ISSN No. 0976-5697

VOLUME 17 SPECIAL ISSUE 1, JULY 2026

International Journal of Advanced Research in Computer Science

RESEARCH PAPER

Available Online at www.ijarcs.info

KRISHI-SAKHI: AN AI-POWERED PERSONAL FARMING ASSISTANT FOR KERALA FARMERS

Somya Agarwal
Assistant Professor
Geetanjali Institute of Technical Studies
Udaipur, Rajasthan, India
somya.agrawal@gits.ac.in

Devdath Sajayan, Divyanshi Shrimali, Snigdha Gupta
4th Year, CSE-AI
Geetanjali Institute of Technical Studies
Udaipur, Rajasthan, India
22EGICA004@gits.ac.in, 22EGICA008@gits.ac.in, 22EGICA025@gits.ac.in

Abstract: This paper describes an intelligent agricultural chatbot to help farmers make data-driven decisions. The chatbot is built off two machine-learning models: A crop recommendation model with an accuracy level of 93% and a crop price prediction model with a 95% level of accuracy. The chatbot integrates both models into a multilingual chatbot with support for the Malayalam language primarily targeted at farmers in Kerala. The chatbot shows strong linguistic capabilities, with a BLEU score of over 95, which provides for accurate responses in context. The user interface is simple and easy to use, allowing users to submit inquiries and get responses quickly and easily. The proposed solution provides seamless and easy-to-use access to predictive analytics using natural language input to assist users in making informed decisions about their farming operations. This demonstrates the potential of AI-driven conversational technology to improve agricultural productivity by providing increased access to agriculture.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Kerala Farmers, Advanced Agriculture, Internet of Things (IoT), Deep Learning (DL).

I. INTRODUCTION

Agricultural production plays a critical role in sustaining the economy of Kerala, contributing significantly to livelihoods, food security, and rural development. Despite this importance, the adoption of smart agriculture technologies in the region remains limited. One of the primary reasons for this gap is the fragmented nature of landholdings, where farming is predominantly carried out on small and scattered plots. This structural limitation restricts the scalability and practical implementation of advanced, technologydriven farming solutions. Another major challenge lies in the nature of agricultural advisories currently available to farmers. Most existing systems provide generalized recommendations that fail to account for local variations such as soil conditions, microclimate, crop diversity, and regional market trends. As a result, farmers often struggle to translate these generic suggestions into actionable practices that suit their specific contexts. This disconnect reduces the effectiveness of decision-support systems and limits their realworld impact. Furthermore, language remains a significant barrier to the adoption of digital agricultural tools. A considerable number of smart agriculture platforms primarily operate in high-resource languages, offering little to no support for Malayalam, which is the native language of the majority of farmers in Kerala. This linguistic exclusion not only hinders accessibility but also reduces user trust and engagement with such technologies. In addition to these challenges, farmers frequently rely on multiple, uncoordinated sources of information, including local agents, market intermediaries, and fragmented digital platforms. [1]

This scattered approach leads to inefficiencies, inconsistencies, and a lack of data-driven decision-making, ultimately affecting productivity and profitability. To address these limitations, this work proposes Krishi-Sakhi, an integrated artificial intelligence (AI)-powered agricultural assistant designed specifically for the needs of Kerala's farming community.[2]

The system incorporates advanced AI models for crop recommendation, achieving an accuracy of approximately 93%, and price prediction, with an accuracy of around 95%. These models are complemented by a multilingual conversational interface that effectively supports Malayalam-speaking users,

ensuring inclusivity and ease of interaction. By delivering localized, context-aware, and actionable insights through a unified platform, Krishi-Sakhi aims to bridge the gap between technology and traditional farming practices. The system is designed to empower farmers with timely and reliable information, enabling them to make informed decisions related to crop selection, market strategies, and resource utilization. Ultimately, this approach enhances efficiency, reduces uncertainty, and contributes to the development of a more sustainable and data-driven agricultural ecosystem.

II. LITERATURE REVIEW

The development and design of Krishi-Sakhi are based on an in - depth analysis of existing research on relevant aspects of digital agriculture, farmers' behavior, and the adoption of intelligent technologies in Kerala. The research papers mentioned below offer critical insights that can be used for the conceptualization and implementation of the proposed system.

