Crop Price pridiction

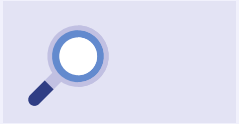
Submitted by
Akash Verma
Shivangi Agarwal

Table of contents

Introduction

- Agriculture is the backbone of the Indian economy, supporting millions of livelihoods.
- Farmers frequently encounter financial instability due to fluctuating crop prices.
- This project aims to develop a predictive model to estimate the current crop price per quintal using historical pricing, environmental conditions, and agronomic factors.

Data Preprocessing

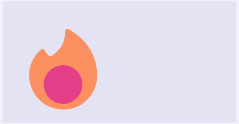


Missing Value Check

Verified that the dataset had no missing values, ensuring clean data input for modeling.

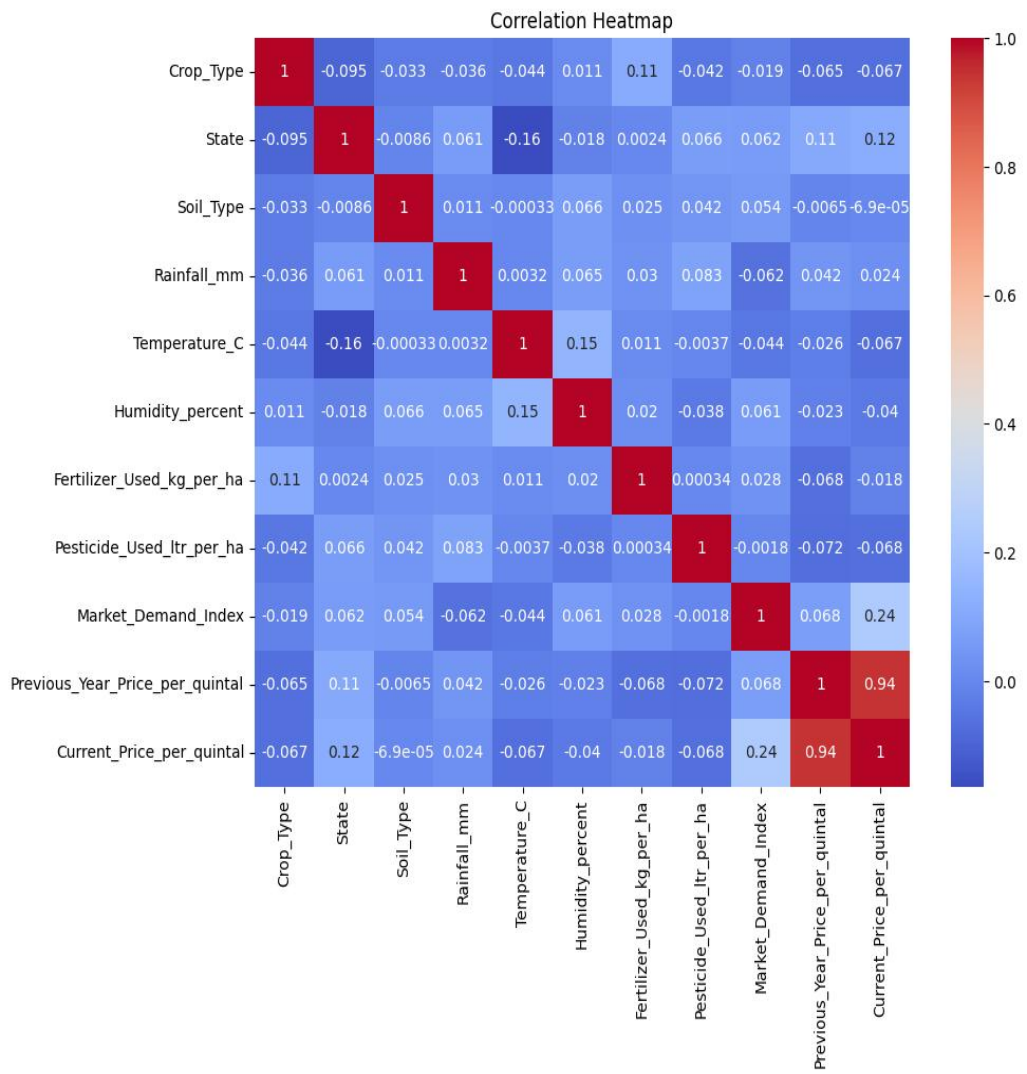
Handling Categorical Variables

Applied Label Encoding to convert Crop_Type, State, and Soil_Type into numerical form for model compatibility.



