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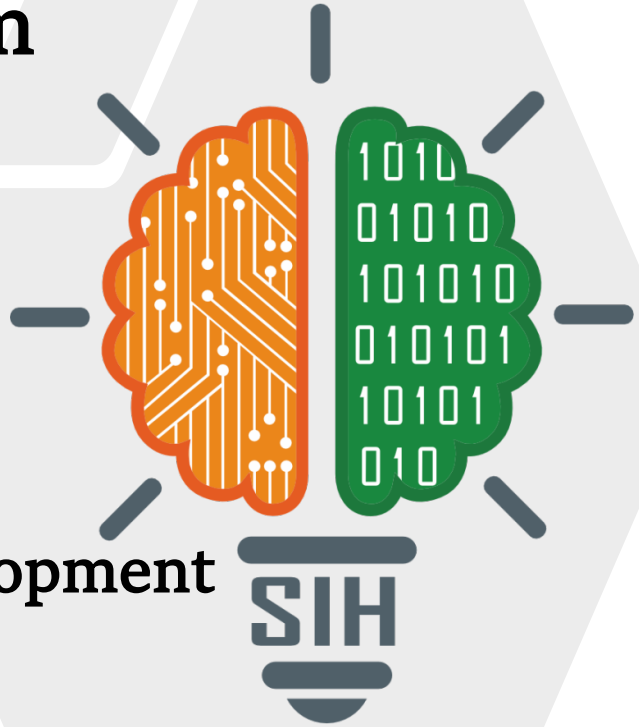
CropGuru -Ai based crop yield prediction and optimization System

- Problem Statement ID – SIH25044
- Problem Statement Title- Ai based yield

  Prediction and optimization
- Theme- Agriculture food tech and rural development
- PS Category- Software
- Team Name – DEV10



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i driven crop optimization and prediction

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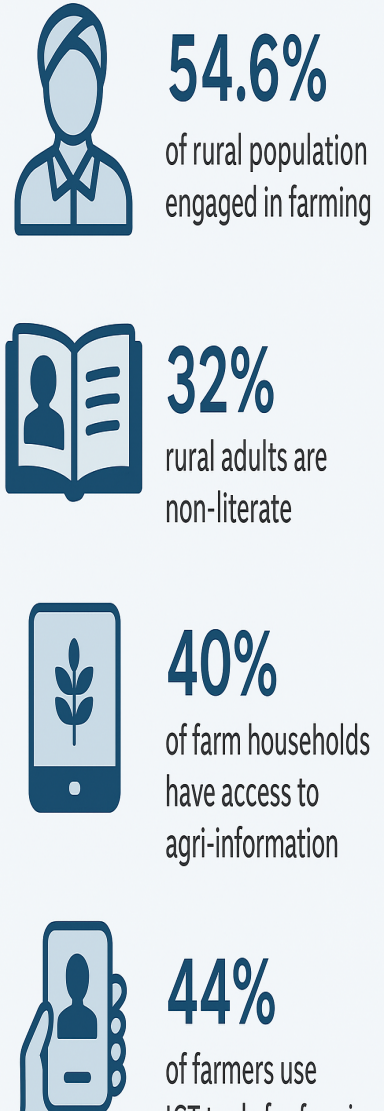
- In India there are more than 250 million farmers ,the need for new and sustainable technology for the crop yield optimization is ever increasing , thus CropGuru is best fit for farmer trying to evolve with time .
- core idea – AI based application that increases the crop yield of the farmer and predicting how much they can earn with single , mixture of several crop based on their land using ml model and integrating it with AI chat bot for wider purpose and query resolve .
- We can further use Google lens tools to find any infection and weather forecast , or display message such as incoming scheme benefits for farmer
- It can solve most of the issue farmer face in one go by knowing What to do, When to do and How to do , to increase crop Yield.
- We can implement Cloud with multiple databases (showing crop data, soil data, weather/region data) spread across.



