

XAI Enabled Forecasting of Crop Yields In India: Advancing Machine learning in Agriculture

Mrs. Ch. Srivatsa Alivelu Mangatayi¹, Singarapu Kalyani²,
Devavarapu Tanuj³, G Bharath⁴, Bandari Pavani⁵

Assistant Professor, Department Computer Science Engineering¹

Students, Department Computer Science Engineering²⁻⁵

ACE Engineering College, Ghatkesar, India

Abstract: *Agricultural productivity plays a vital role in ensuring food security in India. However, traditional methods for crop selection and yield estimation often rely on guesswork and are susceptible to climatic uncertainties. This project leverages machine learning models to accurately predict crop yields and recommend suitable crops based on environmental and soil parameters. To improve transparency and trust in the system, Explainable Artificial Intelligence (XAI) techniques such as SHAP and LIME are integrated to interpret model predictions. By utilizing real-time data, the system enhances prediction accuracy and provides farmers and stakeholders with clear, data-driven insights for informed agricultural decision-making. The system is trained on diverse datasets including weather conditions, soil health metrics, and historical crop performance to ensure robustness across different regions. It supports adaptive learning to continuously update recommendations as new data becomes available. The integration of XAI not only boosts confidence in AI-driven outputs but also aids in identifying key factors affecting yield. This approach bridges the gap between advanced technology and grassroots-level farming, contributing to sustainable agriculture and better resource management[1]*

Keywords: Agricultural productivity, Crop selection, Yield estimation, Random forest, Environmental parameters, Soil parameters, SHAP (Shapley Additive exPlanations), LIME (Local Interpretable Modelagnostic Explanations)