Feature Selection

Chose relevant features such as Rainfall, Market Demand Index, and Previous Year Price for better model performance



Heat Map

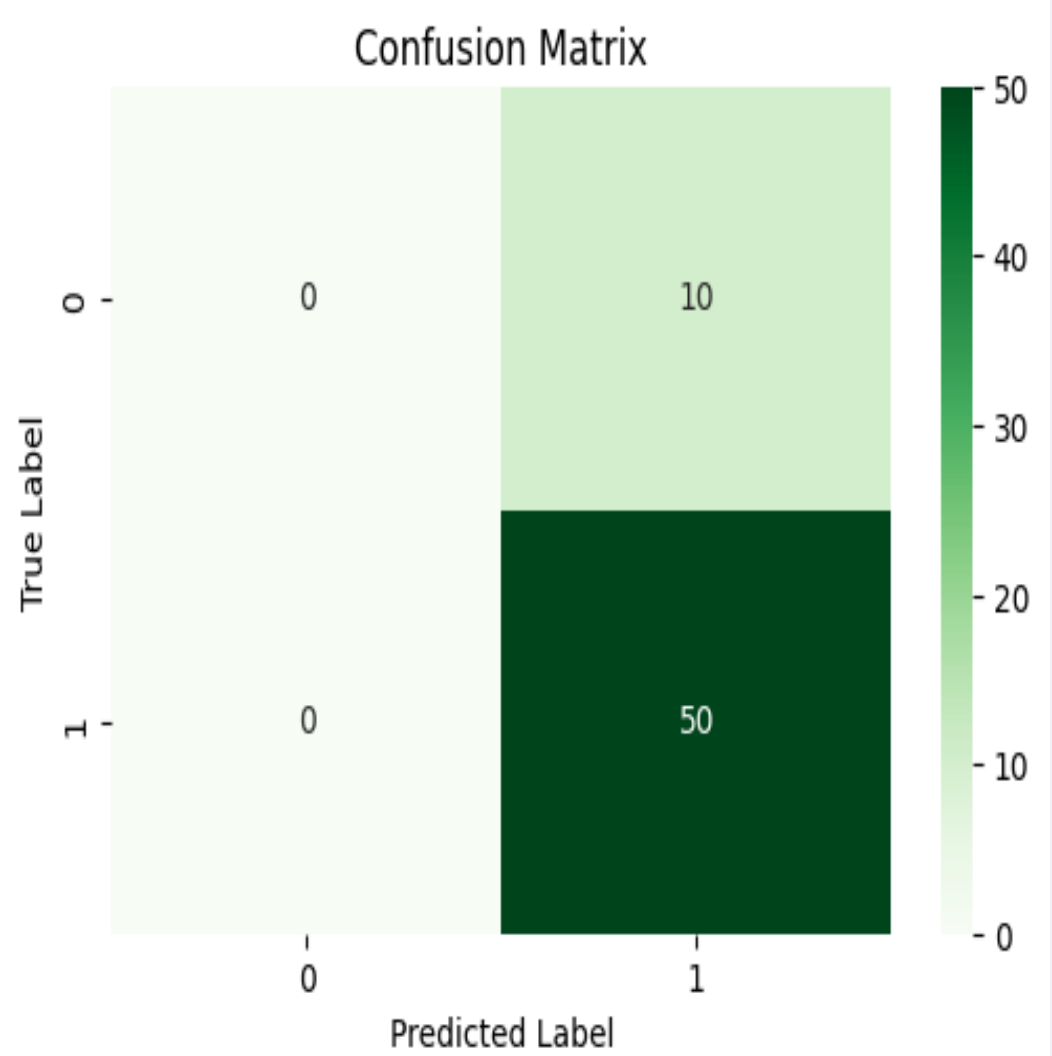
1. Strong Positive Correlation:

Current_Price_per_quintal and Previous_Year_Price_per_quintal: **0.94**

2. Moderate Positive Correlation:

Market_Demand_Index and Current_Price_per_quintal: **0.24**

Humidity_percent and Rainfall_mm: **0.15**



Matrix

The confusion matrix shows that the model **predicts only class 1** for all inputs, **failing to identify any instances of class 0**, indicating a strong bias or imbalance in the predictions.

