



CODECELL-GMPN,VESIT

SYRUS HACKATHON 2025

Category Code: C1

Problem Statement Title: DigiKisan - AI & GIS based Smart Farming

Team Name: CodeYodha

Institute Name: Vivekanand Education Society's Institute of Technology



Idea / Approach details (& implemented features)

DATA COLLECTION & ANALYSIS

- GIS MAPPING FOR LAND ANALYSIS
- WEATHER & SOIL DATA INTEGRATION USING IOT & APIS
- MACHINE LEARNING FOR PREDICTIONS

COMMUNITY-DRIVEN FARMING SOLUTIONS

- FORUM FOR KNOWLEDGE SHARING & ISSUE RESOLUTION
- HINDI-ENGLISH LANGUAGE SUPPORT FOR ACCESSIBILITY



AI-POWERED CROP & IRRIGATION ADVISORY

- CROP RECOMMENDATIONS BASED ON SOIL, CLIMATE & PAST YIELD
- FUZZY LOGIC FOR SMART IRRIGATION SCHEDULING

MARKET INTEGRATION & DECISION SUPPORT

- REAL-TIME CROP PRICES & BUYER CONNECTIONS
- AI-POWERED ALERTS FOR PEST OUTBREAKS & WEATHER RISKS

Idea / Approach details (& implemented features)

DATA COLLECTION & ANALYSIS



Idea / Approach details (& implemented features)

DATA COLLECTION & ANALYSIS

WHY AND HOW IT WAS IMPLEMENTED

“ WHY: TRADITIONAL FARMING RELIES ON EXPERIENCE RATHER THAN DATA-DRIVEN INSIGHTS, LEADING TO INEFFICIENCIES IN CROP SELECTION, SOIL HEALTH MANAGEMENT, AND IRRIGATION PLANNING. ”

“ HOW: DIGIKISAN INTEGRATES IOT SENSORS, APIS, AND GIS-BASED MAPPING TO COLLECT DATA ON SOIL MOISTURE, WEATHER CONDITIONS, AND PAST CROP YIELDS. THIS DATA IS ANALYZED USING MACHINE LEARNING (ML) FOR PREDICTIONS AND DECISION-MAKING. ”



Idea / Approach details (& implemented features)

DATA COLLECTION & ANALYSIS

TECH STACK

- **FRONTEND: REACT.JS, TAILWIND CSS**
- **BACKEND: NODE.JS, EXPRESS.JS**
- **DATABASE: POSTGRESQL WITH POSTGIS FOR GEOSPATIAL DATA**

- **MACHINE LEARNING: PYTHON (SCIKIT-LEARN, TENSORFLOW)**
- **CLOUD & API SERVICES: GOOGLE MAPS API, OPENWEATHER API, NASA EARTH DATA**
- **IOT & SENSORS: SOIL MOISTURE SENSORS, WEATHER MONITORING DEVICES**

Idea / Approach details (& implemented features)

**AI-POWERED CROP &
IRRIGATION ADVISORY**



Idea / Approach details (& implemented features)

AI-POWERED CROP & IRRIGATION ADVISORY

WHY AND HOW IT WAS IMPLEMENTED

“
WHY: FARMERS STRUGGLE WITH SELECTING THE RIGHT CROPS AND OPTIMIZING IRRIGATION SCHEDULES.
”

“
HOW: DIGIKISAN USES AI AND FUZZY INFERENCE SYSTEM (FIS) TO RECOMMEND CROPS BASED ON SOIL QUALITY, WEATHER CONDITIONS, AND PAST YIELD DATA.
”



Idea / Approach details (& implemented features)

**AI-POWERED CROP &
IRRIGATION ADVISORY**

TECH STACK

“

- **AI/ML MODELS: TENSORFLOW, SCIKIT-LEARN**
- **FUZZY LOGIC IMPLEMENTATION: PYTHON, MATLAB FOR SIMULATIONS**
- **GIS & WEATHER DATA: INTEGRATED VIA APIS**

”



Idea / Approach details (& implemented features)

COMMUNITY-DRIVEN FARMING SOLUTIONS



Idea / Approach details (& implemented features)

COMMUNITY-DRIVEN FARMING SOLUTIONS

WHY AND HOW IT WAS IMPLEMENTED

“
**WHY: FARMERS OFTEN LACK
ACCESS TO REAL-TIME
KNOWLEDGE, MARKET TRENDS,
AND EXPERT ADVICE.**
”

“
**HOW: DIGIKISAN INCLUDES A COMMUNITY
FORUM WHERE FARMERS CAN DISCUSS
ISSUES, SHARE BEST PRACTICES, AND
ACCESS EXPERT ADVICE.**
”



Idea / Approach details (& implemented features)

COMMUNITY-DRIVEN FARMING SOLUTIONS

TECH STACK

- **FORUM DEVELOPMENT: NODE.JS, POSTGRESQL**
- **CHATBOT (FASAL AI): NLP-BASED CHATBOT USING PYTHON (NLTK, GPT MODELS)**
- **MULTILINGUAL SUPPORT: HINDI-ENGLISH ENABLED CHATBOT**

CURRENT PROGRESS

- **MACHINE LEARNING: PYTHON (SCIKIT-LEARN, TENSORFLOW)**
- **CLOUD & API SERVICES: GOOGLE MAPS API, OPENWEATHER API, NASA EARTH DATA**
- **IOT & SENSORS: SOIL MOISTURE SENSORS, WEATHER MONITORING DEVICES**



Idea / Approach details (& implemented features)

COMMUNITY-DRIVEN FARMING SOLUTIONS

FEEDBACK BY MENTOR

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Idea / Approach details (& implemented features)

