

- Capture farmer's **GPS location** through the mobile app.
- Use **SoilGrids API** for soil properties (pH, texture, nutrients).
- Integrate **Bhuvan API** for Indian-specific geospatial mapping.
- Collect real-time soil data via **ESP32 sensors (NPK, pH, moisture)**.
- Transmit sensor data via **Bluetooth/Wi-Fi** to the mobile app.
- Fetch **weather forecasts** using Google Weather API.
- Retrieve **crop market prices** through Agri-market APIs/scraping.
- Process all inputs in **FastAPI backend with MySQL database**.
- Run **ML model** to recommend best crop, yield, profit, and sustainability score.
- Enable **voice chatbot** using STT + Gemini/RAG + TTS for local languages(NLP).
- Provide a **multilingual, offline-first mobile interface** for farmers.

### Project flow architecture



## Potential Challenges and Risks:

- **Technical:** Ensuring accuracy of data from diverse APIs and the performance of AI models on varied local conditions.
- **Financial:** Securing initial funding for development and managing ongoing cloud server and API costs.
- **Market:** Overcoming low digital literacy and building trust among farmers to ensure user adoption.
- **Operational:** Providing continuous user support and keeping the regional soil, weather, and market data up-to-date.

## Strategies for Overcoming These Challenges:

- **Technical:** Use data fusion algorithms to cross-verify sources and implement an MLOps pipeline for continuous model retraining.
- **Market:** Design an extremely simple, voice-first UI in local languages and partner with Farmer Producer Organizations for outreach.
- **Operational:** Automate system monitoring with cloud tools and integrate an in-app feedback mechanism for user issues.

## Feasibility :

- **Technical:** The core technologies (AI/ML, mobile dev, cloud) are mature and accessible for development.
- **Financial:** An MVP can be built cost-effectively using open-source tools and cloud startup credits.
- **Market:** There is a massive, underserved market of millions of farmers in India seeking better information.
- **Operational:** The system can be operated and scaled efficiently using modern cloud infrastructure and a small team.

## Potential Impact:

### Positive:

- **Reduces risk** from unpredictable weather events by suggesting climate-resilient crop varieties.
- **Diversifies farm income** by identifying profitable opportunities for inter-cropping and multi-cropping.
- **Improves post-harvest outcomes** by providing data on optimal harvest times and market rates.

### Negative:

- Potential costs for phone or app.
- Risk of over-reliance on technology.
- Initial mistrust from farmers.
- API cost is high.

## Economic Benefits:

**Increases farmer profitability** by boosting yields and providing real-time market price data.

**Lowers cultivation costs** through precise, AI-driven recommendations for fertilizer, water, and pesticides.

## Social Benefits:

**Empowers farmers with data**, turning them into independent, scientific decision-makers for their own land.

**Bridges the digital and knowledge gap** for the rural community through an accessible, voice-controlled interface in local languages.

## Environmental Benefits:

**Conserves critical resources** like water and promotes long-term soil health through sustainable practices.

**Reduces chemical pollution** by preventing the overuse of fertilizers and pesticides, protecting the local ecosystem.

## On Crop Recommendation & Yield Prediction:

- **Crop Recommendation System for Precision Agriculture**
  - *Authors:* P. P. Mainkar, S. Ghorpade, M. Adawadkar.
  - *Publication:* 2015 International Conference on Communication, Information & Computing Technology (ICCICT).
  - *Relevance:* This paper provides a foundational model for a **crop recommendation system** using soil and environmental factors, directly supporting your **AI-Driven Advice** module.
- **A Survey of Machine Learning Approaches for IoT-Based Crop Yield Prediction**
  - *Authors:* P. S. Hiremath, S. B. Kulkarni.
  - *Journal:* Journal of Physics: Conference Series (2021).
  - *Relevance:* This research validates the use of **machine learning models** for forecasting crop yields, a key feature of your project
- **IoT based smart crop-field monitoring and automation irrigation system**
  - *Authors:* S. R. S., D. J. P., A. Kumar, D. Singh.
  - *Journal:* Multimedia Tools and Applications (2020).
  - *Relevance:* Supports the concept of using real-time sensor and external data for **smart agricultural management**, which is the core of your **Smart Data Integration** module.

# IMPORTANT INSTRUCTIONS



Please ensure below pointers are met while submitting the Idea PPT:

1. Kindly keep the maximum slides limit up to six **(6)**. ( Including the title slide)
2. Try to avoid paragraphs and post your idea in points /diagrams / Infographics /pictures
3. Keep your explanation precise and easy to understand
4. Idea should be unique and novel.
5. You can only use provided template for making the PPT without changing the idea details pointers (mentioned in previous slides).
6. You need to save the file in PDF and upload the same on portal. No PPT, Word Doc or any other format will be supported.

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