

# Agricultural Crop Recommendations Based on Productivity and Season

Surapaneni Sai Krishna Prakesh<sup>1</sup>, V. Naga Rajeswari<sup>2</sup>

<sup>1</sup>PG Student in Dept of CSE in Sree Vahini Institute of Science and Technology By-Pass Road, India

<sup>2</sup>Professor in Dept of CSE in Sree Vahini Institute of Science and Technology By-Pass Road, India

**Abstract:** In Indian economy and employment agriculture plays major role. The most common problem faced by the Indian farmers is they do not opt crop based on the necessity of soil, as a result they face serious setback in productivity. This problem can be addressed through precision agriculture. This method takes three parameters into consideration, viz: soil characteristics, soil types and crop yield data collection based on these parameters suggesting the farmer suitable crop to be cultivated. Precision agriculture helps in reduction of non-suitable crop which indeed increases productivity, apart from the following advantages like efficacy in input as well as output and better decision making for farming. Crop yield prediction incorporates forecasting the yield of the crop from past historical data which includes factors such as temperature, relative humidity, ph., rainfall and area (Hectares). This method gives solutions like proposing a recommendation system through an ensemble model with majority voting techniques using Random Forest and K Nearest Neighbor as learner to recommend suitable crop based on soil parameters with high specific accuracy and efficiency.

## 1. Introduction

Agriculture is the one amongst the substantial area of interest to society since a large portion of food is produced by them. Currently, many countries still experience hunger because of the shortfall or absence of food with a growing population. Expanding food production is a compelling process to annihilate famine. Developing food security and declining hunger by 2030 are beneficial critical objectives for the United Nations. Hence crop protection; land assessment and crop yield prediction are of more considerable significance to global food production. This project uses Python 3.6 for the programming in a scientific development environment called the PyCharm. Various data manipulation, machine learning and visualization packages are used to create and analyze the dataset using a traditional machine learning model. A Data Visualization tool called Tableau is used to interpret the results provided by the model after analysis to represent and act as a proof for the intended result.

PyCharm is an integrated development environment (IDE) used in computer programming, specifically for the Python programming language. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django as well as data science with Anaconda.

In Indian economy and employment agriculture plays major role. The most common problem faced by the Indian farmers is they do not opt crop based on the necessity of soil, as a result they face serious setback in productivity. This problem can be addressed through precision agriculture. This method takes three parameters into consideration, viz: soil characteristics, soil types and crop yield data collection based on these parameters suggesting the farmer suitable crop to be cultivated. Precision agriculture helps in reduction of non-suitable crop which indeed increases productivity, apart from the following advantages like efficacy in input as well as output and better decision making for farming. This method gives solutions like proposing a recommendation system through an ensemble model with majority voting techniques using Random Forest and K - Nearest Neighbor as learner to recommend suitable crop based on soil parameters with high specific accuracy and efficiency.

## **2. LITERATURE SURVEY**

Dr. Y. Jeevan Nagendra Kumar depicts the utilization of different ML methods to speed up. This provides us with a thought of a very much arranged harvest that can be planted in the mountains. Sujata Kullur clarified that past yield data doesn't anticipate gathering and reaping. It likewise gives ranchers the data they need to handle climate data about crops that can be reaped, and to deal with the substance of the harvest at the perfect opportunity. The conduct of the mentors of Judah Khan, the numerous choice trees, was obvious, and the division or issuance turned into a penance as indicated by the quantity of divisions. Amrita Vishwa Vidyapeetham clarifies the likely advantages of IoT casualties to the climate at a decent cost, and clarifies the expected effects of its utilization and use. They utilized a Hadoop sound card. Data, research, and related data don't assist with recognizing bugs and bugs. Pavan Patil discloses to us that "Testament Tree and KNN" utilized the power calculation. This strategy assists with guaranteeing that the plants in a specific region are typically full grown. Fatima Sada Tulla considered mathematical creation and clarified the various approaches to digging for the advancement of time. Since a great deal of information assortment can be troublesome, K implies that it utilizes registering to deal with a ton of data. Genuine numbers are utilized to choose the collect as a long-lasting issue. Furthermore, they center around authority abilities and forefront.