**MARKET INTEGRATION
& DECISION SUPPORT**



Idea / Approach details (& implemented features)

MARKET INTEGRATION & DECISION SUPPORT

WHY AND HOW IT WAS IMPLEMENTED

**WHY: FARMERS STRUGGLE WITH
MARKET ACCESS, PRICING, AND
BUYER CONNECTIONS.**

**HOW: DIGIKISAN PROVIDES REAL-TIME
CROP PRICES AND NEAREST BUYER
CONNECTIONS. AI-POWERED ALERTS
NOTIFY FARMERS OF POTENTIAL MARKET
FLUCTUATIONS.**



Idea / Approach details (& implemented features)

MARKET INTEGRATION & DECISION SUPPORT

TECH STACK

- **MARKET DATA INTEGRATION: APIS FOR REAL-TIME PRICE UPDATES**
- **BUYER-SELLER MATCHING: POSTGRESQL DATABASE & AI-DRIVEN ANALYTICS**
- **BLOCKCHAIN (FUTURE INTEGRATION): PLANNED FOR DIRECT TRANSACTIONS.**

CURRENT PROGRESS

- **MACHINE LEARNING: PYTHON (SCIKIT-LEARN, TENSORFLOW)**
- **CLOUD & API SERVICES: GOOGLE MAPS API, OPENWEATHER API, NASA EARTH DATA**
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MARKET INTEGRATION & DECISION SUPPORT

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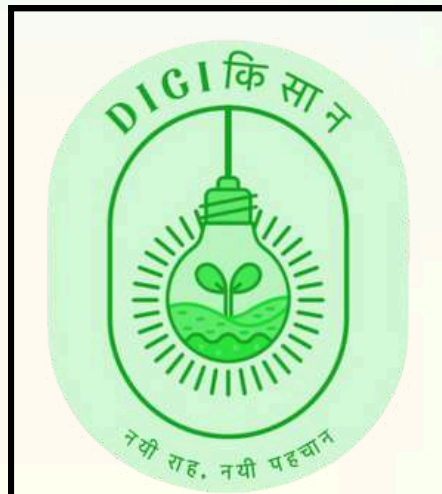
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Innovation (Showstopper)

FASAL AI

THE DIGIKISAN AI CHATBOT IS DESIGNED TO ASSIST FARMERS IN THEIR NATIVE LANGUAGES, MAKING SMART FARMING ACCESSIBLE AND USER-FRIENDLY.

OUR MULTILINGUAL CHATBOT



GIS

DIGIKISAN INTEGRATES GEOGRAPHIC INFORMATION SYSTEM (GIS) TECHNOLOGY TO PROVIDE PRECISION FARMING SOLUTIONS USING REAL-TIME GEOSPATIAL DATA.

GEOGRAPHIC INFORMATION SYSTEM

FIS

THE FUZZY INFERENCE SYSTEM (FIS) IN DIGIKISAN HELPS FARMERS MAKE SMART, DATA-DRIVEN DECISIONS BY ANALYZING MULTIPLE FACTORS SUCH AS SOIL HEALTH, WEATHER CONDITIONS, AND CROP REQUIREMENTS.

FUZZY INFERENCE SYSTEM



Innovation (Showstopper)

FASAL AI



Innovation (Showstopper)

FASAL AI

WHY AND HOW IT WAS IMPLEMENTED

“
WHY: FARMERS NEED INSTANT, AI-POWERED ADVISORY IN THEIR REGIONAL LANGUAGE.
”

“
HOW: BUILT A CHATBOT USING NLP THAT SUPPORTS HINDI & ENGLISH.
”



Innovation (Showstopper)

FASAL AI

TECH STACK

- **NLP MODELS: GPT-BASED AI MODELS**
- **LANGUAGES: HINDI & ENGLISH (EXPANDING TO MORE)**
- **INTEGRATION: WHATSAPP & WEB-BASED CHATBOT**

CURRENT PROGRESS

- **MACHINE LEARNING: PYTHON (SCIKIT-LEARN, TENSORFLOW)**
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Innovation (Showstopper)

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Innovation (Showstopper)

**GEOGRAPHIC
INFORMATION SYSTEM**



Innovation (Showstopper)

GEOGRAPHIC INFORMATION SYSTEM

WHY AND HOW IT WAS IMPLEMENTED

“
**WHY: GIS ENABLES PRECISION
FARMING BY MAPPING SOIL
QUALITY, IRRIGATION NEEDS, AND
CLIMATE TRENDS.**
”

“
**HOW: INTEGRATED GIS TO GENERATE
REAL-TIME FARM MAPS, CROP SUITABILITY
ZONES, AND WATER USAGE PATTERNS.**
”



Innovation (Showstopper)

GEOGRAPHIC INFORMATION SYSTEM

TECH STACK

- GIS SOFTWARE: POSTGRESQL (POSTGIS), QGIS
- MAPPING APIS: GOOGLE MAPS, NASA EARTH DATA

CURRENT PROGRESS

- MACHINE LEARNING: PYTHON (SCIKIT-LEARN, TENSORFLOW)
- CLOUD & API SERVICES: GOOGLE MAPS API, OPENWEATHER API, NASA EARTH DATA
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Innovation (Showstopper)

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Innovation (Showstopper)

**FUZZY INFERENCE
SYSTEM**



Innovation (Showstopper)

FUZZY INFERENCE SYSTEM

WHY AND HOW IT WAS IMPLEMENTED

WHY: TRADITIONAL DECISION-MAKING STRUGGLES WITH UNCERTAINTY IN FARMING VARIABLES.

HOW: IMPLEMENTED FIS-BASED DECISION-MAKING FOR CROP SELECTION AND IRRIGATION.