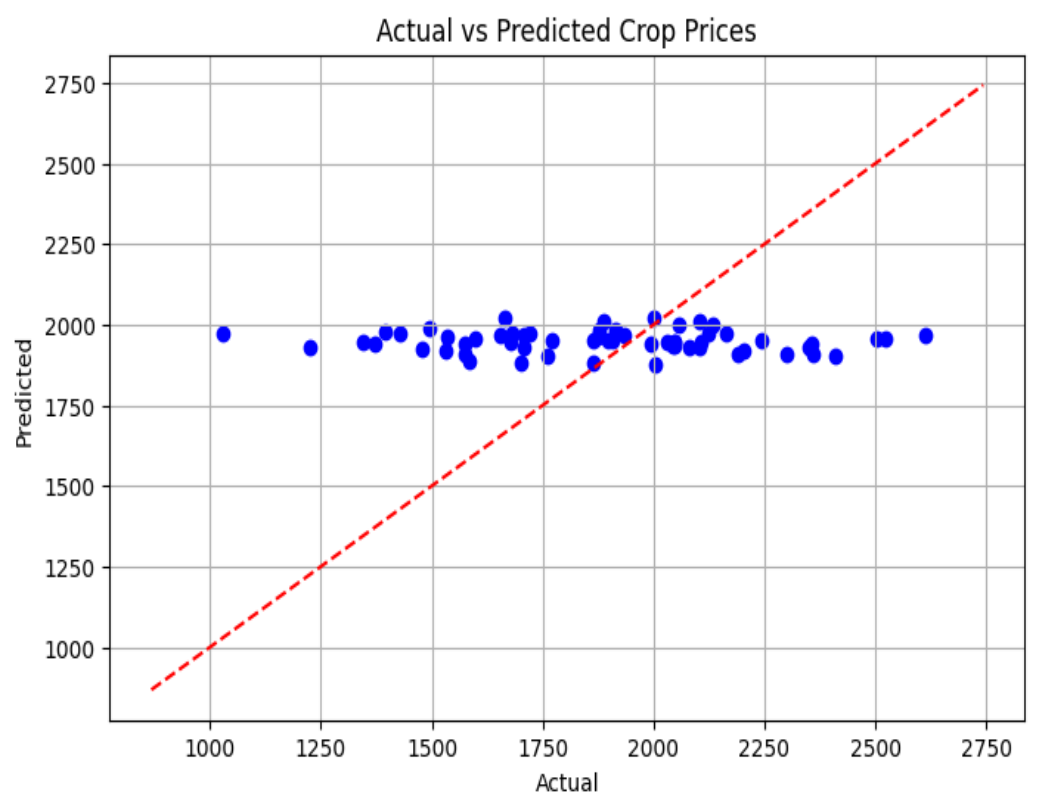
Predictive Modelling

It is statistical technique that uses historical data and algorithms to forecast future outcomes or trends