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IMPACT AND BENEFITS

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Benefit	Description	Supporting Data
Precision Farming	Tailored recommendations based on micro-climate and soil variation.	Yield gains of **up to 30%** in pilot farms.
Input Efficiency	Reduces fertilizer and pesticide usage.	Cost savings of **2500–10000 per acre**.
Improved ROI	More efficient resource use = better margins.	Net profit increase of **15–25%** per hectare.
Time Savings	Automates monitoring and analysis.	70% reduction in field scouting time.
Better Planning	Crop calendar optimization and market alignment.	Reduces post-harvest losses by **10–15%**.
Scalability	AI systems adapt across regions and crops.	Used across **>20 million hectares globally**.

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Features used for optimization and prediction

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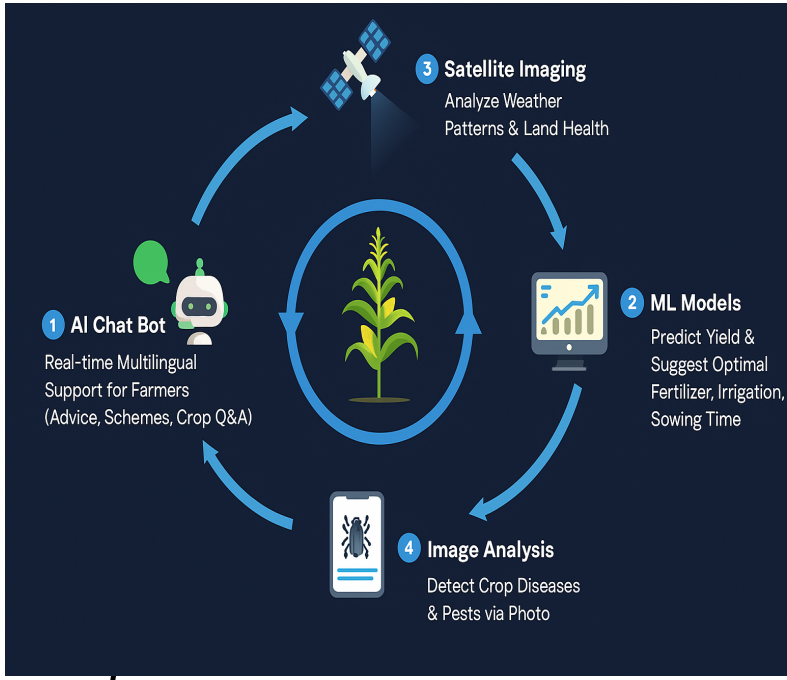
1. ***AI Chat bot (Open AI API Integration)***
   → *Real-time multilingual support for farmers (advice, schemes , crop Q&A)*
2. ***ML Models (Crop Yield Prediction, Input Optimization)***
   → *Predict yield & suggest optimal fertilizer, irrigation, sow time (XGBoost,LSTM) , uses many models such as regression testing etc on datasets on kaggle*
3. ***Satellite Imaging (Google Earth Engine API)***
   → *Analyze weather patterns & land health (forecasting, NDVI-based crop suitability) can be used for forecasting with open ai , predict rain , disaster etc.*
4. ***Image Analysis (Google Lens / Custom Vision API)***
   → *Detect crop diseases and pests via photo (early diagnosis, reduce loss).*



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TECHNICAL APPROACH

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Technology	API/Tool	Use Case
OpenAI API	Chatbot	Multilingual farmer support (Q&A, input advice)
ML Models	XGBoost, LSTM	Crop yield prediction, input optimization
Google Earth Engine	Satellite Data	Weather forecast, NDVI crop suitability
Google Lens / Vision API	Image Detection	Identify crop diseases via photos

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Data flow and work flowchart