Innovation (Showstopper)

FUZZY INFERENCE SYSTEM

TECH STACK

- GIS SOFTWARE: POSTGRESQL (POSTGIS), QGIS
- MAPPING APIS: GOOGLE MAPS, NASA EARTH DATA

CURRENT PROGRESS

- FUZZY LOGIC TOOLS: MATLAB, PYTHON (SCIKIT-FUZZY)
- REAL-TIME DATA INPUT: IOT-BASED SOIL & WEATHER SENSORS



Innovation (Showstopper)

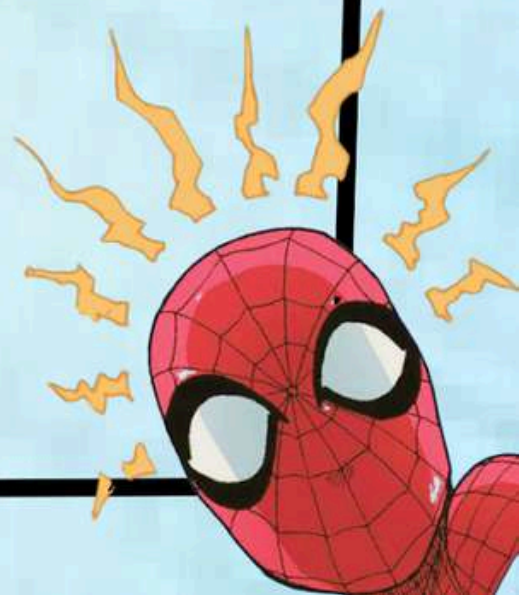
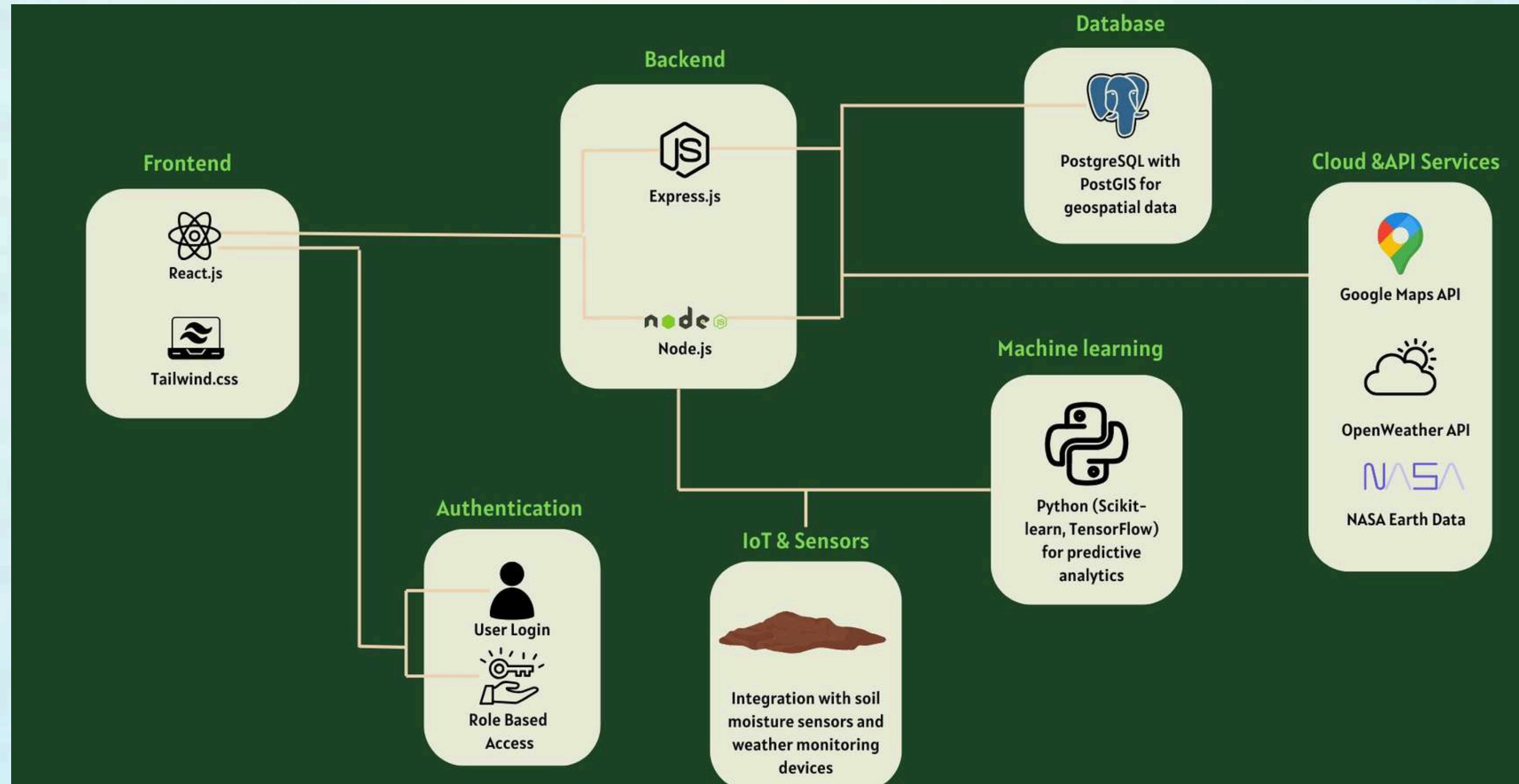
**FUZZY INFERENCE
SYSTEM**

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Tech Stack



Tech Stack

FRONTEND (USER INTERFACE)

TECHNOLOGY USED:

- **REACT.JS – USED FOR BUILDING A DYNAMIC AND INTERACTIVE USER INTERFACE.**
 - **TAILWIND CSS – PROVIDES A RESPONSIVE AND CUSTOMIZABLE DESIGN FOR A CLEAN UI/UX.**
- WHY IT WAS CHOSEN?**
1. **FAST RENDERING: REACT'S VIRTUAL DOM IMPROVES PERFORMANCE.**
 2. **REUSABLE COMPONENTS: MAKES DEVELOPMENT MODULAR AND SCALABLE.**
 3. **USER-FRIENDLY DESIGN: TAILWIND HELPS CREATE A MOBILE-RESPONSIVE UI FOR FARMERS.**



Tech Stack

BACKEND (SERVER-SIDE LOGIC)

TECHNOLOGY USED:

- **NODE.JS + EXPRESS.JS – HANDLES API REQUESTS, AUTHENTICATION, AND BUSINESS LOGIC.**
- **RESTFUL APIS – ENABLE COMMUNICATION BETWEEN FRONTEND AND BACKEND.**

WHY IT WAS CHOSEN?

1. **SCALABILITY: HANDLES LARGE AMOUNTS OF USER REQUESTS EFFICIENTLY.**
2. **FAST & LIGHTWEIGHT: USES ASYNCHRONOUS PROGRAMMING FOR BETTER PERFORMANCE.**



Tech Stack

DATABASE (STORAGE & RETRIEVAL)

TECHNOLOGY USED:

- **POSTGRESQL – A RELATIONAL DATABASE USED FOR STRUCTURED DATA STORAGE.**
- **POSTGIS – A POSTGRESQL EXTENSION FOR HANDLING GIS (GEOSPATIAL) DATA.**

WHY IT WAS CHOSEN?

1. **SUPPORTS COMPLEX QUERIES: IDEAL FOR HANDLING LARGE AGRICULTURAL DATASETS.**
2. **GEOSPATIAL CAPABILITIES: ESSENTIAL FOR GIS-BASED PRECISION FARMING.**



Tech Stack

MACHINE LEARNING & AI (CROP & IRRIGATION ADVISORY)

TECHNOLOGY USED:

- **PYTHON – PRIMARY LANGUAGE FOR AI MODELS.**
- **SCIKIT-LEARN – USED FOR PREDICTIVE ANALYTICS AND CLASSIFICATION MODELS.**
- **TENSORFLOW – USED FOR DEEP LEARNING MODELS (E.G., CROP DISEASE DETECTION).**
- **NLTK & GPT – NATURAL LANGUAGE PROCESSING (NLP) TOOLS FOR THE FASAL AI CHATBOT.**

WHY IT WAS CHOSEN?

1. **POWERFUL ML LIBRARIES: PYTHON'S ECOSYSTEM IS BEST FOR DATA SCIENCE.**
2. **OPTIMIZED PREDICTIONS: TENSORFLOW PROVIDES ACCURATE AI-DRIVEN FARMING INSIGHTS.**
3. **MULTILINGUAL NLP: HELPS CREATE THE CHATBOT FOR FARMERS IN REGIONAL LANGUAGES.**



Tech Stack

GEOGRAPHIC INFORMATION SYSTEM (GIS)

TECHNOLOGY USED:

- **GOOGLE MAPS API – FOR FARM MAPPING AND GEOSPATIAL ANALYSIS.**
 - **NASA EARTH DATA API – PROVIDES CLIMATE AND SOIL INFORMATION.**
 - **QGIS – OPEN-SOURCE GIS TOOL FOR DATA VISUALIZATION.**
- WHY IT WAS CHOSEN?**
1. **REAL-TIME MAPPING: PROVIDES PRECISION FARMING RECOMMENDATIONS.**
 2. **LAND SUITABILITY ANALYSIS: HELPS OPTIMIZE CROP SELECTION.**



Tech Stack

IOT & CLOUD INTEGRATION (REAL-TIME DATA COLLECTION)

TECHNOLOGY USED:

- IOT SENSORS – FOR REAL-TIME SOIL MOISTURE AND WEATHER DATA.
- GOOGLE FIREBASE – FOR REAL-TIME ALERTS AND NOTIFICATIONS.
- OPENWEATHER API – FETCHES WEATHER FORECASTS FOR PREDICTIVE ANALYTICS.

WHY IT WAS CHOSEN?

