CAPSTONE PROJECT

Al Agent for Smart Farming Advice

Presented By:
1. Lokesh Gulla-GMRIT-CSE



OUTLINE

- Problem Statement (Should not include solution)
- Proposed System/Solution
- System Development Approach (Technology Used)
- Algorithm & Deployment
- Result (Output Image)
- Conclusion
- Future Scope
- References



PROBLEM STATEMENT

Problem: AI Agent for Smart Farming Advice

The Challenge – 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 agritech 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 AI-driven assistant bridges the knowledge gap and brings smart farming to the grassroots. Technology – Use of IBM Cloud Lite services / IBM Granite is mandatory.



PROPOSED SOLUTION

- To build an AI-powered Smart Farming Advisor that delivers real-time, localized agricultural guidance in farmers' local languages, covering crop recommendations, market prices, weather forecasts, pest control, and soil management, using IBM Granite with RAG for accurate, data-driven decisions.
- Data Collection: Commodity prices, Crop yield data, Pest control data, Soil guidelines, Weather data, Crop recommendations, NPSMF guidelines, Live weather API, Tools
- Data Preprocessing:
 - Clean & preprocess datasets.
 - Provide agent with clear instructions for consistent responses.
 - Use RAG for context-based retrieval.
 - Optimized prompting for better LLM accuracy.
- Al Models in IBM Cloud Watsonx:
 - Granite-3-8 Model for natural language understanding & generation.
 - **Embedding model for document vectorization, Embedding model for document vectorization, frameworks, architecture in this LLM.** .
 - Knowledge Tools with good datasets, Tools like google search, Wikipedia, weather, document search and many more.
- Deployment:
 - Develop a smart farming advisor agent with save button, create deployment space and deploy it.
 - Test via API reference, preview, and chatbot interface
- Evaluation:
 - Query testing in multiple languages
 - Validation for accuracy and relevance
 - Result: Output is favourable response from prompt which is easy to understand to farmer.



SYSTEM APPROACH

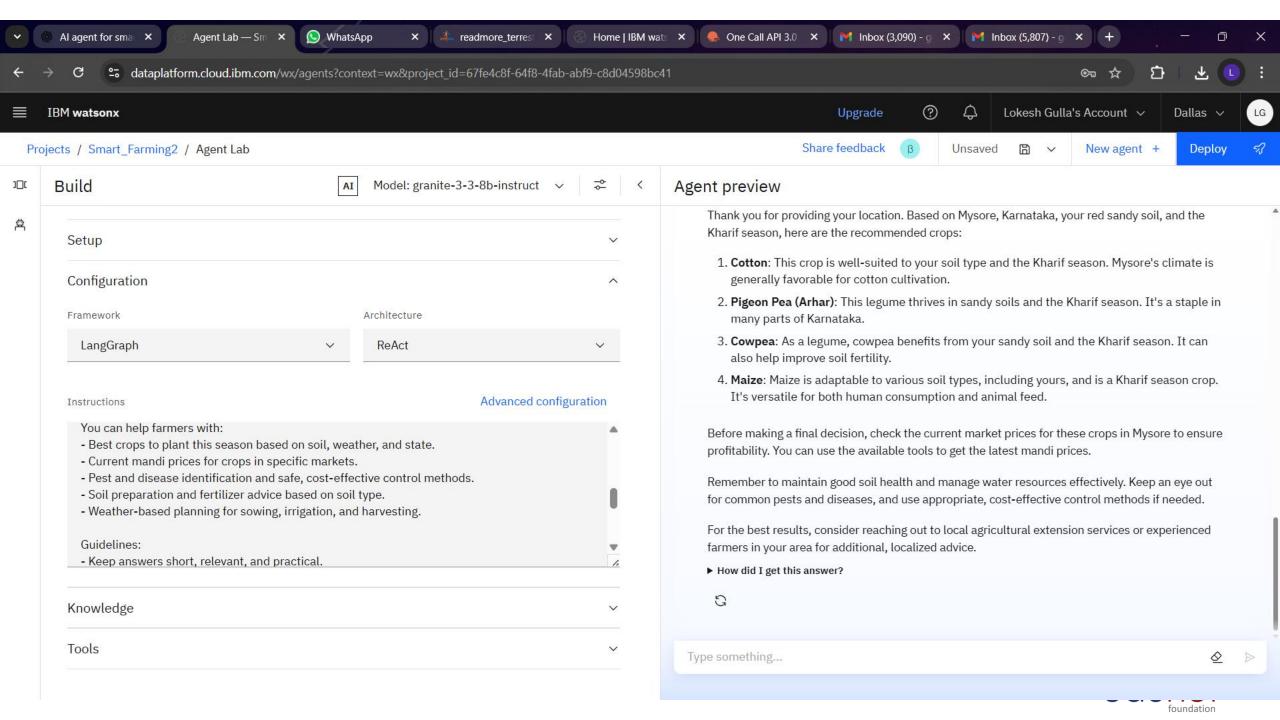
The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Smart Farming Advisor Agent for a system. Here's a suggested structure for this section:

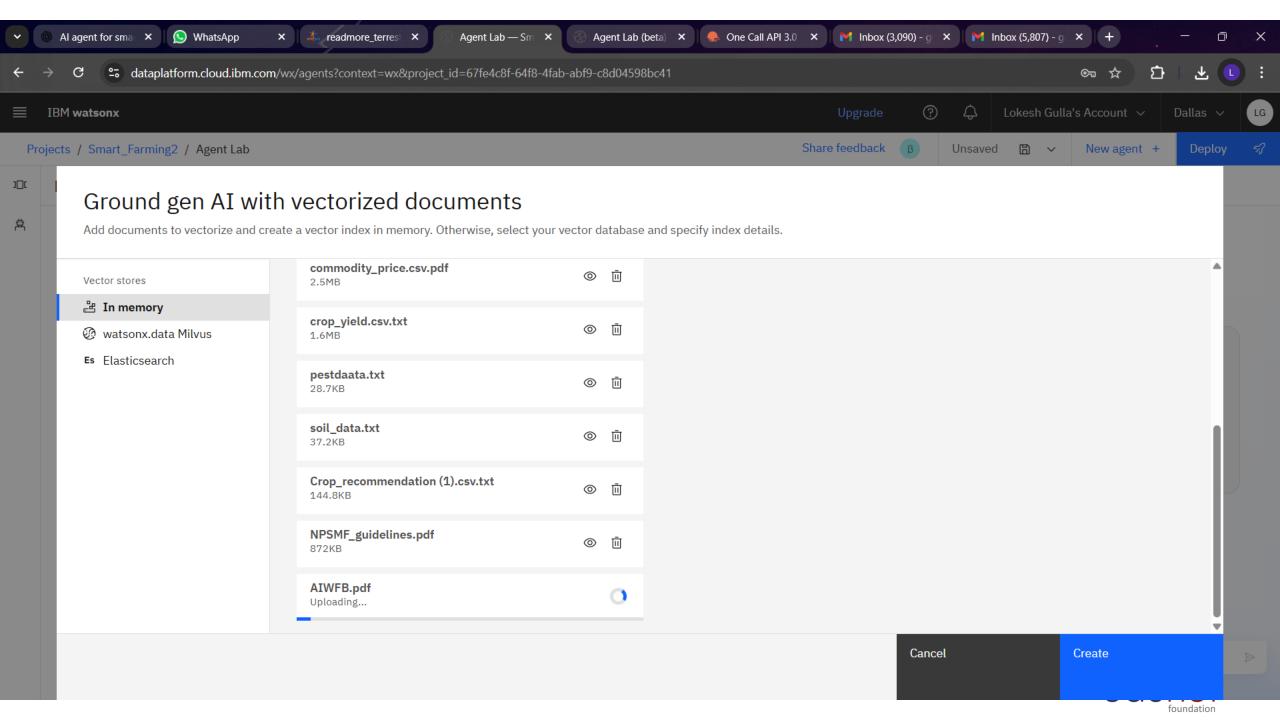
System requirements:

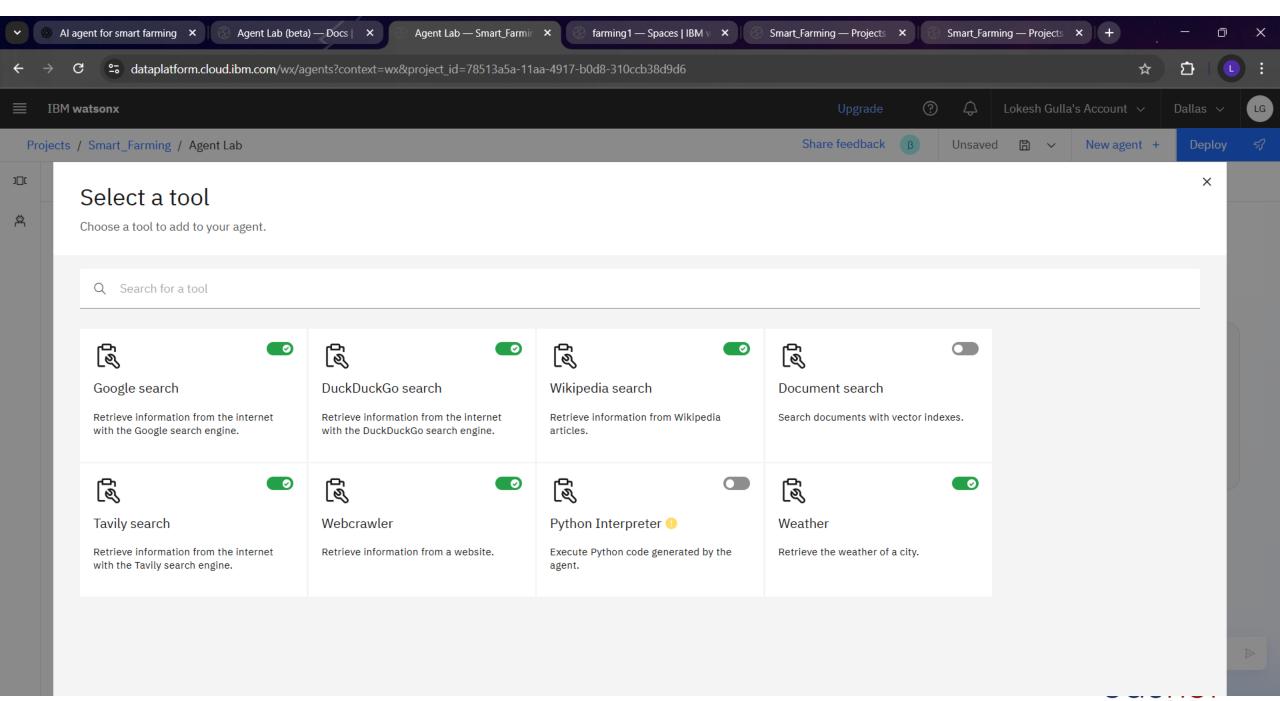
IBM Cloud account with access to IBM Cloud Lite services, IBM Granite model, Relevant agricultural datasets, weather data and api.

- Libraries & Tools:
- IBM Granite and cloud services.
- Instructions to build agent from user which is required to the required results.
- Tools like Wikipedia, rapid api, document search, weather and many more.
- Knowledge which are above datasets.









MODEL & DEPLOYMENT

■ In the Model section, Large learning Model like IBM Granite (granite-3-3-8-b instruct) for AI Agent chosen for helping farmers.

Model:

- Selecting the best LLM model (granite-3-3-8-b instruct) which is helpful to give best responses from following user instructions which are goal oriented.
- Chosen for its strong natural language understanding and generation capabilities.
- Converts knowledge base content (datasets, PDFs, text files) into searchable vector form for Retrieval-Augmented Generation (RAG)

Data Input:

Crop recommendations, Commodity (mandi) prices, Pest control data, Soil guidelines, Weather datasets, National agricultural guidelines (NPSMF).

