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Abstract: Sustainable agriculture is essential for ensuring long-term food security while minimizing environmental impact. This study presents a Smart Agro Advisory System that combines Soil Health Card (SHC) data, real-time weather analysis, and the Leaf Color Chart (LCC) method to optimize fertilizer and pesticide application. Through the use of advanced machine learning models such as Random Forest and XGBoost, the system analyzes soil nutrient levels, predicts nutrient depletion, and provides precise recommendations for fertilizer use. Additionally, Xception-based deep learning algorithms process leaf color images to detect nitrogen deficiencies, enabling targeted nutrient management. The system is integrated into a cloud-based decision support platform, which aggregates diverse datasets and delivers actionable insights through a user-friendly mobile interface. By using this system, farmers can reduce the overuse of chemicals, lower costs, and minimize environmental damage, all while maximizing crop productivity. The integration of AI with traditional farming methods allows for a more efficient, data-driven approach, promoting precision farming and sustainable agricultural practices Keywords: Sustainable agriculture; Smart Agro Advisory System; Soil Health Card (SHC); Leaf Color Chart (LCC); Machine learning; XGBoost; Sustainable farming practices