A research paper on developing a scale to assess farmers' attitude in Kerala towards digital technologies is based on the understanding that behavioral factors play an important role in the development and implementation of intelligent technologies in agriculture. The research states that farmers' perception and trust levels on digital technologies can significantly influence the success of technology interventions in agriculture. The study identified that factors such as access to information, communication skills, learning ability, and problem-solving skills can be considered for developing an effective scale to assess farmers' attitude. Despite having digital infrastructure in place, factors such as digital literacy levels, trust levels on digital technologies, and other associated factors can be considered to be major challenges for farmers in adopting digital technologies for agricultural development. This has directly influenced the development of Krishi-Sakhi's user interface and multilingual support system to ensure that farmers can use the system despite having different levels of digital literacy. [3] Another research study highlights the role of green technology adoption, including biofertilizers and biocontrol agents, in the context of sustainable agriculture in Kerala. The research study highlights that there is a major gap in policy and actual ground- level support for sustainable agriculture. Several factors such as education levels, experience gained in farming activities, perceived economic benefits, and availability of expert support are considered to be major factors that influence decision- making for green technology adoption. The research study highlights the significance of recommendations that must be environment-specific and sensitive to ground conditions. This research study further emphasizes the role of Krishi-Sakhi in including environment-specific crop recommendations rather than adopting generalized advisory models.

Another research study on the adoption of smart agricultural practices based on IoT technology has been analyzed through structured decision-making techniques such as Analytic Hierarchy Process. The research study highlights that there are multiple factors that influence smart technology adoption in agricultural activities. Some of the factors that influence smart technology adoption include operational efficiency, data management, economic feasibility, and social factors. Some of the major factors that influence smart technology adoption include data security issues, internet connectivity, and technical skill sets. Despite the availability of multiple benefits through IoT technology, its actual adoption is influenced by multiple factors such as infrastructure and economic conditions. For instance, Krishi-Sakhi is conceptualized to be software-based and eliminate dependency on hardware costs.

Another area of further research on technology-assisted farming is related to the combined role of Artificial Intelligence and IoT in modernizing farming practices. The study reveals the importance of sensor-based data collection and its integration with Artificial Intelligence to enhance decision-making in areas such as irrigation management, soil assessment, crop management, and yield prediction. However, it also identifies some key challenges, including the cost of implementing such systems and lack of awareness among farmers, especially for marginal farmers. This again emphasizes the importance of developing Artificial Intelligence-based systems that can function effectively even in such environments. However, this is addressed in Krishi-Sakhi, which is based on Artificial Intelligence models that provide high accuracy and can be accessed through a single user-friendly interface. [4]

