AGRIBOT-AI POWERED AGRICULTURE CHATBOT

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Abstract:

Agriculture is one of India's most important economic sectors, however millions of farmers continue to have trouble accessing the right information, at the right time, to make informed decisions. Barriers that hinder farmers' access to this information include a fractured source of information, lack of knowledge on government schemes, not receiving real-time guidance, diversity in languages and varying literacy and digital skills – all of which have a severe impact on their ability to adopt modern and profitable agricultural practices. By utilizing current technology and an artificial intelligence (AI) platform, this Proposal aims to create a multi-language, voice-based, agricultural advice chatbot that will provide an accurate, accessible, and personalized solution to farmers' needs.

This solution uses a multi-language platform (English, Hindi, Kannada), while at the same time, incorporating voice interactions to enable farmers with varying literacy levels to use the system. A farmer would be able to ask questions about their crops, weather, pest management, soil health, fertilizer's, market trends, and government schemes and receive immediate, simplified assistance. In addition to this service, this solution will also provide crop recommendations based on soil test results and related information enabling them to take better decisions regarding crop cultivation. Furthermore, with the separate module for government schemes allowing farmers quick access to eligibility criteria, benefits, and application processes, it addresses the ongoing problem of farmers lacking knowledge about government related assistance available to them.

The architecture of the evidence-based system follows a client-server architecture, however, it is designed to be lightweight.

Index Terms - Agriculture Technology, Artificial Intelligence (AI), Multilingual Chatbot, Voice-Based Interface, Smart Farming, Crop Recommendation System, Government Schemes Awareness, Precision Agriculture, Decision Support System.

I. INTRODUCTION

The backbone of the Indian economy is its agricultural sector, which is responsible for a majority of India's job creation and economic development and therefore will continue to grow, considering almost half of India's population depends on agriculture. Although agriculture plays an important role in the growth of India's economy, farmers still experience difficulties in obtaining accurate and timely information about agriculture as many farmers do not have access to an adequate amount of credible agricultural information. Farmers need knowledge about which crops to grow, the correct type of fertilizers to use, how to control pests, what weather conditions they will experience, how to maintain healthy soils, fluctuations in markets, and the availability of government programs to assist them. Most of this information can be found on a variety of different

fragmented platforms, creating challenges for farmers to be able to identify and utilize credible sources, especially farmers in rural areas.

A large portion of the farming population is hindered by the language and literacy gap. More than 65% of farmers experience language difficulties; therefore, they will have limited access to digital materials written in English. Many farmers also have limited digital skills, which affects their ability to effectively navigate traditional websites and portals that are available. Furthermore, awareness of government programs, subsidies, and access to various forms of financial assistance is very low; only 23% of farmers are aware of benefits that may be available to them. The lack of information leads to confusion, poor decision-making, and decreased productivity. The potential for crop loss and the missed opportunity of enhancing the farmer's economic well-being is extremely high. Advances in Artificial Intelligence (AI), Natural Language Processing (NLP), and other technologies have provided solutions to these challenges for farmers.

II. LITERATURE SURVEY

[1] Patel Retal. (2022) note the development of a rule-based Chatbot that assists farmers by providing instantaneous information on weather and crop issues, but lacks multilingual support and voice interaction to assist those living in rural areas with limited reading and writing capabilities.

[2] Singh Petal. (2021) have created a machine-learning-based method for recommending crops for cultivation based upon several soil parameters and weather conditions. This method uses both the Decision Tree and Random Forest models for the purpose of training the Machine Learning algorithms using past crop yield data. The system does not provide real-time conversational interactions or use multiple languages; it also requires the user to enter the data in a structured format.

[3] Reddy N. & Rao S. K. (2022) have developed a multilingual Agricultural Chatbot that provides assistance to farmers in both Hindi and English, as well as other Indian regional languages, and emphasizes the need for voice input and output capabilities for farmers with low literacy.

[4] The article "Mobile Applications that Provide Information on Indian Farming Schemes" by Sharma et al. (2021), looks specifically at Mobile Apps which encompass all government schemes and subsidies for farmers and their compatibility with vulnerable populations (e.g., those living in rural areas) and how the use of Mobile Apps is hindered by issues related to Usability through Limited literacy and English proficiency of most farmers. In order to address these issues the authors propose that AI and Conversational Agents should be included to provide the necessary information and real-time notifications to help farmers access these solutions. These findings are consistent with the goals of through the use of the proposed Agriculture Chatbot.