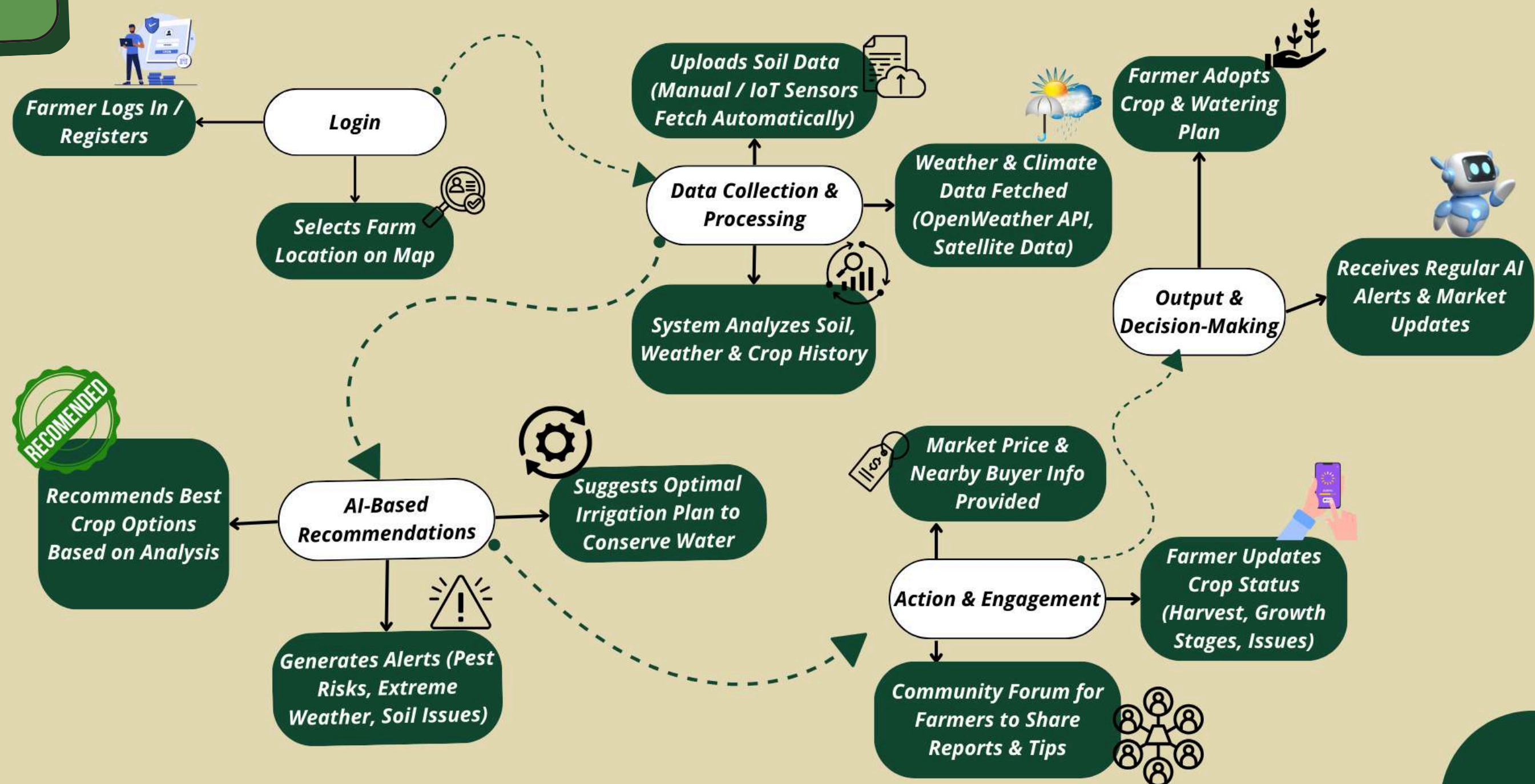
1. REAL-TIME MONITORING: HELPS FARMERS RECEIVE INSTANT ALERTS.
2. REMOTE ACCESSIBILITY: CLOUD-BASED ARCHITECTURE MAKES DATA ACCESSIBLE ANYWHERE.



Implementation/Prototype/Use Case Diagram

USE CASE

USER FLOW



Implementation/Prototype/Use Case Diagram

USE CASE

1. REGISTER & LOGIN – FARMERS SIGN UP VIA OTP AND ENTER FARM DETAILS. (TECH: FIREBASE, POSTGRESQL)
 2. FARM DATA COLLECTION – IOT SENSORS, WEATHER APIS, AND MARKET DATA ARE COLLECTED. (TECH: OPENWEATHER API, IOT, POSTGRESQL)
 3. AI-POWERED ADVISORY – FARMERS ASK THE FASAL AI CHATBOT FOR CROP & IRRIGATION ADVICE. (TECH: TENSORFLOW, NLP, FUZZY LOGIC)
 4. COMMUNITY SUPPORT – FARMERS JOIN FORUMS TO DISCUSS PROBLEMS & GET EXPERT HELP. (TECH: NODE.JS, POSTGRESQL)
 5. MARKET INTEGRATION – REAL-TIME CROP PRICES & AI-DRIVEN SELLING RECOMMENDATIONS. (TECH: MARKET APIS, AI, BLOCKCHAIN - FUTURE)
 6. SMART ALERTS – FARMERS RECEIVE IRRIGATION, PRICE, & WEATHER NOTIFICATIONS. (TECH: FIREBASE, OPENWEATHER API)
- RESULT: BETTER FARMING DECISIONS, HIGHER PROFITS, AND IMPROVED SUSTAINABILITY! 🚀

