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Crop Price Prediction using Machine Learning

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Abstract:- Crop planning for the next season in agriculture is a difficult task for farmers because it is difficult to predict the price of the product in a particular season depending on the weather. Accurate and timely estimation of crop prices is important in making planting, harvesting and marketing decisions. Crop prices cannot be predicted accurately using crop price methods. This problem can be solved with machine learning models that will predict crop prices, show crop analysis patterns and present future situations to farmers. Farmers choose the right crop to produce crops; this includes crop selection, setting crop standards and storage. harvested crops provide sufficient information to estimate the appropriate crop price as a business. It will be used for past, present and future rainfall as well as last year's value. Based on this framework, machine learning algorithms are used to predict crop prices and produce accurate crop price prediction results. It helps farmers and others in agriculture make better decisions about crops. With the help of this survey, researchers will help find the best ideas and methods to predict crop prices using machine learning.

Keywords:- *Market Analysis, Future Forecasting, Mahine Learning, Crop Pattern.*

I. INTRODUCTION

Have you ever wondered how farmers decide on the prices for their crops? Well, with the help of machines and smart computer programs, we can now predict how much crops might cost in the future. Here we will use some machine learning algorithms and prediction model to predict the crop prices. A prediction model is a mathematical orcomputational tool that uses historical data, patterns, and relationships to forecast future outcomes. Crop price prediction has emerged as a powerful tool in agricultural sector. With advance data analytics and machine learning techniques, predicting crop prices has become more accurate and efficient. Machine learning models can hold historical data, market trends, weather patterns, and various other relevant factors to forecast future crop prices with a considerable level of accuracy. The process of crop price prediction using machine learning typically involves data preprocessing, feature engineering, model selection, model training, and model evaluation. Various supervised and unsupervised learning algorithms, such as regression models,time series analysis, and deep learning techniques, can be used to predict crop prices and produce accurate results. Oneof the key advantages of hiring machine learning in crop price prediction is its ability to handle complex and nonlinear relationships among multiple variables. Machine learning algorithms play a significant role in developing precise and efficient crop price prediction models. It facilitates informeddecision-making. Of course, using machine learning for crop price prediction involves using a variety of techniques and methods appropriate to specific situations.

II. PURPOSE OF PROPOSED SYSTEM

- Machine learning models can analyze historical data, weather patterns, and other relevant factors to predict crop yields. Farmers can use these predictions to make informed decisions about planting, harvesting, and resource allocation.
- Farmers can use crop prediction models to anticipate potential risks such as droughts, pests, and diseases. With this information, they can take proactive measures to protect theircrops and reduce losses.
- Crop prediction systems align with the principles of precision agriculture, which involves fine-tuning farming practices to maximize efficiency and minimize waste.
- Machine learning models can offer customized recommendations to farmers based on their specific conditions and needs.
- These systems can also serve as educational tools, helping farmers and agricultural students understand the complex interactions between various factors affecting crop growth.

