

Farming System for Stable Market Access

SURESH BHASKAR LAHANE

COMPUTER SCIENCE & ENGINEERING OF SHREEYASH COLLEGE OF ENGINEERING AND TECHNOLOGY/BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE TAL MANGAON DIST. RAJGAD INDIA

M.P. VIJAYKUMAR

COMPUTER SCIENCE & ENGINEERING OF SHREEYASH COLLEGE OF ENGINEERING AND TECHNOLOGY/BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE TAL MANGAON DIST. RAJGAD INDIA

(lahane.suresh05@gmail.com)

Abstract—Every day new technology is arriving and billions of people were connected to the Internet. Purchasing goods, groceries, clothes everything is online. He or She can able to place the order from their Smartphone within a minute. But, Farmers are still lack of benefitting from the internet. As we all knew that Farmers are the backbone of our country and without them, we can't complete a day. Well, this idea is completely dedicated to farmers and helps them in generating good profitable revenue by using our platform. This is an online e-Commerce platform that enables a farmer to buy or sell anything related to the agriculture. Nowadays Smartphone is like a coin in a pocket. So, it's not a big question of thinking about smart phones with a farmer. Also, most of them are already familiar with social media accounts and it is quite easy to play with our online e-platform. But, there will be demo videos for each like registration, adding products, payment, etc. Safe payment gateway with a good logistic delivery partner, A farmer can do profitable business from his/her home itself. Both time and energy are also saved. This portal helps farmers to sell their agriculture produce online and is used to suggest best practices for farming. Hence it also provides a wider market and doesn't restrict them from the local market. It helps the wholesaler vendors and retailer vendors for expanding their business.

Keywords: *e-Commerce, Farming, Equipment Rental.*

I. INTRODUCTION

Agriculture, as the backbone of many economies, faces challenges stemming from uncertainties in weather conditions, market dynamics, and resource management[1]. In response to these challenges, we present the AI Farmer Support System—a transformative solution aimed at predicting crop yield and market prices to empower farmers with data-driven insights[2]. In this era of technological advancements, the integration of artificial intelligence and data analytics holds immense potential for revolutionizing traditional farming practices[3].

The AI Farmer Support System employs a novel sliding window non-linear regression technique, allowing for a dynamic and accurate analysis of multiple factors influencing agricultural production [4]. By considering historical data related to rainfall, temperature, market dynamics, and prior crop yields, the system goes beyond conventional approaches, providing a comprehensive understanding of the agricultural ecosystem [5]. This approach enables the generation of precise predictions for crop yield and market prices[6].

Our system is not just a predictive tool; it is a decision support system crafted to empower farmers in making informed choices about the crops they cultivate[7]. By aligning these choices with market demand and optimizing yields, the system contributes to the economic viability of agriculture[8]. The impact of such a technological intervention extends beyond individual farms, representing a promising step towards improving the economic sustainability of agriculture and enhancing the livelihoods of millions of Indian farmers[9].

This paper outlines the architecture, methodologies, and key components of the AI Farmer Support System[10]. We present our findings, including the accuracy of predictions, user feedback, and the system's potential for societal impact [11]. As we delve into the intricacies of this innovative approach, we invite the reader to explore how technology can be harnessed to address real-world challenges and contribute to the sustainable development of the agricultural sector[12].

II LITERATURE SURVEY:

1. “Artificial intelligence-based decision support systems in smart agriculture: Bibliometric analysis for operational insights and future directions.”

As the world population is expected to touch 9.73 billion by 2050, according to the Food and Agriculture Organization (FAO), the demand for agricultural needs is increasing proportionately. Smart Agriculture is replacing conventional farming systems, employing advanced technologies such as the Internet of Things (IoT).

Previous literature reviews have also conducted similar bibliometric analyses; however, there is a lack of research in Operations Research (OR) insights into Smart Agriculture.

2. “Demand Based Crop Recommender System for Farmers.”