Yash Sanghvi states the usage of agricultural information with data processing and visual data processing techniques are delineate. Data processing in agriculture is employed for analysing the varied organic phenomenon and abiotic factors. Nirupama Mallick clarified that it assumes a significant part in data handling in the rural area. They need to decide specific computational abilities, for example, K normal, SVM, ANN. Collect is anticipated predominantly founded on the climate, with a genuine score of 95%, C4.5. Rakesh Kumar discusses the factors deciding the crop choice like production rate, value and government policies are mentioned. The projected methodology could improve web yield rate of crops. Use of ecological variables, emphasis examination (RA), direct relapse calculation (LR), and collected item reviles. Satish Babu states the wants and designing required for developing a computer code model for exactitude agriculture is mentioned. This approach can end up in the farmer and crop-level support advisories through devices like mobile phones and tablets. Abhay V. Raorane explains how to boost harvest productivity by applying several data mining tactics. The processes they used for order, like as ANN, SVM, and K implies, among others. Anshal Savla explains during this paper, varied algorithms are used associated with classification techniques of information mining. A comparative analysis is finished to indicate that classification algorithmic rule is best fitted to predicting the yield with relevance classification techniques.

## **3. EXISTING SYSTEM**

Machine learning algorithms such as KNN, support vector machine, Random Forest, and Decision tree were employed in the previous procedure. The model's accuracy is roughly 97 percent. In the present model, the 20 crops are trained. Users can now choose things they like thanks to recommender systems. A recommendation system is a method of making suggestions to people based on their preferences. This can also be used for agricultural purposes. Farmers are offered recommendations for their production procedure based on agricultural elements. It is also possible to offer new ways for increasing crop cultivation.

**DISADVANTAGES OF EXISTING SYSTEM:** In the present system, simplest the precise country has been considered, and not all states and other parameters. • Relatively sluggish to build. • Interpretation is difficult. • Computationally highly-priced.

## **4. PROPOSED SYSTEM**

- Our proposed system is an application which predicts name of the crop as well as calculate its corresponding yield.
- Name of the crop is determined by several features like temperature, humidity, wind-speed, rainfall etc. and yield is determined by the area and production.
- In this project KNN and Random Forest is used for prediction. It will attain the crop prediction with best accurate values.

Machine learning is a branch of computer science that employs statistical techniques to enable computer systems to "learn" (i.e., progressively improve performance on a specific task) from data without being explicitly programmed. Arthur Samuel coined the term "machine learning" in 1959. Machine learning,

which evolved from the study of pattern recognition and computational learning theory in artificial intelligence, investigates the study and construction of algorithms that can learn from and make predictions on data – such algorithms overcome strictly static programme instructions by making data-driven predictions or decisions, by building a model from sample inputs. Machine learning is used in a variety of computing tasks where designing and programming explicit algorithms with high performance is difficult or impossible; examples include email filtering, network intruder detection, and computer vision. Machine learning is closely related to (and frequently overlaps with) computational statistics, which is also concerned with making predictions using computers. It has strong ties to mathematical optimization, which provides the field with methods, theory, and application domains. Machine learning is frequently confused with data mining, the latter of which focuses on exploratory data analysis and is referred to as unsupervised learning.

#### SYSTEM ARCHITECTURE

Crop yield is extremely useful information for farmers. Understanding the yield can help you save money by lowering your losses. Crop yields were previously predicted by experienced farmers. The proposed system works in a similar manner. It uses previous data to forecast future yields. Crop productivity is most affected by weather and fertilizers. The accuracy of this prediction is determined by the accuracy of the information provided.

As a result, the proposed method predicts yield and reduces loss. The expected system assumes the role of an experienced farmer. It is, however, more precise and takes into account a number of additional parameters. There are several factors to consider, including soil condition, weather forecast, pH, humidity, and yield.