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A. System Architecture

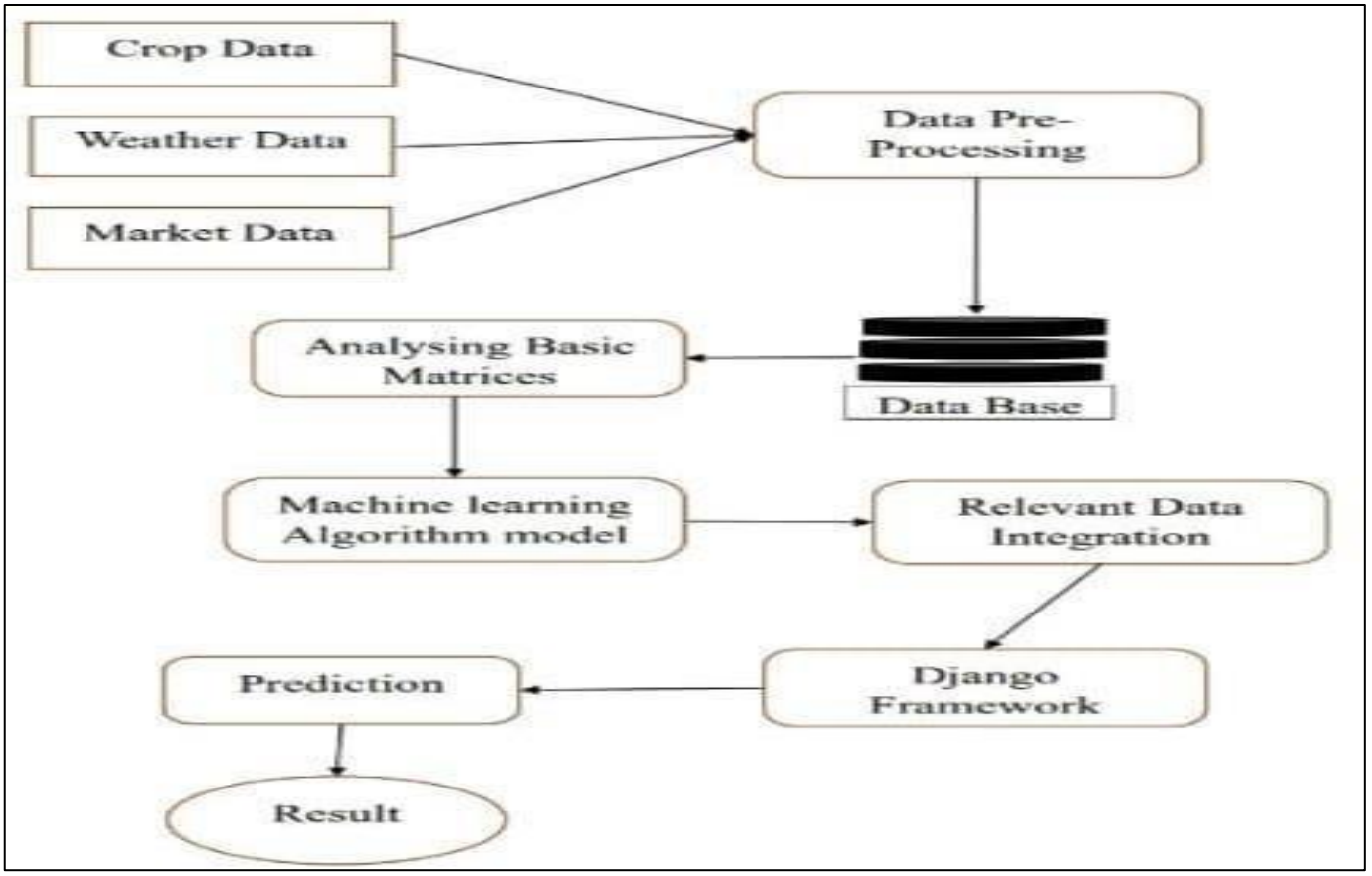

Fig 1: System Architecture

- Data Collection: Crop prices, weather, farm information, etc.
- Preprocessing: Cleaning, integrating and transforming data for analysis.
- Feature Engineering: Select and design relevant features for prediction.
- Modelling: Use machine learning, time series analysis, or deep learning models to make predictions.
- Training and evaluation: Train the model and measure per formance using metrics such as MAE and RMSE.
- Deployment: Deploy the model to the production environ ment and provide the API/interface to the user.
- Monitor and Monitor: Monitor and update the model regu larly to fix issues such as strategy drift.
- User Interface: Create a userfriendly interface for stakeho lders with forecasting and visualization.

III. LITERATURE SURVEY

- **Conference/Journal:** Published in 2021 Department of Information Technology, Sri Krishna College of Technology, Coimbatore, India.
- **Paper Title:** "Crop price prediction using supervised machine learning algorithms*"*
- **Author:** Ranjani Dhanapal 1, A AjanRaj 1, S Balavinayagapragathish 1, J Balajji 1

The paper focuses on agriculture. As we all know, the most important role in agriculture falls to farmers. When prices dr op after harvest, farmers face huge losses. A country's GDP will be affected by changes in agricultural production. Crop cost estimation and evaluation is done to decide before plant ing a crop. Predicting crop prices will help you make better decisions to minimize losses and manage the risk of price fl uctuation. In this article, we estimate the value of different crops by analyzing historical rainfall and WPI data. We use decision tree regressors (tracking machine learning algorithms) to analyze previous data and predict the value of new data and predict the value for the next twelve months.

