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# Smart Farming Trade Application and Crop Prediction Model for Agriculturalists

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**ABSTRACT—**

The primary source of revenue for the central and state governments is agriculture. It serves as the foundation for boosting the economy of any nation. Because distributors establish cheap prices when purchasing from farmers but then charge consumers more for the same goods, farmers have been experiencing problems while trying to sell their food crops on the market directly. In this paper, we are contributing a web-based portal that aids farmers in quickly registering themselves and reselling their goods via a payment gateway. By using the web portal, the farmers can sell the product easily than usual because it connects them directly to the buyers. Apart from this farmer would have a clear understanding of the needs of the consumer based upon the product consumption. Due to unnatural climate fluctuations, farmers are also experiencing difficulties in food production and crop prediction, which has a negative impact on their business by resulting in a low yield and makes them less adept at predicting future crops. To solve this problem, portal also assists farmers by using machine learning based crop prediction model.

**Keywords- Agriculture, farmers, Web-based portal, ML- Algorithm, crop prediction.**

## I. Introduction

Agriculture and the production of necessary food crops have been connected for centuries. It serves as the foundation for growing the economy in our nation. There are also numerous job options offered in the agriculture sector. The majority of individuals depend on agriculture as their primary source of livelihood. Due to distributors who establish cheap prices when purchasing from farmers but then charge consumers more for the same goods, farmers are experiencing many problems. To benefit both the producers and the consumers, the produced crops must be distributed directly to the final customers, so that they can obtain them fresh directly from the farm. To confirm that there are no middlemen, this application is designed to connect the farmers directly to the clients. The farmer will charge the customer fair pricing for the goods they purchase as well, because the farmer will be interacting with them directly. The producer can boost earnings in a scenario where the consumer can cut costs. This proposed work aims to provide an interface for farmers to sell their produce directly to consumers and run their agro-businesses successfully. The majority of farmers would greatly benefit from this application, as they are not as familiar with modern trends and technology. This illiteracy and lack of information allow the middlemen to take advantage of the farming community. These circumstances need to be rectified as soon as possible, and farmers need to be properly informed. Doing so will have a significant impact on the future of the profession of agriculture for generations and will ultimately lead to a significant increase in the country's economy. Crop production that depends on inputs such as soils and environmental conditions can also be a challenging process for farmers. Different fields and farmers will use different input parameters. This system also includes a machine-learning model-based crop prediction that is used to produce high-yield crops based on demand.

## II. Problem Statement

Distributors establish cheap prices when purchasing from farmers but then charge consumers more for the same goods, farmers have been experiencing problems. Farmers also face difficulties in crop prediction and food production due to unnatural climate fluctuations. Farmers might not be able to fulfil the demand of the goods

## III. Literature survey

The software application proposed in the paper provides an integrated solution for the farmers to access various types of information through the database and make changes to it wherever necessary. Farmer has the access to on/off their product visibility in this application. The proposed project work also describes the searching for agriculture product through the mobile application services. The customers can select the kind of product required from the product listed, customer can do purchase based the cost offered. Thus, the huge gap between the farmers and customers is reduced from the e-commerce