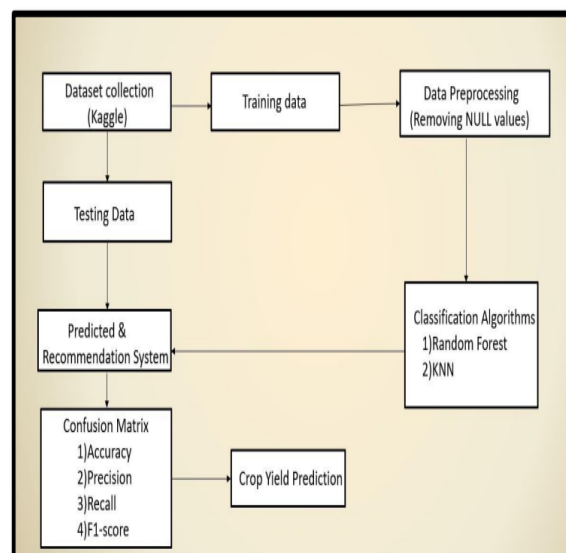


Fig: System Architecture

#### RANDOM FOREST

Random Forest is a supervised machine learning technique that can be applied to Classification and Regression problems. It is based on the concept of ensemble learning, which is the process of combining multiple classifiers to solve a complex problem and improve the model's performance. Random Forest is a classifier that uses the average of a number of decision trees from a given dataset to improve the predictive accuracy of the data set. Instead of relying on a single decision tree, the random forest takes the predictions from each tree and predicts the final output based on the majority vote of predictions.

**K- NEAREST NEIGHBOUR:** The k-nearest neighbors 'algorithm (K-NN) is a nonparametric method for classification that is used in N pattern recognition. The result is class membership. A majority vote of its neighbours classifies an object, with the object assigned to the class most common among its k nearest neighbors (k is a positive integer, typically small). If k = 1, the object is simply assigned to the class of the object's single nearest neighbor.

**DATASETS:** The dataset comprising the soil specific attributes which are collected from Kaggle. In addition, similar online sources of general crop data were also used. The crops considered in our model include rice, maize, chickpea, kidney beans, pigeon peas, moth beans, Mungbam, black gram, lentil, pomegranate, banana, mango, grapes, watermelon, muskmelon, apple, orange, papaya, coconut, cotton, jute, coffee gives an analysis of the dataset. The number of instances of each crop available in the

training dataset is depicted. The attributes considered where Nitrogen(N), Potassium(K), Phosphorus(P), Temperature, Humidity, Ph and Rainfall.

### PSEUDO CODE FOR PROPOSED SYSTEM

START

// Step 1: Define seasonal crop database

DEFINE Crop Database as a list of crops with attributes:

- Crop Name
- Suitable Seasons
- Average Productivity (e.g., kg per hectare)
- SoilType
- Rainfall Range
- Temperature Range

// Step 2: Input current environmental data

INPUT Current Season

INPUT SoilType

INPUT Average Rainfall

INPUT Average Temperature

// Step 3: Filter crops based on the current season

SET SeasonalCrops = []

FOR each crop in Crop Database:

IF Current Season IN crop. Suitable Seasons THEN

ADD crop TO SeasonalCrops

// Step 4: Filter based on environmental conditions

SET Suitable Crops = []

FOR each crop in SeasonalCrops:

IF SoilType == crop. SoilType AND

Average Rainfall IN crop. Rainfall Range AND

Average Temperature IN crop. Temperature Range THEN

ADD crop TO Suitable Crops

// Step 5: Sort crops based on productivity

SORT Suitable Crops BY Average Productivity in descending order

// Step 6: Recommend top crops

DISPLAY "Recommended Crops Based on Productivity and Season."

FOR each crop in Suitable Crops:

DISPLAY croppamide + " - Productivity: " + crop. Average Productivity

END

### 5. RESULTS AND DISCUSSIONS

The pre-model data visualization section includes all data visualizations, such as visualizations created with the pure data set to understand the features and distribution of data in the data set.

Plots are essentially one-way circuits. It is also a method for determining the appropriation of each trademark in a size. The Density Plot is a simple histogram detail. Thickness addresses an unsteady measurement of dissemination. It only recognizes passages as a numerical list. A density plot is used to track the distribution of at least one factor. The main thing to do when recovering new information is to independently check the dissemination of the factors. It provides a wealth of information.

For farmers, crop yield is extremely useful information. Knowing the yield can help you save money by reducing your losses. In the past, experienced farmers predicted crop yields. In a similar way, the proposed system operates. It takes the prior data and applies it to forecast future yields. The weather and fertilizers have the greatest impact on crop productivity. The accuracy of the information provided determines the accuracy of this prediction. As a result, the suggested approach anticipates yield and reduces loss. The expected system takes on the role of a seasoned farmer. However, it is more precise and takes into account a variety of additional parameters. Soil condition, weather forecast, pH, humidity and yield are all factors to consider.

