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ANTICIPATE CROP PRICE AND MITIGATE RISK IN FARMING BUSINESS

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1. ABSTRACT:-

The agriculture sector plays a crucial role in supporting livelihoods and employment in densely populated nations like India, serving as a foundational pillar of the economy. However, this sector faces challenges from climate change and volatile market prices, leading to crop damage and significant financial losses. To tackle these issues, it's essential to enhance farmers' awareness of crop management techniques, climate trends, and market dynamics. One promising solution is leveraging machine learning, particularly Decision Tree Regression algorithms, for price forecasting. By using these algorithms, a dedicated platform can offer farmers tailored price prediction models, enabling them to make well-informed decisions about crop cultivation and marketing strategies. Additionally, this explore commodity platform can provide farmers with real- time crop prices, optimal locations for cultivation, seasonal planting advice, and insights into export opportunities. By consolidating these features, the platform becomes an invaluable tool for farmers, equipping them with the data-driven insights needed to optimize their agricultural practices. This approach promotes a more streamlined and informed agricultural sector, benefiting both farmers and consumers.

Keywords: crop price prediction, explore commodities, Decision tree regression.

2 .INTRODUCTION:-

India, a major exporter of agricultural products, grapples with relatively low productivity, highlighting the urgent need to enhance yield without escalating labour costs. Precision in agricultural recommendations is crucial, as erroneous advice can lead to significant material and financial losses for farmers.Agricultural economies rely heavily on accurate crop price predictions to shape policies, aid decision-making, and ensure food security. Fluctuations in crop prices affect stakeholders across the agricultural value chain, from farmers and traders to consumers and policymakers. Predicting these prices accurately involves analyzing a multitude of factors, including weather conditions, market demand, supply chain dynamics, government policies, and global economic trends.In India, agriculture remains the backbone of the economy, providing livelihoods for a vast population and contributing significantly to the GDP. However, the sector is susceptible to various risks such as weather variations, market volatility, and policy changes, which directly influence crop prices. Thus, the development of robust crop price prediction systems is crucial.Indian farmers face numerous challenges, including limited access to credit, inadequate infrastructure, volatile market prices, and unpredictable weather conditions. These challenges often result in debt cycles, distress sales, and reduced profitability, exacerbating the vulnerability of smallholder farmers who constitute the majority. Machine learning-based crop price prediction systems offer transformative solutions to these challenges. By leveraging historical and real-time data, these systems provide accurate price forecasts, enabling farmers to make informed decisions about crop selection, cultivation practices, and market timing. This empowers farmers to optimize yields, maximize profits, and reduce vulnerability to market fluctuations. Access to reliable price forecasts translates into tangible benefits for Indian farmers. They can negotiate fair prices, avoid distress sales, and plan their crop cycles effectively. Improved market information also enables them to diversify crops, adopt innovative farming practices, and explore value-added opportunities, thereby enhancing income and financial stability.

Furthermore, machine learning-based prediction systems serve as invaluable tools for risk management, allowing farmers to hedge against price volatility and market uncertainties. By promoting market transparency, reducing wastage, and optimizing resource utilization, these systems contribute to the overall sustainability of Indian agriculture. They facilitate efficient agricultural markets, stimulate sector investment, and foster long-term sustainability.

In summary, exploring the dynamics of various commodities through decision tree regression provides stakeholders with valuable insights into agricultural markets' intricacies. This facilitates the development of sustainable and resilient agricultural systems across diverse geographical contexts. Advanced analytical techniques like time series analysis, machine learning, and econometric modeling help stakeholders gain insights into evolving crop market dynamics. Historical data on yield, weather, practices, demand, and policies inform crop trend forecasts, aiding stakeholders in making informed decisions and strategies in agriculture.

