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Market Analysis of Crop Price Prediction

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ABSTRACT: This paper provides a comprehensive review of various machine learning and neural network approaches for crop price prediction. The methodologies covered include ARIMA, LSTM, SVR, and hybrid models combining multiple techniques such as BP, Apriori algorithms, EDA, and Decision Trees. These methods were found to enhance prediction accuracy and reliability, addressing issues such as data quality, computational efficiency, and pattern recognition in historical data. Overall, the paper highlights the potential of these advanced models in improving agricultural market predictions.

KEYWORDS: Machine Learning, Neural Networks, ARIMA, LSTM, SVR, Hybrid Models, BP (Back Propagation), Apriori Algorithms, Decision Trees, Prediction Accuracy, Data Quality, Computational Efficiency, Pattern Recognition, Agricultural Market Predictions.

I. INTRODUCTION

Agriculture forms the backbone of the Indian economy, accounting for 18% of the nation's Gross Domestic Product (GDP) and supporting the livelihoods of over half of India's workforce. In spite of being the largest economic sector, the contribution of Indian agriculture to the country's economy has been gradually declining. This decline is largely due to stagnant productivity growth, which has negatively impacted the sector's overall input into the economy.

Market fluctuations and lack of effective price support mechanisms have also made it difficult for farmers to predict their income, leading to uncertainty and reduced investment. Additionally, the sector is dealing with demographic issues, such as an ageing farmer population and a lack of skilled and educated farmers.

Insufficient storage and logistics infrastructure have caused substantial post-harvest losses, diminishing the sector's overall efficiency and productivity. Moreover, the number of individuals engaged in agriculture has decreased as a result of the growth of non-farm activities in rural areas, further reducing the sector's economic contribution.

To address the issues of inadequate skills and resources, crop prediction market analysis is conducted using various machine learning (ML) algorithms. These tools offer farmers insights into previously planted crops, enabling them to predict and identify the best crops to cultivate for improved productivity. Additionally, these tools provide farmers with climate data and information to aid in making informed decisions about market demand and prices. The application of ML algorithms in agriculture is enhanced by the availability of large datasets and advanced computing power, allowing for accurate predictions of weather patterns, soil health, and crop diseases.

Various ML algorithms are employed to analyse optimal outcomes and predict market prices. Clustering algorithms, such as K-means, assist in segmenting agricultural zones and identifying patterns within large datasets. Deep learning, particularly neural networks like convolutional neural networks (CNNs), are accustomed to analyse satellite imagery and detect crop health issues. Using reinforcement learning, one can produce adaptive crop management strategies that optimise inputs and maximise yields with time.

One of the main challenges in predicting crop prices within the agricultural market is ensuring the availability of high-quality and consistent data for testing ML algorithms. Accurate crop prediction heavily depends on reliable data, which is often limited or inconsistent in India. Additionally, limited awareness and reluctance among farmers, particularly smallholders, to adopt new technologies significantly impact the accuracy of crop price predictions. Unpredictable weather patterns caused by climate change further complicate the process of predicting crop yields.

Machine learning-driven precision farming techniques optimise resource use and boost productivity. Improved crop

prediction models enhance the agricultural supply chain, minimising waste and expanding market access for farmers. These advancements increase both the amount and quality of the produce, thereby boosting export opportunities.

ML algorithms and methodologies offer significant possibilities of revolutionising crop prediction in India. By addressing current challenges and leveraging opportunities, ML can result in more efficient, productive, and sustainable agricultural practices, benefiting farmers, consumers, and the overall economy

II. RELATED WORK

Jing Hua et al. [1] proposed a ARIMA model leveraging data meticulously gathered through an advanced web crawler. They employed the Levenberg–Marquardt BP function for training and the gradient descending beam learning function for learning. These functions enable neural networks to effectively learn intricate patterns and relationships within historical crop price data, resulting in more accurate and reliable crop price forecasts. They used an RNN to predict prices and compared the performance across the three methods.