mobile application services provided which in turn saves the cost and time. The e-commerce mobile application provides betters shopping experience for the farmers and customers. The farmer and customers can view the detail of agriculture products from their location [1]. The suggested application in this paper provides businesses with a web-based platform to promote their items and bring in new customers thanks to the edit and remove post choices. The e-Krishi platform offers the farmers the chance to sign up and publish so they may select potential buyers and sellers and assess market opportunities. This initiative intends to provide farmers more negotiating leverage by providing them with an online platform that can be accessed both online and through e-centers and that allows small farmers to obtain information and connect with different stakeholders. The application has modules for authentication, posting ads, editing ads, reviewing ads, and generating passwords. For access to the application, both farmers and consumers must sign in [2]. An IVR system is created keeping in mind the digital divide environment. This ensures that users without high end devices like computers and smart phones are also be able to use all the services easily and comfortably. This application will be helpful to sustain life in the new normal world as it will be beneficial to maintain social distancing at marketplaces and stores. For accessing the portal, the customers can log in or signup on to the website or mobile application through e-mail or phone number. For signing up, they must provide their name, location, phone number and email address. Those who don't have a proper internet connection or devices can register or sign in through IVR. The farmers need to register themselves through the IVR system following the voice instructions [3]. The classifier models used in this system are Decision Tree Classifier and KNN. The decision tree is a technique for choosing the best root nodes; once we have members of the same class, we continue to split the tree based on attributes. KNN is a type of instance-based learning in which each computation is held off until the categorization and performance is only barely estimated regionally. Decision trees eventually fail when a dataset has more variants, yet in these circumstances naïve Bayes performs better than decision trees. When compared to using a single classifier model, combination classifier algorithms like naive Bayes and decision tree classifier perform better [4]. This information is also used to show consumers which farmers are available when they need them. Farmers should enter the special identifying ID as well in the future to authenticate. The portal also has a delivery option. End users have the option of picking up items personally or opting for delivery. The farmers' revenue will rise thanks to this gateway. As a result, after understanding the maximum requirement, it verifies the farmer's stock. If there is enough stock, every consumer who wants something receives it, otherwise it goes to the next farmer who raises the same crop. It reduces the total amount in stock after allocating to the maximum. If there is stock, the farmer is given the following maximum customer. This continues until all the conditions have been met. If all farmers have used up their supplies, it will say out of stock. Thus, the farmers can sell all their goods in this manner without suffering a loss. Additionally, shoppers can purchase high-quality products for a fair price [5]. The suggested system has a login page, a farmer page, and a customer page on its website. Two different webpages are accessible from the farmer and customer pages. Before a product can be put on the market, the payment gateway and the logistics from the agricultural field to the client location must be put in place to establish e-trade between the farmer and agriculture. The government's declared plans are also on exhibit. When the order is delivered, the customer has the option of paying online or in cash for the items they have selected on the customer page [6]. Farmers who intend to sell their food crops must first log in. Once they have done so, they must identify the nearest market, the date, the items' photos, the quantity, and the starting bid price as the minimum amount. Buyers must also join in order to purchase goods from the sellers who are closest to them by providing the location of the market. Following an agreement, any party may choose to pay online or with cash on delivery. This tool also serves as a suggestion system by analyzing the disease uploaded by farmers and offering treatments. Hotels, canteens, and housing societies can buy cheap, high-quality vegetables in quantity without going through an auction by contacting the source directly. The database used in the proposed study is SQLite. Text files are often used to store data in an open-source database called SQLite on consumer mobile devices. A database handler class and an activity will be used to build the application (My DB Handler class). Between the activity class and the SQLite DB, a subclass of the SQLite Open Helper will control database handlers and act as an abstraction layer. It is need to create a third class (the seller class) for the handler in order to transfer the data between the activity class and the other classes [7]. This paper offers advice to new farmers on utilizing inexpensive machinery, and outlines a process for predicting crop growth using the Naive Bayes algorithm and conditions such as temperature, humidity, and moisture. Users are prompted to input criteria like temperature, and the program automatically determines their location to begin forecasting. The proposed work consists of four steps: pre-processing, feature extraction, classification, and algorithm. Pre-processing involves using image processing techniques to improve or extract information from an image. Feature extraction reduces the number of variables required to accurately reflect data. Classification involves categorizing items according to specific criteria. Finally, the algorithm used in this study is CNN, which is a supervised learning technique primarily used for image recognition and consists of four essential layers: the convolution layer, the ReLu layer, the pooling layer, and the fully connected layer [8].

## IV. Existing System

**Table 1: Existing System**

| TITLE OF THE PAPER | ALGORITHMS USED | BENEFITS | LIMITATIONS |
|---|---|---|---|
| E-Commerce: Portal for Selling the Agricultural Products Using Mobile Application [1] | Flutter and Firebase software application are used. Flutter is Google's cross-platform UI toolkit with a single codebase for desktop, mobile, and the web. Google's platform for developing mobile applications, called Firebase, can assist you in creating, enhancing, and expanding your app. | • controlled and organized trading<br>• remote access for buyers and dealers spread out widely.<br>• Using product descriptions, farmers<br>• high trade activity. | Feedback system is not available; hence the portal is not reliable. |