3. LITERATURE SURVEY:-

Agriculture is a major source of livelihood in India and Indian farmers put in their heart and soul to feed people. A literature survey focusing on crop price prediction using decision tree regression algorithms reveals a significant body of research aimed at leveraging this technique's strengths in agricultural economics. Decision tree regression algorithms, including popular variants like Random Forest and Gradient Boosting Machines (GBM), offer interpretable models capable of handling complex relationships between crop prices and various predictor variables.

Studies in this area typically employ historical price data, agricultural production metrics, weather patterns, market indicators, and socio-economic factors as input features for decision tree regression models. By analyzing these factors, researchers aim to capture the intricate dynamics that influence crop prices and forecast future trends accurately.

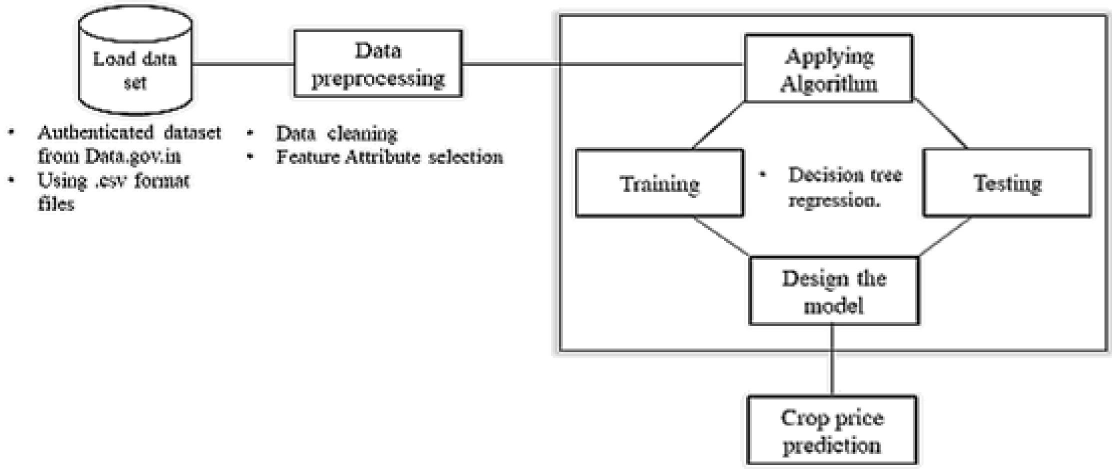
Decision tree regression algorithms have demonstrated efficacy in handling non-linear relationships, capturing interactions among predictor variables, and dealing with noisy datasets commonly encountered in agricultural markets. Moreover, the interpretability of decision trees allows stakeholders to understand the underlying factors driving price predictions, facilitating informed decision-making for farmers, traders, and policymakers.

G.Thapaswi , M.Gunashekar ,"A Methodology for crop price prediction using machine learning" (IEEE), 2022 In this research, the proposed framework is evaluated with a simple dataset from kaggle, entropy and information gain are most important findings the root node and to arrive at the decision, neuro evolutionary algorithms are widely important in computing the prices in the market prices, the paper provides a comprehensive analysis on the machine learning based techniques/algorithms used in agricultural segment. Wei Wang, Hua Yan, and Zhixin Liu "A Crop Price Forecasting Model Based on Machine Learning Algorithms" (IRJET), 2020 In their research, Wang, Yan, and Liu proposed a crop price forecasting model based on machine learning algorithms. They collected historical crop price data along with various factors influencing crop prices such as weather conditions, market demand, supply factors, economic indicators, and government policies. The researchers employed several machine learning algorithms including decision tree regression, random forest, support vector machines, and neural networks to develop predictive models. Ahmed Wahdan, Ali Selmy, and Amr Farouk "Crop Price Prediction using Machine Learning Techniques: A Comparative Study"(R-10-HTC), 2021 In their study, Wahdan, Selmy, and Farouk conducted a comparative analysis of machine learning techniques for crop price prediction. They collected historical crop price data and various parameters influencing crop prices, including weather variables, market dynamics, economic indicators, government policies, crop production data, and acreage. The researchers employed a range of machine learning algorithms, including decision trees, random forests, support vector machines, and gradient boosting machines, to develop predictive models.