Algorithms

1. Linear Regression
2. Decision Tree
3. Random Forest

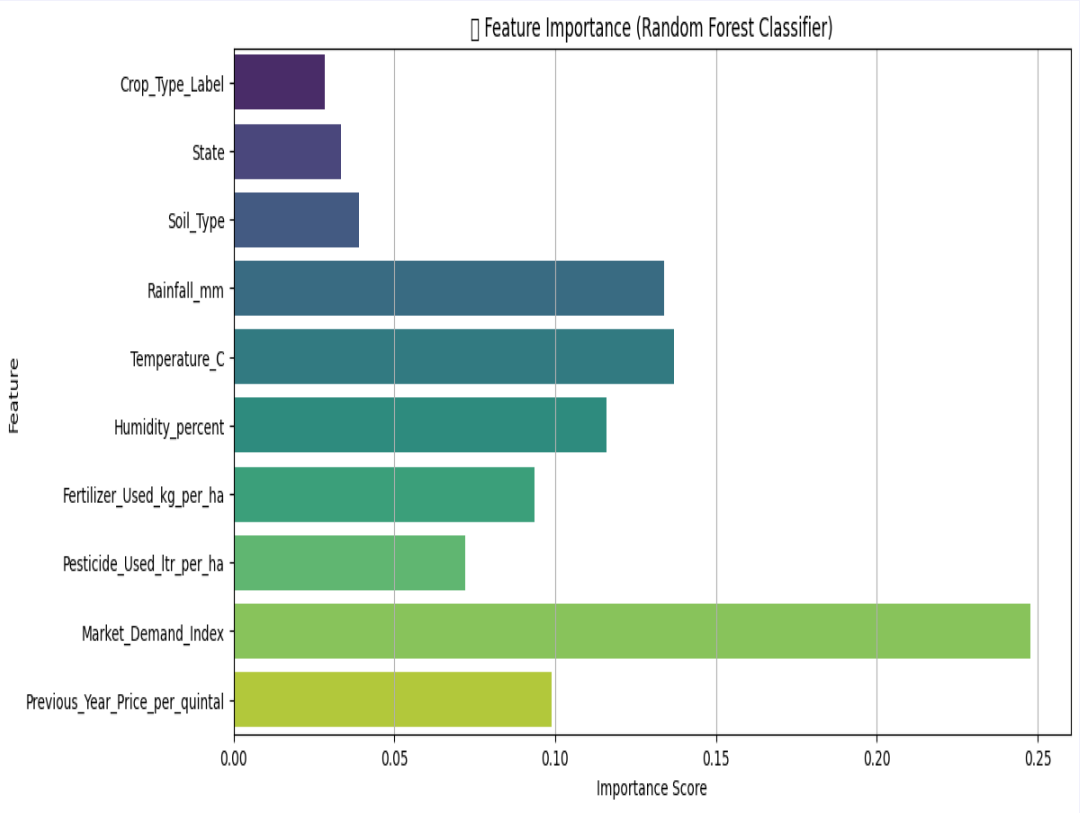
Linear Regression




```
Linear Regression Results:
R² Score (Accuracy): 0.9315
MAE: 71.52
MSE: 7733.38
RMSE: 87.94
```

The plot shows that the model consistently predicts crop prices around 2000, failing to capture the variation in actual prices.

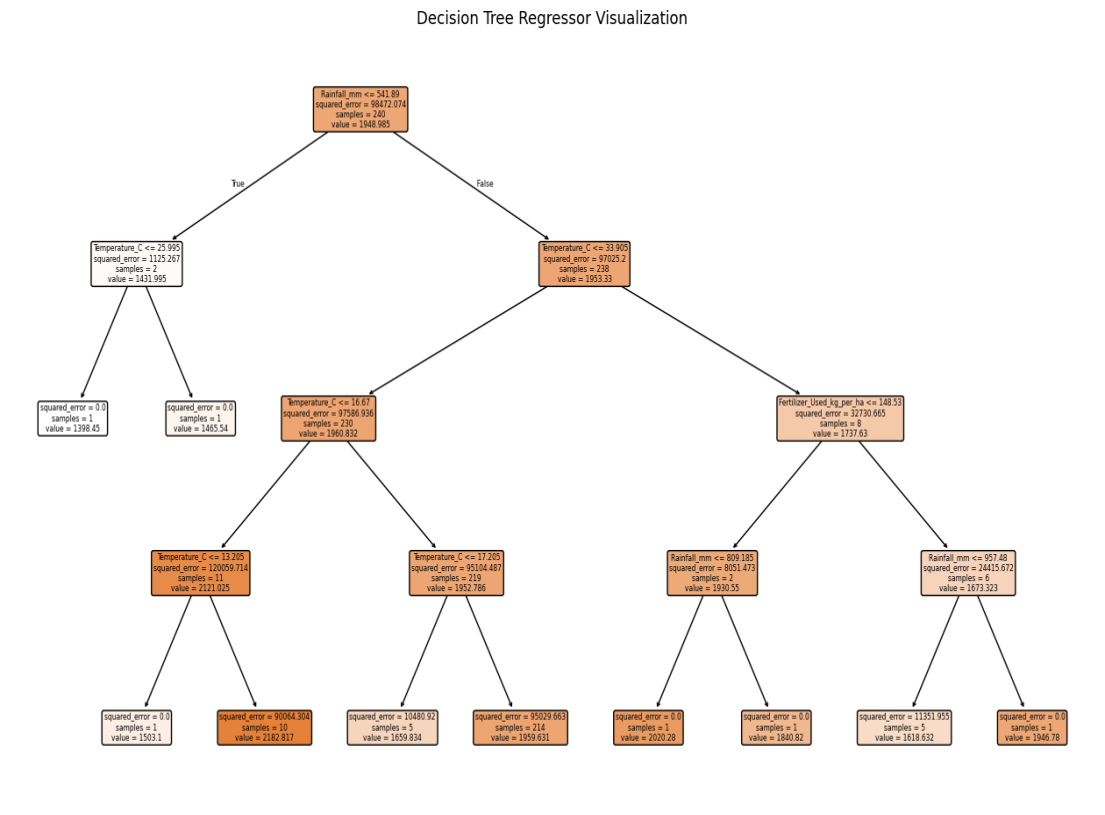
Random forest




```
Random Forest Results:
R² Score (Accuracy): 0.9182
MAE: 77.32
MSE: 9237.57
RMSE: 96.11
```