About half of the population of India depends on agriculture for its livelihood, but its contribution towards the GDP of India is only 14 per cent. One possible reason for this is the lack of adequate crop planning by farmers. There is no system in place to advice farmers what crops to grow. In this paper we present an attempt to predict crop yield and price that a farmer can obtain from his land, by analyzing patterns in past data. We make use of a sliding window non-linear regression technique to predict based on different factors affecting agricultural production such as rainfall, temperature, market prices, area of land and past yield of a crop. The analysis is done for several districts of the state of Tamil Nadu, India. Our system intends to suggest the best crop choices for a farmer to adapt to the demand of the prevailing social crisis facing many farmers today.

3. “Crop Recommender System Using Machine Learning Approach.”

Agriculture and its allied sectors are undoubtedly the largest providers of livelihoods in rural India. The agriculture sector is also a significant contributor factor to the country's Gross Domestic Product (GDP). Blessing to the country is the overwhelming size of the agricultural sector. However, regrettable is the yield per hectare of crops in comparison to international standards. This is one of the possible causes for a higher suicide rate among marginal farmers in India. This paper proposes a viable and user-friendly yield prediction system for the farmers. The proposed system provides connectivity to farmers via a mobile application. GPS helps to identify the user location. The user provides the area soil type as input. Machine learning algorithms allow choosing the most profitable crop list or predicting the crop yield for a userselected crop. To predict the crop yield, selected Machine Learning algorithms such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Random Forest (RF), Multivariate Linear Regression (MIR), and K-Nearest Neighbour (KNN) are used. Among them, the Random Forest showed the best results with 95% accuracy. Additionally, the system also suggests the best time to use the fertilizers to boost up the yield.

4. “Performance Evaluation of Best Feature Subsets for Crop Yield Prediction Using Machine Learning Algorithms”

The rapid innovations and liberalized market economy in agriculture demand accuracy in Crop Yield Prediction (CYP). In accurate prediction, machine learning (ML) algorithms and the selected features play a major role. The performance of any ML algorithm may improve with the utilization of a distinct set of features in the same training dataset. This research work evaluates the most needed features for accurate CYP. The ML algorithms, namely, Artificial Neural Network, Support Vector

Machine, and Decision Tree, are used to assess the predictive ability. The results show that the ML algorithm reaches the highest accuracy by means of its Emory analysis values for all the distinct feature subsets using the same training agricultural data.

5. “Design of a smart hydroponics monitoring system using an ESP32 micro- controller and the Internet of Things”

This paper presents the design and construction of a hydroponics monitoring system that can collect parameters of hydroponic systems, such as temperature, water limit, pH level, and nutrient levels. The monitoring system was developed using an ESP32 microcontroller and several sensors, including total dissolved solids (TDS), pH, water level, and temperature sensors.

6. “Smart irrigation system based on IoT and machine learning”

This paper proposes an intelligent and flexible irrigation approach with low consumption and cost that can be deployed in different contexts. This approach is based on machine learning algorithms for smart agriculture. A set of sensors (soil humidity, temperature, and rain) in an environment that ensures better plant growth for months, from which we collected data based on an acquisition map using the Node-RED platform and MongoDB.

7. “Design and Implementation of Smart Hydroponics Farming Using IoT-Based AI Controller with Mobile Application System”

This article presented the design and implementations of AISHES with IoT, which is developed by integrating the Raspberry Pi, IoT environment with mobile application. The farmer observes and manages his hydroponics farm field using the Agri-Hydroponic program, which has manual and automated control modes. A Raspberry Pi controller based hardware design is installed in hydroponics farm field to monitor plant statics using various sensors.

8. “A Smart Hydroponics Farming System Using Exact Inference in Bayesian Network”

This study developed a smart hydroponics system that is used in automating the growing process of the crops using exact inference in Bayesian Network (BN). Sensors and actuators are installed in order to monitor and control the physical events such as light intensity, pH, electrical conductivity, water temperature, and relative humidity. “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

III METHODOLOGY:

1. Data Collection:

The first step of the proposed system is to collect the agricultural data required for analysis and decision-making. The system considers important factors such as rainfall, temperature, market conditions, land-related information, and previous crop yield. Historical agricultural information is used

This data is further prepared for analysis and machine learning. The overall purpose is to provide farmers with useful information based on available agricultural data.

