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# **CAPSTONE PROJECT**

## **SMART FARMING AI AGENT FOR REAL-TIME AGRICULTURAL GUIDANCE**

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# OUTLINE

- **Problem Statement**
- **Proposed System/Solution**
- **System Development Approach**
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
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- **References**

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# PROBLEM STATEMENT

Small-scale farmers in India often face challenges in making informed decisions due to lack of real-time, localized guidance on farming practices. These include uncertainties about crop suitability, pest outbreaks, weather impact, and fluctuating market prices. Without timely and trustworthy advice, their yields and incomes are at risk. There is a critical need for an AI-powered assistant that delivers contextual, region-specific farming advice in the farmer's local language.

# PROPOSED SOLUTION

## PROPOSED SOLUTION:

- The Smart Farming AI Agent aims to solve this problem using Retrieval-Augmented Generation (RAG) and IBM Watsonx. The system delivers real-time answers to the farmer queries.

## Key Features:

- Retrieves trusted agricultural data from APIs and internal sources
- Interacts via chat interface to answer queries on crops, weather, pests, and market
- Built using IBM Granite LLM with tools like Google Search, Wikipedia, Weather

## Components:

- RAG-based Agent Lab interface
- Agent Tools: Google, Weather, Wikipedia Search
- Deployed using Watsonx.ai deployment space

# SYSTEM APPROACH

## Technologies Used:

- IBM Watsonx.ai Studio
- Granite Foundation Model (``granite-3-3-8b-instruct``)
- IBM Agent Lab (to create and deploy the AI agent)
- IBM Cloud Object Storage
- Python and Streamlit for frontend development
- Requests library for API integration
- GitHub for version control and deployment reference

# SYSTEM APPROACH

## System Requirements:

- IBM Cloud Lite account with Watsonx runtime
- Deployed Agent via IBM Deployment Space
- Public or local hosting of Streamlit app (e.g., streamlit.app or localhost)
- Internet access to communicate with IBM's REST API
- Streamlit environment (Python 3.10+, `streamlit`, `requests`)

# ALGORITHM & DEPLOYMENT

## Model & Interaction:

- Agent model: IBM Granite-3-3-8b-Instruct
- AI Agent created using IBM Agent Lab
- Agent enhanced using tools: Google Search, Weather, Wikipedia

## Streamlit Deployment:

- Streamlit used to build custom front-end UI for the agent
- User inputs are sent to IBM Watsonx AI via REST API
- Access token dynamically fetched using IBM API key
- Answers are streamed back and shown in real-time on the app

## Deployment URL:

<https://chz-smart-farm.streamlit.app>

# RESULT

The screenshot displays the IBM watsonx Agent web interface. The browser address bar shows the URL: `https://dataplatfom.cloud.ibm.com/wx/agents/afad7f4f-99c2-4cae-bfb1-f3c9be9f375e?project_id=c2fb919c-9756-4aa5-9bed-eab5e33dfcf6&context=wx&open_agents=true`. The interface is divided into two main sections: 'Build' on the left and 'Agent preview' on the right.

**Build Section:**

- Model:** Set to 'granite-3-3-8b-instruct'.
- Framework:** Set to 'LangGraph'.
- Architecture:** Set to 'ReAct'.
- Instructions:** A text box contains the following text:  
You are a smart farming assistant for small-scale Indian farmers.  
Your job is to give helpful advice about:  
- What crops to grow in different regions and seasons  
- Fertilizers and pest control methods
- Tools:** Two buttons are visible: 'Add a tool' and 'Create custom tool'.

**Agent preview Section:**

The chat window shows a conversation between a user (VN) and the watsonx Agent.

**User (VN):** 11:40 PM  
What is the weather today in Coimbatore? Will it rain this week in Hyderabad? Is monsoon season good for growing rice?

**watsonx Agent:** 11:40 PM  
Hi, I am Watsonx Smart Farming Assistant. How can I help you?

1. The current weather in Coimbatore is 23.2°C with 0.1mm of rain, 89% relative humidity, and a wind speed of 12.2km/h.
2. For Hyderabad, the weather forecast indicates a chance of rain this week. However, for the most accurate and up-to-date information, I recommend checking a reliable weather forecast service.
3. Monsoon season is generally considered good for growing rice. Rice is a water-intensive crop and requires a hot and humid climate to thrive. It's traditionally a kharif crop in India, planted in the rainy season and harvested in the autumn. However, the success of rice cultivation also depends on other factors like soil type, irrigation facilities, and pest management.