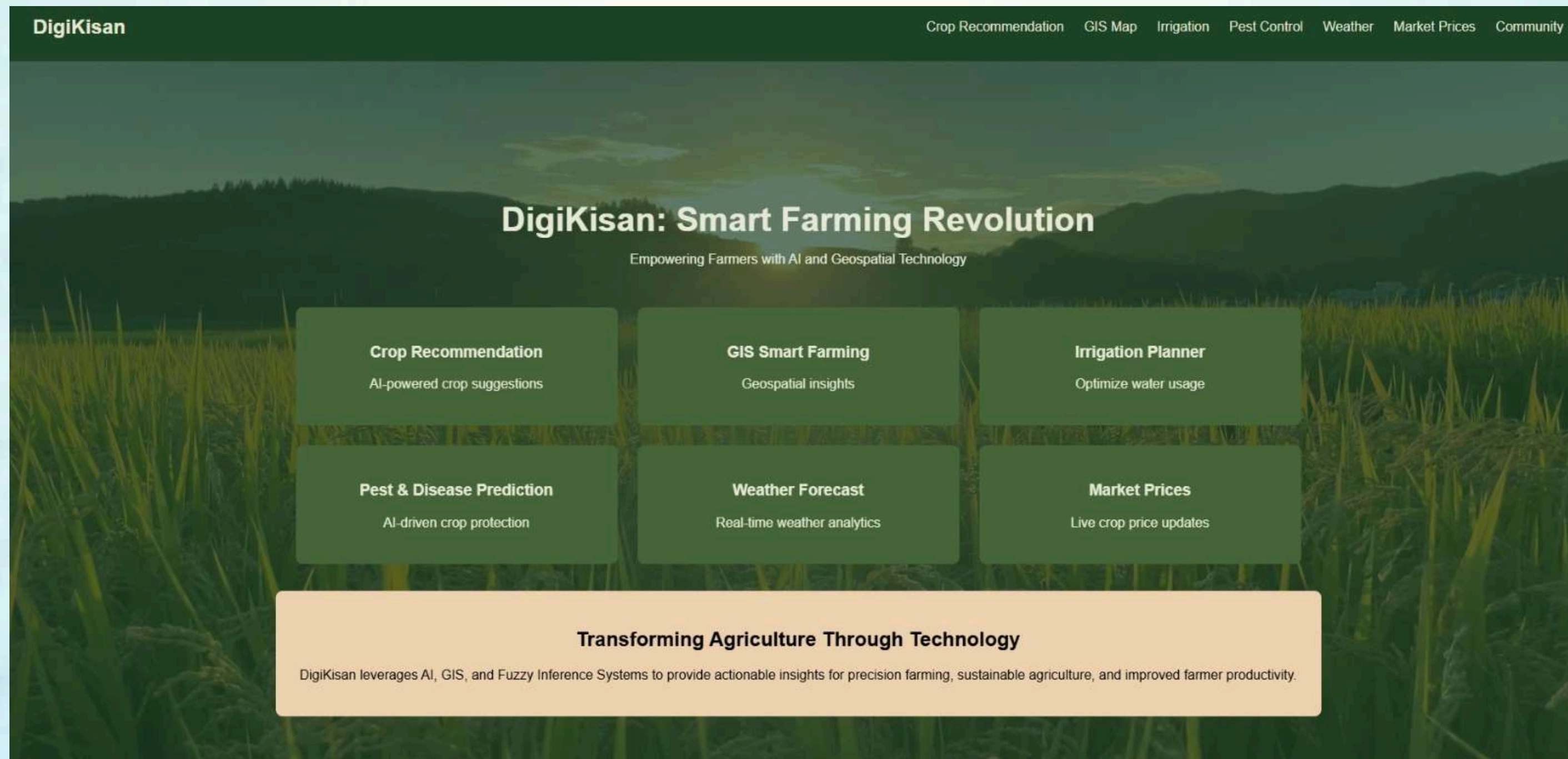
Implementation/Prototype/Use Case Diagram

IMPLEMENTATION



Implementation/Prototype/Use Case Diagram

HOMEPAGE



Implementation/Prototype/Use Case Diagram

CROP RECOMMENDATION SYSTEM

DigiKisan

[Crop Recommendation](#) [GIS Map](#) [Irrigation](#) [Pest Control](#) [Weather](#) [Market Prices](#) [Community](#)

Crop Recommendation System

Nitrogen (0-100)

Phosphorus (0-100)

Potassium (0-100)

Temperature (0-100)

Humidity (0-100)

Ph (0-14)

Rainfall (0-100)