2. Data Preprocessing:

After collecting the required agricultural information, the data is prepared for further processing. The collected records are organized into a suitable structure so that they can be effectively analyzed by the system. Unnecessary or unsuitable information is removed wherever required, while relevant agricultural information is retained. The data is arranged according to the factors required for prediction and decision support. Proper preprocessing helps maintain the quality and consistency of the dataset. It also makes the data easier for the machine learning algorithm to process. The prepared dataset is then used for feature selection and model development.

3. Feature Selection:

In this stage, important features that can influence agricultural decisions are selected from the available data. The proposed system considers factors such as rainfall, temperature, previous crop yield, land area, and market-related information. These features provide useful information about agricultural production and market conditions. Selecting relevant features helps the system focus on the factors that are most useful for prediction. It also reduces the effect of unnecessary information during model training. The selected features are then provided as inputs to the machine learning model. This step supports the development of an effective agricultural decision-support system.

4. Agricultural Data Analysis:

The selected agricultural data is analyzed to identify useful relationships and patterns. The system studies information related to environmental conditions, previous crop performance, and market situations. Historical data helps in understanding how different factors can affect agricultural production. Market information is also considered to understand demand and price-related conditions. This analysis provides a better understanding of the agricultural environment. The results of the analysis can support farmers in making informed decisions. The proposed system therefore uses data analysis as an important part of its decision-support approach.

5. Random Forest Algorithm:

The proposed system uses the Random Forest algorithm for machine learning-based prediction. Random Forest consists of multiple decision trees that work together to produce a final prediction. Different training samples and input variables are selected for constructing the individual trees. Each decision tree performs its own classification or prediction based on the learned patterns. After all trees produce their results, the final output is determined through majority voting. This approach allows the system to use the combined results of multiple trees rather than relying on a single decision tree. The Random Forest algorithm is therefore used as the main machine learning

forest model. During training, the algorithm learns patterns from the selected agricultural features and their corresponding outcomes. Multiple decision trees are developed using different training samples and variables. Each tree learns the relationship between the input agricultural factors and the expected result. The remaining data can be used to evaluate how well the trained model performs on new information. After the training process is completed, the model becomes capable of generating predictions for new agricultural inputs. The trained model is then integrated into the proposed farmer support system.

7. Prediction and Decision Support:

Once the Random Forest model has been trained, new agricultural information can be provided as input to the system. The trained decision trees process the input data and generate individual predictions. These predictions are combined using the voting mechanism of the Random Forest algorithm. The final prediction provides useful information that can support farmers in making agricultural decisions. The system is designed not only to provide predictions but also to act as a decision-support tool for farmers. It can help farmers understand available information before selecting suitable farming options. In this way, the prediction stage contributes to more informed and data-based decision-making.

8. Market Analysis and Recommendation:

The system also provides market-related information to help farmers make better selling decisions. It helps farmers find nearby markets and provides information about current stock and demand for particular products. Farmers can use this information to compare different market opportunities. The analysis helps identify a market that may be more suitable or profitable for their agricultural products. This reduces the time and effort required to manually search for market information. By combining agricultural information with market conditions, the system provides more practical support to farmers. The market recommendation component therefore strengthens the overall usefulness of the proposed platform.

9. Agricultural E-Commerce Platform:

The proposed system provides an online e-commerce platform specifically designed to support farmers. Through this platform, farmers can browse agricultural products and check their availability and prices. They can select the required products and purchase them through the online system. The platform provides direct access to agricultural products from companies or organizations. By reducing the involvement of middlemen, the system aims to make purchasing more convenient for farmers. It also saves the time and effort required to visit different places to find agricultural products. Thus, the e-commerce component provides a practical online facility for farmers.

10. Final System Output:

The final system combines agricultural data analysis, machine learning-based prediction, market information, and e-commerce facilities into a single platform. Farmers can use the system to access agricultural products and obtain useful market

simple and accessible interface. It reduces the time and effort required for agricultural product purchasing and market analysis. The overall system aims to support farmers in making better farming and marketing decisions. Therefore, the proposed methodology provides an integrated approach for improving farmer support through technology.

