



# Survey On Smart Crop and Fertilizer Prediction System

Mansur Khan<sup>1</sup>, Snehal Kadganchi<sup>2</sup>, Silky Kedar<sup>3</sup>, Pallavi Ghodke<sup>4</sup>

Mrs. Sweta KalSe, Head Of Department , IT Department, RMDSSOE, Pune  
RMD Sinhgad School Of Engineering, Warje, Pune, India

**Abstract**— The agriculture industry plays a major role in the process of economic development as well as the gross domestic product of India. The informatization of agriculture is an important driving force in the development of agricultural modernization. With the further improvement of the construction of agricultural information infrastructure, the use of modern information technologies has become an effective solution to achieve personalized services of recommending agricultural information resources and providing timely and effective information to users. This paper aims to provide a comprehensive overview of recent research efforts on the application of agricultural information based on intelligent recommender systems. First, the content analysis method used in this paper to sort the contributions is presented. Second, the basic concepts of recommender systems and key technologies are introduced. Third, applications of recommender systems/technologies for agricultural information are detailed. applications of recommender systems/technologies for agricultural information are described in detail. Finally, a summary and outlook for the application of agricultural information recommendation systems are presented. The project aims to design the best crop based on soil fertility and recommends a fertilizer schedule to minimize the amount of fertilizer needed. The project developed a multi-platform web application that suggests the best crops based on available soil fertility. Furthermore, a fertilization plan will be proposed based on the NPK values of nitrogen (N), phosphorus (P), and potassium (K) to optimize the use of fertilizers in order to increase profitability and prevent soil degradation.

**Keywords**— Crop Recommendation, Fertilizer Recommendation, Machine Learning, Agriculture

## I. INTRODUCTION

Agriculture has an extensive history in India. Recently, India is ranked second in the farm output worldwide. Agriculture-related industries such as forestry and fisheries contributed for 16.6% of 2009 GDP and around 50% of the total workforce. Agriculture's monetary contribution to India's GDP is decreasing [1]. However, farmers are still not getting a profit margin for their produce in the market. Although India is the second largest producer of fruits and vegetables in the world, according to the annual report of the Ministry of Agriculture, Cooperation and Farmer Welfare, farmers are financially threatened due to crop loss. The most serious reason is the inappropriate choice of crops or sometimes they did not get the exact price for their harvest due to overproduction of the crop [2]. By analysing the soil and environmental factor in a particular area, the best crop is

predicted to achieve a higher crop yield [3]. This forecast will help farmers to select suitable crops for their land based on soil type, temperature, humidity, water level, soil fertility [5]. The project aims to provide a system to help farmers select the appropriate crop based on the nature of the soil and environmental factors such as temperature, soil moisture, humidity, and market demand, using technological advances such as data analysis, cloud storage, and the Internet Things.

## II. MOTIVATION

India is a country where agriculture plays a prime role. Prosperity of farmers makes the nation prosperous. Thus, our system would help farmers sow the right seeds based on soil requirements to increase productivity and profit. This allows farmers to plant the right crop that will increase the yield and also increase the overall productivity of the nation. Agricultural productivity mainly depends on the condition of the soil, which in turn depends on the nutrients present in the soil. Based on soil analysis, crops should be recommended to farmers to increase crop productivity and subsequently increase the financial situation of farmers. Farmers also face huge losses due to improper use of fertilizers, we are also building fertilizer recommendation systems to help farmers choose the right fertilizer.

## III. GOALS AND OBJECTIVES

A project objective is the highest end goal to which the project is expected to contribute. The goal of the project is a broad overall strategic orientation to which the project will contribute and should be in line with the organization's strategic plans. It provides a strategic rationale for the project and describes the long-term impact of the project, such as increased shareholder value. Many different projects can have the same goal. It is desirable that only one goal is set, otherwise there is a risk that the project will not be focused. Agriculture is a risky business, and reliable forecasting of crop yields is essential for decisions related to agricultural risk management. The vision of meeting the world's demand for food for a growing population worldwide has become more important in recent years. Ultimately, it helps to achieve ZERO hunger. Forecasts could be used by crop managers to minimize losses when adverse conditions may occur.

IV. LITERATURE SURVEY

Crop Recommender System Using Machine Learning Approach Agriculture and its allied sectors are undoubtedly the largest livelihood providers in rural India. The agricultural sector is also a major contributor to the country's gross domestic product (GDP). A boon to the country is the sheer size of the agricultural sector. This is one possible reason for the higher suicide rate among marginal farmers in India. This paper proposes a viable and user-friendly yield prediction system for farmers. The proposed system provides connectivity to farmers through a mobile application. GPS helps identify the user's location. The user enters the area and soil type as input. Machine learning algorithms allow selecting the most profitable crop list or predicting crop yield for a crop selected by the user.

