

Development of a Multilingual AI-Based Agricultural Chatbot for Farmer Assistance

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Abstract:

Agriculture is an important part of India's economy. Farmers require quick access to information on crops, soil, fertilizers, irrigation, pests and diseases, weather and government schemes. However, language, limited information and connectivity, and lack of access to experts create problems for farmers in getting information in time. To solve these problems, this paper details the development of a multilingual AI-based agricultural chatbot with simple human-computer interaction. The chatbot is done in two languages, Hindi and Marathi apart from English to answer queries related to crops, soil, fertilizers, irrigation, pests and diseases, weather and government schemes. The implementation is done with the help of Python and Flask. SQLite is used as a database to store interaction history of users with the chatbot. Weather information is obtained through APIs and the dashboard gives detailed information on the number of chats at all times. In the study, the chatbot was tested by running agriculture-related queries in English, Hindi, and Marathi, which proved that the chatbot was capable of communicating with the users in all languages. To summarize, the work demonstrated a way of how to make agricultural information available to farmers by providing them with the ease of access to the information when.

Keywords —Agricultural Chatbot, Artificial Intelligence, Natural Language Processing, Multilingual System, Agriculture, Crop Recommendation, Soil Information, Irrigation, Weather Information, government schemes, SQLite.

I. INTRODUCTION

Agriculture plays a key role in the Indian economy as it provides job opportunities to many people. Farmers need accurate information to help them make decisions related to crop selection, soil management, fertilizers, irrigation, pest and disease management, weather conditions and government schemes. But getting the required information can be a challenge for farmers because of language barriers, limited digital literacy, and lack of access to agricultural specialists.

Artificial Intelligence (AI) and Natural Language Processing (NLP) have opened new avenues for providing agricultural information using intelligent chatbots. A chatbot allows users to communicate with the system using a natural language to get information without having to navigate complex information systems. Various studies have investigated multilingual agriculture chatbots, AI-based farmer assistance systems, and chatbot-based agricultural advisory systems.

Language accessibility is very critical in the Indian agriculture sector since farmers may prefer regional languages to communicate. A multilingual agriculture chatbot can thus help make information more accessible by letting farmers communicate in the language they are comfortable with. The chatbot focuses on the use of English, Hindi, and Marathi for providing agricultural advisory services.

The proposed chatbot provides information about crop advice, soil information, fertilizers, irrigation, diseases, weather conditions and government schemes.

II. PROBLEM STATEMENT

Farmers need timely and accurate information on crop selection, soil management, fertilizers, irrigation, pest and disease control measures, climatic conditions, and government agricultural schemes. However, getting relevant agricultural information is not easy due to language issues, lack

of access to experts, and difficulties with complex digital information systems.

Most of the present-day agricultural help systems concentrate on a particular field of services or use inconvenient interfaces for farmers who want to receive the information in their mother tongue. Therefore, a convenient system of communication that can deliver the needed agricultural information in languages widely used by Indian farmers has to be developed.

In addition, agricultural information is usually distributed among various sources. For instance, farmers might have different sources of crop information, soil recommendations, irrigation, fertilizer, disease-related information, weather information, and other relevant information.

Thus, the issue discussed in this research is the creation of an uncomplicated multilingual agricultural chatbot able to assist farmers through an interactive web interface. This chatbot should be able to operate in English, Hindi and Marathi; to clarify agricultural questions with information about various crops, soils and fertilizers, irrigation processes, diseases and government programs, to pull weather data via API, to keep track of chat sessions.

The system also solves the need of basic usage analytics by providing a dashboard with such information as the number of chats, daily chats, information regarding the most common types of crops and crop-related inquiries.

III. OBJECTIVES

The primary goal of this study is to create a simple, user-friendly agricultural chatbot in multiple languages that can offer useful information to farmers via a conversational interface.

The detailed goals of the proposed system are as follows:

1. To create a multilingual chatbot that is able to provide information in English, Hindi, and Marathi, thus increasing accessibility to agricultural information.
2. To offer guidance on crops including information about suitable crops based on the demands of users.

3. To provide recommendations with respect to soil type by providing suitable crops and key characteristics of various soil types.

4. To provide information about irrigation in order to help farmers choose wisely regarding irrigation.

5. To provide information on fertilizers based on questions regarding agriculture.

6. To provide information on pests and diseases in order to help farmers know the common problems in agriculture and how to solve them.