[5] The article "Voice Based Agricultural Assistant Using NLP and AI" by Tripathy and Tripathy (2021) provides an introduction to an AI Voice Enabled Assistant created for farmers to assist them with crop management and irrigation practices. The authors show how the use of Voice Input/Output (VIO) technologies can help farmers break through the literacy barrier that exists within the agricultural community and provide high levels of effectiveness when delivering advice/tips. One limitation of the current system is that it does not offer multilingual translations or provide recommendations related to crop management based on soil conditions.

[6] The FAO report outlines the role of AI technology in promoting Sustainable Agriculture through the use of intelligent systems that provide personalized recommendations based on Data driven guidance. Through the utilization of AI technology and Voice Interface, as well as Multilingual Capabilities added to the proposed Agriculture Chatbot, smallholder farmers will be able to transition to Sustainable agricultural practices.

III. METHODOLOGY

1.User Interaction

Method

- A web-based or mobile app where farmers can access the chatbot.

- Farmers can communicate with the chatbot using either text or voice in English, Hindi, or Kannada.

2.Language Recognition and Translation

- The chatbot recognizes the language used by the farmer and, if required, translates it into a format suitable for the AI system to process.

- A multilingual interface will provide more options to farmers.

3.AI Processing of Query

- The farmer's query is received by the back-end system and processed using an AI system (specifically the OpenAI API) to identify the intent and contextual relevance of the query.

- The AI system will also classify the farmer's query according to the type of information requested; the four possible classifications are: crop recommendations, pest management information, weather updates, or government scheme inquiries.

4.Information Gathering

- Crop recommendations will be based on soil testing and environmental data collected in the area where the farmer resides.

- Weather information; market prices; and information about government schemes will be compiled using APIs or stored data sets.

5.Response Creation

- An AI system will create personalized responses to farmers and will automatically translate them into the preferred language of the farmer.

- The response will be delivered in a text format, and if desired, farmers may elect to receive voice output as well.

6.Notification/Alert System

- All weather, market price, and government scheme changes will be updated in real-time via SMS, in_x005F_xfffe_app notifications, or voice messaging.

7.Data Collection and Learning

- All queries and the associated responses will be stored in a MySQL or JSON database. These records will facilitate potential improvements to the service, personalized recommendations to users, and data analytics.
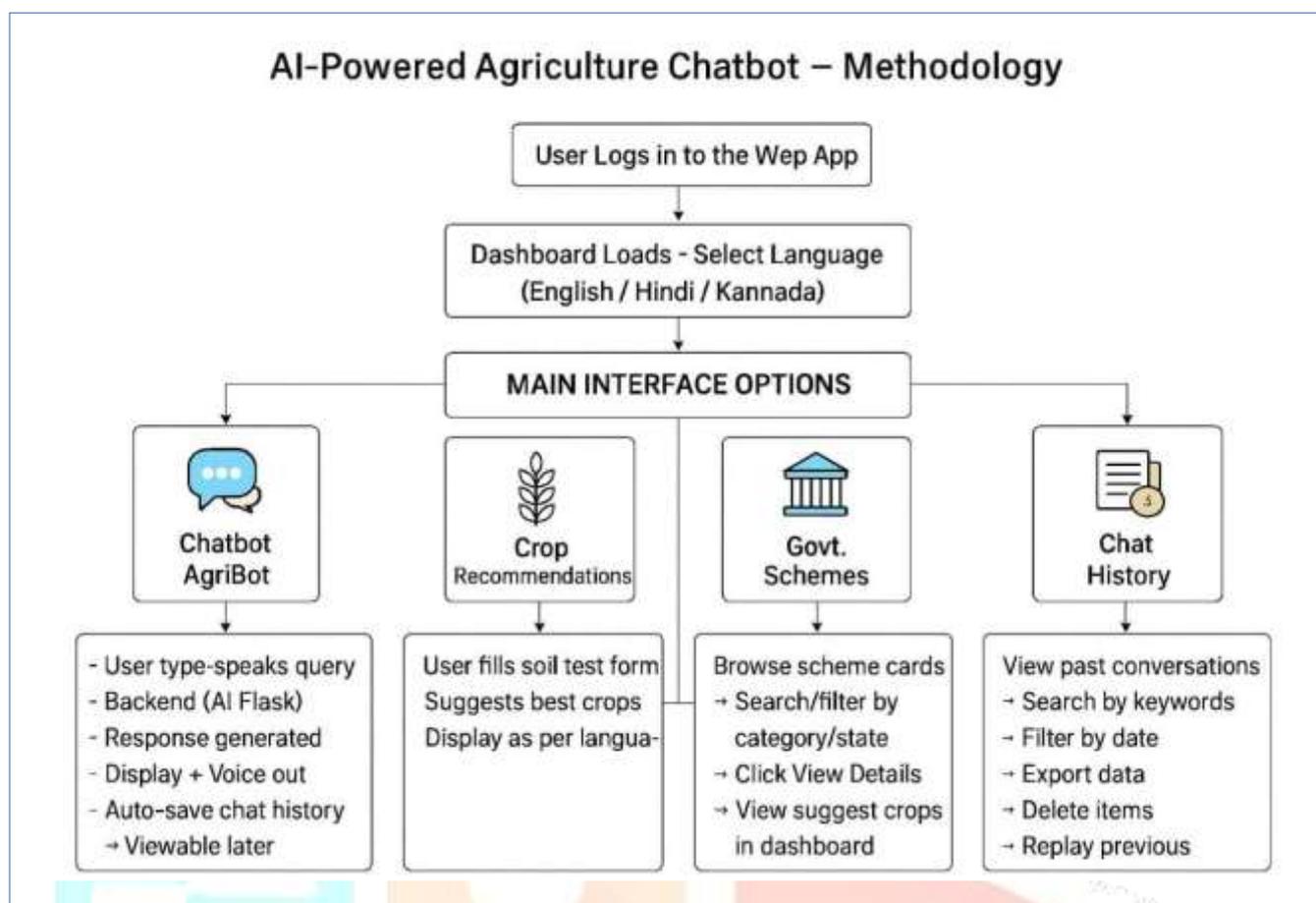
Figure1:Flow Chart Of Methodology

