

SMART KISAN: A mobile app for farmers' assistance in agricultural activities

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Abstract—Farmers in India face various challenges during the crop cycle, including a lack of knowledge about the latest technologies, practices, and disease identification and management. Additionally, farmers often struggle to find appropriate storage facilities and determine fair market prices for their produce. To address these issues, a digital solution is proposed in the form of a mobile application for farmers. The application includes six features: a technology library, plant disease identification and diagnosis, an automated chatbot for answering questions, weather alert information, information on nearby warehouses and market prices for produce. The proposed application has been developed based on the results of a survey conducted with 50 farmers from Maharashtra and Madhya Pradesh states using a Google form. The app is designed to provide farmers with the necessary tools to address their problems independently, including multilingual support.

Index Terms—Mobile app, Deep learning, Chatbot, Weather Alert

I. INTRODUCTION

In India, agriculture is the most significant source of livelihoods, providing employment to a vast portion of the population. India is renowned as the second-largest producer of several key crops, including rice, wheat, sugarcane, cotton, groundnuts, fruits, and vegetables, contributing to nearly 11% and 9% of the world's total fruit and vegetable production, respectively [8]. Despite these impressive figures, agriculture's contribution to India's overall progress is still a matter of concern. Over the years, as the Indian economy has grown and evolved, agriculture's contribution to the GDP has steadily decreased from 1951 to 2011 [8]. This trend can be attributed to the lack of adequate resources and guidance among the farmers. A staggering 70% of India's rural households still depend primarily on agriculture for their livelihood, and among them, small and marginal farmers account for 82% [8]. In India, farmlands are inherited by family members from generation to generation. Because of the high population in each generation, the original area of farmland gets subdivided among family members. So, the average size of farmland is small, just around 2.3 hectares per family. With such small holdings in hand, most farmers are unaware which crop to grow on the field to get maximum profit. Lack of guidance leads to their loss. Not only this but also, a communication gap between the government

and the farmers is observed due to which most farmers are unaware of government schemes made for their benefit. Their questions are not resolved on time and the required assistance is also not provided. There is also lack of knowledge related to minimum support price.

Apart from this, farmers face challenges due to uncertain weather conditions. Weather conditions are an important factor in farming practices and farmers would be able to make informed decisions only if they are aware about current climate and future weather conditions. Another struggle for farmers is the language. Most farmers are only familiar with their mother tongue. Hence, most solutions made for their benefit must be localized so that farmers are able to take advantage of them. Following these issues, this paper proposes an Artificial Intelligence based mobile application for farmers to assist them in their agricultural activities.

II. PROBLEM DEFINITION

Farmers in India face several challenges due to lack of access to information and resources. There is a lack of awareness among farmers about the latest technologies, best practices, and plant diseases, which can lead to significant losses[11]. Additionally, farmers often do not have access to crucial information such as weather forecasts, market prices, and warehouse locations. Language barriers also pose a significant obstacle, as many farmers are not literate in English and can only understand their local language. As a result, they are unable to take advantage of digital tools and resources that could otherwise help them improve their yields and profits.

III. LITERATURE REVIEW

This section provides a comprehensive review of the existing literature and research conducted in the field of agriculture.

Available android based applications which are useful for farmers such as AgroMobile, Krishiville etc are analysed in a study paper [1]. These apps are developed and used by farmers for gaining information regarding crop, pesticides, fertilizer, irrigation, and seed. They also use these applications for selling of crop, estimation of crop production, weather insights and to know about the best practices of farming. This study found that many of the apps are static and that dynamic apps will be better to use for the farmers [1]. Moreover, they highlighted

that if all such listed functionalities are bundled into the one single app and in the native language of the farmer, then it is easy to utilize it.

Another paper studied for research proposes a web application for farmers looking to improve their farming methods [2]. Various features like crop recommendation, query section, weather forecasting as well as assistance to Kisan helpline centers are provided in the app. One of the key limitations is that the app is only available in a limited number of languages, which may pose a barrier for farmers who do not speak those languages.

A flutter application has also been developed for farmers in the past which has two different interfaces [3]. The deep learning model interface utilizes image recognition techniques to accurately identify and classify the disease affecting the crop. The multilingual interface, on the other hand, will provide a user-friendly and accessible way for farmers to communicate with the system in their native language. The proposed app takes into consideration the fact that most farmers are illiterate [3]. Many farmers are unable to detect the disease the crop is infected with and are unaware whom to approach for guidance. The app helps them in this and also provides the solution to the same. The user interface is very simple to use for the farmers. The drawback is that the usage of the app is only limited to crop disease prediction and questions-answering. However, there are many more problems which farmers face and need assistance for.