7. To provide information about the government schemes of agriculture so that farmers can get information on agricultural schemes.

8. To implement an API for weather information that can be used to provide weather-related services to users.

9. To document the history of communication based on the information stored in the SQLite database.

10. To create a dashboard intended for chatbot analytics using measurements like the total number of chats, daily chats, most searched crop, inquiries related to weather information, and usage of languages.

11. To put the chatbot to the test using agricultural inquiries in three languages i.e., English, Hindi, and Marathi and analyze its ability to provide accurate multilingual responses and its overall functioning.

IV. LITERATURE REVIEW

The recent literature has shown how Artificial Intelligence, Natural Language Processing, and multilingual conversational systems have opened up new avenues for better access to agricultural information. The current systems are somewhat like the agricultural chatbot proposed in the present study.

1 *CropCare Companion*: An AI Powered Multilingual Chatbot for Agricultural Assistance

Saili Sable, Siddhi, Chinmayi Vaidya, and Shubham Mashalkar have proposed the

CropCare Companion: a multilingual chatbot based on AI for agricultural assistance. The study finds how poor access to agricultural information due to language barriers and limited access to agricultural experts creates problems for the farmers.

The study concludes that multilingual conversational systems have great potential to improve access to agricultural information. However, the system relies on an internet connection and does not have image-based disease detection functions, nor does it have a way of providing real-time weather information or market-price integration, creating possibilities for developing a more integrated system for agricultural assistance.

2. AgriTalk: Transforming Farming with a Multilingual Chatbot

M. V. Abhishek, A. Jaya Sreekar, D. M. Mohith, Susmitha Vekkot, and V. Bhavana came up with AgriTalk, which is a multilingual agricultural chatbot that employs natural language processing technology. This system supports the following languages: English, Hindi, Kannada, Malayalam and Telugu. Sentence transformers are employed to help with comprehending agricultural queries.

AgriTalk showcases use of NLP-based multilingual chatbots in agricultural communication. Despite its potential, this system is also limited by the fact that it lacks functionalities in the areas of disease detection, pricing, and personalisation. The limitations suggest need for agricultural chatbots that provide several agricultural functionalities under one platform.

3. Farmer.Chat: Deploying AI-Driven Agriculture Solutions for Smallholder Farmers

According to Namita Singh, Mohammed Irfan Rafiq, Rikin Gandhi, and Akshay Nambi (2024), they have developed a generative AI-based agricultural chatbot known as Farmer.Chat which aims to offer timely, region and farmer-specific help to smallholder farmers. This system uses Retrieval-Augmented Generation (RAG) for context-aware agricultural solutions and has been developed to be implemented on a large scale.

While Farmer.Chat has paved the way for showing the capability of generative AI in agriculture consultancy, its reach is huge, and its focus is not limited to Indian vernacular languages like Marathi or to specific local conditions of farming in India. This opens the door for creating a less advanced version of an agricultural chatbot that may be designed particularly for Indian farmers.

V. RESEARCH GAP

The analysis of the studies confirms that AI-based and multilingual conversational systems can enhance the accessibility of agriculture data. Still, the available systems have various drawbacks, including the absence of integrated real time services and limited number of covered languages as well as niches of agricultural knowledge.

It means that there is a necessity to create a user-friendly and integrated agricultural chatbot for Indian farmer users.

The system that is going to be created will fill in the gap since it is going to provide information and advice in English, Hindi, and Marathi, and will cover agriculture, soil, fertilizer, watering, disease, weather and government schemes related theses. The system also includes a web based dashboard enabling user interaction analysis and determination of the most frequently requested agricultural knowledge.

Thus, the system will unify multilingual agriculture assistance and weather forecast access with analysis of chat history and user behaviour through a dashboard.

VI. PROPOSED SYSTEM

The proposed system is a multilingual agricultural chatbot developed with the aim of providing agricultural information over the web via a simple conversational interface. It is aimed mainly at farmers who need immediate information about crop production and agricultural practices.

The chatbot has the capability to work in English, Hindi, and Marathi. Through the chatbot, the users can communicate their queries in their language of choice.