| | | | |
|---|---|---|---|
| Design of Web Portal for E - Trading for Farmers[2] | The technologies used are Java and MySQL. Apache Tomcat server is used for the backend. Software requirements are Eclipse IDE, MySQL 5, JDK and Apache Tomcat Server. | • Allows for the identification of potential buyers and brokers to investigate market prospects.<br>• Offers advertising for a variety of goods and draws potential customers with the opportunity to edit and delete posts. | The customers will only be able to contact the farmers, no delivery facility is provided by the farmers. |
| OUR INDIAN SHOP – E-Commerce Website Interconnecting the Farmers, Shopkeepers, Delivery Personnel and Consumers[3] | An IVR system to enable the users without high end devices like computers and smart phones are also be able to use all the services easily and comfortably, and JavaScript | • Internet connection is not mandatory because of the IVR system<br>• This proposed work is helpful in a difficult situation like the COVID-19 pandemic where social distancing is a must to follow. | Registration of farmers, shop owners will be first verified and then approved only if the documents are valid. This process may take a long time. |
| Spry Farm: A Portal for Connecting Farmers and End Users[4] | Technologies used are CSS, JavaScript and SQLite3<br>Algorithm used is max-prior algorithm. | • It is a trustworthy and simple application.<br>• The max-prior algorithm is the standout feature that distributes the harvests to end users with the highest requirements. | No delivery of products is available. |
| Crop Prediction Using Machine Learning[5] | CNN (supervised learning algorithm) is used. | • This software aids farmers in managing the process of choosing crops based on factors including soil type, climate, and location.<br>• Farmers will save time by doing this as they choose the best crop to produce. | Real-time data cannot be used. |

## V. Methodology

The proposed system consists of a web application built with NodeJS for the backend and ReactJS for the frontend with the aim of selling a farmer's goods directly to the consumer without the need for a middleman. The program has three modules: administrator, farmer, and consumer.

To use the available features, both the producer and the end users must log into the system using the necessary data. The administrator is in charge of managing the operation and execution of the entire system.

The farmer must provide both their personal information and the specifics of their product after registering on this website. Users are then sent to their profile, where they can change it after finishing this step. Users must provide their name, age, phone number, residence, and the location of the agricultural field along with other personal data on the website. Users must upload the product's details, such as the name and cost of the item. Moreover, the cultivation date and the actual they have a distance in kilometers. Data about farmers is entered and stored in the database. Consumers may also see which farmers are available when they need them using this data.
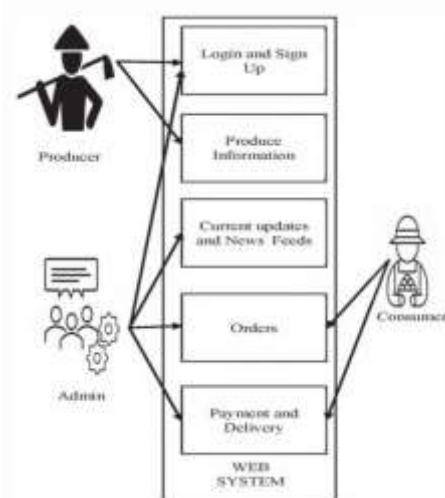


Fig1. Proposed Web Application

Growers should enter the distinctive identification ID for authentication in the future. The end stoner will have access to all the planter's information, as well as the yield, pricing, position, and contact information. The end stoner has the option to choose a specific planter and place an order grounded on their requirements. The runner under" schemes offered by the government" lists the government- blazoned programs for the weal of growers. The evaluations and reflections they admit from guests are shown on their runner. The client should use the portal to place the order and choose the necessary yield. The gate will also show all the most recent information and news about different products and deals. As a result, this point will serve as a birth for all directors to raise their earnings, which will boost the public frugality. On the runner under" schemes offered by the government," you may see the programs the government has declared for the weal of growers. The witnesses and reflections they admit from guests are shown on their runner. The client's particular information, including name, age, address, phone number, and delivery position, can be seen on the client runner. There's another column called the review block where people can partake their opinions regarding a specific product and the quality of the goods produced by a specific planter. From the product column, druggies can place an order for the item they ask. Along with the image and biographical information of the planter who grew the specific crop, it includes information on the product itself.
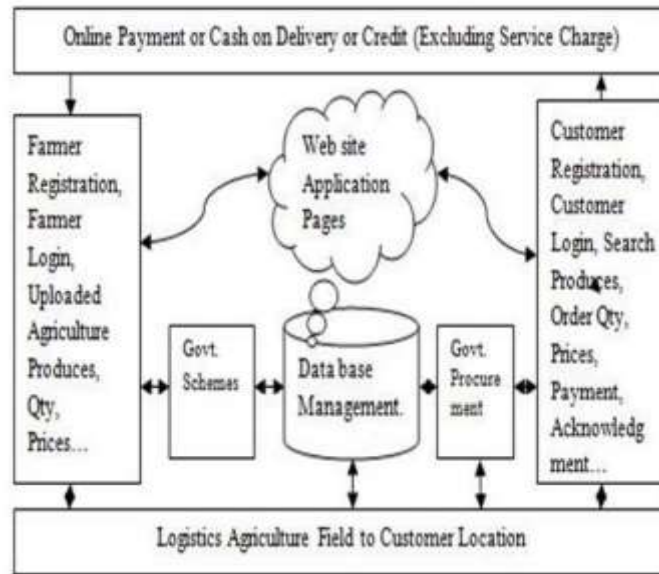


