Crop Recommendation System using Machine Learning

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Abstract: *India's agricultural sector remains a cornerstone of the national economy, contributing around 17% to the country's GDP and employing over 60% of the workforce. Despite advancements in agricultural technologies such as vertical farming, precision agriculture, and smart irrigation systems, many Indian farmers continue to rely on conventional farming practices and seasonal patterns. This often leads to suboptimal crop yields, especially in the face of unpredictable climate changes. Our research addresses this gap by introducing a data-driven crop recommendation system that empowers farmers to make informed decisions based on real-time environmental conditions. By analyzing key agricultural factors such as soil nutrient content (Nitrogen, Phosphorus, Potassium), soil pH, humidity, and rainfall, we predict the most suitable crops for cultivation. We explore and compare the effectiveness of multiple machine learning models, including Decision Tree (DT), Support Vector Machine (SVM), Logistic Regression (LR), and Gaussian Naïve Bayes (GNB). Our approach aims to promote adaptive farming, enhance productivity, and support sustainable agriculture in India..*

Keywords: Smart agriculture, Crop recommendation, Soil nutrients, NPK, Soil pH, Humidity, Rainfall, Climate resilience, Machine Learning (ML), Decision Tree (DT), Support Vector Machine (SVM), Logistic Regression (LR), Gaussian Naïve Bayes (GNB).

Abbreviations—DT: Decision Tree, GNB: Gaussian Naïve Bayes, SVM: Support Vector Machine, LR: Logistic Regression, NPK: Nitrogen-Phosphorus-Potassium