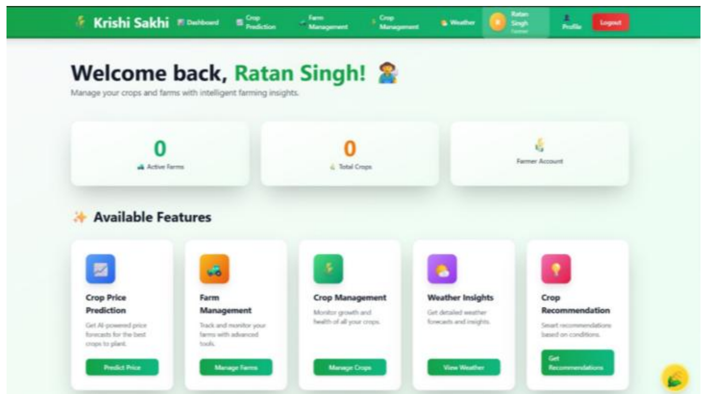

Fig. 1: Home Page Krishi Sakhi

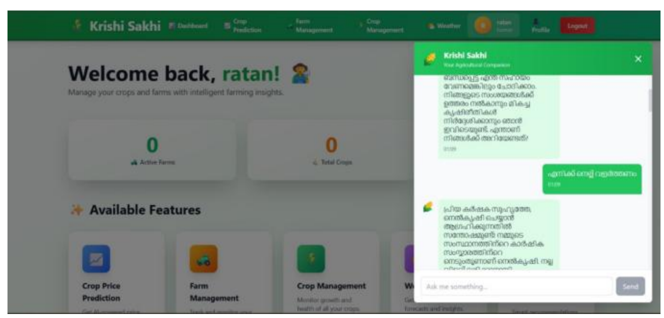

Fig. 2: Krishi Sakhi Multilingual Chatbot

III. METHODOLOGY

Krishi-Sakhi, the system which we proposed, has been developed using a comprehensive architecture, which will use Machine Learning models, a Backend API, and an Interactive Frontend Interface.

1. Data Preparation

The data has been collected from the following sources:

1. The price data for the last 4 years has been obtained from the government website, which represents multiple states.[5]
2. The data recommends the crop to be grown based on the climate, soil macros, and pH and nutrients present.[6]

The datasets for this project have included extensive data about the agricultural sector, which describes the amount of nutrients present in the soil, such as Nitrogen, Phosphorous, and Potassium, temperature, humidity, rainfall patterns, and the prices of the crops. The diversity in the data helps in building a comprehensive understanding about the agricultural sector, which will eventually lead to accurate predictions. The data which we have collected has gone through various stages of pre-processing, which included cleaning the data to make it consistent, normalization to make it uniform, and selecting the most significant features for the purpose of training the models.[7]

2. Building the Models

The system which we proposed uses various Machine Learning models, which are specific to the agricultural sector. The datasets which we have obtained have gone through various stages of training using supervised learning algorithms, which helps in building accurate models. The models which we have developed are specific to the agricultural sector, which helps in making accurate predictions. We have given specific attention to the evaluation of the models which we developed.

3. Chatbot Implementation

The chatbot portion of this system utilizes the Gemini-2.5-Flash model for Natural Language Processing. This allows a user to interact with this system in a more personalized manner. This is a very accessible system, even for those who are not very tech-savvy. The chatbot receives user queries, understands user intents, and interacts with APIs to fetch relevant information and provide personalized, context-specific responses. This interaction layer helps bridge the gap between AI systems and end users by providing easier access to information.

4. Front-end Development

The front-end interface of this system has been developed keeping in mind user experience, accessibility, and user-friendliness. This interface has a secure authentication system for user data. It has several modules integrated into this interface. There is a "Farm Management" module that allows farmers to enter their farm-related information in a more efficient manner. Users can enter information regarding crop activities, weather updates, and even utilize predictive models such as crop recommendation and price forecasting. There is a seamless interface for the chatbot interface, allowing users to utilize all features in one place.

5. System Integration

Krishi-Sakhi has all of its components integrated into one single interface, allowing for a seamless flow of communication among all parts of this system. This is necessary for a Machine Learning model, [8] where all components of this system interact with each other. These API's act as a bridge for this interaction. This integrated system allows a farmer to easily manage their activities, receive accurate predictions, and interact with this system in a more efficient manner. The image below is the page of the website representing the crop price prediction model detecting the price of market from past 4 years and predict the future prices on the basis of historical trend.

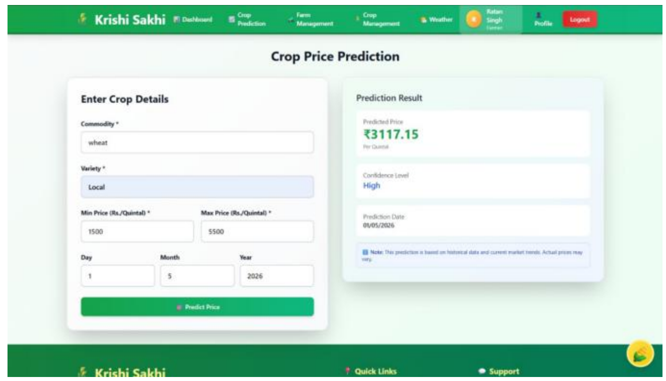

Fig. 3: Crop Price Prediction

The image below suggests the crop to be grown in the environment. It determines which crop is best suited with the minerals present in the soil including nitrogen (N), phosphorous (P), Potassium (K), pH of the soil, humidity, rainfall and temperature.