Some researches also focus on the concept of sustainable agriculture [4]. Their focus is to ensure that new young people enter into farming without hesitation. They developed a mobile app wherein new people who want to start farming can get guidance. It also provides a platform for farmers to directly sell their produce to customers [4]. In this way, the app ensures to eliminate ageing farming and also farmers do not need to depend on middlemen to sell their produce. The drawback in this study is that the farmers are not verified and this would lead to the incidence of spam and fraudulent activity in the marketplace as malicious users can post fake products or wrong prices.

Another application developed for farmers also provided crop recommendation and yield prediction [5]. Farmers can also know the market price from the app. The app helps in informing farmers about current soil and weather conditions. Farmers are notified when there is a need to water the plants based on the water content in the soil. Instead of disease detection, the app provides early pest detection which reduces the chances of loss for farmers. The limitation in this study is that only few crops were considered for training data and only few number of markets were considered for market price prediction [5].

Many studies also showed that a chatbot is very helpful in providing solutions to the problems faced by farmers [6]. The chatbot saves farmers' time and money and makes them more aware to make right decisions regarding farming. A voice bot has also been developed which responds to farmers' queries in multi-language [7].

IV. PROPOSED METHODOLOGY

To develop an application which would guide the farmers and ease their access to crucial information related to agriculture, a system with following features is proposed:

Farming Guidance features:

1) Market price Information

In this section, farmers would be able to get the latest information on the market prices of their produce[16]. The information would be displayed in the form of a table to make it easy for farmers to know the current market situation.

2) Warehouse Location

Using this section, farmers would be able to see the warehouses near to their current location. A google map showing the location of various nearby warehouses would be displayed on the screen[17]. In order to make this feature work, farmers would need to enable geolocation of their mobile[18].

3) Plant disease Detection

In order to know which disease the plant is suffering from farmers can use the plant disease detection feature[15]. They need to upload the picture of their diseased plant either using their mobile camera or from the photo gallery. The proposed app would then predict the disease of the plant and display the name of the disease on the screen.

4) Doubt Forum

This is an automated chatbot which will answer various queries of farmers related to farming such as market price, seed price, government schemes, helpline numbers and so on[19]. Farmers can ask their questions by typing their query in the chat box.

Other features:

1) Farmers' library

Farmers can enhance their knowledge regarding the latest technologies, tools and practices related to farming by watching videos in this farmers' library section. Here, videos for farmers are displayed on the screen and farmers can watch these videos by just clicking on the play button.

2) Change language

The app has a language-changing feature that enables users to switch the app's language from English to either Hindi or Marathi. By default, the app's language is set to English, but if users have trouble understanding it, they can change it at any time. This means that users can choose the language that they are most comfortable with and switch between them whenever necessary.

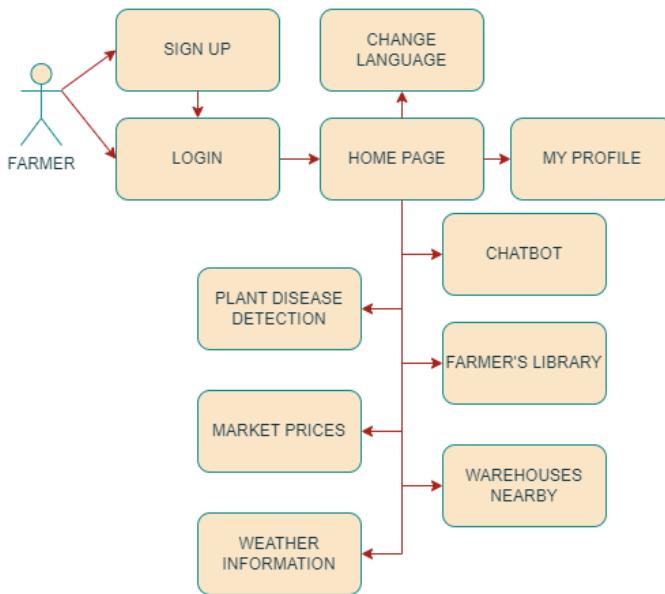


Fig 1 : Flowchart of Smart Kisan App

V. RESULTS

The proposed system was implemented and before mentioned features were incorporated in the system. The application was built in flutter and hence, supported by android as well as iOS devices.

