CAPSTONE PROJECT

AI AGENT FOR SMART FARMING ADVICE

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OUTLINE

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PROBLEM STATEMENT

An AI Agent for Smart Farming Advice, powered by RAG (Retrieval-Augmented Generation), supports small-scale farmers by delivering real-time, localized agricultural guidance. It retrieves trusted data on weather forecasts, soil conditions, crop recommendations, pest control measures, and current market prices from agricultural departments, meteorological sources, and agri tech platforms. Farmers can interact in their local language and ask questions like "What crop is best for this season?" or "What is today's mandi rate for tomatoes?" The agent ensures timely, data-driven decisions that reduce risk, increase yield, and boost income. This Al-driven assistant bridges the knowledge gap and brings smart farming to the grassroots.



PROPOSED SOLUTION

The proposed system aims to assist small-scale farmers by providing real-time, localized agricultural guidance through an Al Agent powered by Retrieval-Augmented Generation (RAG). This system integrates real-time retrieval, machine learning models, and natural language interaction to deliver accurate, actionable farming advice.

Data Collection:

- Collect historical data on soil conditions, crop yields, rainfall, pest outbreaks, and local farming practices.
- Retrieve real-time data from weather APIs, mandi (market) databases, agricultural departments, and IoT sensors in the field.

Data Preprocessing:

- Clean and preprocess data to handle missing values, inconsistencies, and noisy sensor input.
- Use feature engineering to extract meaningful indicators like soil pH ranges, rainfall trends, or crop suitability scores.

Al Algorithm & RAG Integration:

- Integrate RAG to retrieve domain-specific knowledge (from agri-dept portals, market rates, expert articles) for answering farmer queries in natural language.
- Use machine learning for crop and fertilizer recommendation.

Deployment:

- Deploy the Al Agent via a chatbot interface or mobile app, allowing interaction in local languages.
- Ensure scalability and fast response time, especially in low-connectivity rural areas.

Evaluation:

- Evaluate prediction models using metrics like accuracy, precision, and user feedback quality.
- Continuously improve the system through user interactions, feedback loops, and periodic model retraining.

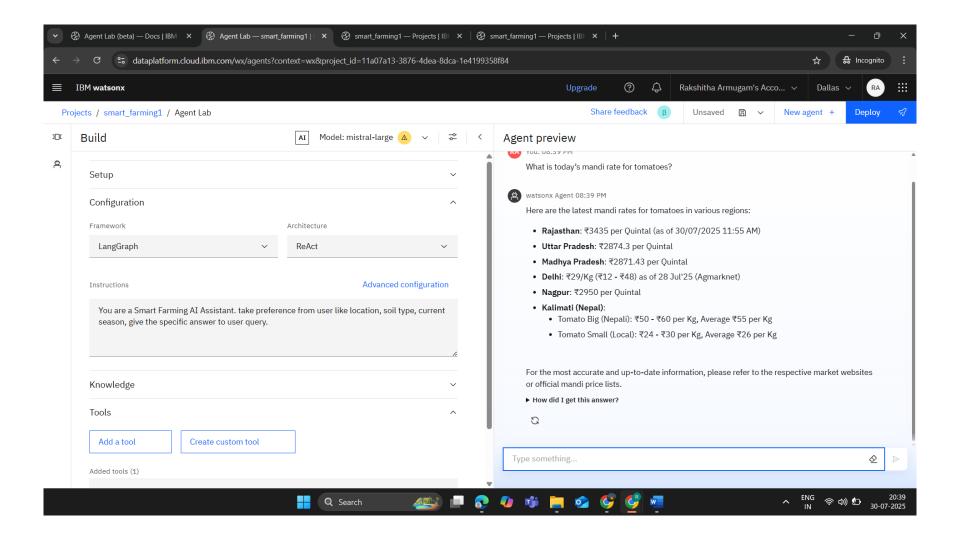


SYSTEM APPROACH

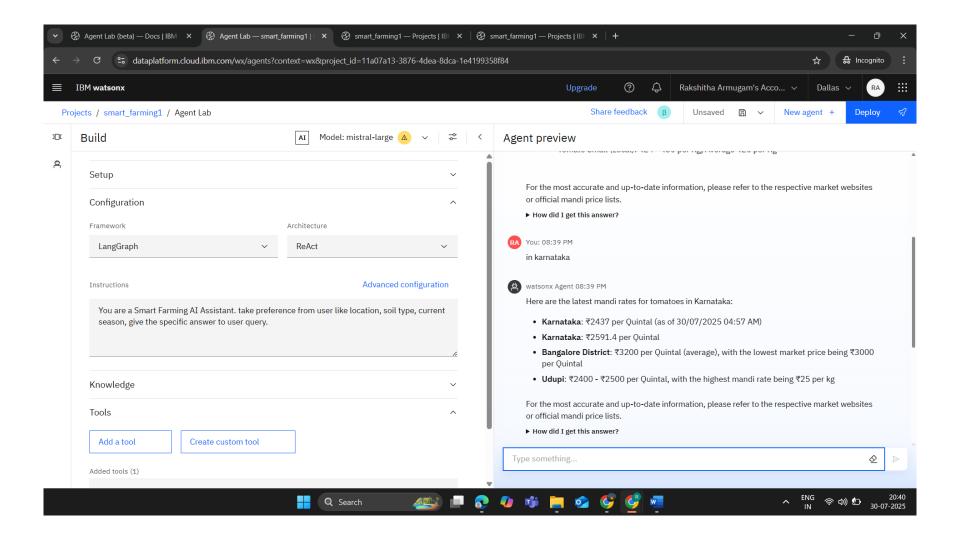
The Smart Farming Al Agent was developed using IBM Watsonx.ai Studio, which enables building, training, and deploying Al models in a cloud-based environment.