3. PROPOSED METHOD:-

Implementing advanced machine learning models like Decision tree algorithm that analyse a wide range of data, including historical prices, market trends, economic indicators, to generate accurate crop price forecasts. Systems to keep farmers informed about market dynamics and potential risks, allowing them to adapt quickly to changing conditions. Creating a platform for farmers to learn experiences in managing crop prices and risks. Helps new farmers to know things about various crops/commodities such as market current price, msp, prime location, season they grow an exporting area. In order to provide advantages to underprivileged farmers, our initiative strives to efficiently handle the problem of crop price forecasting. It makes use of machine learning techniques to produce better solutions from various data. With the help of trained data from approved datasets, this system employs decision tree regression techniques to forecast crop values. This program can enhance productivity. Recognizing and foreseeing under varied environmental settings. An efficient crop price forecasting system can offer clients options that can satisfy customers in a variety of situations.

Ultimately, the outcomes are presented in the form of a web application so that struggling farmers can quickly access them. In this project we used the Decision Tree regression algorithm. Decision Tree regression: This supervised learning technique uses trees to make decisions. Unlike other supervised learning algorithms, the decision tree method can be utilized to address regression and classification problems. A decision tree can be used to create a training model that can be used to forecast the class or value of the target variable by learning fundamental choice rules inferred from prior data (training data). In Decision Trees, we anticipate the class label for the record by starting at the top of the tree and working our way down. The cost of the initial attribute and the value of the attribute in the record are contrasted. We collaborated to find answers to the attribute selection issue. And advised employing criteria such as: Entropy, Gaining Information, Gini Index, Gain Ratio, Chi-Square. Each characteristic's worth will be determined using these criteria. The features are organized in a tree with the most significant feature at the top (in the case of information gain) and the values are sorted. We look at hierarchical qualities when using information gain as a criterion, and we look at continuous characteristics when using the Gini index. We utilized Decision Tree Regression because the dataset's data is continuous. Prices for crops change throughout time since they are seasonal. approved datasets, this system employs decision tree regression techniques to forecast crop values. This program can enhance productivity. Recognising and foreseeing Under varied environmental settings, cropper induces acne. An efficient crop price forecasting system can offer clients options that can satisfy customers in a variety of situations. Ultimately, the outcomes are presented in the form of a web application so that struggling farmers can quickly access them.