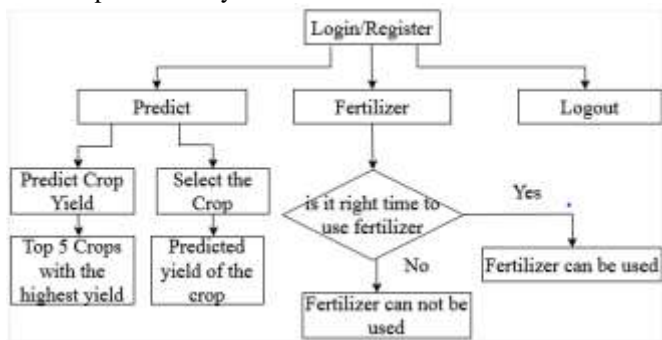


Fig. System Architecture

TABLE I : Accuracy vs Algorithm

Algorithm	Accuracy (%)
Artificial Neural Network (ANN)	86
Support Vector Machine (SVM)	75
Multivariate Linear Regression (MLR)	60
Random Forest (RF)	95
K Nearest Neighbor (KNN)	90

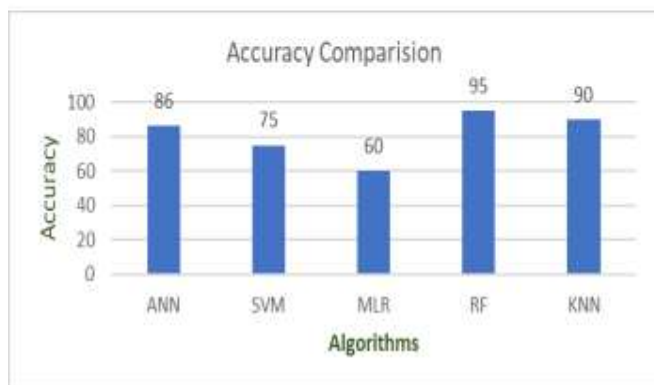


Fig. Accuracy vs Algorithm

A research paper on crop prediction using machine learning proposed a system where agriculture is the backbone of India. It also plays an important role in the Indian economy by providing a large percentage of domestic cultivation to ensure food security. Nowadays, all the farmers are facing problems in cultivation due to natural calamities and poor selection of crops. Machine learning is one of the best possible ways to solve the problem of farmers on a larger scale. However, the problem arises as to which algorithm is the best fit and what is the best way to achieve this. This article is an overview of the strategies and algorithms used, with pros and cons. With existing system issues and used libraries.

Crop Forecasting Using Machine Learning Approaches as we know India is the second most populous country in the world and most of the people in India are engaged in agriculture. Farmers repeatedly grow the same crops without testing the new crop truth and apply fertilizers in random amounts without knowing the insufficient content and amount. This has a direct effect on crop yield and also causes soil acidification and damage to the topsoil. Therefore, we designed a system using machine learning algorithms to improve farmers. Our system will suggest the most suitable crop for a specific plot based on content and weather parameters.

Machine learning algorithm for prediction :-

Predictive machine learning algorithms have a highly optimized estimate that must be the likely outcome based on the training data. Predictive analytics is the use of data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes based on historical data.

A. Rainfall Prediction: The flow chart of rainfall prediction as shown in figure.

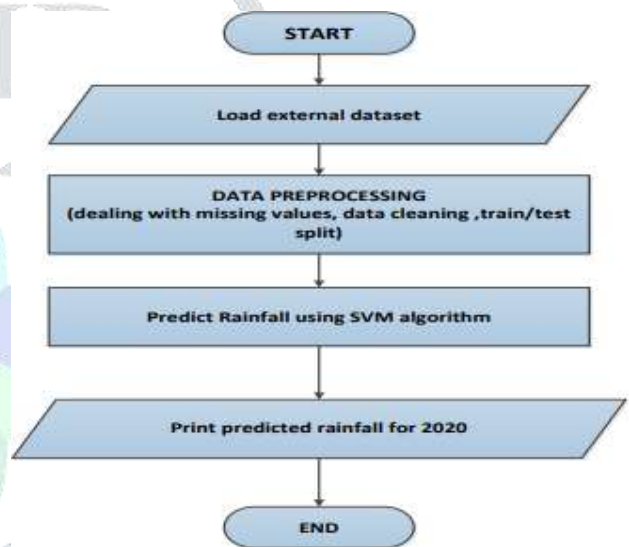


Fig. Flow chart for rainfall prediction

B. Trim Prediction:

The crop prediction process is performed by loading external crop datasets. Once the dataset is read, pre-processing will be performed in various stages as described in the Data Pre-processing section. After pre-processing the data, train the models using a decision tree classifier on the training set. We take into account various factors such as temperature, humidity, soil pH and predicted rainfall to predict the yield. These are input parameters for the system that can be entered manually or taken from sensors. Estimated rainfall and input parameter values will be appended in the list. A decision tree algorithm predicts the crop based on the list data. The overall flow diagram of the proposed system is shown in the figure.

