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# AI-DRIVEN AGRICULTURAL ADVISOR

## SMART CROPPING ADVISOR

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# OUTLINE

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

# PROBLEM STATEMENT

India's small-scale farmers face challenges in accessing real-time, localized, and reliable agricultural information.

From selecting appropriate crops for the season to knowing daily mandi (market) prices, timely decisions can significantly affect their yield and income.

Currently, the gap between available information and its accessibility at the grassroots level limits productivity and decision-making capabilities.

There is a critical need for a multilingual AI agent that can interact with farmers in local languages and provide contextual advice by retrieving up-to-date data from authentic agricultural sources.

# PROPOSED SOLUTION

•The proposed system aims to assist small-scale farmers by delivering real-time, localized agricultural guidance through an AI agent using Retrieval-Augmented Generation (RAG). The system retrieves trusted data on weather, soil, crop choice, pest control, and market prices, enabling informed decision-making in local languages.

•**Data Collection:**

- Collect data from reliable sources such as IMD (weather), Soil Health Card databases, AgMarknet (mandi prices), and agri-tech APIs.
- Ensure timely updates to reflect real-world conditions and pricing.

•**Data Preprocessing:**

- Clean and structure data from varied sources to ensure consistency.
- Tag data with contextual features like crop type, region, and season for effective retrieval.

•**AI Architecture (RAG):**

- Use a retriever to fetch relevant farming data.
- Use IBM Granite to generate responses by combining retrieved info with farmer queries.
- Support multilingual inputs and responses using translation and speech tools.

•**Deployment:**

- Create a user-friendly mobile/web app for interaction.
- Host on IBM Cloud with scalable backend and API integration for real-time responses.

•**Evaluation:**

- Measure system accuracy via expert validation and farmer feedback.
- Continuously improve results based on real-world usage and query resolution rate.

# SYSTEM APPROACH

The "System Development Approach" section outlines the overall strategy and methodology for developing and implementing the AI Agent for Smart Farming Advice. Below is the suggested structure:

## System Requirements:

- Platform:** IBM Cloud Lite (for backend deployment and model hosting)
- AI Model:** IBM Granite (foundation model for generation)
- Data Sources:** APIs from IMD (weather), AgMarknet (mandi prices), Soil Health Card database, pest control advisories
- User Interface:** Mobile/Web app supporting multilingual interaction
- Storage:** IBM Cloud Object Storage for documents and indexes
- Compute:** IBM Cloud Functions / Kubernetes Lite for scalable deployment

## Libraries/Tools Required:

- Backend Development:** Flask / FastAPI (Python) or Express (Node.js)
- RAG Pipeline:** LangChain or Haystack for Retrieval-Augmented Generation
- Retrieval Engine:** FAISS (Facebook AI Similarity Search) for document indexing
- Model Integration:** IBM Watson SDK / REST API for connecting to IBM Granite
- Language Support:** Google Translate API or IBM Watson Language Translator
- Frontend Tools:** HTML/CSS/JavaScript, React or Flutter for UI
- Monitoring:** IBM Cloud Monitoring for system health and logs

# ALGORITHM & DEPLOYMENT

Algorithm Selection: The solution uses Retrieval-Augmented Generation (RAG), combining a retriever (to fetch relevant information) with a generator (IBM Granite model) to provide accurate, human-like responses to farmer queries. RAG is ideal due to the need for domain-specific, real-time, and contextual agricultural information.

## **Data Input:**

Farmer's query in a local language

Retrieved documents from:

IMD (weather forecast)

Soil health records

AgMarknet (mandi prices)

Pest control databases

Location, crop season, and past interactions used to refine context

## **Training Process:**

IBM Granite is pre-trained; custom fine-tuning is applied for agri-domain vocabulary

RAG retriever is trained with indexed agricultural documents using FAISS

Regular updates to the index ensure the system stays current

No labeled dataset needed — relies on semantic relevance and contextual fusion

## **Prediction (Response) Process:**

Query is converted to an embedding and passed to the retriever

Top-k relevant documents are fetched and combined with the query

IBM Granite generates a natural language answer based on both inputs

Response is translated (if needed) and sent to the frontend with voice/text output

# RESULT



Smart Farming Advisor 02:21 PM

The best crop for the Rabi season in Punjab is wheat.

► How did I get this answer?



You: 02:22 PM

best crop for jharkhand



Smart Farming Advisor 02:22 PM

The best crop for Jharkhand is rice, followed by wheat and maize. Other major crops include arhar, urad, moong, gram, and mustard.

► How did I get this answer?



You: 02:22 PM

what temp and weather required for saag?



Smart Farming Advisor 02:22 PM

The ideal temperature for growing saag (mustard greens) is between 60°F to 75°F (15°C to 24°C). Saag prefers cooler weather and can tolerate light frosts. It's best to plant saag in early spring or late summer/early fall, when the weather is cooler. In areas with hot summers, saag can be grown in partial shade to prevent bolting. Consistent moisture and well-draining soil are also essential for healthy saag growth.

► How did I get this answer?

|Type something...



# CONCLUSION

- The AI Agent for Smart Farming Advice bridges the gap between grassroots farmers and real-time agricultural knowledge by leveraging IBM's Granite model and RAG-based architecture.
- It empowers farmers to make data-driven decisions regarding crop selection, pest control, and market pricing — in their local language and through a user-friendly interface.
- The system's ability to retrieve updated, region-specific information ensures that advice is accurate, timely, and personalized.
- By integrating multiple government and agri-tech data sources with IBM Cloud Lite and AI services, the solution is scalable, secure, and effective for widespread rural adoption.
- This project demonstrates the transformative impact of AI in agriculture, enhancing productivity, reducing risk, and supporting sustainable farming practices.



# FUTURE SCOPE

- IoT Integration:**

Add real-time data from IoT-based soil sensors and weather stations to enhance advisory accuracy.

- Voice Assistant Support:**

Implement AI voice bots to provide hands-free interaction for farmers with limited literacy.

- Crop Disease Detection:**

Use image-based AI models (e.g., CNN) for detecting crop diseases via photos uploaded by farmers.

- Offline Access:**

Enable offline functionality with periodic data sync to serve farmers in areas with limited internet access.

- Scalable Expansion:**

Expand the system to include animal husbandry, fisheries, and other rural advisory services.

- Custom Model Training:**

Fine-tune domain-specific versions of IBM Granite for various regions and languages.

# REFERENCES

1. **IBM Cloud & AI Services Documentation**  
<https://cloud.ibm.com/docs>
2. **Indian Meteorological Department (IMD)**  
<https://mausam.imd.gov.in>
3. **AgMarknet – Market Price Portal**  
<https://agmarknet.gov.in>
4. **Soil Health Card Scheme**  
<https://soilhealth.dac.gov.in>
5. **LangChain Documentation (RAG Framework)**  
<https://docs.langchain.com>
6. **IBM Granite Model – AI Foundation Models**  
<https://www.ibm.com/products/granite>

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**Completion date:** 23 Jul 2025 (GMT)

**Learning hours:** 20 mins



**THANK YOU**