BHOOMI SEVA – An Application for Farmers

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***Abstract*—In this research, we are developing a mobile application that is very useful for farmers who are looking to increase the profitability of their farming. For assisting agriculture with routine activities, a lot of methods and techniques are being developed. Even many contents are available on the internet. Mobile apps in the field of agriculture can be an excellent option to boost farming production in the country. The new inventions in technology in agriculture are not easily getting to the farmers due to a lack of knowledge. They don't know the source from which they can get valuable information. Hence, a number of farmers are failing to gain probable production rates. Therefore, it is necessary to develop a user-friendly system through which essential information is accessible to farmers. In this research, we try to collect all the valuable information that various farmers can use into a single application that explores many new opportunities for farmers with the help of smartphone technologies. Here we propose a farmer-friendly application in multi-language that will assist farmers in understanding plant needs and also provide many features such as weather information, farming tips, and a chatbot to help farmers. We provide farmers with a variety of information services that are useful for farm management, control, and monitoring. Further research investigates how agricultural services are provided. Mobile apps have impacted farmers' farming activities, and more innovative agricultural services will be provided via mobile apps.**

Keywords— Farmers, crops, agriculture, Mobile apps, LGBM Classifier, Chatbot, agriculture routine control, assisting agriculture activities.

I. INTRODUCTION

Agriculture is the primary occupation of the majority of Indians. The agriculture sector provides a living for 60-70% of the Indian population. The most difficult task for farmers in precision farming is information access and management due to the volume of data and the complication of processes. Data for farming, such as crop life cycle detail, seeds, crop selection, weather, pesticides, fertilizer, and so on, are available from a variety of sources, including newspapers, printed media, audio and, mobile, TV, internet, visual ads, and so on. However, the structures and formats of data vary [3]. As a result, it is extremely difficult for farmers to obtain precise information and to understand the variety of information that has been disseminated from various sources.

When transferring data from one format to another, it may be necessary to carry out a number of manual processes. Farmers may readily download agricultural mobile applications to their smartphones to gain a variety of capabilities that weren't before available to them. The importance of agriculture is growing in these times of economic turmoil. Livestock management, Agro Mobile, Krishiville, and other mobile applications have all been created to help users learn more about agriculture [5]. The application must adhere to all environmental and human safety regulations. This paper deals with the study of existing android-based applications that are helpful for farmers and the design and development of the best apps for agriculture that include various diverse services for farmers. It is important to monitor the crops to support the demand from consumers and prevent any food shortage problems. One of the reasons for low yield is the improper management of pests and diseases. The control activity started late as the disease and infection in the crop were already severe and impossible to control. The control activity for pests and diseases should be done before the symptoms become serious, and frequent monitoring of the crop is mandatory. The application must follow the safety requirements for humans and the environment.

The proposed project will focus on agricultural information providing mobile app development for Indian farmers. We are going to develop a multi-language app using Flutter, Dart, and VS code, and the technology for using the app is AI (Artificial Intelligence) and ML (Machine Learning). The App will allow the users to estimate whether the use of pesticides will damage their crops or not. The algorithm used for the Chatbot in an app is the LGBM algorithm (Light Gradient Boosting Machine) applied in the chatbot. Our proposed app also provides important information to the farmers like the weather, soils types and tips for good farming. Since the app is multi-language the farmers will not face any issues if they are not familiar with the English language. This application will emerge as an essential productivity tool for farmers if implemented in the future. Since the app is multi language the farmers will not face any issues if they are not familiar with the English language.

II. LITERATURE SURVEY

A wide range of mobile app innovations is available on the market that aims to simplify farming. Certain mobile apps are made expressly to offer farmers information services. This article has reviewed several research papers and mobile apps relevant to the agricultural industry.

M. Aggarwal et al. designed an application to sell their commodities directly to the customers at a reasonable market value without any mediator with the help of volunteers. For the efficient utilization of our mobile application by the farmers, we have incorporated features like information in regional language, crop-disease identification and sell their products directly [1]. J. Jayachitra et al. application is about having three main roles of our application are farmers (sellers), volunteers and buyers. The personal details of all the users are highly confidential and secure. In this mobile app, the farmers can provide details about their farmlands and groceries that are being cultivated in their land. The information can be entered either in text or voice format that too in his/her own language [2]. M. Singhal et al. describes an application which would take care of the updates of the

different agricultural commodities, weather forecast updates, agricultural news updates. The application has been designed taking Indian farming in consideration [3].

A. Chandavale et al. main purpose of the review paper is to present an overview of various techniques adopted in automated agriculture systems which save the farmers' time, money and power. This paper also extracts key features of existing automated agriculture systems based on their advantages and disadvantages. This paper will assist in the development of a system which will overcome the drawbacks of existing automated agriculture systems [4]. N. Chauhan et al serves a platform for the growers and retailers or customers to sell and buy their farm products. This system aims at giving a profitable price to farmers to their farm products cutting the middlemen. This allows the retailers or the customers to buy products from the farmers at a lower than the normal price [5].

H. Nasir et al. made a system that is used by the Agriculture Department to detect the occurrence of pest infestation, identifying their location and report to the early warning system. The system will be able to record the infestation data provided by the farmers into the databases. The information will be used by the Agronomist to assess the risk of the paddy plot. There are 4 stages of risk; Low, Medium, High and Very High. Every stage will be classified by the amount of pest, type of pest, location and current situation. After a complete evaluation from the Agronomist, the system will notify the farmers through email about the quality of their current paddy plot [6]. Mane et al. tells us about the variety of Mobile app developments in the marketplace, designed to make farming easy. Some mobile applications have designed to specifically provide information services to farmers. In this work various research paper and Mobile App have reviewed related to agriculture sector [7].

Samer D et al. had the horticulture sector in which smartphones can be used to provide the farmer with the details of all the different types of crops that he can harvest and also the best efficient way in which he can get the yield. All this information will be provided in regional audio form also so that it will be easy for farmers to understand. For example, it can be extremely useful for the farmers in India as he/she will get information in multiple languages within a few key presses. Even an illiterate person can use this app easily [8]. M. Bhende et al. the platform will help farmers to find out nearest markets, its current stock details and its demand for particular product within less time & with less effort. This analysis will thereby help to determine which market will be more profitable for his crop/product. Here we are providing a complaint box for farmers to launch complaint, e.g :- suppose any merchant offers less price than the government's specified price for minimum quality of crop/product then farmers can directly launch complaint against him via the complaint box.

III. PROPOSED METHOD

The development of mobile applications used by farmers, since farmers are a semi-literate community, an application was developed using these farmers to get an idea about the crops and about good farming tips. In mobile applications, there are three layers known as the presentation layer, the application layer, and the database layer. Users access the presentation layer through mobile devices such as smartphones and tablets. This layer is made up of the user interface (UI) and its process components. Its focus is on the way this application is presented to the user. The application layer, or business layer, is focused on the management of the application. For the information about the soils and tips for Good Farming all the data is coming from the backend Firebase. Connecting the data to the Firebase helps us to do the work more easily and quickly using Firebase if there is small change in the information we don't need to make the change in the code. Changes in the backend can automatically make change in the app

A. System Design and Architecture

The proposed system is designed to provide a user-friendly interface for farmers. All users' personal information is highly safe and protected. Farmers will receive comprehensive soil information on the mobile app. The application is an internet-based application that allows all farmers to get detailed information about the soils and crops. The various navigation bars provided for the farmer consist of checking the weather, providing information about types of soil, and providing some tips related to good farming. The interface is built in a user-friendly manner for the user to access all these segments easily. Once the user clicks on a particular icon, it will directly show him the content related to that particular icon. As such, if we click on the Soilpedia navbar, it will show us the various types of soil and give a detailed view of that soil. The tips consist of various tips for good farming that can help the farmers while they are farming. The Sahayak navbar represents the chatbot, while all the data is trained using the LGBM algorithm.

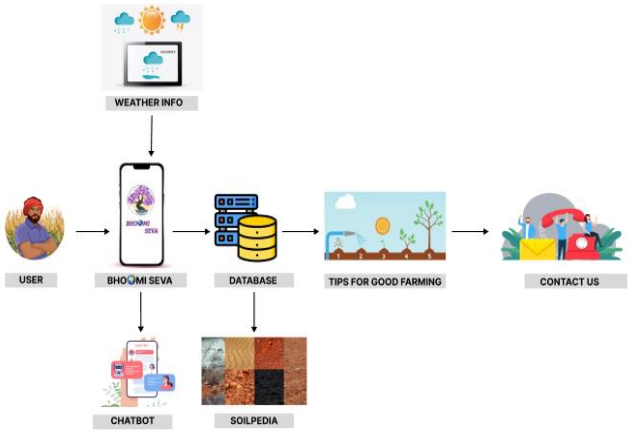

Fig 1. Architecture of Bhoomi Seva

The farmers may use the app in any language. Before harvesting the crops, the person who is unfamiliar with farming can get a sense of whether the crop he or she will be producing will be healthy or not. The data for the soils and tips for good harvesting is coming from the backend. The backend used in the app is Firebase.

The proposed system of the software aids in its development by demonstrating its functionality. The application layer is known as an application program interface (API), which passes the information into the presentation layer. The database layer contains all the information entered into the application and helps secure it. First, the user will sign in to Google using their email address. Following then, the user must maintain location awareness in order to view the weather prediction for today and the following two to three days. The Soilpedia offers in-depth details regarding soils, including information on their qualities, location, and the crops that may be produced. The "Contact Us" section

includes email addresses and helpline numbers so that farmers may get in touch with them if they have an issues.

IV. Proposed Methodology

We have done implementation of our proposed system as shown in the below figures wherever user open the application the Figure 2 shows the splash screen of the proposed system. After that, the user will come to the login screen, where they have to select the language in which they are comfortable.

Fig 2. Splash Screen

Fig 3. Login Screen

Figure 3 has a login screen where the user had to change the language in English, Hindi and Marathi. Once the user had Sign in one time they need not to do the Sign in again and again. Figure 4 has a screen where there are various types of soils, such as mountain and forest soil, alluvial soil, desert soil, red and yellow soil, saline and alkaline soil, laterite soil, and black soil. After that, the user has to select the soil, and they will get detailed information about the soil. Figure 5 has a screen where we can see information about soil, its characteristics, and where it is found. Figure 6 represents the weather information with which it will forecast the today's weather and the weather after four days with humidity and pressure values. For weather, we have used the API related to weather. Figure 7 has the information related to Tips for Good Farming.

Fig 4. Various types of Soil

Figure 5. Soil Info

Fig 6 Weather information

Fig 7 Tips for Good Farming

Figure 6 represents the weather information with which it will forecast the today's weather and the weather after four days with humidity and pressure values. For weather, we have used the API related to weather. Figure 7 has the information related to Tips for Good Farming.

Fig 8 Chatbot

Fig 9. Result

Figure 8 has an "about" page in which there is a helpline number so that the farmers can easily contact the helpline number or email id in case they faced any problems while growing a crop or if they wanted some guidelines related to the crops. Figure 9 has a chatbot where we have to answer the questions that are trained by the LGBM Classifier. It is a machine learning framework based on a decision tree to increase the efficiency of the model and reduce memory usage. It is used for regression, classification, ranking, and other ML tasks; after that, the app will show whether the crops that it will be growing are healthy or not. The crops will not be healthy if we have not used proper soil or if we add more pesticides to the crops.

V. Result Analysis

ID	Test cases	Expected Output	Actual Output	Pass / Fail
01	Google Sign in	The Login to the system should be try with the login the correct password	Login Successfully enter into the system	Pass
02	User are able to change the language	Language get changed from one language to another	System get changed into another language	Pass
03	Healthy Crop	The crop grown will be healthy or not	Your crop grown is healthy	Pass
04	Damaged Crop	Number of pesticides are more than the crop get damaged.	Your crop may be damaged	Pass
05	Soils	User must be able to get detailed information about the soil.	Got information about the soils	Pass

VI. Conclusion

Several innovative technologies have been created for agriculture. The Indian government also offers farmers more resources to boost output. Due to unjust management, farmers do not receive all the necessary information and plans for farming in a timely manner. Most farmers are unaware of how modern technology is used in agriculture. Thus, researchers will create a novel way to close this gap between farmers and modern technology, as well as provide government support to promote agricultural growth. This smartphone app will outline the process and approach required to educate farmers about new, varied agricultural information and assist them in enhancing our country's agriculture.

With the development of the agricultural industry, smartphone apps are now available to support farmers. The application has the potential to improve farmers' livelihoods as well as agricultural standards. The details can be given in various languages so that they can be accessed in the regional languages. The helpline for the farmers can offer immediate information on agricultural plans, the weather, crop diseases, and treatments for those illnesses. The application can provide the information for the particular soil in details so that it becomes easier for the farmers to get more information about crops they can plant in that area.

VII. Future Scope

We can add more information, such as connecting IoT components to our application, so farmers can gain more benefits from their crops.We can create profile portals for various farmers in the application so that they can buy and sell crops based on their needs directly to the customer, so that no third party can steal their profits from farmers. Feature extraction and image processing accessibility for the user will help him or her find out what type of soil he or she has and according to which farming can be done. We can add a chat GPT instead of a chatbot it will be more user-friendly and provide more informative information to the farmers, which is a good thing.

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