Weather Forecasting Using Machine Learning Algorithm Many primary sector activities depend on weather for production, e.g. agriculture. The climate is changing at a drastic rate these days, making the old methods of weather forecasting less effective and more hectic. Improved and reliable weather forecasting methods are needed to overcome

these difficulties. These predictions affect the national economy and people's lives.

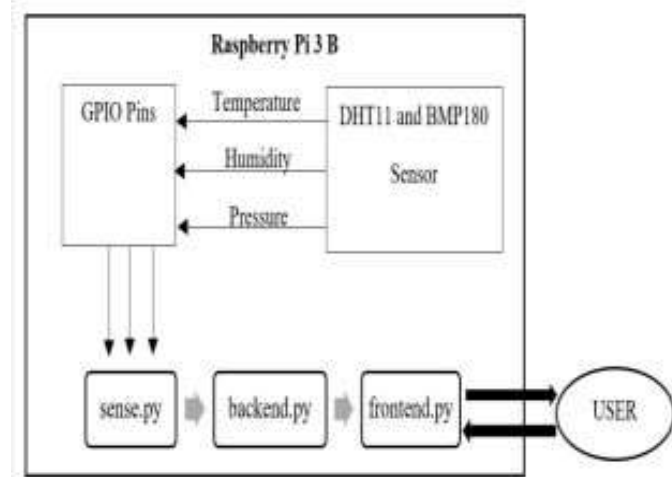


Fig. Block diagram of the system.

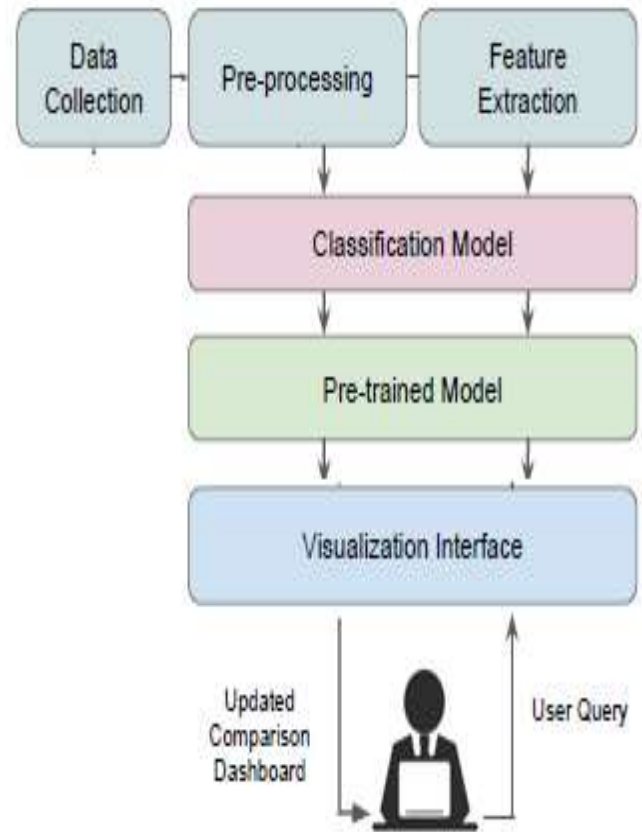


Fig. System Architecture

**2.2. Related Work-**

1.A Scalable Machine Learning System for Pre-Season Agriculture Yield Forecast: The system projected during this work is created by a neural network wherever inputs area unit treated on an individual basis. Static soil information in handled by fully- connected layers whereas dynamic meteorological information is handled by continual LSTM layers. This explicit design was trained with historical information for many soil properties, precipitation, minimum and most temperature against historical yield labels at county level. When training, the model was tested in an exceedingly separate information set and showed comparable results with existing yield prognostication ways that create use of in-depth remote sensing data. the most important lesson learnt from our experiments is that it's attainable get ascendable yield forecast as a result of the projected neural network model will notice and exploit redundant info each within the soil and within the weather information.

2.Machine learning approach for forecasting crop yield based on climatic parameters the present study provides the potential use of information mining techniques in predicting the crop yield supported the environmental condition input parameters.

**V. SYSTEM ARCHITECTURE**

A system architecture is the conceptual model that defines the structure, behaviour, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system.

**VI CONCLUSION**

This project highlighted the limitations of current systems and their practical use in yield prediction. The web application includes several features that users can use to select a crop. A built-in prediction system helps farmers predict the yield of a given crop.

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