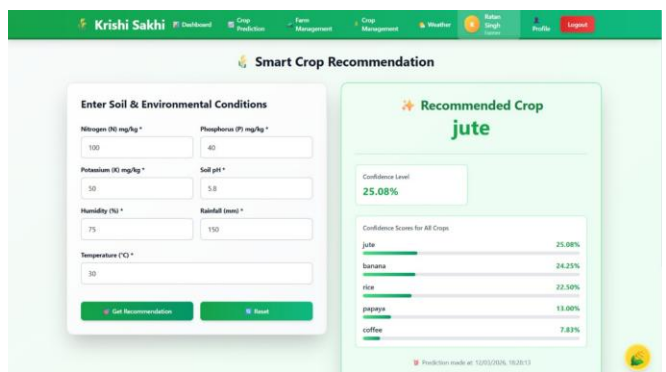

Fig. 4: Krishi Sakhi Crop Recommendation System

Fig. 5: Krishi Sakhi Workflow

IV. RESULTS

The Krishi-Sakhi project has been shown to function well in all elements of the system that were tested. For example, the crop recommendation model built with XGBoost is able to recommend what crops will grow best in a given area.The model performed at 93% accuracy and was able to use available information about soil types and other Weather variables to create crop recommendations.

In addition, the crop price prediction model built on Random Forest regressor model is able to provide accurate predictions of potential market price of crops. This predictive model produced an overall accuracy level of 95% by utilizing historical supply / demand data.

Additionally, the chatbot developed for use with Krishi-Sakhi is based on the Gemini-2.5-Flash model and received an average BLEU score of over 95 across three independent language model tested with English, Hindi, and Malayalam.

In summary, the overall functionality of the integrated Krishi-Sakhi system is designed to provide accurate information about crop production and pricing through a user-friendly interface, thus allowing farmers to connect to farm production, manage their farms, and make good decisions about their farms quickly and easily.

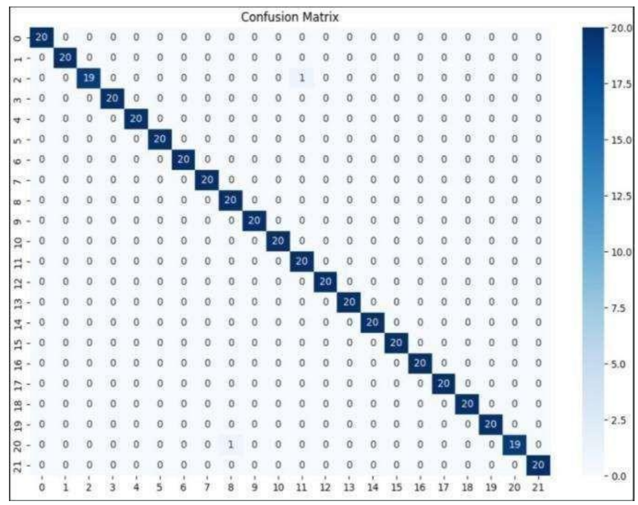

Fig. 6: Confusion Matrix Results

V. FUTURE SCOPE

The next step in the progression of Krishi-Sakhi is to further develop and improve the system to increase its prediction and analytical capabilities. One of the new features that will be incorporated into the system is the addition of crop yield prediction models. This will enable farmers to predict the yield that can be obtained from the crops that they have planted. This will be done based on parameters like soil conditions and weather patterns. This addition will enable farmers to increase their productivity by optimizing resource usage and minimizing losses.[9]

Another new feature that will be incorporated into the system is the addition of a disease detection module using Computer Vision.[10] This will enable farmers to upload images of the affected plant and will provide them with real-time feedback regarding the disease that has affected the plant. This will enable farmers to eliminate confusion and will make it easy for them to understand and diagnose the disease that has affected their plant. This will be highly useful for farmers who are not technically sound and will enable them to understand complex concepts in a much simpler manner.[11]

Another new feature that will be incorporated into the system is the addition of Internet of Things-based sensing capabilities.