Fig2. Block Diagram of Farmer to Customer E-Trade

After their purchase is delivered, the client has the option of paying online or in cash for the items they have selected on the customer page. There is no need for additional logistics if the buyer can get the items on their own; but, if a service is made accessible for the particular location, they may receive the product delivery by any suggested logistics.

Crop prediction uses classification algorithms to increase agricultural production.
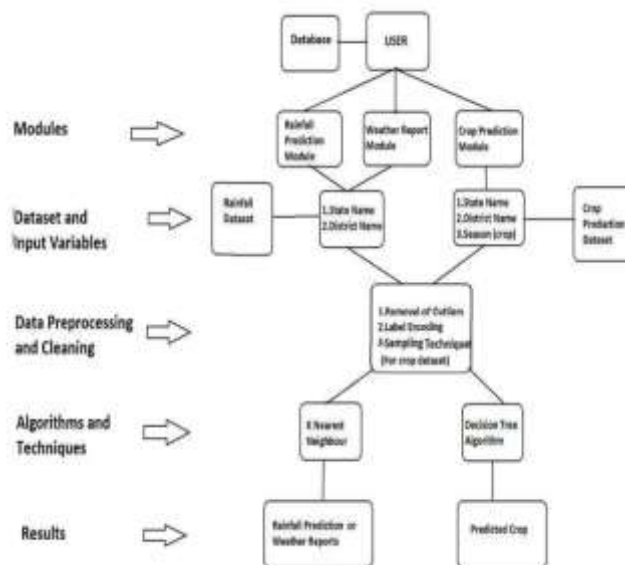


Fig3. Algorithm classification for improved agricultural yields.

There are three steps in the crop prediction model. They are as follows:

1.Data Acquisition:

Dataset has to have the following characteristics

Soil characteristics – Type of Soil and pH of Soil

Climatic Parameters - Temperature, Humidity, Wind, and Rainfall

Production: 1. Farming costs

Finding a dataset with information on past performances as well as information on climatic and soil characteristics, such as rainfall, temperature, moisture, and soil content, is the main objective. These variables will aid in the prediction of the crops by using different classifiers on the available dataset. Consequently, a number of parameters are assessed, with the components significantly assisting accurate crop forecast.

2. Pre-Processing:

Pre-processing is required since the dataset in use has redundant and noisy qualities. With a data redundancy procedure, the unnecessary components are first identified and eliminated from crop forecast. The categorical components are divided as part of the exploratory data analysis and given values of 0 or 1 depending on whether an element is present or absent. Further categorization based on that particular component is aided by these assigned values.

3. Classifier: Models: Decision Tree Classifier:

The decision tree is a technique for choosing the best root nodes; once we have members of the same class, we continue to split the tree based on attributes. Due to its adaptable characteristics that help materialize both categorical and continuous dependent variables, it is a type of supervised learning approach that is frequently used to address categorization problems most. This method splits the population into two or more homogenous sets depending on the most crucial criteria in order to make the groups as dissimilar as feasible. The decision tree algorithm will give us the ideal split on a number of factors for selecting the crop that will work best for the population. The decision tree classifier is suitable for crop prediction due to the feature selection procedure.

**KNN:**

With KNN, each computation is delayed until the classification and performance is only hazily assessed regionally. Giving neighbors contributions weights will help both classification and regression by allowing the nearest neighbors to contribute more to the average than the farthest neighbors.