IV. RESULT AND ANALYSIS

The AI-Powered Agricultural Chatbot system was created and is working at its best level as confirmed by a successful and effective test. It allows customers to ask questions about plants, weather, pest control, and government programs with accurate and relevant answers, which helps provide useful information. The AI was specifically designed to allow for an easy transition between English, Hindi, and Kannada for farmers who may be from different language groups. In addition to using voice recognition to communicate with AI, this provides a great advantage for farmers who may be illiterate and unable to read. For selecting crops, the AI used soil test information (such as pH, NPK value, and moisture content) to give suitable crop recommendations. This validated the effectiveness of the rule-based method utilized by the AI. The government schemes function of the AI allows farmers to see all government programs available at their location, with an updated view of what is available, as well as search and sort by category for ease of use. The AI also stores and retrieves user chat logs for later reference. Overall, the AI was efficient, exhibited quick communication between the front-end and back-end, provided fast responses via API, and had minimal delay. These findings demonstrate that the Chatbot increases farmers' knowledge of and access to agricultural resources, and is an effective digital support system for farmers.

V. CONCLUSION

The AI-Powered Agri Chatbot aims to solve the major problems that an Indian farmer encounter with obtaining the right information when they need it in a language they understand in a timely manner about what type of crops they are growing, when they are planting, how to properly monitor the crop throughout the growth cycle, and how to get assistance from the government with respect to obtaining prospects for loans and resources.

By using a chatbot that provides multilingual support, voice interaction capability, real-time weather alerts, assistance to farmers with government schemes they may be able to qualify for and crop recommendations from the results of a soil test report; the AI-Powered Agri Chatbot provides a comprehensive and easy-to-use

solution tailored for the needs of rural areas. Additionally, the AI-Powered Agri Chatbot is able to close the information gap created by the language barriers, low levels of digital literacy and fragmented source information; thus empowering them to make better informed economic and operational decisions leading to increased production and greater income.

With a modular architecture that can be installed on any low-cost device, a light-weight back-end and responsive front-end; the AI-Powered Agri Chatbot delivers seamless performance across all devices, allowing it to be accessible in remote areas. The success of the pilot program has shown that AI-Powered Agri Chatbots are practical solutions and can effectively augment the agricultural advisory services to improve the livelihood and welfare of farmers, facilitate the digital transformation of agricultural systems, support the use of smart farming technology, and contribute to the emergence of a digital agriculture ecosystem.

VI. REFERENCES

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