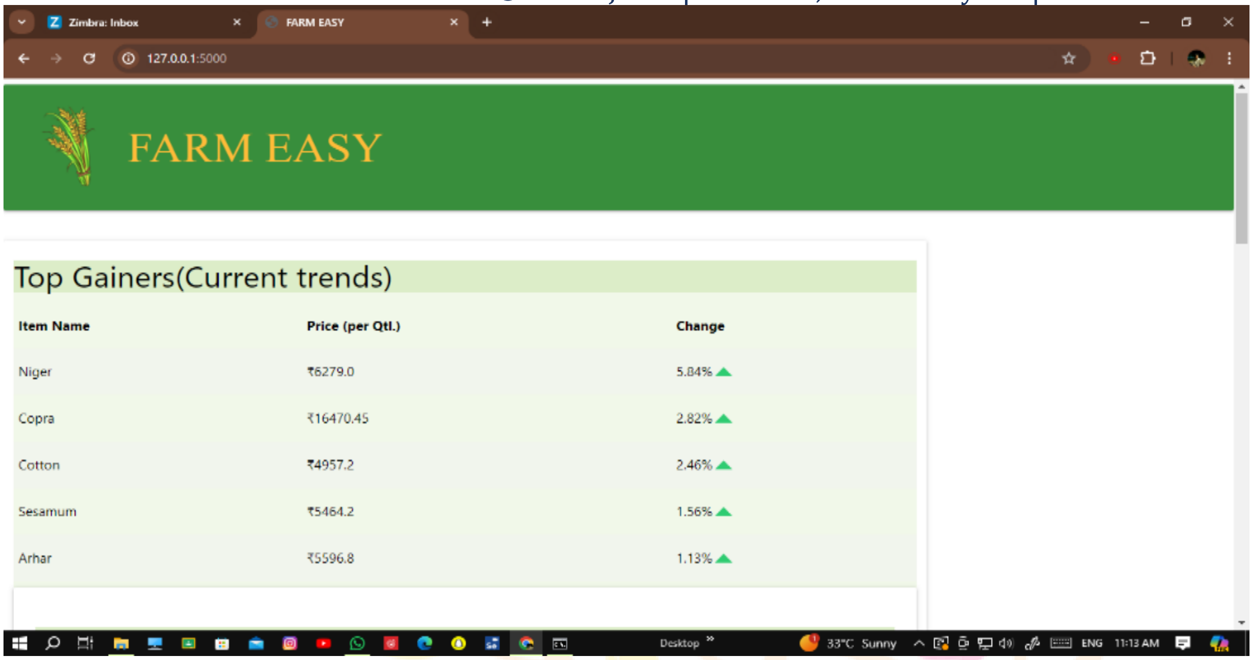
4. RESULTS

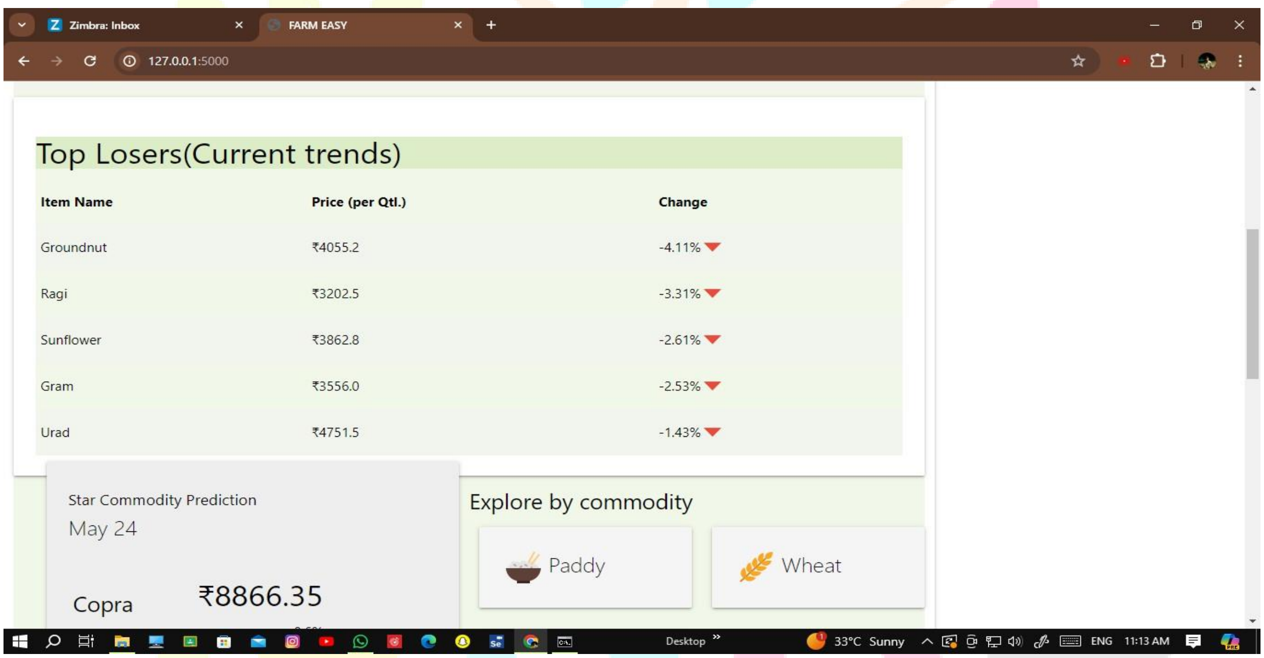
Our system employs Decision Tree Regression, an advanced machine learning technique, to transform crop price forecasting in emerging economies like India. It conducts comprehensive analyses of diverse data sets, including historical prices and market trends, to provide accurate forecasts. This empowers farmers with insights into market dynamics and risks, enabling informed decision-making and optimizing agricultural practices. The system forecasts prices for 23 commodities, offering detailed predictions for the next 12 months with an impressive accuracy of 93% to 95%. Training on authenticated datasets from data.gov.in enhances the model's credibility, and the user-friendly interface facilitates easy navigation and actionable insights for farmers, despite challenges such as data reliance and biases.