The figure shows that "Market_Demand_Index" and "Previous_Year_Price_per_quintal" are the most important features for predicting the target variable.

Linear Regression

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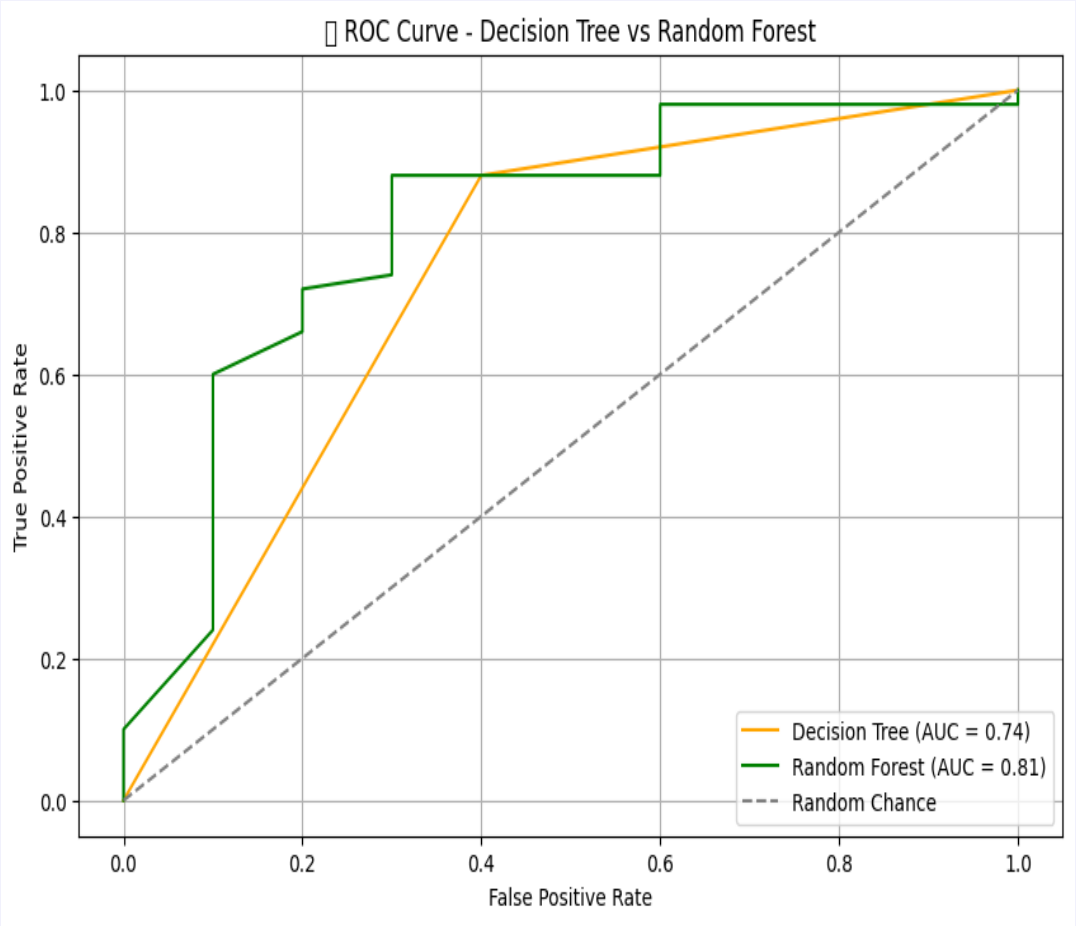
Decision Tree Results:
R² Score (Accuracy): 0.8158
MAE: 107.58
MSE: 20795.42
RMSE: 144.21
```



The figure compares the ROC curves of Decision Tree and Random Forest classifiers, showing that the Random Forest (AUC = 0.81) outperforms the Decision Tree (AUC = 0.74) in distinguishing between classes.

Prediction

