AN EFFECTIVE AND COMPREHENSIVE CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING

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Abstract— Agriculture plays a crucial role in Indian economy. However, the agriculture sector is suffering from low productivity and yielding due to various factors. One of the factors is the failure to select suitable crops for a particular type of soil in an agricultural region. Most of the farmers highly depend on the direction of agricultural experts and experienced farmers in the task of crop selection. The shortage of technical knowledge and awareness of the latest technology hinders the progress of the farmers resulting in low yielding. Therefore, a machine learning model is developed to predict a set of best suitable crops that are intended to produce high-yielding for a particular agricultural region based on environmental and soil conditions. In this regard, comprehensive data sets which are intended to produce high yielding for different crop types, are gathered from various regions of the country. Both environmental parameters (viz., temperature, humidity, and moisture) and soil parameters (viz., pH, NPK values) are considered as a feature set for training the proposed model. The comprehensive datasets from different parts are trained and tested based on performance metrics like precision, accuracy, recall, confusion matrix, and F1- score. The proposed model achieves 75% to 80% accuracy in predicting suitable crops for a soil type in a certain region.

Index Terms— Environmental and Soil Parameters, Machine Learning Model, Crop prediction.

I. INTRODUCTION

In the realm of agriculture, a sector of global significance, the cultivation of crops that are both sustainable and profitable is mandated. The impact on crop output due to improper crop selection, leading to lower productivity and potential financial losses for agriculturalists is a significant concern. The full potential of selected crops may not be realized when farmers neglect crucial elements such as essential soil features. Traditionally, decisions about crop selection based on an understanding of status of local soils conditions were made by farmers relying on empirical knowledge and experience. However, this conventional approach is not always precise orscalable, and challenges are often faced by farmers in adapting to changing environmental factors [1]. The gap in this conventional approach is addressed by the advent of machine learning in agriculture. This enables the development of predictive models that leverage advanced algorithms to analyze and interpret complex relationships between soil parameters and optimal crop types [2].

Consideration of soil parameters across different regions is not merely a detail in analysis; it is crucial for strategic decision-making. Natural diversity in agricultural landscapes is recognized. emphasizing the significance of careful decision precision. Accounting for the specific needs of different soils becomes vital inthis context. This approach aids in building resilience in agriculture, promoting the development of practices that are both productive as well as environmentally friendly. To achieve more sustainable and efficient agriculture, soil datasets is collected and studied from various regions. The variation in soils significantly affects crop growth. Utilizing an advanced machine learning algorithm allows the analysis of this data to take