Crop Price Prediction: Utilizing Decision Tree Regression, this project forecasts crop prices by analyzing historical data, aiding farmers, traders, and policymakers in anticipating market shifts and optimizing decisions.

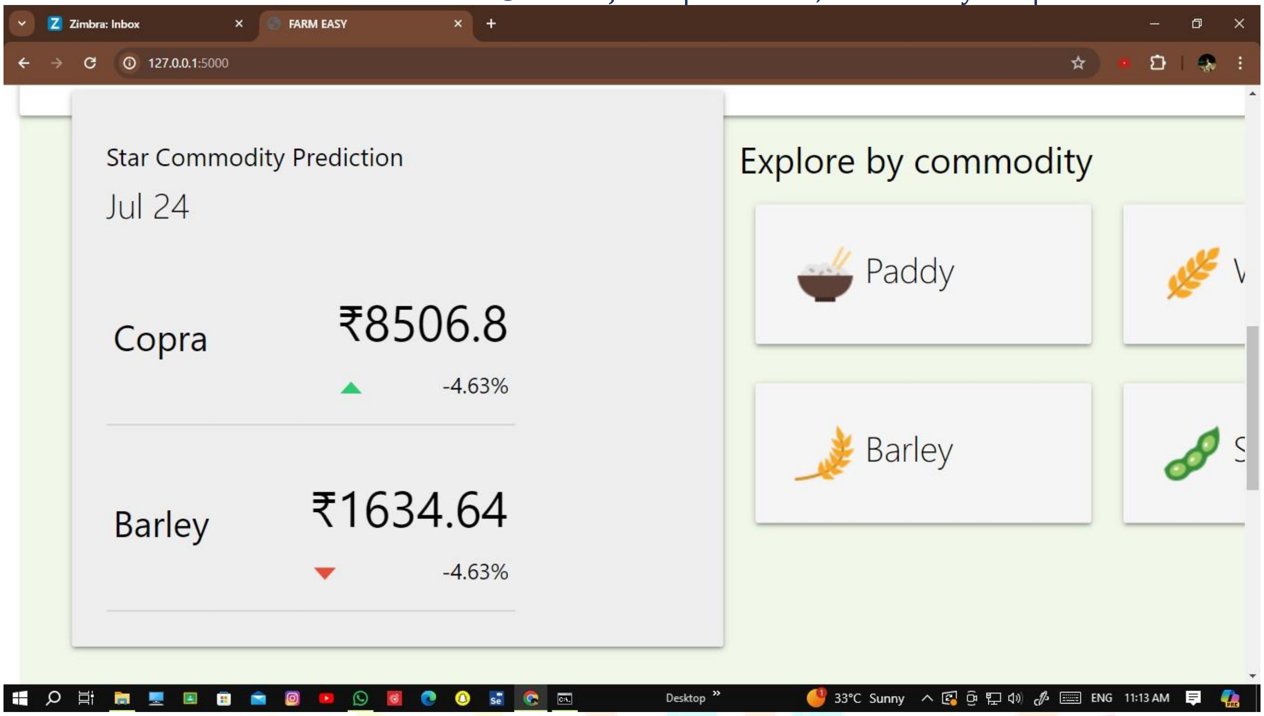
Exploring Commodities/Crops: Offering insights on growth seasons, cultivation regions, and exporting countries, this platform empowers users to diversify agricultural activities and maximize profitability.