Get Crop Recommendations



Implementation/Prototype/Use Case Diagram

SOIL HEALTH ANALYSIS

```
Soil Health Analysis: {'ndvi_mean': {'type': 'Image', 'bands': [{'id': 'NDVI'}  
Weather Data: {'coord': {'lon': -74.006, 'lat': 40.7128}, 'weather': [{'id':
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Implementation/Prototype/Use Case Diagram



The screenshot displays the DigiKisan website, which is a platform for smart farming. The website features a dark green header with the DigiKisan logo on the left and navigation links (Irrigation, Pest Control, Weather, Market Prices, Community) on the right. A large green banner in the center reads "IMPLEMENTATION". Below this, the main heading is "DigiKisan: Smart Farming Revolution" with the subtitle "Empowering Farmers with AI and Geospatial Technology". The website is divided into six green boxes, each representing a different feature: "Crop Recommendation" (AI-powered crop suggestions), "GIS Smart Farming" (Geospatial insights), "Irrigation Planner" (Optimize water usage), "Pest & Disease Prediction" (AI-driven crop protection), "Weather Forecast" (Real-time weather analytics), and "Market Prices" (Live crop price updates). At the bottom, a light orange box contains the text "Transforming Agriculture Through Technology" and "CROP RECOMMENDATION SYSTEM: https://colab.research.google.com/drive/1ZK-G4E_W9HQSQSK08UVJJMLOZEENKV4G?USP=SHARING".

DigiKisan

Irrigation Pest Control Weather Market Prices Community

IMPLEMENTATION

DigiKisan: Smart Farming Revolution

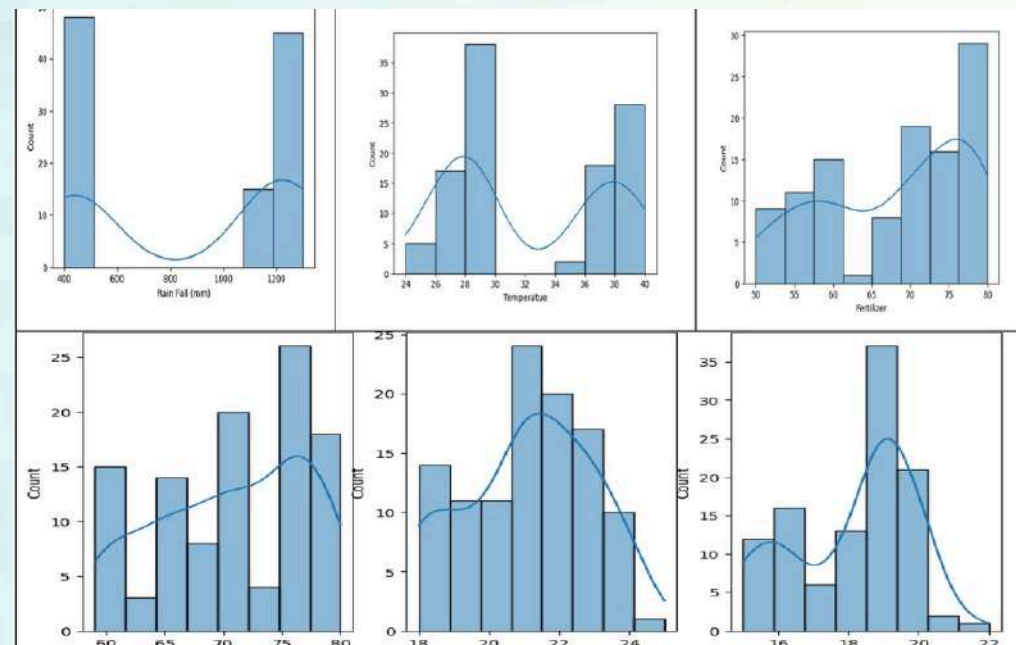
Empowering Farmers with AI and Geospatial Technology

- Crop Recommendation**
AI-powered crop suggestions
- GIS Smart Farming**
Geospatial insights
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Transforming Agriculture Through Technology

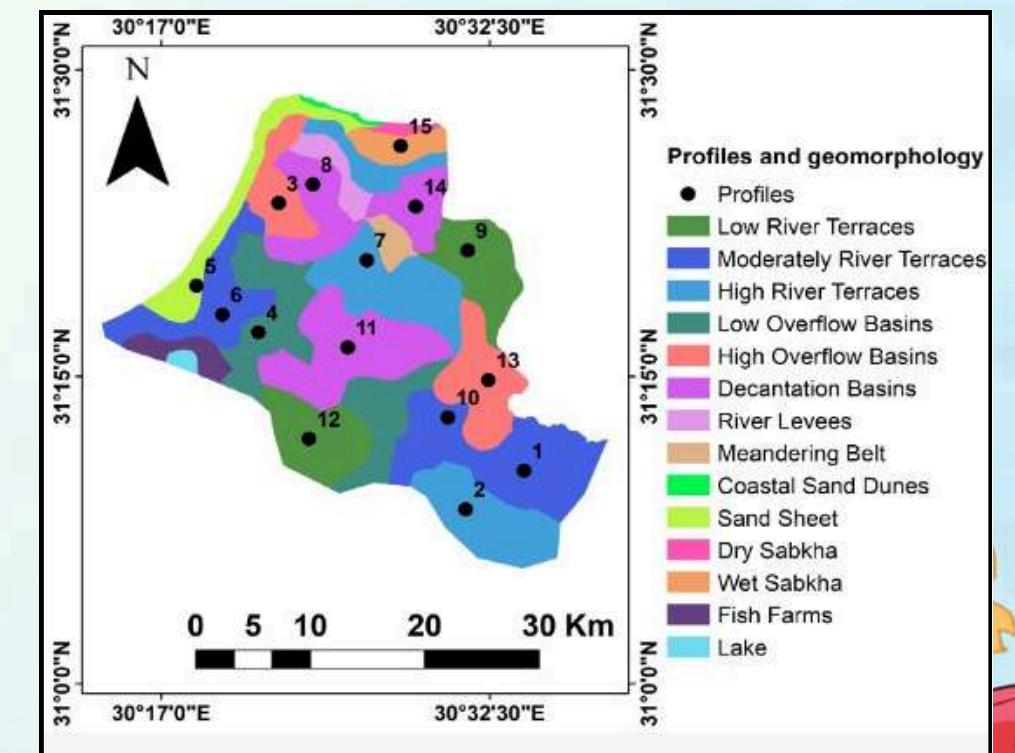
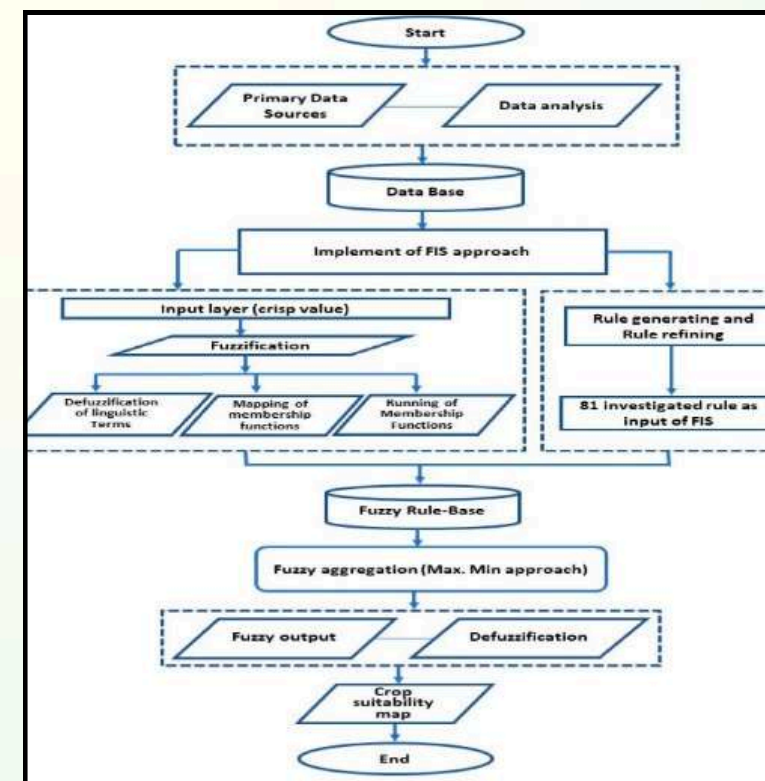
CROP RECOMMENDATION SYSTEM:
https://colab.research.google.com/drive/1ZK-G4E_W9HQSQSK08UVJJMLOZEENKV4G?USP=SHARING

Researches and references



HISTOGRAMS TO ANALYZE RAINFALL, TEMPERATURE, AND MACRONUTRIENT DISTRIBUTION IN RICE FIELDS DURING TWO SEASONS (KHARIF AND RABI) IN THE REGION USED FOR MACHINE LEARNING IMPLEMENTATION

GIS-BASED SOIL PROFILE AND GEOMORPHOLOGY MAP, HIGHLIGHTING DIVERSE LANDFORMS FOR SUSTAINABLE AGRICULTURE, IRRIGATION PLANNING, AND ENVIRONMENTAL MANAGEMENT.



Reference: Apat, Shraban & Mishra, Jyotirmaya & Padhy, Dr. Neelamadhab & Raju, Srujan. (2023). An Artificial Intelligence-based Crop Recommendation System using Machine Learning. Journal of Scientific & Industrial Research. 82. 558-567. 10.56042/jsir.v82i05.1092.