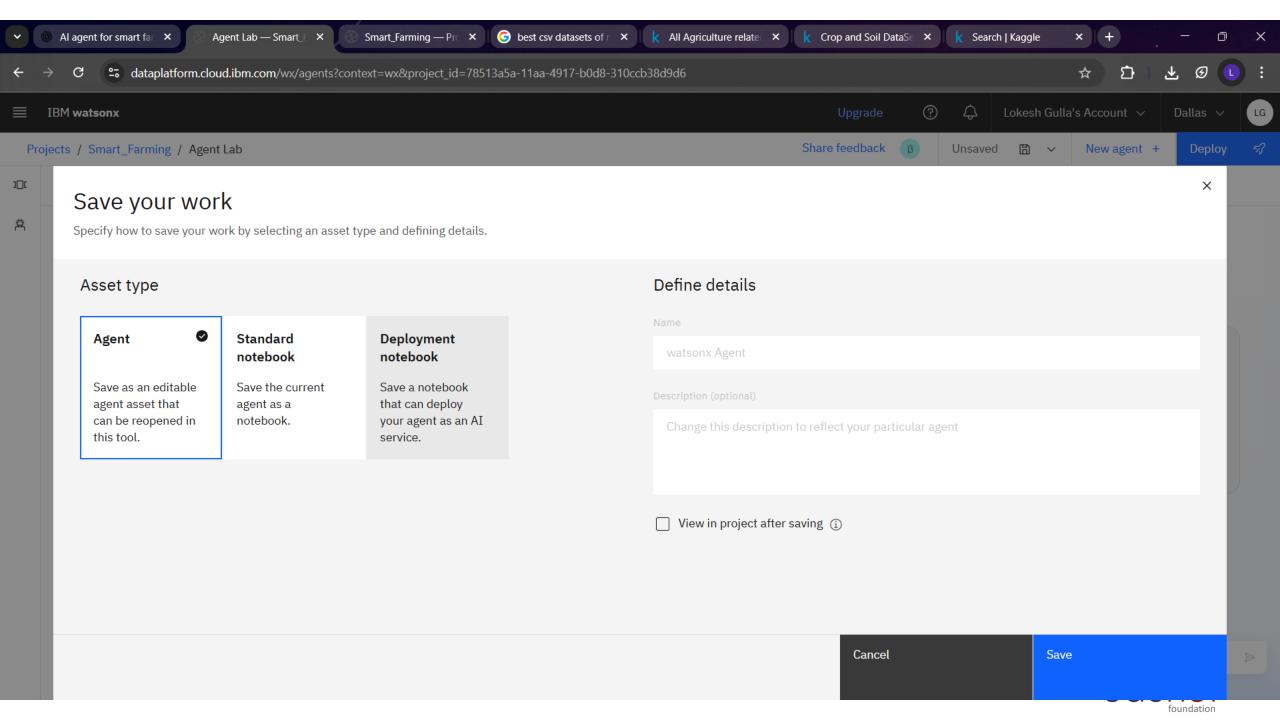
Training Process:

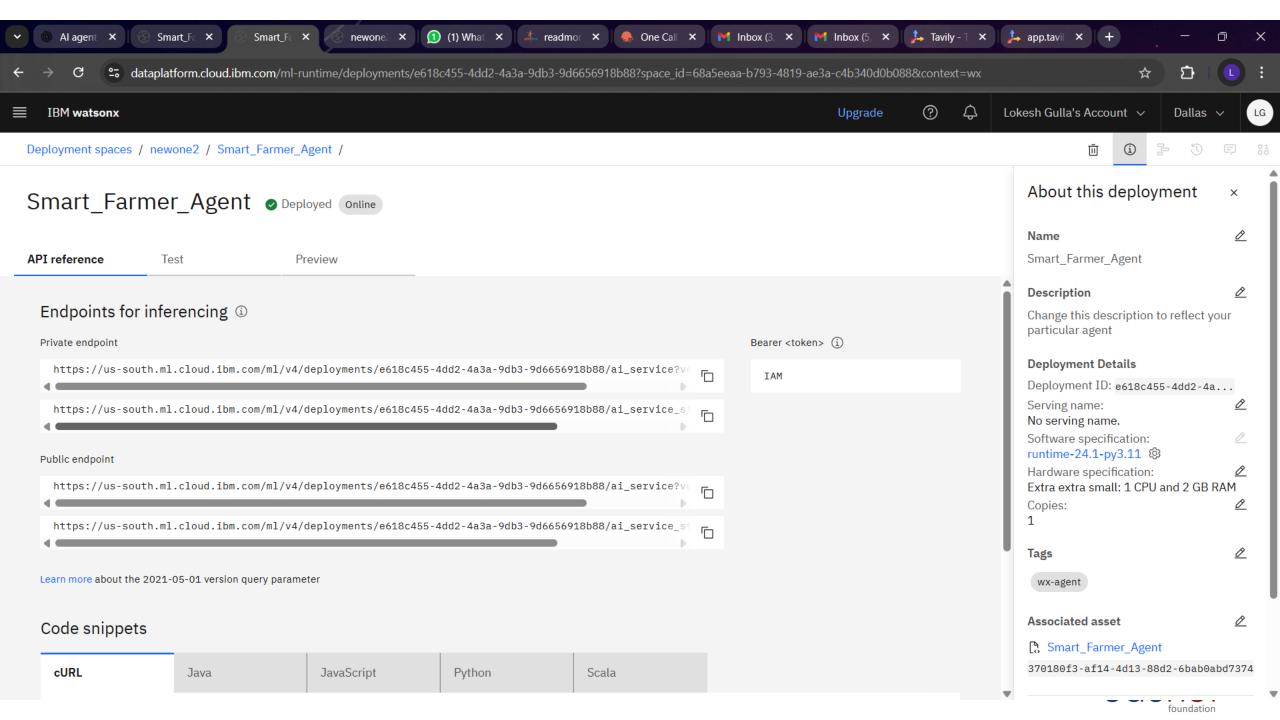
- The AI Agent take tools in each section like knowledge, tools, specified model, Project favorable instructions to work properly.
- Also give favorable input and output from farmers which helpful to easy to understand to them. Follow prompting techniques.
- Ask questions from farmers, check responses whether working properly or not from this model, if problem faces retrain it.