IV PROPOSED SYSTEM

In this system we are going to implement E-commerce platform for farmers by using this platform they can purchase the Agricultural product. This platform provide the agricultural product direct through the company or organization. In this system there is no middle man is present, there is no middle man present means price of the doesn't increases by any chance. Farmers can go through the online platform and check the product availability and price, and accordingly purchase it. It saves the time and efforts for the farmers. They can purchase the product within time. This 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 product. This platform can accommodate traditional marketing method as well as modern marketing methods. This application makes the farmers requirement become easy. One can easily browse through the various details using the well defined interfaces provided by the system.

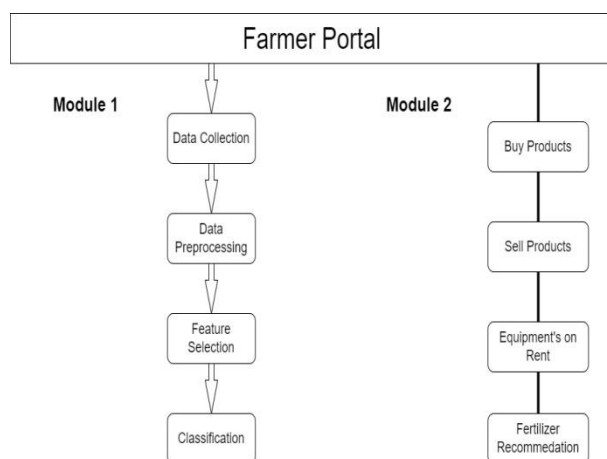


Figure1.system architecture

Algorithm – Random Forest

The algorithm used here is Random Forest. Random Forest is the machine learning.

Step 1: Assume N as number of training samples and M as number of variables within the classifier

Step 4: Randomly select m variables for each node on which to base the choice at that node. Evaluate the best split based on these m variables in the training set.

Step 5: Each tree is fully grown and not pruned (as may be done in constructing a normal tree classifier). For forecasting, a new sample is pushed down the tree. It is assigned the label of the training sample in the terminal node it ends up in. This procedure is repeated over all trees in the ensemble, and the average vote of all trees is reported as random forest prediction. i.e. classifier having most votes.

V CONCLUSION

The Farmer Support System is a transformative tool for Indian farm- ersoffering data-driven insights for informed decisionmaking. Our research and implementation have demonstrated its significant impact on Indian agriculture and rural development .Key findings include improved crop yields and income stability among adopting farmers, re- ducing income fluctuations. The system's commitment to eco-friendly practices contributes to sustainability and environmental responsibly-ity. Strong user adoption and engagement underline the system's practicality and acceptance. The feedback mechanism plays a pivotal role in its continuous improvement. As we look ahead, the AI Farmer Support System holds promise for empowering farmers, promoting sustainability, and expanding its impact through scalability and collaboration. In conclusion, this system represents a significant step towards improving Indian agriculture, benefiting millions of farmers, and promoting a sustainable future.

A farming system designed for stable market access can help farmers achieve better and more reliable incomes by connecting production with market demand. Diversification of crops, proper planning, improved storage and transportation, value addition, and strong links with buyers can reduce the risks caused by price fluctuations and market uncertainty. Farmers' cooperatives, digital market platforms, contract farming, and government support can further strengthen their bargaining power and access to profitable markets. Therefore, adopting a market-oriented and sustainable farming system is essential for improving farmers' livelihoods, reducing losses, and ensuring long-term economic stability in agriculture.

Agricultural Data



Data Preprocessing

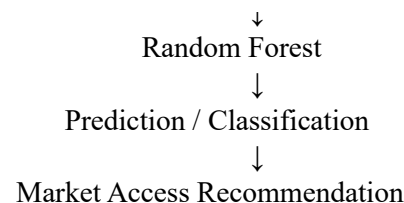
↓ most popular and powerful algorithm of



Decision Tree Decision Tree Decision Tree

Step 2: The number of input variables to decide the decision at each node of the tree; m should be much less than M .

Step 3: Consider training set by picking n times with replacement from all N available training samples. Use the remaining of the cases to estimate the error of the tree, by forecasting their classes



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