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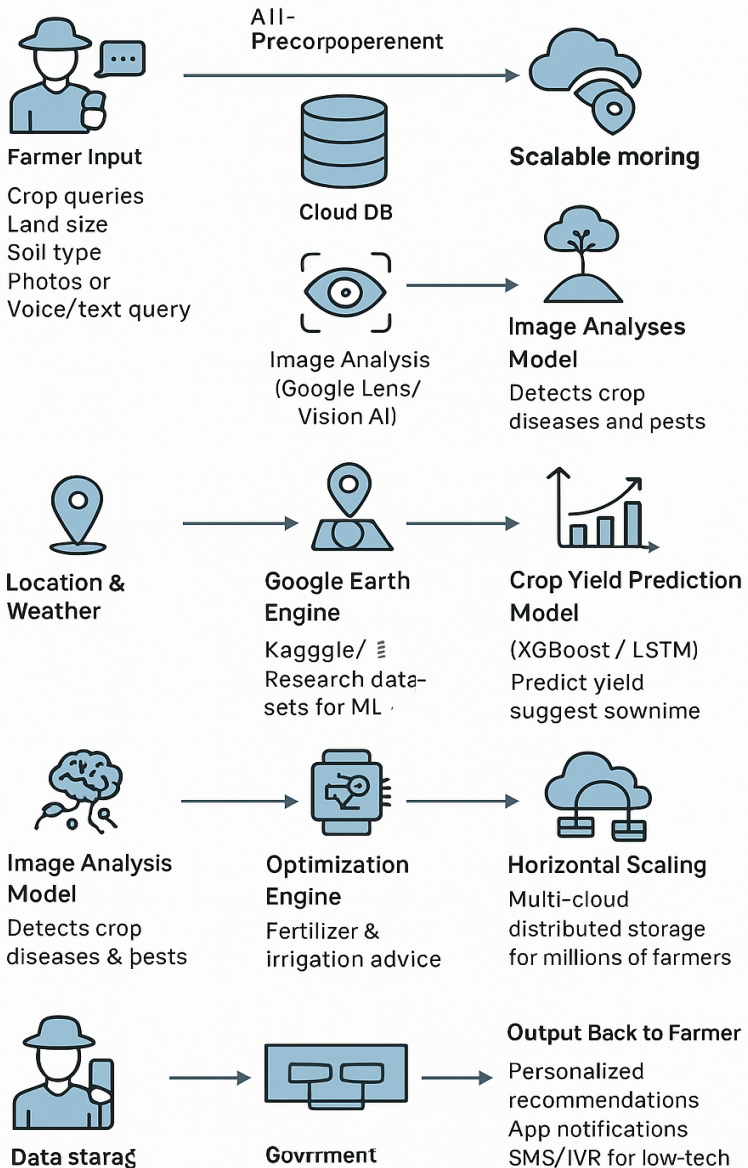


Bridging Data & Decision: From raw farm data to actionable insights.