The proposed system covers multiple agricultural information categories, including:

- Crop information and suggestions
- Soil information and related crops
- Irrigation and water-related advice
- Fertilizer information
- Pest and disease information
- Government agricultural policies
- Weather information

The mechanism makes use of a weather API to retrieve data related to weather when queries are raised. This function enables the chatbot to cater to any information concerning weather in addition to the agricultural details stored in the system.

The chatbot uses an SQLite database to keep a record of all the discussions that take place. The saved conversations are then analyzed, and various statistics are drawn up such as the number of conversations that took place, the number of discussions that took place during the day, the crops asked about most often, and how many queries are raised with respect to a crop.

A web-based monitoring dashboard is incorporated to analyze the use of the chatbot. This is essential to understand which topics concerning agriculture are requested most often.

The overall objective of the proposed system is to combine multilingual agricultural assistance, weather information, chat-history management, and usage analytics into a single, easy-to-use platform for agricultural information access.

System Architecture

The proposed system follows a web-based client-server architecture in which the user interacts with the agricultural chatbot through a browser interface. The system is designed to process multilingual agricultural queries and provide relevant responses using structured agricultural information, weather data, and stored interaction history.

The architecture consists of the following major components:

User Interface:

The user enters agricultural queries through the web-based chatbot interface. The interface supports interaction in English, Hindi, and Marathi.

Language Detection and Translation Module:

The system detects the language of the user query. When required, the query is translated into English for internal processing. After generating the response, it can be translated back into the user's detected language.

Query Processing Module:

The processed query is analyzed to identify relevant agricultural keywords and categories. Based on the query, the chatbot determines whether the user is asking about crops, soil, irrigation, fertilizers, pests and diseases, government schemes, or weather information.

Agricultural Knowledge Base:

Structured agricultural information is used to generate responses for crop recommendations, soil guidance, irrigation, fertilizer information, pest and disease information, and government agricultural schemes.

Weather API Module:

If the query is related to weather, the system retrieves current weather information through the integrated weather API and returns the required weather details to the user.

Response Generation Module:

After identifying the appropriate information source, the system generates a response and presents it through the chatbot interface. The response is provided in the user's preferred language when translation is required.

SQLite Database:

User messages and chatbot responses are stored in an SQLite database. The stored chat history is used for maintaining interaction records and generating usage statistics.

Dashboard Analytics Module:

The dashboard analyzes the stored chat history and displays information such as total chats, today's chats, most-asked crop, top-asked crops, crop-wise query counts, weather-search count, and supported-language usage.

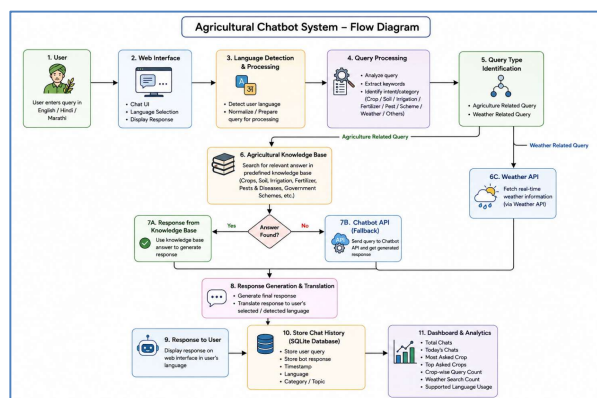


Fig. 1. System architecture of the proposed multilingual agricultural chatbot.

The system architecture diagram represents the major components of the proposed multilingual agricultural chatbot and their interaction. The user accesses the chatbot through a web-based interface and submits a query in English, Hindi, or Marathi.

The query is processed through the Language Detection and Processing module, followed by the Query Processing module. The system first searches the Agricultural Knowledge Base, which contains information related to crops, soil, irrigation, fertilizers, pests and diseases, and government agricultural schemes.

If a relevant answer is available in the knowledge base, the system uses the stored information to generate the response. If the required information is not available, the query is forwarded to the Chatbot API as a fallback mechanism for generating a suitable response.

For weather-related queries, the system communicates separately with the Weather API to obtain current weather information. The generated response is then processed and presented to the user in the appropriate language.

The system also stores chatbot interactions in an SQLite database. The stored data is used by the Dashboard Analytics module to analyze system usage, including total chats, daily chats, most-asked crops, crop-wise queries, weather searches, and language usage.