```
🔮 --- Future Crop Predictions ---
Crop: Cotton
 - Previous Price: ₹1561.15
 - Prediction: ↑ Increase
 - Predicted Increase: ₹195.43 ₹
 - Expected New Price: ₹1756.58
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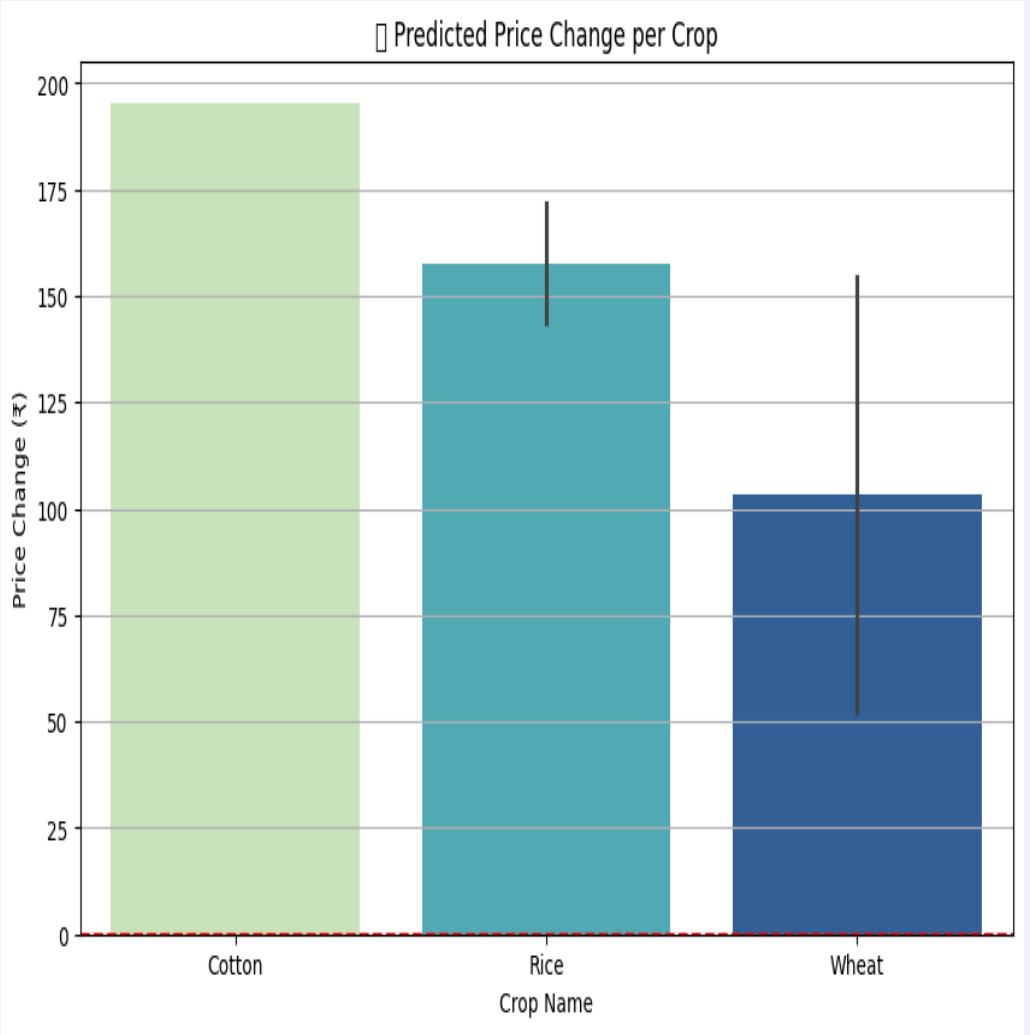
Crop: Rice
 - Previous Price: ₹1601.16
 - Prediction: ↑ Increase
 - Predicted Increase: ₹143.60 ₹
 - Expected New Price: ₹1744.76
---------------------------------------
Crop: Wheat
 - Previous Price: ₹2002.98
 - Prediction: ↑ Increase
 - Predicted Increase: ₹52.41 ₹
 - Expected New Price: ₹2055.39
---------------------------------------
```



Conclusion

This project demonstrates how machine learning can be leveraged to predict crop prices based on historical and environmental data. By improving the accuracy of price forecasts, it has the potential to positively impact agricultural economics, benefiting farmers, traders, and policy-makers alike.

Thanks!