ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

Predicting Crop Prices with Machine Learning Techniques

Cholla Surya Siva[1], Chiraparapu Srinivasa Rao*[2]
[1,2]Department Master of Computer Application(MCA), SVKP & Dr KS Raju Arts & Science College(A), Penugonda, W.G.Dt., A.P India
sivacholla@gmail.com[1], chiraparapu@gmail.com[2]

ABSTRACT

Agriculture forms the backbone of our nation's economy. However, in recent years, unpredictable climatic conditions and fluctuations in market trends have caused significant variability in crop prices. These uncertainties often catch farmers off guard, leading to crop spoilage and substantial financial losses. Moreover, limited awareness of profitable crop choices and insufficient knowledge about crop-specific diseases and remedies further worsen the situation. To address these challenges, we propose an intuitive and user-friendly system that accurately predicts crop prices using Machine Learning techniques. Specifically, the model employs a Decision Tree Regression algorithm and considers features such as rainfall, wholesale price index, month, and year for effective forecasting. By providing advance pricing predictions, the system empowers farmers to make informed decisions, thereby boosting their profitability and contributing positively to the national economy. In addition, the platform includes supplementary modules such as weather forecasting, crop and fertilizer recommendations, and integrated features like a shopping portal, chat support, and multilingual guides — making it a comprehensive agricultural assistant.

Keywords: Crop Price Prediction, Machine Learning, Decision Tree Regression, Agricultural Forecasting, Random Forest, K-Nearest Neighbors (KNN), Crop Yield Prediction, Weather Forecasting, Precision Agriculture, Fertilizer Recommendation.

I. INTRODUCTION

India, being a predominantly rural nation, relies heavily on agricultural yield and allied agro-industrial products for its economic growth. At present, the country is rapidly progressing towards technological development. Smart farming is revolutionizing agriculture in India, as technology can provide solutions to most of the challenges faced by farmers. It can help them predict weather conditions more accurately, reduce wastage, increase productivity, and improve profit margins.

In the current scenario, both farmers and consumers struggle to determine accurate crop prices without prior knowledge of fluctuating market trends or weather conditions. Hence, technological innovation will prove to be extremely useful for agriculture. This paper aims to predict crop prices in advance. The proposed system, Agro-Genius, is built using Machine Learning (ML) techniques to develop a price prediction model. The system relies on regional datasets to achieve higher accuracy and better performance.

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

Over the past few years, crop prices have shown high variability, which has contributed to increased crop damage and financial instability for farmers. The primary objective of this prediction system is to provide farmers with better insights into their yields and enable them to manage price-related risks effectively.
Weather unpredictability further impacts crop production. The proposed system also includes a weather forecasting module to assist farmers in making accurate decisions regarding field ploughing, sowing, and harvesting. Similarly, fertilizers play a crucial role in maintaining soil fertility by replenishing nutrients removed by crops. Without proper fertilizer application, crop yield and production are significantly reduced. To address this, the system will recommend fertilizer usage specific to different crops and provide a portal for purchasing fertilizers and seeds from nearby locations. The system will even display the exact address of the supplier. By guiding farmers toward the most suitable crop and fertilizer combination, based on cultivation date, month, and location, the platform ensures maximum yield and profitability.

Additionally, the system will provide multilingual and region-specific guidebooks to support farmers. This feature is especially beneficial for beginners who may lack documented knowledge passed down from previous generations. To further assist farmers, interactive maps are incorporated:

- Irrigation Maps: Show irrigated and non-irrigated areas across the country.
- Agricultural Land View Maps: Provide an overview of agricultural land in different states and help farmers identify non-agricultural land that can be developed.

Farmers can simply hover over a state to view detailed information, making it easier to select suitable land for cultivation. This is particularly advantageous for new farmers, as choosing the right land and location is the first step towards successful farming.

The system will also integrate a chat application to facilitate knowledge sharing. Farmers often encounter queries that cannot be resolved due to limited expertise. Through this platform, they can exchange information and gain valuable insights. Since language is often a barrier—most non-English-speaking farmers in India primarily use Hindi—translation features are provided to make the platform user-friendly. Over time, support for other regional languages can also be added.

Our system is designed as a web application powered by Machine Learning algorithms such as Naïve Bayes, Decision Trees, and K-Nearest Neighbor (KNN). These models are compared to determine the most accurate prediction model, which is then used to forecast crop prices. By combining crop price prediction, weather forecasting, fertilizer recommendations, and information sharing tools, Agro-Genius serves as a comprehensive agricultural assistant for farmers.

II. LITERATURESURVEY

The following papers focus on predicting crop prices using Machine Learning and providing practical results. In April 2019, research was conducted to forecast both the cost and the benefit of a given harvest before planting. The training datasets acquired provided sufficient insights to predict the suitable price and demand in the markets [1]. The authors predicted the most profitable crops and their expected price

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

during harvesting time based on location, using different historical raw datasets and various Machine Learning algorithms.