Below given figure represents the start screen of the app

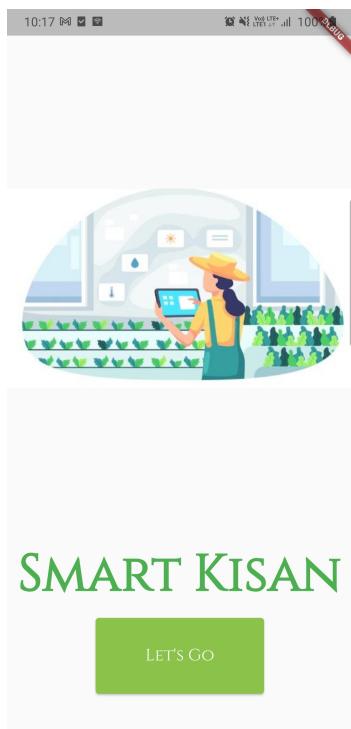


Fig 2 : Start Screen

Fig 2 represents the Welcome Screen of the app. From this screen user can navigate to the home page using "Let's Go" button.



Fig 3 : Home Page

Fig 3 represents the Home page of the app. This page allows the user to choose between 4 options which are Market Price, Warehouses, Doubt Forum and Plant Disease. User needs to click on the respective buttons in order to use these functionalities of the app. The bottom navigation bar provides features such as farmers' library and weather information.

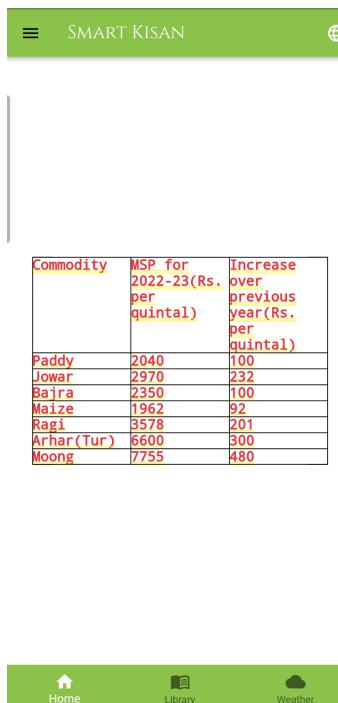


Fig 4 : Market Price Page

Fig 4 represents a snapshot of the app when the user clicks on the market price option. A table appears on the screen which lists down the market prices of various crops in the current

year and increase of market price over the previous year.



Fig 5 : Warehouse Location Page

Fig 5 represents a snapshot of the app when the user clicks on the warehouses option. A google map appears on the screen which displays warehouses locations near the current location.

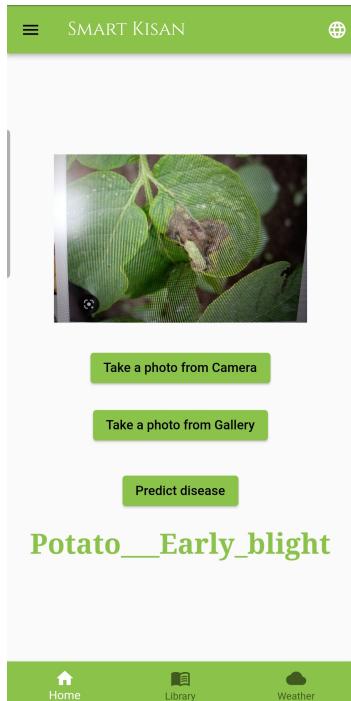


Fig 6 : Plant Disease Detection

Fig 6 represents the screen of plant disease detection. User need to upload image of diseased plant either through camera or from photo gallery. After uploading, they need to click on "Predict Disease" button. The name of the disease would then

be displayed on the screen.

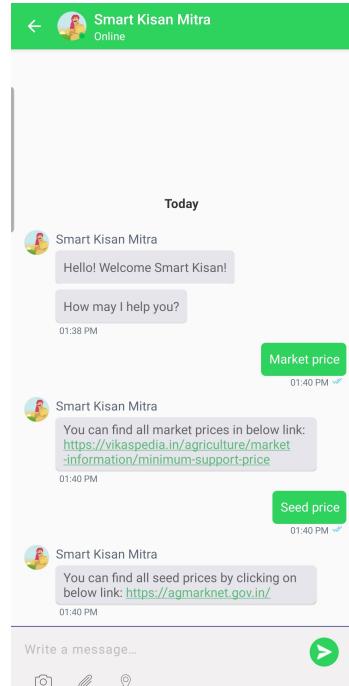


Fig 7 : Doubt Forum

Fig 7 shows the functionality of automated chatbot built in the app. Farmer can ask question by typing his query in the chatbox and the answer will be given immediately by the chatbot.