Deploy Process:

- Save the AI Agent asked and click deploy asked to create new space and asks api key give it properly and deploy.
- Shows the API references, Test, Preview sections, Project details fully related to the Smart Farming Advisor Agent.







RESULT

The deployed AI Agent was tested with multiple farmer queries in English and local languages (Hindi, Telugu, Tamil, Kannada). It successfully retrieved relevant agricultural information from the Knowledge Base and integrated live API results for weather and mandi prices.

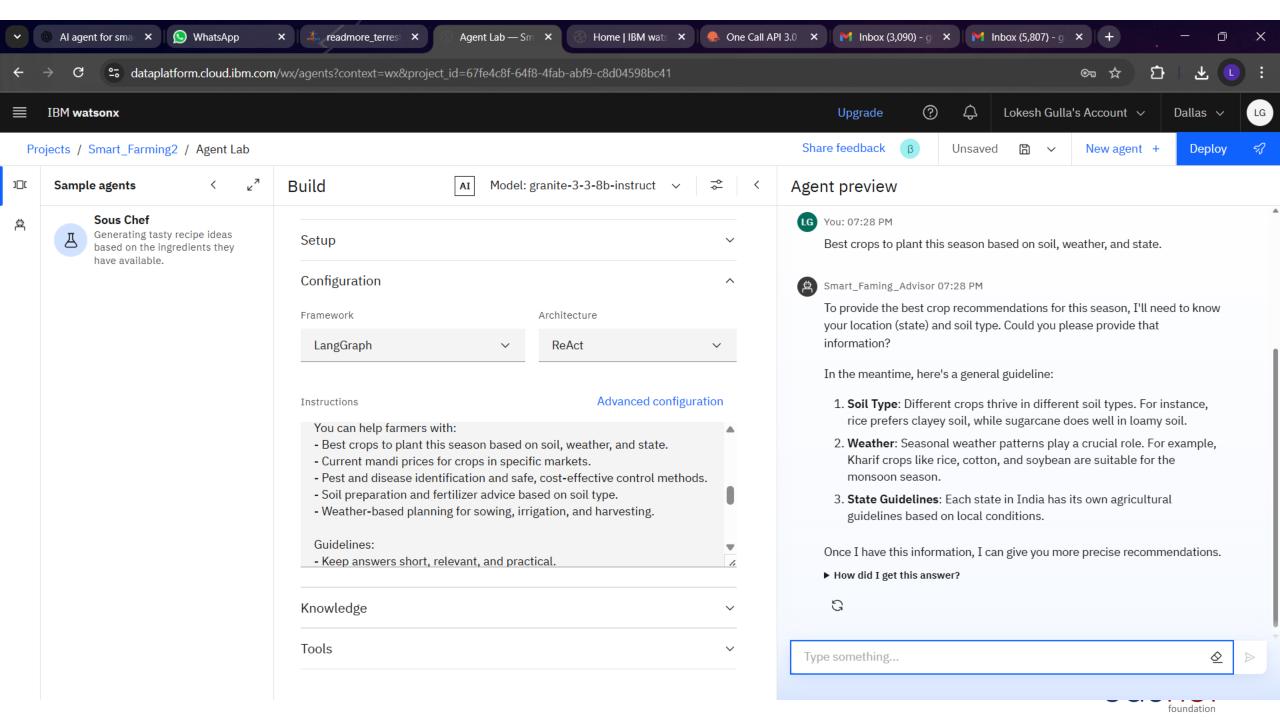
Example Outputs:

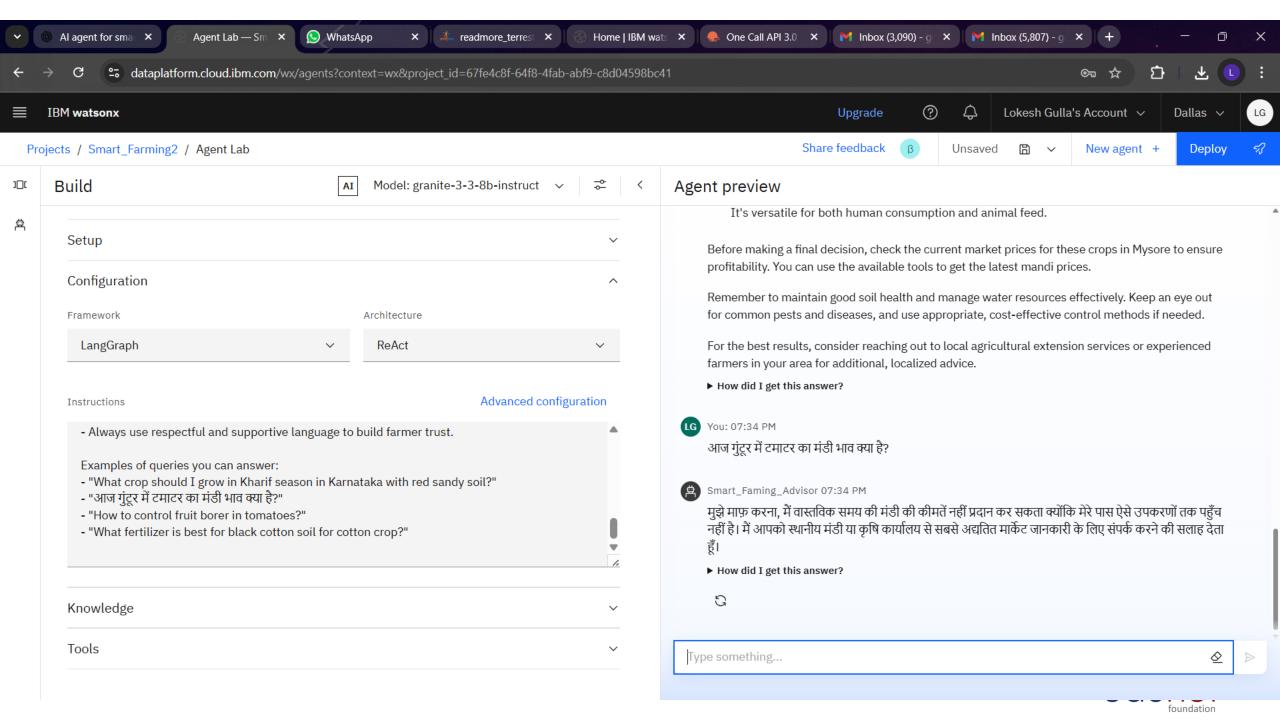
- Query: "What crop should I plant in Kharif in Karnataka with red sandy soil?"
- **Response**: "Millets and groundnut are recommended for Kharif in Karnataka with red sandy soil due to low water needs and good profitability."
- Query: "आज गुंटूर में टमाटर का मंडी भाव क्या है?" Response: "आज गुंटूर में टमाटर का औसत मंडी भाव ₹1450 प्रति क्विंटल है।"