Nishiba [2] highlighted the application of data mining techniques in predicting harvest yield, based on input parameters such as average rainfall and field area. An easy-to-use webpage was developed for crop yield prediction, where any user can input rainfall and region details to obtain results.

Different data mining techniques have been applied to different datasets. Some papers also discuss including additional modules [11] to support farmers in decision-making based on harvested area or current market trends. The system can be extended by visualizing crop details in maps with districtwide cultivation data. Furthermore, a graphical visualization of predicted prices would improve farmers' understanding.

The proposed systems are intended to help farmers estimate the best yield and forecast crop prices. They also allow farmers to check previous commodity prices. Algorithms such as Random Forest, Polynomial Regression, and Decision Trees [9] are commonly applied. The ability to recommend the best crop and its required fertilizers increases farmers' confidence in both yield and profitability. In addition, such systems may also handle marketing tasks [4] by estimating the total value of crops based on current market prices. Future extensions include integrating a nearby shop-location portal for purchasing seeds and fertilizers.

These studies aim to predict prices and provide forecasts through web applications that run on efficient Machine Learning algorithms. Popular models include the Autoregressive Integrated Moving Average (ARIMA), Traditional ARIMA [6], Support Vector Regression (SVR) [8], and others, all designed with user-friendly interfaces. Training datasets [7] provided sufficient insights to forecast the appropriate price [10] and demand in the markets. Results are generally displayed via web applications to ensure accessibility for farmers, including those with limited resources.

The accuracy of these models can be improved by integrating agricultural domains such as horticulture, sericulture, and related sectors, which face various challenges today. Incorporating them would expand the scope of the systems and provide support to new farmers entering the field. Moreover, the work can be extended by developing frameworks to suggest agricultural produce distribution strategies. With such frameworks, similar accuracy could be achieved even in independent data-driven environments. Further improvements could include building an Android application for wider accessibility.

III. PROPOSEDSYSTEM

In this paper, the author applies various Machine Learning algorithms such as Random Forest, Decision Tree, and K-Nearest Neighbors (KNN) to predict crop prices. These algorithms are trained on a Crop Prices dataset, which includes crop details and weather-related parameters such as rainfall. A sample view of the dataset contains crop names, market names, prices, and rainfall values.

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

System Architecture

☐ **Wireless Sensor Nodes**
- Deployed in the field to collect real-time data.
- Capture information related to soil conditions, plant health, and the environment.

☐ **Data Flow to Cloud**
- Sensor data is transmitted wirelessly to a centralized cloud storage and analysis system.

☐ **Cloud Storage & Analysis**
- The central system stores, processes, and analyzes the collected data using intelligent algorithms.
- Provides decision support for precision farming.

☐ **Smart Data Analysis**
- Generates actionable insights for:
  - Automatic seed spreading
  - Crop growth monitoring

☐ **Plant Disease Detection**
- Utilizes sensors and image processing techniques to identify plant diseases.
- Sends alerts and recommendations for treatment.

☐ **Soil Analysis**
- Evaluates soil parameters such as moisture, nutrients (NPK), and pH levels.
- Assists in fertilizer management and crop planning.

☐ **Smart Irrigation**
- Automatically regulates irrigation based on soil conditions and weather data.
- Saves water and ensures optimal crop hydration.

☐ **Mobile Interface**
- Farmers can monitor and control farm operations through a mobile application.
- Provides remote access to farm data, alerts, and recommendations.

IV. METHODOLOGY

Project Overview

This project aims to support farmers in making data-driven decisions to enhance agricultural productivity through Machine Learning (ML) techniques.

The methodology involves the following key steps:

1. **Problem Identification**
   - Identify major farming challenges such as low crop yield, pest and disease outbreaks, crop selection issues, weather impact, and soil nutrient deficiencies.
2. **Data Collection**
   - Gather data from credible sources including government agricultural portals, meteorological departments, and open datasets.
   - Data includes soil metrics (pH, NPK), weather data, crop yield records, and pest images.
3. **Data Preprocessing**

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

- Clean, normalize, and encode data.
- Apply image processing techniques for pest and disease detection tasks.