Results and discussions of existing systems

For all farmers and end users, the gateway that links them directly with customers is a huge benefit. In Figure 4, the profile page is displayed. Figure 5 displays the login page for farmers.



Fig.4 Profile Page for Farmers and Buyers

Figure 4 shows the profile page which will get opened as soon as the farmer or the buyer logs in.

Fig 5. Login Page for Farmers

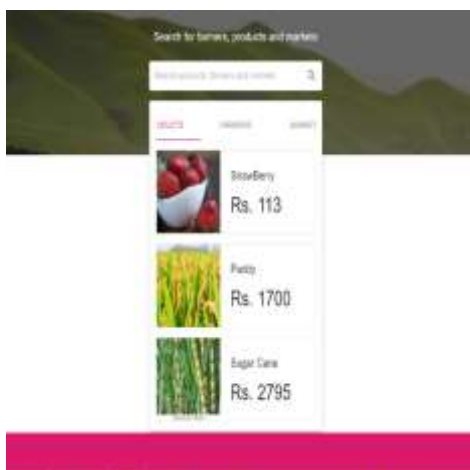In Figure 5, the prior gateway to enter the website will be there.



Fig 6. List of Products available in the market

Figure 6 shows the available products entered by the farmer to sell through the portal.



Fig 7. Details of the product available in market

In Fig 7, the product details will be displayed like stock of the product, available amount of the product and cost. Through this the buyer can place order or can contact the farmer.
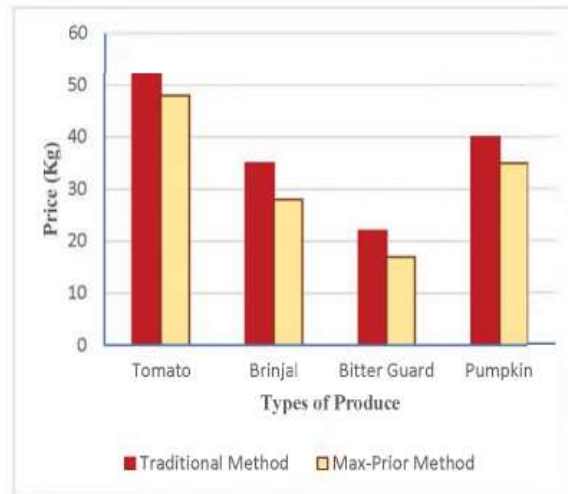
Fig.7 Comparison of the Costs of the Max-Prior Technique and the Conventional Technique

Fig 7 compares the costs that will be provided to the buyers using max-prior technique and also through conventional technique. The graph states that price value reduces through the max-prior method, which thereby profits the buyers.



Fig.8 Profitability of the Classical and Max-Prior Methods

Fig 8 compares the profit that occurs to the farmers through classical and max-prior methods. When these graphs are compared, it can be seen that the farmers' overall profit has increased by 5%. So, it is advantageous to link farmers and customers directly

Table 2. Comparison of machine learning algorithms used for crop prediction model

| S No. | Type of Algorithm | Accuracy |
|---|---|---|
| 1 | SVM | 80.65% |
| 2 | Random Forest Regression | 83.22% |
| 3 | Back Propogation ANN | 85.96% |
| 4 | Decision Tree Classifier | 93.11% |

The proposed algorithm for crop prediction model is Decision Tree Classifier. It has an accuracy of 93.11%

## VII. Conclusion

Through this trading application platform, customers from urban and rural locations can connect with adjacent farmers. It is a trustworthy and uncomplicated application. Fresh products may be bought through this site, and People could move to many of the neighboring villages and, as a result, purchase goods directly from the farmers. This lowers costs for both farmers and customers and increases profit. Thus, a customer may place an order on this portal and receive fresh, high-quality goods from the farmers. Both the farmers and the consumers may earn more by doing this.This method aims to

boost farmer revenue and cut down on production costs. In addition, it will give farmers the opportunity to sell their goods at a higher price. As the farmers will register themselves in the portal directly, they can sell their agricultural products at a reasonable price without worrying about mediators. This will increase the income of farmers and boost their production. Instead of using a middleman, the farmers will be able to sell their product directly at the market. Moreover, this study presents a productive crop recommendation system that utilizes classifier models. The classifier models used in the prediction system are Decision tree classifier and KNN. KNN provides higher accuracy when compared to decision tree classifier.

## VIII. References

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