- **Conference/Journal:** Published in 2021 in Computer Science, Vellore Institute of Technology, Chennai, Tamil Nadu, India.
- **Paper Title:** "Crop price prediction using machine learning"
- **Author:** Ganesh Sastry Kakaraparthi*1, B.V.A.N.S.S.Prabhakar Rao*2

Agricultural planning plays an important role in the economi c development of food security in agricultural countries.

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However, agriculture in India has gone through a difficult phase due to lack of agricultural knowledge. Farmers sometimes and often do not know which crops are suitable to growdepending on the soil quality and soil structure. The system will take into account many factors such as weather and soil conditions and ensure that the most suitable crop is grown for. Crop forecasting can be used to reduce losses in emergenc y situations. Farmers can use this system to maximize crop yields when they grow well. The system also includes crop pr ice forecasting; system, M.S.P. will determine M.S.P. will be determined by the government.Help estimate net 12 month cost based on M.S.P. and the previous month's or previous month's price. It allows farmers to calculate their income. According to crop forecast can choose suitable crop and earn more profit.

- **Conference/Journal:** Published in Department of E&C Engineering P.E.S College of Engineering, Mandya India **Paper Title:** "Crop price prediction using machine learningApproaches"
- **Author:** Dhanush Vishwakarma, Mahendra N, Ashwini, Manjuraju M.R

India is the second most populous country in the world and most of the people in India work in agriculture. Farmers continue to replant old crops without trying new ones and use fertilizers indiscriminately without knowing their content and fertilizer. Therefore, this not only directly affects crop yield but also leads to acidification of the soil and thus surface tre atment. That's why we developed this system using machine learning algorithms to improve the lives of farmers. Our sys tem will show you the best crops for a given land depending on the context and weather conditions. The system also prov ides information about the content and amount of fertilize and seeds required for planting. Therefore using our system, farmers can grow new crops, increase their income and prev ent soil pollution.

IV. METHODOLOGY

A. Data Collection:

Here we have gathered historical data on crop prices from reliable sources such as government agencies, commodity exchanges, agricultural market reports, etc.

We have collected data on factors that might influence crop prices, such as weather data, crop yields, economic indicators, global market trends, wpi etc.

B. Data Preprocessing:

Here we have performed data preprocessing by cleaning thedata by removing any inconsistencies, missing values, or outliers. Normalize or scale the data to ensure that all variables are on a similar scale, which helps in model training.

➢ *Here are Some Graphs of Outliers of the Crops in our Dataset:*

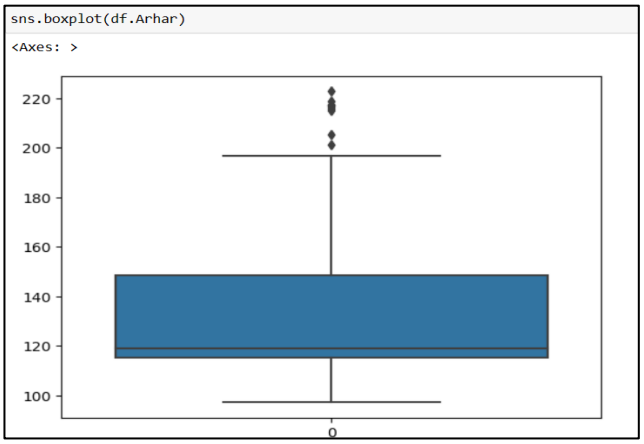

Fig 2: This is the Figure Showing Outliers of Arhar Crop, there are10 Outliers Present after we Implement the Code.