4. **Feature Selection**
   - Select important features based on correlation and relevance to specific tasks such as crop recommendation and yield prediction.
5. **ML Model Selection**
   Crop Recommendation: Random Forest, KNN
   Yield Prediction: Linear Regression, XGBoost
   Pest Detection: CNN
   Fertilizer Recommendation: Decision Tree, Naïve Bayes
6. **Model Training and Evaluation**
   - Use training/testing splits and cross-validation.
   - Evaluate performance using Accuracy, F1-score, and RMSE.
7. **Model Optimization** o Apply hyper parameter tuning techniques and methods to prevent overfitting.
8. **System Integration**
   o Integrate models into a user-friendly web or mobile application with support for voice input, image uploads, and localized recommendations.
9. **Real-Time Updates**
   o Incorporate APIs for weather forecasts, market prices, and government scheme notifications.
10. **Feedback and Retraining**

- Collect user feedback and continuously retrain models with new data to improve accuracy and relevance.

Algorithms

This project employs a set of machine learning algorithms tailored to address key agricultural challenges:

1. **Crop Recommendation**
   - **Algorithm:** Random Forest Classifier
   - **Role:** Suggests the most suitable crop based on soil nutrients (NPK), pH, rainfall, temperature, and humidity.
   - **Output:** Recommended crop (e.g., Rice, Wheat).
2. **Crop Yield Prediction**
   - **Algorithm:** Linear Regression or XGBoost Regressor
   - **Role:** Estimates expected yield using historical yield data, soil conditions, fertilizer usage, and weather patterns.
   - **Output:** Estimated crop yield in kg/hectare.
3. **Pest and Disease Detection**
   - **Algorithm:** Convolutional Neural Network (CNN)
   - **Role:** Analyzes crop leaf images to detect diseases or pests.
   - **Output:** Identified disease/pest along with treatment suggestions.

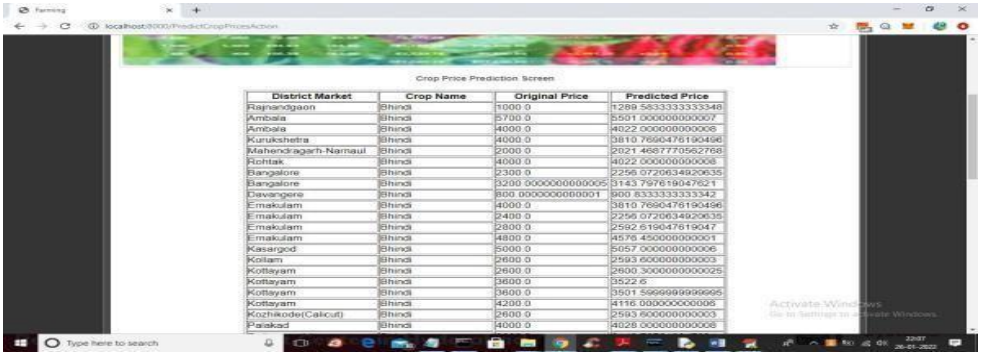
ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

4. **Fertilizer Recommendation**
    - **Algorithm:** Naïve Bayes Classifier
    - **Role:** Recommends suitable fertilizers based on crop type, soil NPK levels, and observed conditions.
    - **Output:** Suggested fertilizer type.

V. RESULT



Figure 1 : Shows the server has started. Now, open the browser and enter the URL.



District Market	Crop Name	Original Price	Predicted Price
Rajnandgaon	Bhindi	1000.0	1289.5833333333348
Ambala	Bhindi	5700.0	5501.000000000007
Ambala	Bhindi	4000.0	4022.000000000008
Kurukshetra	Bhindi	4000.0	3810.7690476190496
Mahendragarh-Narnaul	Bhindi	2000.0	2021.4687770562768
Rohtak	Bhindi	4000.0	4022.000000000008
Bangalore	Bhindi	2300.0	2256.072063492063S
Bangalore	Bhindi	3200.000000000005	3143.797619047621
Davangere	Bhindi	800.0000000000001	900.8333333333342
Ernakulam	Bhindi	4000.0	3810.7690476190496
Ernakulam	Bhindi	2400.0	2256.072063492063S
Ernakulam	Bhindi	2800.0	2592.619047619047
Ernakulam	Bhindi	4800.0	4576.450000000001
Kasargod	Bhindi	5000.0	5057.000000000006
Kollam	Bhindi	2600.0	2593.600000000003
Kottayam	Bhindi	2600.0	2600.3000000000025
Kottayam	Bhindi	3600.0	3522.6
Kottayam	Bhindi	3600.0	3501.5999999999995
Kottayam	Bhindi	4200.0	4116.000000000008
Kozhikode(Calicut)	Bhindi	2600.0	2593.600000000003
Palakad	Bhindi	4000.0	4028.000000000008

Figure 2 : Shows the Details of the Different Columns

In the above screen, the first column represents the 'District Market Name', the second column represents the 'Crop Name', the third column represents the 'Original Crop Price', and the fourth column represents the 'Predicted Price' using Machine Learning algorithms. Now, scroll down to view the predicted accuracy of the Machine Learning algorithms.