Below the list, there is a link: [How did I get this answer?](#)

The input field at the bottom of the chat window contains the text: 'Type something...'

The bottom of the screenshot shows a Windows taskbar with the date and time: 11:40 PM, 03-08-25, and the language set to ENG IN.



# RESULT

The screenshot displays the IBM watsonx Agent web interface. The browser tabs include 'Project', 'Smart Farming Ai Agent Deploy', 'watsonx Agent — Smart Farming', 'IBM', and 'Demo on Agentic AI on IBM Cloud'. The URL is [https://dataplatform.cloud.ibm.com/ml-runtime/deployments/1b037028-e3f3-4b77-8ad1-ae72027803d/chat?space\\_id=c9823e52-92a4-4674-bcfe-9c5945dabc6a&context=wx&...](https://dataplatform.cloud.ibm.com/ml-runtime/deployments/1b037028-e3f3-4b77-8ad1-ae72027803d/chat?space_id=c9823e52-92a4-4674-bcfe-9c5945dabc6a&context=wx&...). The breadcrumb navigation shows 'Deployment spaces / Smart Farming Ai Agent Deploy / watsonx Agent /'. The main heading is 'watsonx Agent' with a green 'Deployed' status and an 'Online' indicator. Below the heading are tabs for 'API reference', 'Test', 'Evaluations', and 'Preview', with 'Preview' being the active tab. A 'New chat +' button is in the top right. The chat history shows a user query at 11:49 PM: 'What is urea fertilizer used for? What are the advantages of drip irrigation? Explain organic farming in simple terms.' The agent's response at 11:49 PM starts with 'Let's break down your questions:' followed by two numbered points. The first point, '1. Urea Fertilizer', explains its use for crops like wheat, rice, sugarcane, and vegetables, and its benefits for soil fertility and disease resistance. The second point, '2. Advantages of Drip Irrigation', lists three advantages: 'Water Conservation', 'Nutrient Management', and 'Weed Control'. At the bottom, there is a text input field with the placeholder 'Type something...' and a send button.

Deployment spaces / Smart Farming Ai Agent Deploy / watsonx Agent /

watsonx Agent ✓ Deployed Online

API reference Test Evaluations **Preview**

New chat +

**You 11:49 PM**  
What is urea fertilizer used for? What are the advantages of drip irrigation? Explain organic farming in simple terms.