Yan Guo et al. [2] applied a hybrid model that integrates the residuals from ARIMA with LSTM for training. Additionally, they used BP to train the prediction results of both LSTM and ARIMA. The Apriori algorithm was employed to identify patterns and uncover linear relationships among factors affecting crop prices, aiding in making informed future price predictions. Utilising XGBoost and LightGBM models significantly reduced prediction errors in crop price forecasting by leveraging their robust gradient boosting frameworks.

Inspired by the LSTNet technique, Xiaolu Wei et al. [3] presented a model that combines a CNN module with a recurrent skip component. While the recurrent skip component finds prolonged patterns using temporal skip-connections, the CNN module records short-term temporal patterns among essential variables

This method improves the model's ability to identify long-term recurring patterns as well as short-term swings in multivariate agricultural commodity futures prices, which helps to anticipate prices more accurately.

Ralf Korn et al. [4] developed a Two-step hybrid model employing machine learning techniques. Firstly, K-means clustering identifies future price states, followed by K-nearest neighbours or random forest classification for predictions. Applied to actual corn futures data, the model generates price scenarios using Monte Carlo simulation. Error measures such as MAE, RMSE, and MAPE are utilised for accurate approximation of futures prices. The authors determined that the ML model incorporating K-nearestneighbours classification outperforms others based on these error measures.

Several models for price prediction concerning the stationarity of the price data were examined by V. Jadhav et al. [5]. When price series are steady, they suggested ARMA models; otherwise, they suggested ARIMA models. The Box-Jenkins Methodology was used in conjunction with the ARIMA model to assess the model's performance adequacy. The Makridakis and Hibbon, MSE, Mean Absolute Percentage Error (MAPE), and Theil's U tests were utilised to evaluate the forecasts' precision for both forward-looking and retrospective results.

H Gulati et al. [6] endeavoured to predict vegetable prices by analysing fluctuations in crude oil prices. Their methodology encompassed data cleansing and ensuring conformity, addressing missing values through linear extrapolation. They employed various forecasting methods, including the Naïve approach and regression (utilising multiple predictors such as oil prices and time functions). These approaches were assessed considering their precision through minimal errors in the predicted values. Additionally, they suggested enhancing the model by creating a neural network based on genetic algorithms for price forecasting to enhance precision.

Kelly Lim et al. [7] conducted a comprehensive analysis of ARIMA, LSTM, and SVR models for forecasting crop prices. They found that while the ARIMA model exhibited the greatest stability with MSE, the LSTM model outperformed both ARIMA and SVR due to its superior capability to handle large datasets. The study used MSE as the primary metric forevaluating forecasting methods' performance and accuracy.

S. Quadri et al. [8] developed a robust crop price forecasting model by integrating EDA insights and the Decision Tree algorithm. EDA helped identify key variables and trends influencing crop prices using statistical graphics and visualisation techniques. The Decision Tree algorithm improved predictive accuracy by systematically mapping

observations to target values, significantly enhancing the reliability of crop price predictions.

K. Lavanya et al. [9] introduced a framework that extracted market-specific crop prices from web tables using XML SAX expressions. They clustered crop prices based on seasons and varieties using Self- Organizing Neural Networks (SONN). For long-term and mid-term price decision-making, the study found that SVR required the least computational time and achieved superior performance across most datasets regarding error measure.

III. EXPERIMENTAL RESULTS

To responsibly feed a growing population, it is essential for farmers to boost food production on existing farmland, thereby avoiding deforestation. Long-term efforts should focus on optimising farming practices to sustainably enhance yields, improve crop quality, and increase incomes.

With a dashboard that looks at crop production patterns and employs statistical techniques to predict market trends over at least a seasonal duration, it is feasible to build an advanced value prediction system. An agricultural platform should combine big data, artificial intelligence, machine learning, satellite imagery, and meteorological data to assess land areas and track crop health in real time. This will enable the prediction of prices, estimation of crop yield and output, and detection of pest and disease infestations.

The price Projections must additionally consider other important inputs, such as the pricing in the key markets of nearby states. The system ought to be built with real-time analysis in mind, offering precise answers to farmers' issues and enhancing their agricultural methods. In order to provide early warnings of pest and disease outbreaks, it can introduce and make available sophisticated AI-based crop monitoring systems as well as climate-aware cognitive farming approaches.

The study indicates that the ARIMA model has a lower Mean Square Error Score, making it suitable for smaller, simpler datasets. However, it is not preferred due to its accuracy limitations. Additionally, the system used in this study does not include alerts for pest and disease outbreaks or climate-inclusive cognitive farming methods, both of which are crucial for comprehensive crop management and forecasting.

Ultimately, we may conclude that a number of important factors substantially limit the efficacy of crop prediction models for price forecasting. The accuracy of these models is hampered by cases of falsified data, significant data loss, and poor data quality. Furthermore, the generalizability of these models may be limited by their poor performance on datasets with unclear repeated patterns. Additionally, the strategy is mostly dependent on estimates of outside variables influencing the product and on observable pricing patterns, both of which are not always available. Furthermore, the validation of these models.

IV. CONCLUSION

This study shows how sophisticated machine learning and artificial intelligence methods can improve crop price prediction. By leveraging models such as Support Vector Regression (SVR), Recurrent Neural Networks (RNN), and with ARIMA and LSTM combined, we have shown that precise and dependable forecasts can be achieved. These methods outperform traditional approaches, particularly in handling large datasets and uncovering complex patterns within historical data. Despite challenges like data quality and the requirement for increased adoption of technology among farmers, the potential benefits for the agricultural sector are substantial. Improved crop price predictions can result in better decision-making, optimised resource use, and increased productivity, ultimately benefiting farmers, consumers, and the overall economy. Future work should focus on addressing difficulties with data quality and promoting technology adoption to further enhance the crop's precision and dependability on the price forecasts

REFERENCES

1. M. S. Satu, M. H. Parvez, and Others, 'Review of integrated applications with aiml based chatbot', in 2015 International Conference on Computer and Information Engineering (ICCIE), 2015, pp. 87–90.
2. Y. Guo et al., 'Agricultural price prediction based on combined forecasting model under spatial- temporal influencing factors', *Sustainability*, vol. 14, no. 17, p. 10483, 2022.
3. H. Ouyang, X. Wei, and Q. Wu, 'Agricultural commodity futures prices prediction via long-and short-term time

- series network', *Journal of Applied Economics*, vol. 22, no. 1, pp. 468–483, 2019.
4. P. Oktoviany, R. Knobloch, and R. Korn, 'A machine learning-based price state prediction model for agricultural commodities using external factors', *Decisions in Economics and Finance*, vol. 44, no. 2, pp. 1063–1085, 2021.
 5. V. Jadhav, R. B. V. Chinnappa, and G. M. Gaddi, 'Application of ARIMA model for forecasting agricultural prices', 2017.
 6. M. Kaur, H. Gulati, and H. Kundra, 'Data mining in agriculture on crop price prediction: techniques and applications', *International Journal of Computer Applications*, vol. 99, no. 12, pp. 1–3, 2014.
 7. Z. Chen, H. S. Goh, K. L. Sin, K. Lim, N. K. H. Chung, and X. Y. Liew, 'Automated agriculture commodity price prediction system with machine learning techniques', arXiv preprint arXiv:2106.12747, 2021.
 8. S. A. Mulla and S. A. Quadri, 'Crop-yield and price forecasting using machine learning', *International journal of analytical and experimental modal analysis*, vol. 12, pp. 1731–1737, 2020.
 9. K. Lavanya, T. Raguchander, and N. C. S. Iyengar, 'SVM Regression and SONN based approach for seasonal crop price prediction', *International Journal of u-and e- Service, Science and Technology*, vol. 6, no. 4, pp. 155–168, 2013.



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