- System requirements:
- IBM Watsonx.ai cloud environment
- IBM Cloud Object Storage
- Stable internet and browser access
- Library required to build the model:
- Watsonx.ai Studio For model training and deployment
- Watson NLP / Discovery For understanding and retrieving relevant content.
- APIs For weather, soil, and mandi price data.

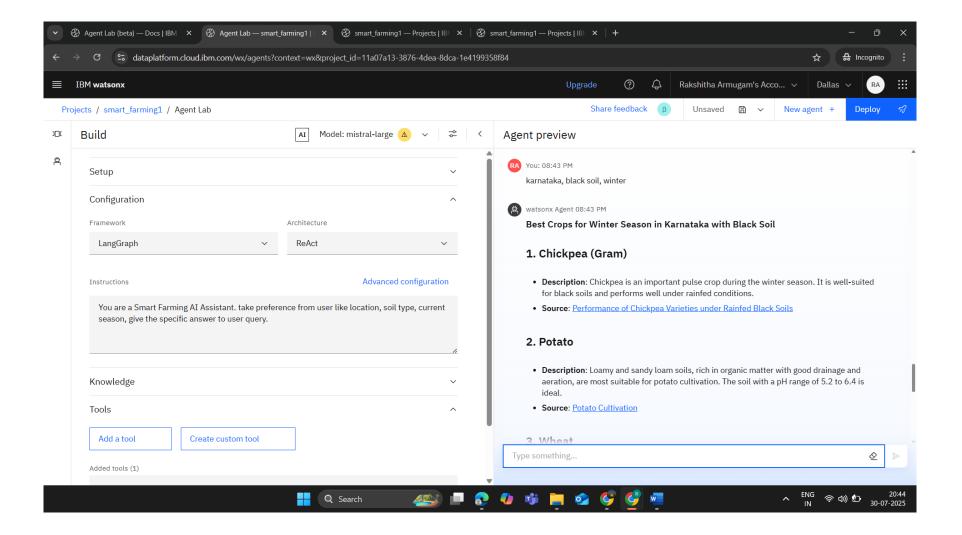




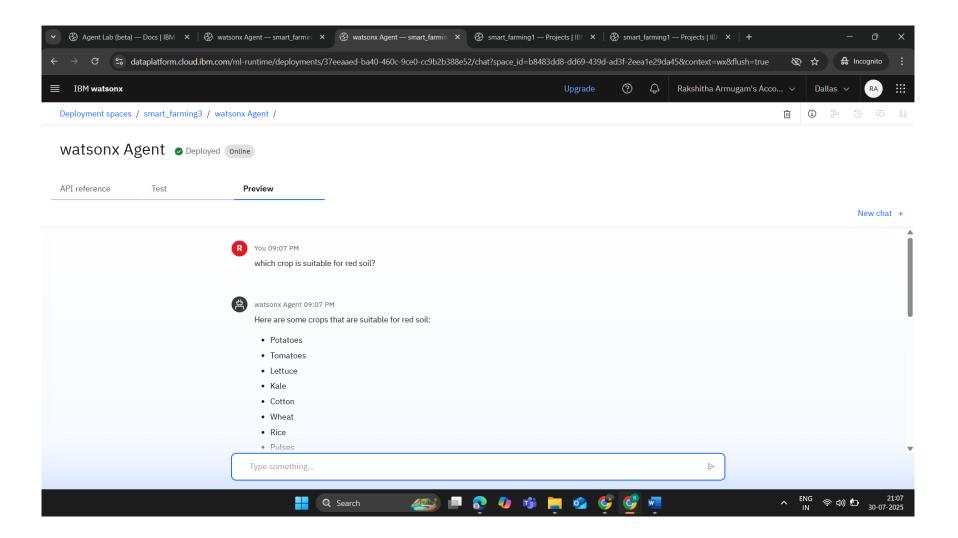














CONCLUSION

■ The Smart Farming Al Agent, built using IBM Watsonx and RAG, provides farmers with real-time, data-driven agricultural advice. By combining Al with live weather and mandi data, it offers accurate crop suggestions and market insights. This project shows how Al can empower small-scale farmers, Improving decision-making and promoting sustainable farming. With future enhancements, it can become a valuable tool for rural development.



FUTURE SCOPE

The Smart Farming AI Agent has strong potential for expansion and enhancement. Future improvements could make the system more robust, accessible, and impactful for farmers across regions.

1. Integration of Voice and Local Languages

Add voice-based interaction for farmers who may not be comfortable typing.

2. Mobile and Offline Access

Develop a mobile app or WhatsApp chatbot version.

3. Satellite and Drone Integration

Use remote sensing data to analyze soil moisture, crop health, and disease detection.

4. Sustainable Farming Suggestions

Promote organic fertilizers, climate-resilient crops, and rainwater harvesting tips as part of long-term sustainability.



REFERENCES

- •IBM Watsonx.ai Official Product Documentation
- •IBM Granite Foundation Models IBM Research Blog
- •Facebook AI Research Retrieval-Augmented Generation (RAG) Whitepaper
- •Open Government Data Platform (India) Agricultural Market Prices



IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence Rakshitha A Has successfully satisfied the requirements for: Getting Started with Artificial Intelligence Issued on: Jul 15, 2025 Issued by: IBM SkillsBuild Verify: https://www.credly.com/badges/f915c48f-7c32-4e6a-8fea-4959c2bcc539



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Completion Certificate



This certificate is presented to

Rakshitha A

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU