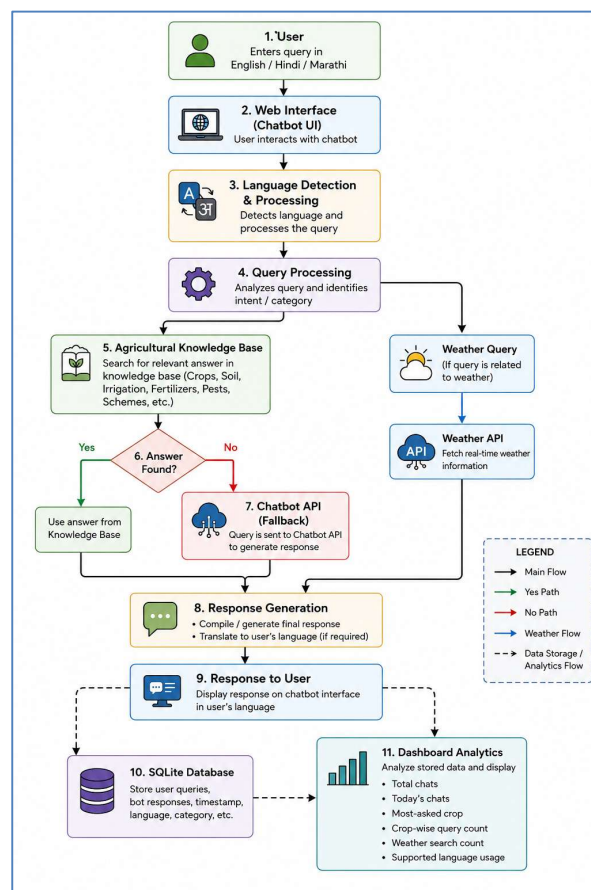


Fig. 2. Working flow of the proposed multilingual agricultural chatbot.

The working flow diagram illustrates the step-by-step operation of the proposed agricultural chatbot.

Initially, the user enters a query through the chatbot web interface. The system detects the language of the query and performs the required language processing. The query is then analyzed by the Query Processing module to identify its category and intent [3].

For agricultural queries, the system searches the Agricultural Knowledge Base. A decision is then made regarding whether a suitable answer is available. If an answer is found, the knowledge-base response is used. If an answer is not found, the query is forwarded to the Chatbot API (Fallback) to generate a response.

When the query is related to weather, it is directed to the Weather API, which provides the required weather information. The response from the knowledge base, Chatbot API, or Weather API is then passed to the Response Generation module.

If required, the response is translated into the user's selected language and displayed through the chatbot interface.

The interaction data is stored in the SQLite database. This stored information is subsequently used by the Dashboard Analytics module to monitor chatbot usage and generate agricultural query statistics.

Thus, the flow diagram demonstrates the complete working process from user query to response generation, data storage, and dashboard analysis.

VIII. METHODOLOGY

The presented system is designed as a multilingual agricultural chatbot utilizing a web-based framework intended to deliver agricultural knowledge through an interactive conversation format. The process consists of several steps, such as preparation of agricultural data, query processing, multilingual processing, generation of responses, management of database, weather API integration, analytics, and conducting system tests.

A. AGRICULTURAL DATA COLLECTION AND PREPARATION

The agricultural data used in the chatbot is structured into the following categories: crop advice, soil recommendation, irrigation, fertilizer advice, pests and diseases advice, and other agricultural assistance. Agricultural terms and other words that relate to agriculture are used to define user queries.

All of the collected information is organized systematically to enable the chatbot to correlate the user request with the correct category in order to formulate a corresponding answer.

B. MULTILINGUAL QUERY PROCESSING

The chatbot operates in three languages: English, Hindi, and Marathi. By assessing the user's input, the chatbot can detect the language of the question. Once the input is detected, it will be converted to English for later processing, if required.

The chatbot is also able to accommodate agricultural terminology in any language. For instance, the crop-related inputs can be given in

English, Hindi, or Marathi, making it easier for the users to input the queries in the chosen language.

C. QUERY CLASSIFICATION AND RESPONSE GENERATION

After receiving the query, the chatbot looks into the already prepared agricultural information based on the keywords found in the input. The chatbot will respond to the input based on the specified agricultural field.

The chatbot can provide information related to:

Crop recommendations

Soil types and suitable crops

Irrigation guidance

Fertilizer information [2].

Pest and disease information

Crop water requirements

Weather-related information

Government agricultural schemes

D. INTEGRATING WEATHER API

The information concerning weather data comes through the integration with a weather API. When the user inquires about the weather information, the system identifies the location and proceeds to obtain the necessary information using the API.

The incorporation of the weather API means that apart from the agricultural information, the chatbot will also be in a position to provide current weather data.

E. DATABASE AND CHAT HISTORY

SQLite is used by the system to keep the records of interactions with the chatbot. The user's messages and responses are stored so that the system could analyze previous interactions through the dashboard.

Storing chat history will also allow the system to compute other metrics such as total amount of conversations, daily conversations, searched for crops, and weather information.

F. DASHBOARD ANALYTICS

A web-based dashboard is implemented to analyse chatbot usage. The dashboard provides information including:

Total number of chats

Today's chat count

Most asked crop

Top asked crops

Weather-search count

Number of supported languages used

These analytics help evaluate user interaction patterns and identify frequently requested agricultural information.

G. TESTING AND EVALUATION

The chatbot designed is put through query testing, through agricultural questions posed in English as well as in Hindi and Marathi. The tests include tests that include questions of different natures about crop problems, questions of soil issues, questions to irrigation, questions related to fertilizers, queries about crop diseases, and queries related to agriculture.

The functionality of multi-language processing is tested by posing Agricultural Queries in the language of question being processed and verifying if appropriate answer is provided in the language in question. The functionality of the dashboard is also tested by generating various queries and checking whether the responses are properly represented in analytical statistics.

The outcome is then analyzed and used to check the functionality of the system while responding to queries in the respective language, answering agriculture-related questions as well as addressing other functions.

IX. TECHNOLOGIES USED

The proposed multilingual agricultural chatbot was developed using a combination of web technologies, database systems, APIs, and language-processing techniques.

Python: Used as the primary programming language for backend development and application logic.

Flask: Used as the web framework to develop the chatbot backend and handle user requests.

HTML, CSS and JavaScript: Used to design the web interface, chatbot interaction, and dashboard.

SQLite: Used to store chat history, user queries, and chatbot responses.

Agricultural Knowledge Base: Used to provide predefined information related to crops, soil, irrigation, fertilizers, pests and diseases, and government agricultural schemes.

Chatbot API: Used as a fallback mechanism when a suitable answer is not available in the predefined knowledge base.

Weather API: Used to retrieve current weather-related information based on the user's location.

Multilingual Processing: Supports English, Hindi, and Marathi queries and responses.

Dashboard and Data Visualization: Used to analyze chatbot usage, including total chats, frequently asked crops, weather searches, and other interaction statistics.

X. IMPLEMENTED FEATURES

The developed multilingual agricultural chatbot incorporates several features designed to provide farmers with easy access to agricultural information through a web-based conversational interface. The major implemented features of the system are described below.

1 Multilingual Query Support

The chatbot supports English, Hindi, and Marathi, allowing users to enter agricultural queries in their preferred language. This feature helps reduce language barriers and makes the system more accessible to users from different linguistic backgrounds.

2 Crop Advisory

The system provides information related to different crops, including basic crop requirements and suitable agricultural practices. Users can ask crop-related questions using English, Hindi, or Marathi agricultural terms.

3 Soil Recommendation

The chatbot provides information about suitable soil conditions and recommendations for different crops. This helps users understand the relationship between soil characteristics and crop selection.

4 Irrigation Guidance

The system provides information about irrigation methods and water-management

practices. It includes guidance related to methods such as drip irrigation and flood irrigation, along with general water-saving practices.

5 Fertilizer Information

The chatbot provides agricultural information related to fertilizers and their application. This feature helps users obtain basic guidance regarding fertilizer requirements for agricultural activities.

6 Pest and Disease Information

The system provides information about common agricultural pests and crop diseases. Users can enter questions describing crop-related problems and receive relevant information from the available agricultural knowledge base.

7 Government Agricultural Schemes

The chatbot also includes information related to government agricultural schemes. This feature enables users to obtain basic information about available agricultural support programs and schemes through the conversational interface.

8 Weather Information

A Weather API is integrated into the system to provide current weather-related information. When a user asks a weather-related question, the system identifies the required location and retrieves the corresponding weather information through the API.

9 Chatbot API Fallback

The system primarily searches its predefined agricultural knowledge base for answering user queries. If a suitable answer is not available, the query is forwarded to the Chatbot API as a fallback mechanism. This improves the system's ability to handle queries that are not covered by the predefined information.

10 Chat History and Database

The chatbot uses SQLite to store user queries and chatbot responses. The stored conversation history can be used to analyze user interactions and identify frequently requested agricultural information.

11 Dashboard Analytics

A web-based dashboard is implemented to monitor chatbot usage. It displays statistics such as total number of chats, today's chats, most

frequently asked crop, crop-wise question counts, and weather searches. These analytics provide an overview of user interaction with the system.

XI. MULTILINGUAL SUPPORT

The proposed agricultural chatbot will have multilingualism features to offer language preferences including English, Hindi, and Marathi to enable users to interact using their preferred language.

The user will be allowed to enter their agricultural questions using their preferred language from the chatbot's interface.

The multilingualism feature will involve the recognition of the language used by the user in the chatbot interface.

Agricultural terminologies such as crop names and other agricultural-related words can be interpretable in the three languages, English, Hindi, and Marathi. This feature will enable users to present their concerns using professional terminologies relevant to the conversation.

It is expected that the chatbot will present the responses in the same language offered by the users to enable easier reading and understanding of the information.

Multilingualism is an essential element in the proposed chatbot application because it targets to offer agricultural assistance through a conversation interface for users who might prefer regional languages rather than English.

XII. DATABASE AND DASHBOARD

Our system makes use of SQLite database to store user questions and the chatbot's replies. The chats are stored in the database to keep track of the conversation and to analyze the chatbot's performance.

The web dashboard displays the stored information in a well-organized manner. It shows the number of chats, chats per day, the crop asked about the most, number of queries per crop, number of weather searches, and languages used.

The dashboard and the database work together to ensure that the information stored is informative enough to help determine the most frequent inquiries and the chatbot's effectiveness. It can

also be used to check the overall performance of the proposed chatbot.

XIII. TESTING AND RESULTS

The developed agricultural chatbot was tested to validate the main functions and check the general working of the system. Various agricultural questions were asked to check the chatbot's answers about soil, crop, irrigation, fertilizers, pests and diseases, government schemes and subsidies, and weather.

The multi-language feature of the chatbot was tested by asking questions in English, Hindi, and Marathi to ensure that the chatbot can understand and answer in these languages.

The Chatbot API fall back was tested by asking questions that the chatbot cannot answer using the agricultural knowledge base. The questions about the weather were tested using the Weather API.

Finally, the storage of data was checked by ensuring that SQLite database stores the user's questions and the chatbot's answers. Additionally, the dashboards were tested by sending different questions and checking if chats, daily chats, crop questions, popular crops, and weather searches were updated.

The observed tests demonstrate basic multilingual responses, weather API output, and SQLite chat-history storage. Specific fertilizer guidance, response-language consistency, and dashboard analytics require further validation.

TABLE I. FEATURE-WISE TESTING RESULTS

Test Feature	Test Query / Input	Observed Output and Status
English language	Tell me about wheat	Wheat information displayed in English. Status: Pass.
Hindi language	मुझे आलू की जानकारी चाहिए	Potato information displayed in Hindi. Status: Pass.
Marathi language	टोमॅटोची माहिती द्या	Tomato information displayed in Marathi. Status: Pass.

Test Feature	Test Query / Input	Observed Output and Status
Roman Hindi	aalu ki jankari do	Potato information displayed in Hindi. Status: Pass.
Crop information	Tell me about rice	Rice-related information displayed. Status: Pass.
Soil guidance	What type of soil is suitable for cotton?	Crop-related information returned; detailed soil guidance needs validation. Status: Pass
Irrigation guidance	What is drip irrigation?	Drip-irrigation information displayed in English. Status: Pass.
Fertilizer guidance	Which fertilizer is suitable for tomato?	General tomato-growing information returned; no specific fertilizer recommendation. Status: Pass.
Weather API	What is the weather in Mumbai?	29.66°C; clear sky; humidity 67%. Status: Pass.
Government scheme	What is the PM-KISAN scheme?	Scheme information returned in Hindi for an English query. Status: Pass.
SQLite chat history	Submit an agricultural query	Sample query, response, and language records observed in the database. Status: Pass.
Dashboard analytics	Open the analytics dashboard	Dashboard open on click the button. Status:pass.

XIV. ADVANTAGES

The proposed multilingual agricultural chatbot offers several advantages to farmers and other users who need agricultural information.

Multilingual Accessibility: The chatbot supports English, Hindi, and Marathi, making it accessible to users who prefer to communicate in a language of their choice.

Easy Access to Agricultural Information: The chatbot provides information on topics such as crops, soil, irrigation, fertilizers, pests and

diseases, and government agricultural schemes in a conversational interface.

Chatbot API Fallback: Queries that are not covered by the predefined knowledge base can be handled by the integrated Chatbot API.

Weather Information: The integrated Weather API provides current weather-related information.

Simple Web-Based Interface: The user can access the chatbot through a web browser without having to install a complex application.

Centralized Agricultural Assistance: Multiple agricultural information services are available through a single platform.

Chat History Management: SQLite stores the chat history, which can be used to record and analyze previous interactions.

Dashboard Analytics: The dashboard provides useful statistics such as total chats, daily chats, crop-wise queries, most-asked crops, and weather searches.

Improved Accessibility: The conversational interface makes agricultural information more accessible than systems that require the user to navigate through multiple information sources.

XV. LIMITATIONS

Although the proposed agricultural chatbot has various attractive features, the system has several disadvantages:

Internet Dependency: Features like Weather API and Chatbot API are dependent on internet connectivity.

Knowledge Base Coverage: The system's predefined responses are constrained by the information contained within the knowledge base.

API Dependency: For queries falling outside the knowledge base, responses are contingent on the functionality and performance of the integrated Chatbot API.

Weather API Dependency: Information pertaining to weather is subject to the availability and accuracy of the external Weather API.

Limited Language Support: The current system only supports three languages: English, Hindi, and Marathi.

No Image-Based Diagnosis: The system lacks the feature for diagnosing crop diseases and pests using images.

Limited Personalization: Currently, the system does not offer fully personalized recommendations based on factors such as the user's field conditions, location, soil type, and history with specific crops.

Information Accuracy: The agricultural recommendations provided should be treated as suggestions. It is advisable to consult agricultural experts or relevant authorities before implementing any recommendations.

XVI. FUTURE SCOPE

The proposed agricultural chatbot can be enhanced with more features and technologies in future scope.

Image-Based disease detection: A computer-vision module can be added to the proposed chatbot so that it can detect any crop disease and insect by uploading any crop image.

Support for more Indian regional languages: To cater to a larger audience, the chatbot can be upgraded to support more Indian regional language options.

Personalized recommendation: The chatbot can recommend based on your crop, soil, area, climate, and farm.

Crop market price: It will help the user in knowing the current price of their crops in the market.

Government scheme: The system can be connected to a source containing updated information about government schemes to provide the latest information about government subsidies to the users.

XVII. CONCLUSION

The proposed system is designed to provide multilingual agricultural chatbot support through web-based conversational interfaces. The chatbot is available in three languages: English, Hindi, and Marathi. The chatbot provides information about crops, soil, irrigation, fertilizers, pests, and diseases, government agricultural schemes, and weather.

Agriculture Knowledge Base, Chatbot API fallback, Weather API, SQLite, and Dashboard

Analytics were combined in the system to demonstrate the system's ability to perform several functions. The system demonstrated the ability to respond to predefined agricultural questions, fetch weather information from the API, and store data in a SQLite database for analytics.

The proposed system exemplifies the potential of multilingual chatbots in agricultural applications. The system can be developed into a comprehensive agricultural assistance platform by adding features such as image recognition of pests and diseases, personalized recommendation systems, support for other local languages, provision of market information, and voice recognition.

XVIII.ACKNOWLEDGMENT

I would like to tender my heartfelt thanks to my project supervisor and to the faculty members of the Department of M.Sc. Computer Science at SIES College of Arts, Science and Commerce in Sion, Mumbai, for their valuable advice, encouragement and support during this research project.

I would like to express my gratitude to my institution for having given me the opportunity and the necessary resources to carry out this project, and I should also mention the developers of the technologies and tools employed in this work, such as Python, Flask, SQLite, and the weather API, since it was these that assisted in the development of the multilingual agricultural chatbot proposed herein.

I would like to express my thanks to all those who, either directly or indirectly, helped to complete this research paper.

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