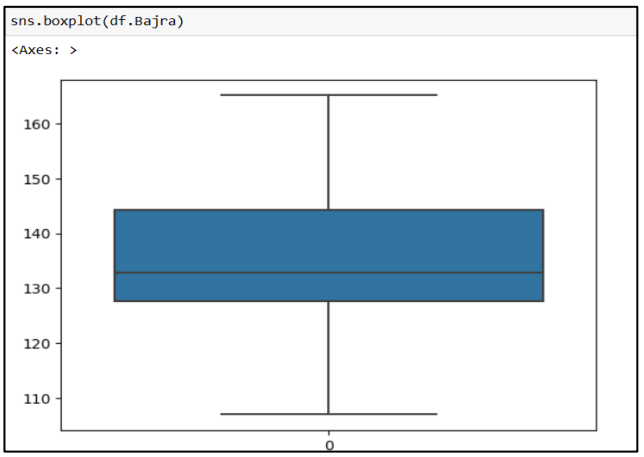

Fig 3: This is the Figure Showing Outliers of Bajra Crop, there Are0 Outliers Present After we Implement the Code

So, in this way we get the graphs of outliers for all the remaining crops and then we remove the outliers by normalizing the data.

C. Feature Selection:

Here we have identified relevant features that may affect crop prices, such as weather conditions during planting and harvesting seasons, demand-supply dynamics, government subsidies, etc.

We have performed feature engineering to create new features or transform existing ones if necessary to improve model performance.

D. Model Selection:

We have chosen Time Series model that is ARIMA. We have considered the nature of the data (cross-sectional or time-series), complexity of relationships, interpretability requirements, and computational resources available when selecting the model.

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E. Model Training:

We have split the data into training and testing sets. Ensuring that the test set includes data from different time periods to evaluate the model's generalization ability and the trained the selected model on the training data using appropriate techniques and algorithms.

F. Model Evaluation:

We have evaluated the trained models using appropriate evaluation metrics such as Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), etc.

And then we have compared the performance of different models and select the one with the best performance on thetest set.

G. Model Tuning:

We have done tuning for ARIMA model, in which we havetuned p,d and q parameters. While tuning the model the p, dand q value which is giving least AIC, that is being considered as a tuned parameters. Model is once evaluated with given p, d, q values.

H. Prediction:

Once the model is trained and evaluated satisfactorily, weused it to make predictions on new or unseen data.

I. Deployment:

We have deployed the trained model into production environment, ensuring scalability, reliability, and security. We have deployed our model on website using Flask.

➢ *Challenges*

- Obtaining high-quality, reliable, and diverse datasets can be challenging.
- Machine learning models may suffer from overfitting (capturing noise in the data) or underfitting (oversimplifyingcomplex relationships) issues. Balancing model complexity to avoid these problems while capturing relevant features is crucial.
- Alternative/Substitute crop are also not considered.
- Deployment of time series is challenging due to version mismatch of stats model.

V. RESULT

```
New Forecast: 117    147.901926
118    147.324924
119    146.790510
120    146.295541
121    145.837104
122    145.412504
123    145.019244
Name: predicted_mean, dtype: float64
```

Fig 4: Next 6 Months Price Prediction for Arhar Crops

```
100    162.281521
101    158.331358
102    153.371910
103    148.030721
104    144.002873
105    139.802048
106    135.995240
Name: predicted_mean, dtype: float64
```

Fig 5: Next 6 Months Price Prediction for Bajra Crops

```
New Forecast: 117    142.552848
118    142.299283
119    142.057748
120    141.827674
121    141.608516
122    141.399756
123    141.200900
Name: predicted_mean, dtype: float64
```

Fig 6: Next 6 Months Price Prediction for Barley Crops

```
New Forecast: 117    158.519028
118    157.827867
119    157.176717
120    156.563261
121    155.985317
122    155.440831
123    154.927864
Name: predicted_mean, dtype: float64
```

Fig 7: Next 6 Months Price Prediction for Copra Crops

So, in this way we get the results for all the remaining crops.

VI. CONCLUSION

Crop price prediction represents a significant advancement inthe field of agriculture and has the potential to revolutionize the way farmers, policymakers, and stakeholders make decisions.Through the utilization of historical data, weather patterns, market dynamics, and various other relevant features, machine learning models have demonstrated their ability to offer accurate and timely predictions of crop prices. This project's significance lies in its ability to providefarmers with valuable insights into the future market trends, allowing them to make informed

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decisions about planting, harvesting, and selling their crops. Moreover when it integrated into decision-making processes, can assist governments and organizations in developing policies and strategies that promote food security and sustainable agriculture. They can help in mitigating the impact of price volatility, thus benefiting both producers and consumers.

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