This will enable Krishi-Sakhi to become a much more precise and aware system. This will be done by using sensors to collect data regarding the soil conditions. This will enable Krishi-Sakhi to become a proactive system that will be able to provide highly precise and aware suggestions to the farmers.
These improvements, in aggregate, are expected to evolve KrishiSakhi into an all-encompassing and intelligent ecosystem, effectively bridging the gap between conventional agriculture and modern technology-based solutions.

VI. CONCLUSION AND FUTURE WORK

In summary, Krishi-Sakhi is an evolutionary step in the creation of accessible and intelligent agriculture support solutions, particularly with regards to the specific needs of the agriculture landscape in Kerala. The proposed system is an integral part of the overall vision for the development of sustainable agriculture solutions, driven by the power of technology, simplicity, and inclusiveness, all within the same platform.[12]
With the integration of crop recommendation and price prediction tools, the proposed system allows the farmer to make the most informed decisions, ensuring the viability of the decisions made. The support for multiple languages, such as Malayalam, ensures that the benefits of technology are not denied to the farmer based on the limitations of the language, thereby making the proposed solution more accessible and usable for the local farmer community.
In addition to the decision support tools, the proposed KrishiSakhi also allows the farmer to record data regarding crops, farming activities, and relevant information in an organized manner. This not only allows for better operational efficiencies but also ensures better planning for the farmer, thus improving the overall management of the agriculture landscape.

In summary, the proposed system has the potential for the application of artificial intelligence in evolving conventional agriculture into more efficient, reliable, and user-friendly processes. The proposed Krishi-Sakhi has the overall potential for making significant contributions towards the betterment of the agriculture landscape.

VII. Acknowledgment

We would like to express our sincere gratitude to our mentor for her ongoing assistance, inspiration, and guidance while developing the Krishi-Sakhi project. The insights sharing between us enabled us to better realize our concepts and significantly improved the overall quality of this document.

We also extend our heartfelt thanks to the faculty members of Geetanjali Institute of Technical Studies for generously guiding us with your academic understanding and confidence.

Finally, we are grateful to everyone else who contributed (in any way) to the successful completion of this project:

VIII. References

[1] P. S. Birthal *et al.*, "Sources of growth in Indian agriculture," *Agricultural Economics Research Review*, 2015.
[2] Y. Zhang, L. Wang, and S. Wang, "Application of artificial intelligence in agriculture: A review," *Information Processing in Agriculture*, vol. 8, no. 1, pp. 1–12, 2021.
[3] S. Shanila and S. Helen, "Development of a scale to assess Kerala farmers' attitude towards digital technologies in agriculture," *Indian Journal of Extension Education*, vol. 61, no. 4, pp. 165–169, 2025.
[4] "A study on adoption of IoT-based smart agricultural practices in Kerala using Analytic Hierarchy Process," 2024.
[5] Agmarknet, "Agricultural market information system," 2025. [Online]. Available: https://agmarknet.gov.in/home
[6] Nirmalgaud, "Crop recommendation system using machine learning," *Kaggle*, 2026. [Online]. Available: https://www.kaggle.com/code/nirmalgaud/crop
[7] P. I. Devi, S. S. Solomon, and M. G. Jayasree, "Green technologies for sustainable agriculture: Policy options towards farmer adoption," 2015.
[8] S. Wolfert, L. Ge, C. Verdouw, and M. J. Bogaardt, "Big data in smart farming: A review," *Agricultural Systems*, vol. 153, pp. 69–80, 2017.
[9] K. G. Liakos, P. Busato, D. Moshou, S. Pearson, and D. Bochtis, "Machine learning in agriculture: A review," *Sensors*, vol. 18, no. 8, p. 2674, 2018.
[10] "A study on adoption of IoT-based smart agricultural practices in Kerala using Analytic Hierarchy Process," 2024.
[11] K. P. Ferentinos, "Deep learning models for plant disease detection and diagnosis," *Computers and Electronics in Agriculture*, vol. 145, pp. 311–318, 2018.
[12] S. Mittal, S. Gandhi, and G. Tripathi, "Socio-economic impact of mobile phones on Indian agriculture," *ICRIER Working Paper*, 2010.