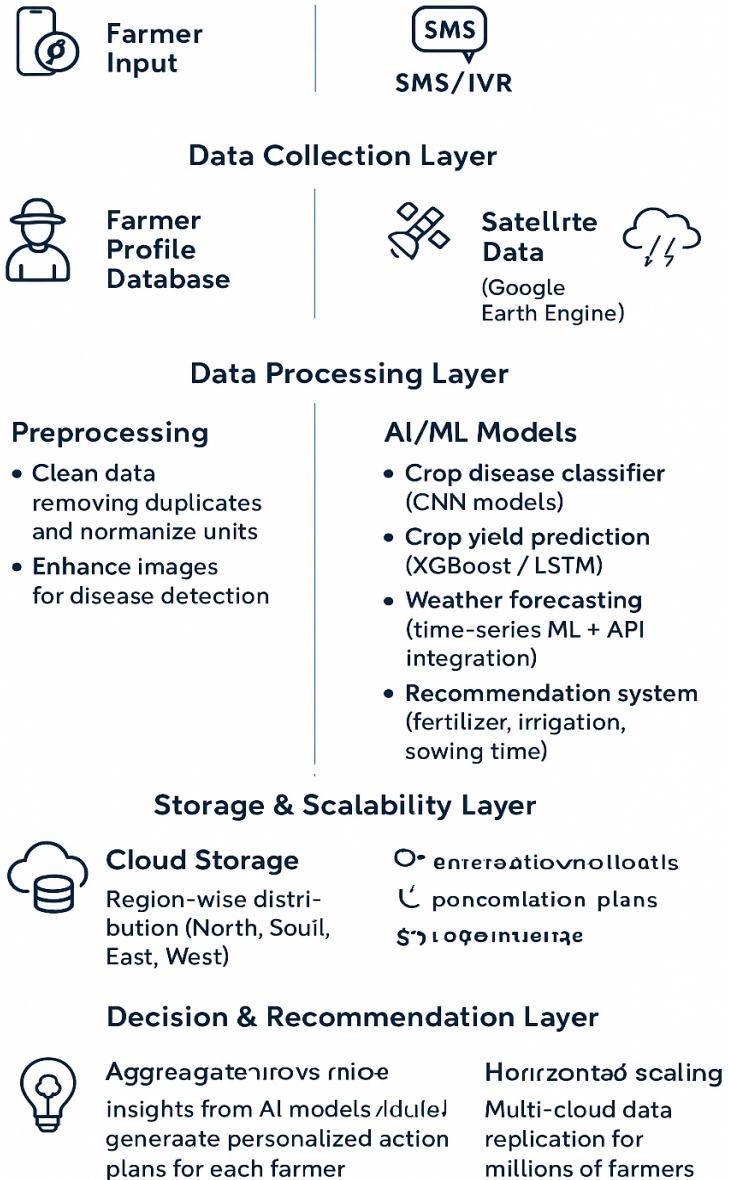
Multi-Source Inputs: Farmer apps, IoT sensors, images, and satellite data.

AI-Powered Intelligence: Disease detection, yield prediction, and weather forecasting.

Cloud Scalability: Regional data storage with vertical & horizontal scaling.

Personalized Recommendations: Tailored advice delivered via app, SMS, or IVR.

Continuous Feedback Loop: Farmer feedback improves AI accuracy over time.



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FEASIBILITY AND VIABILITY

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- **Feasibility:**

➢ Uses existing APIs (OpenAI, Google Earth Engine, Vision API)
Scalable architecture (web + mobile) by using cloud to increase precision of model prediction
Accessible data sources (ICAR, FAO, SoilGrids) and government

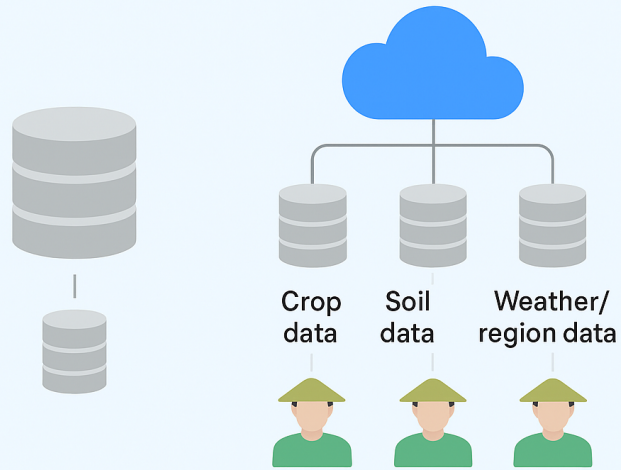
- Potential challenges and risks

➢ Poor data quality
Prediction accuracy in diverse regions

- Strategies for overcoming these challenges

➢ Use verified govt. datasets
Retrain models with local feedback

App Scalability in Smart Agriculture System



All farmer data stored in one location → bottleneck, high risk

Data distributed across cloud + vertical scaling → faster, reliable, supports millions of farmers

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Reference and research

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