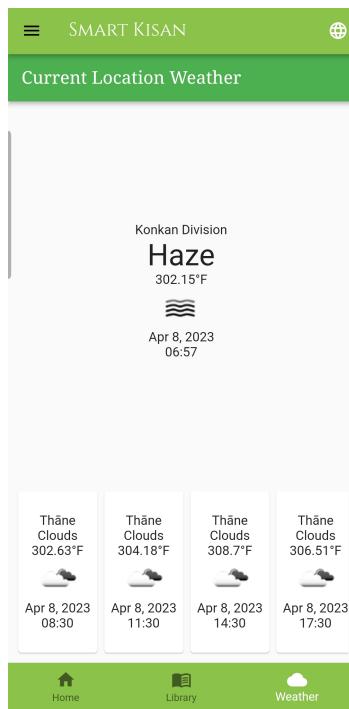


Fig 8 : Weather Forecast

Fig 8 represents weather information[20]. It shows the name of current location, weather condition and temperature in Fahrenheit along with date and time.



Fig 9 : Farmers' Library

Fig 9 represents farmers library section where farmers can watch videos related to latest farming techniques by clicking on the play button.

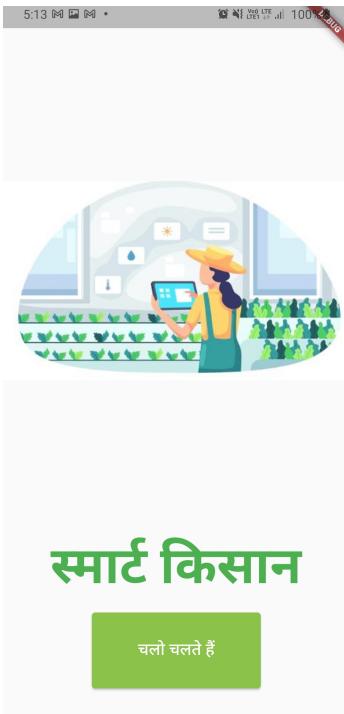


Fig 10 : Welcome Screen in Hindi

Fig 10 represents the multilingual feature of the app. It shows the welcome screen in Hindi which was the language chosen by selecting the language from the drop down menu located at the top right position of the home page.

VI. GAP ANALYSIS

The below table compares the proposed application with 4 other existing apps. It shows whether a particular feature is present in the app or not. Among these features weather information for more than 5 days, dedicated section for market price and information on latest techniques are unique to only proposed app and absent in other apps.

TABLE I
COMPARISON TABLE FOR COMPARING FEATURES OF PROPOSED APP WITH EXISTING APPLICATIONS

Features	AgriApp[9]	AgroStar App[10]	Krishi Network[13]	DeHaat[14]	Our App
Chatbot	Yes	Yes	Yes	Yes	Yes
Weather forecast more than 5 days	No	No	No	No	Yes
Dedicated Section for information on market price	No	No	Yes	No	Yes
Information on nearby warehouses	No	No	No	No	Yes
Plant Disease Detector	No	No	Yes	No	Yes
Farmers' library	No	No	No	No	Yes
Sell products or buy resources	Yes	Yes	No	Yes	No
Multilingual	Yes	Yes	No	Yes	Yes

VII. CONCLUSION

Farmers in India are working day in and out to grow crops, harvest them, store and sell them in the market. Unfortunately, this process is not smooth and they encounter various problems during the whole crop cycle. A mobile app can help farmers become self-reliant and make them capable of solving their problems during the crop cycle.

According to the survey, 39 % of the farmers face weather related issues. We propose to incorporate a weather section where farmers can know weather information at a particular time of the day not only for that day but for more than 5 days ahead. This would help them to prepare themselves beforehand and they do not need to rely on sources which show weather forecast for only 2 to 3 days ahead. A plant disease detection is also suggested where farmers can add a photo of their infected crop and they would be informed about the disease. The proposed app also ensures to enhance their knowledge regarding the latest techniques in farmers' library section. In

the google forms, many farmers also pointed out that they are unaware of the warehouse location to store their crops. They are also not aware of the market prices. Hence, a dedicated section to know the market price would be incorporated in the application. In addition to this a chatbot to answer the queries of farmers within a few seconds was also incorporated.

As farmers in India are familiar with their local languages, the need is ensure to make proposed app multilingual. This would increase the reach of the proposed app to a lot of farmers and they would be able to use it to their advantage. With the help of this proposed application, the aim is to resolve various issues of the farmers and make their life easier.

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