VI. CONCLUSION

This project is undertaken using Machine Learning and evaluates performance with KNN, Naive Bayes, and Decision Tree algorithms. Among these, the proposed model shows that the Decision Tree algorithm provides better yield prediction compared to the others. As most types of crops can be secured under this system, farmers may become more familiar with yields that might otherwise have been

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

unpredictable. The study demonstrates the potential application of Machine Learning techniques in forecasting crop costs based on the given attributes. The developed web application is user-friendly and achieves a testing accuracy of over 90%.

Scope

Accurate forecasts of climate parameters and improved historical crop data would result in more precise crop and yield predictions in the future. Additionally, the developed webpage is user-friendly and can be further enhanced by providing additional useful information such as intercropping practices, fertilizer recommendations, and more.

We can also create a more interactive User Interface by incorporating features like chatbots and speech recognition systems.

Future Work

To make the system more intelligent, accessible, and widely usable in real-world agricultural settings, several enhancements are proposed:

1. **Integration of IoT Devices**

Smart soil moisture sensors, weather monitoring stations, and drones can be integrated to collect real-time environmental and field data. These inputs will enable the ML models to generate more accurate and timely recommendations for irrigation, fertilization, and pest control, thereby reducing human dependency and increasing automation in decision-making.

2. **Voice-enabled Virtual Assistant**

A multilingual assistant capable of understanding and responding in regional Indian languages can be developed. This feature will make the platform more usable for farmers with little or no formal education by eliminating language and literacy barriers. The assistant can also provide alerts on weather changes or disease outbreaks.

3. **Real-time Weather Forecast Integration**

APIs from meteorological departments can be used to provide real-time weather forecasts. By continuously analyzing these predictions, the platform could dynamically adjust crop, irrigation, and fertilizer plans, protecting crops from unexpected climate variations.

4. **Drone Surveillance**

Drone-based aerial imagery can be employed to scan large fields for water stress, pest infestations, or disease spread. These images can be processed using deep learning models, offering scalable crop monitoring solutions.

5. **Blockchain Integration**

Blockchain can be used for crop lifecycle tracking and supply chain transparency. Each batch of crops can be securely recorded from seed to market, enabling buyers and sellers to verify authenticity, origin, and quality. This enhances trust and traceability, especially for exports.

ISSN: 2582 - 6379
IJISEA Publications
International Journal for Interdisciplinary Sciences and Engineering Applications
IJISEA - An International Peer- Reviewed, Open Access Journal
2025, Volume 6 Issue 3
www.ijisea.org

6. AI-powered Chatbot

A smart chatbot can provide farmers with real-time support on crop health, best practices, and market advice. It would serve as a 24/7 virtual guide, accessible via both mobile and web platforms.

7. Marketplace Module

Incorporating a marketplace within the application would allow farmers to check live crop prices and connect directly with buyers, bypassing intermediaries. This ensures fair pricing, reduces exploitation, and increases profits.

8. Automated Model Retraining

An adaptive retraining pipeline should be developed so that the ML models can continuously learn from new data. This would ensure the system remains up-to-date and relevant, maintaining high accuracy over time.

REFERENCES:

[1] Rachana, Rashmi, Shravani, Shruthi, & Seema Kousar. (2019, April). Crop Price Forecasting System Using Supervised Machine Learning Algorithms. International Research Journal of Engineering and Technology (IRJET).

[2] Nishiba Kabeer, Dr. Loganathan D., & Cowsalya T. (2019, June). Prediction of Crop Yield Using Data Mining. International Journal of Computer Science and Network.

[3] Vijayalakshmi, J., & Pandi Meena, K. (2019, July). Agriculture TalkBot Using AI. International Journal of Recent Technology and Engineering (IJRTE).

[4] Gamage, A., & Kasthurirathna, D. (2019, October). Agro-Genius: Crop Prediction Using Machine Learning. International Journal of Innovative Science and Research Technology, 4(10).

[5] Vohra, Aman, Pandey, Nitin, & Khatri, S. K. (2019). Decision Making Support System for Prediction of Prices in Agriculture Commodity. Proceedings of the Amity International Conference on Artificial Intelligence (AICAI). IEEE.

[6] Nguyen, Huy Vuong, et al. (2019). A Smart System for Short-Term Price Prediction Using Time Series Models. Computers & Electrical Engineering, 76, 289–297.

[7] Sangeeta, & Shruthi G. (2020, January). Design and Implementation of Crop Yield Prediction Model in Agriculture. International Journal of Scientific & Technology Research, 8(1).

[8] Rohith, R., Vishnu, R., Kishore, A., & Deeban Chakkarawarthi. (2020, March). Crop Price Prediction and Forecasting System Using Supervised Machine Learning Algorithms. International Journal of Advanced Research in Computer and Communication Engineering.