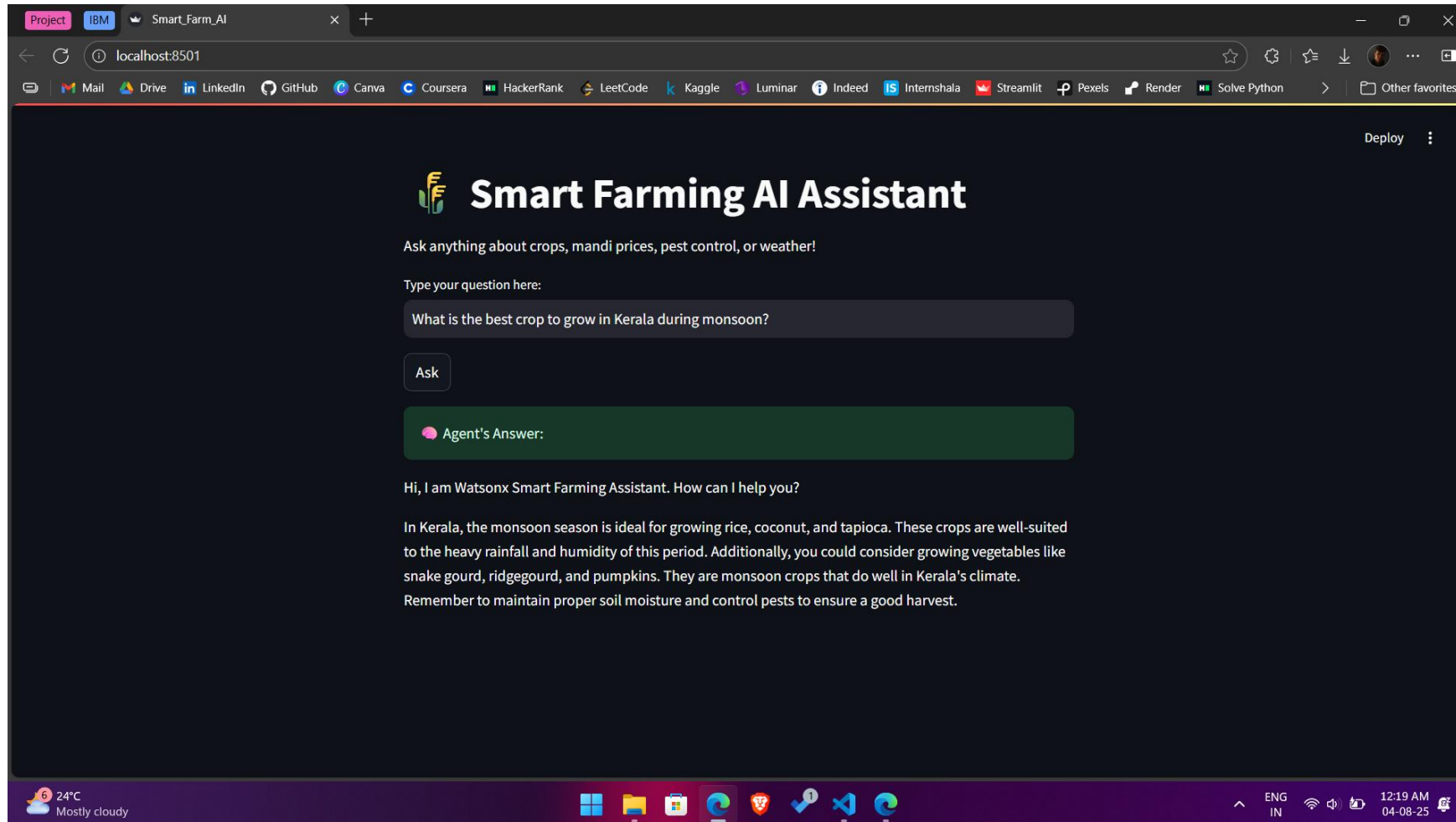
**watsonx Agent 11:49 PM**  
Let's break down your questions:

- 1. Urea Fertilizer:** Urea is a popular nitrogen-rich fertilizer used to promote healthy plant growth. It's primarily used for crops like wheat, rice, sugarcane, and vegetables. Urea improves soil fertility, enhances crop yield, and helps in disease resistance.
- 2. Advantages of Drip Irrigation:** Drip irrigation is a highly efficient method of watering plants. Here are some advantages:
  - **Water Conservation:** It delivers water directly to the plant roots, reducing evaporation and saving water.
  - **Nutrient Management:** It can be used in conjunction with fertilizers to provide nutrients directly to the root zone.
  - **Weed Control:** Since water is applied directly to the root zone, it can help suppress weed growth.

Type something...

24°C Mostly cloudy 11:49 PM 03-08-25

# RESULT



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# CONCLUSION

The Smart Farming AI Agent effectively bridges the knowledge gap for small-scale Indian farmers. It provides contextual and multilingual answers powered by IBM Watsonx AI, increasing farming accuracy and reducing guesswork. The platform demonstrates how retrieval-augmented generation can improve agricultural decision-making in real-time.

# FUTURE SCOPE

## FUTURE SCOPE:

- Add voice-based support for farmers with low literacy
- Integrate crop disease detection via image input
- Expand to multilingual support using translation APIs
- Include financial advice based on crop cycles and subsidy availability
- Train the model on Indian agricultural datasets for hyperlocal accuracy

# REFERENCES

- IBM Watsonx Documentation
- RAG-based Agent Lab – IBM Official Guide
- Edunet Foundation IBM Internship Program –Instructor led sessions
- Demo on Agentic AI on IBM Cloud –Internship Guide PDF provided via Edunet Group

# IBM CERTIFICATIONS

In recognition of the commitment to achieve  
professional excellence



## Vaisakh Nirupam

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/bdf79bed-647e-4880-9382-f3a6d78c5bcc>



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Journey to Cloud: Envisioning Your Solution



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# IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Vaisakh Nirupam

for the completion of

**Lab: Retrieval Augmented Generation with  
LangChain**

(ALM-COURSE\_3824998)

According to the Adobe Learning Manager system of record

**Completion date:** 29 Jul 2025 (GMT)

**Learning hours:** 20 mins





# THANK YOU