Future Objectives

EXPANDING AI MODELS

ADD SUPPORT FOR MORE CROPS AND SPECIFIC PEST/DISEASE DETECTION MODELS.

GOVERNMENT & NGO COLLABORATION

PARTNERING WITH AGRICULTURAL AGENCIES TO PROMOTE AI ADOPTION IN FARMING.

BLOCKCHAIN-BASED MARKET PLATFORM

DIRECT FARMER-TO-BUYER TRANSACTIONS ENSURING FAIR PRICING.

MULTILINGUAL SUPPORT

VOICE & TEXT-BASED AI CHATBOT IN REGIONAL LANGUAGES FOR BETTER FARMER ACCESSIBILITY.

IOT-BASED AUTOMATED IRRIGATION

INTEGRATING AI WITH SMART IRRIGATION SYSTEMS THAT AUTO-REGULATE WATER SUPPLY.



Future Objectives

EXPANDING AI MODELS

OBJECTIVE:
DEVELOP A DECENTRALIZED, FAIR-TRADE PLATFORM WHERE FARMERS SELL CROPS DIRECTLY TO BUYERS, REDUCING MIDDLEMEN EXPLOITATION.

IMPLEMENTATION PLAN:

- **CREATE A BLOCKCHAIN-POWERED TRANSACTION SYSTEM.**
- **FARMERS LIST THEIR PRODUCE WITH TRANSPARENT PRICING.**
- **BUYERS PLACE ORDERS WITH SMART CONTRACTS, ENSURING SECURE PAYMENTS.**



Future Objectives

BLOCKCHAIN-BASED MARKET INTEGRATION

OBJECTIVE:

DEVELOP A DECENTRALIZED, FAIR-TRADE PLATFORM WHERE FARMERS SELL CROPS DIRECTLY TO BUYERS, REDUCING MIDDLEMEN EXPLOITATION.

IMPLEMENTATION PLAN:

- **CREATE A BLOCKCHAIN-POWERED TRANSACTION SYSTEM.**
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- **BUYERS PLACE ORDERS WITH SMART CONTRACTS, ENSURING SECURE PAYMENTS.**



Future Objectives

GOVERNMENT & NGO COLLABORATION

OBJECTIVE:

ENABLE FARMERS TO EASILY ACCESS GOVERNMENT SUBSIDIES, LOANS, AND SCHEMES BY INTEGRATING DIGIKISAN WITH OFFICIAL PORTALS.

IMPLEMENTATION PLAN:

- **DEVELOP AN AUTOMATED SCHEME RECOMMENDER BASED ON FARMER PROFILE DATA.**
- **PROVIDE DIGITAL APPLICATION ASSISTANCE FOR SCHEMES.**
- **PARTNER WITH NGOS & AGRICULTURAL DEPARTMENTS TO INCREASE AI ADOPTION.**



Future Objectives

MULTILINGUAL AI CHATBOT

OBJECTIVE:

EXPAND THE FASAL AI CHATBOT TO SUPPORT REGIONAL LANGUAGES AND VOICE COMMANDS, MAKING IT ACCESSIBLE FOR ALL FARMERS.

IMPLEMENTATION PLAN:

- **IMPLEMENT VOICE-TO-TEXT NLP FOR NON-LITERATE FARMERS.**
- **ADD SUPPORT FOR HINDI, MARATHI, TAMIL, TELUGU, AND OTHER LANGUAGES.**
- **IMPROVE CONTEXTUAL AI LEARNING FOR BETTER RESPONSES.**



Future Objectives

AI-DRIVEN PRECISION IRRIGATION & SMART FARMING

OBJECTIVE:

INTEGRATE IOT-POWERED SMART IRRIGATION SYSTEMS THAT OPTIMIZE WATER USAGE BASED ON REAL-TIME WEATHER AND SOIL CONDITIONS.

IMPLEMENTATION PLAN:

- **DEPLOY IOT SOIL MOISTURE SENSORS IN FARMS.**
- **USE AI TO CALCULATE IRRIGATION NEEDS AND AUTOMATICALLY TRIGGER WATERING SYSTEMS.**
- **COMBINE REAL-TIME WEATHER DATA TO AVOID UNNECESSARY IRRIGATION.**