Forecasting Market Trends: Through visualizations and trend analysis, the project predicts agricultural trends, highlighting price fluctuations and opportunities, enhancing competitiveness in the sector.

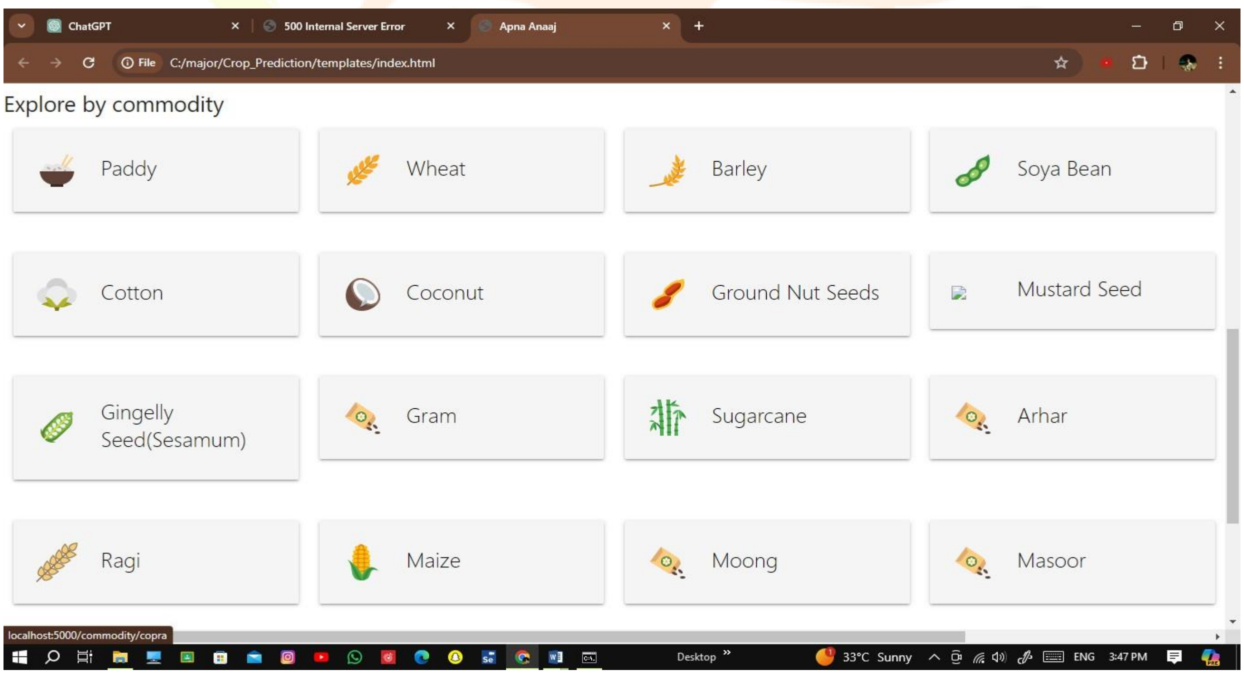




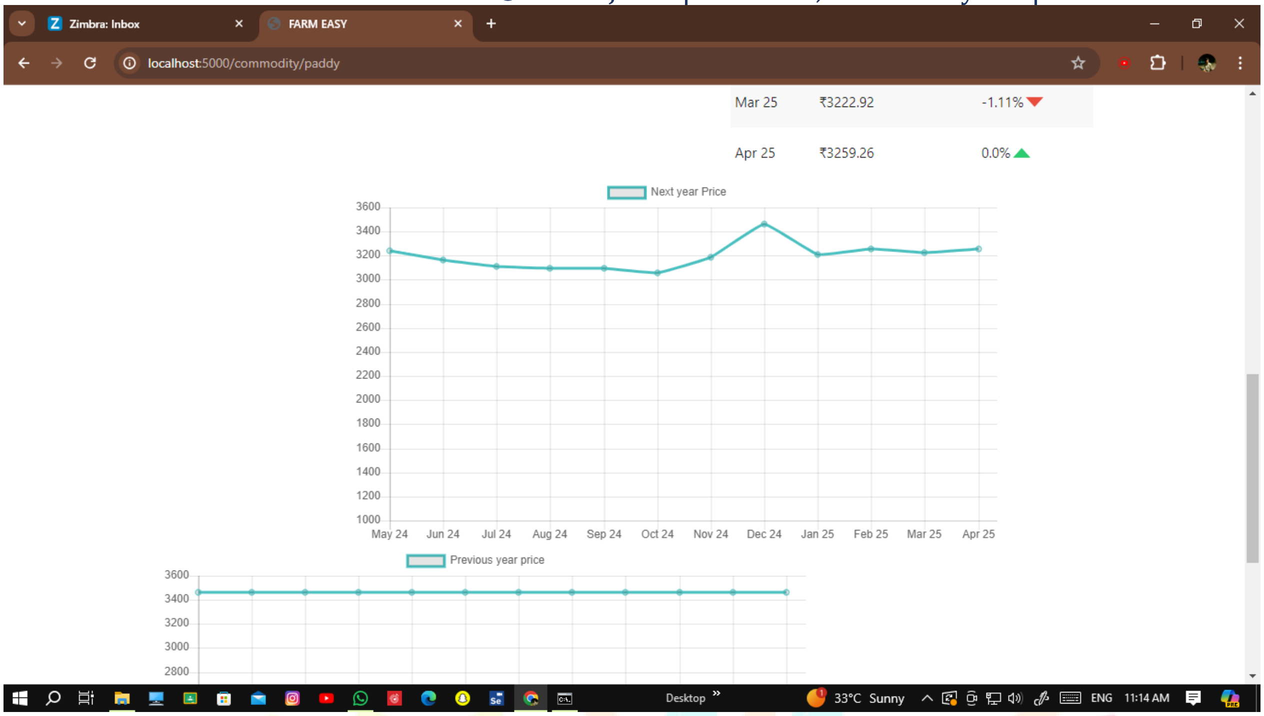
A Flask-based Python webpage displays the month's Top Gainers and Star Commodity Prediction from MySQL data. It also lists the month's Top Losers.



The system features an "Explore by Commodity" section, displaying results for each commodity directly on the website as shown above.



Clicking on each commodity reveals its crop price, prime location, best season, and export availability, along with future 12-month predictions are as above.



Right there on the page, we can view graphs displaying forecasting trends for the next and previous twelve months.

5. CONCLUSION

For years, crop price forecasting has been a well-studied subject in the discipline of time-series analysis and serves potential to agriculture sector in growing economies like India. our system aims to revolutionize crop price forecasting by leveraging advanced machine learning techniques, particularly Decision Tree Regression, to analyze a wide range of data sources such as historical prices, market trends, and economic indicators. By providing accurate forecasts and keeping farmers informed about market dynamics and risks, the system empowers them to adapt quickly to changing conditions and make informed decisions .Key features of the system include forecasting for around 23 commodities, detailed forecasts up to the next 12 months, identification of top gainers and losers in real-time, and a high prediction accuracy of 93-95%. The model is trained on authenticated datasets from data.gov.in, ensuring reliability and credibility. The system also offers a user-friendly interface for easy access to forecast outcomes, including detailed analysis using tables and charts. While Decision Tree Regression is chosen for its ability to handle continuous data and provide interpretable results, challenges such as dependency and potential biases in the training datasets must be addressed. Overall, the proposed system has the potential to significantly enhance productivity and support underprivileged farmers by efficiently handling the problem of crop price forecasting. The outcomes, presented in the form of a web application, aim to provide valuable insights and options for farmers, ultimately contributing to the improvement of agricultural practices and livelihoods.

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