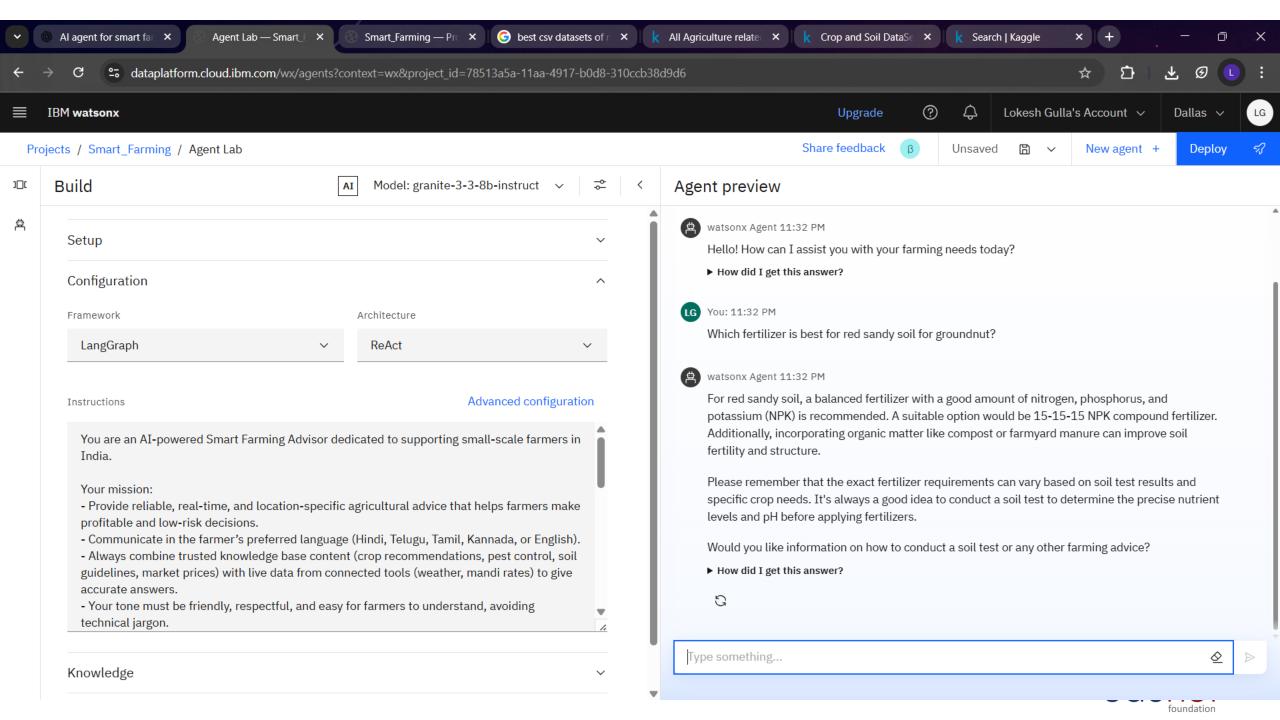
Performance Highlights:

- Accurate and context-based answers using RAG.
- Real-time integration with weather and market price APIs.
- Smooth handling of multilingual queries.
- Simple, actionable advice for farmers.









CONCLUSION

- The Smart Farming Al Agent successfully bridges the gap between farmers and critical agricultural knowledge.
- By combining IBM Watsonx Granite models, RAG, and real-time APIs, it delivers accurate, localized, and multilingual advice on crops, prices, pests, weather, and soil management.
- Farmers receive **actionable recommendations** that improve yield, reduce risks, and increase profitability.
- The system's multi-language support ensures inclusivity for farmers from different regions.
- This AI-driven approach empowers farmers to make **data-driven decisions**, reducing dependency on middlemen and outdated information sources.



FUTURE SCOPE

- **IoT Integration:** Connect with soil moisture, temperature, and humidity sensors for real-time farm monitoring.
- **Satellite Imagery Analysis:** Detect crop health issues, pest outbreaks, and irrigation needs using remote sensing.
- **Expansion of Language Support:** Add more Indian regional languages and dialects for wider farmer reach.
- Offline Mobile App: Provide AI-powered advice without internet dependency in rural areas.
- **Predictive Analytics:** Forecast pest infestations, crop yields, and market trends for better planning.
- Integration with Government Portals: Link with agricultural subsidy, crop insurance, and market support schemes.



REFERENCES

- IBM Cloud: https://cloud.ibm.com
- IBM Watsonx.ai Documentation: https://dataplatform.cloud.ibm.com/docs
- IBM Granite Models: https://www.ibm.com/granite
- AGMARKNET Agricultural Marketing Information Network: https://agmarknet.gov.in/
- OpenWeatherMap API https://openweathermap.org/api
- Indian Meteorological Department (IMD) https://mausam.imd.gov.in
- ICAR Indian Council of Agricultural Research https://icar.org.in
- NPSMF National Project on Soil Mapping and Fertilizer Recommendations https://fert.nic.in



IBM CERTIFICATIONS



Screenshot/ credly certificate(getting started with AI)



IBM CERTIFICATIONS



Screenshot/ credly certificate(Journey to Cloud)



IBM CERTIFICATIONS



Screenshot/ credly certificate(RAG Lab)



THANK YOU