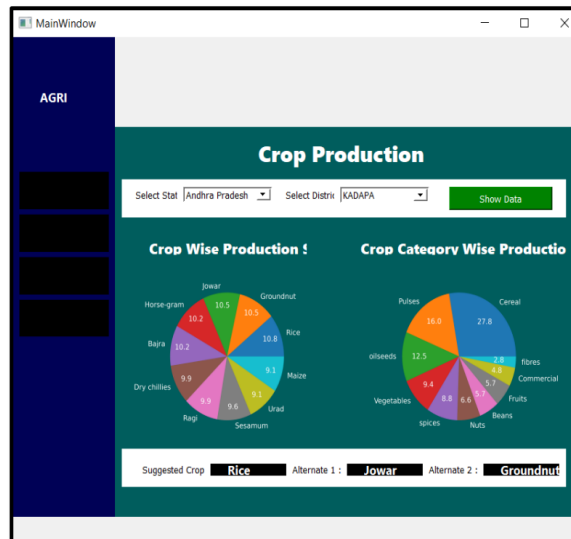


Fig: State Prediction

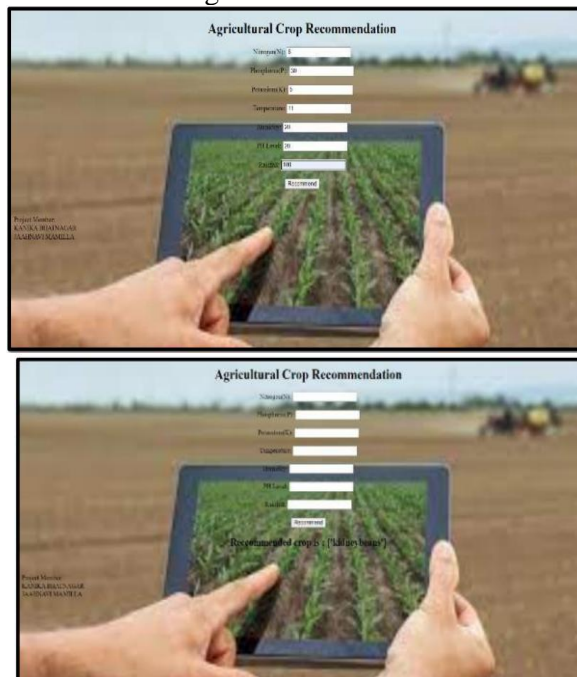


Fig: Crop Prediction.

The above figure shows to discover, we will utilize seven unique fixings: nitrogen (N), phosphorus (P), potassium (K), heat, temperature, pH, and precipitation. Presently you want to get a decent gather to get a decent reap. Contrasted with the past task, we got 9% more on KNN.

## 6. CONCLUSION AND FUTURE WORK

**CONCLUSION:** Machine learning techniques are applied in various fields of agriculture. Implement a system to predict crop production from the collection of past data. Carry out an arrangement to conjecture generally upheld rural creation. Plant creation is gotten ready for data handling strategies. Today, random forest is utilized to characterize a fascinating yield as a genuine harvest. In agribusiness, it is for the most part consistent with anticipate yields. The higher the yield, the higher the yield. The proposed procedures assist ranchers with being careful about various harvest necessities and costs. This assists ranchers with picking what harvests to plant. This work is frequently used to distinguish extra plants that can be gathered monetarily and proficiently. This innovation can grow a wide assortment of yields. Indian ranchers might enjoy the benefit of precisely foreseeing yields in various pieces of India.

**FUTURE SCOPE:** This research work can be enhancing to the high level by building a recommender system of agriculture production and distribution for farmer. India may be a country wherever agriculture is extremely vital. The prosperity of the farmers ends up in the prosperity of the state. Thus, our work would assist farmers in sowing the acceptable seed supported soil necessities so as to extend productivity and exploit such a way. As a result, farmers will plant the acceptable crop, increasing their yield and therefore the nation's overall productivity. Our future work can concentrate on associate degree improved knowledge set with an oversized variety of attributes, in addition as yield prediction.

## References

- [1]. E Aruvansh Nigam, Saksham Garg, Archit Agrawal —Crop Yield Prediction using ML Algorithms —, 2019 Fifth International Conference on Image Information Processing (ICIIP)
- [2] LeoBrieman, —Random Forests|, 2019 IEEE Transactions on Instrumentation and Measurement
- [3] Priya, P., Muthaiah, U., Balamurugan, M.| Predicting Yield of the Crop Using Machine Learning Algorithm|,2020 International Journal of Engineering Sciences & Research Technology (IJESRT)
- [4] Mishra, S., Mishra, D., Santra, G. H.,—Applications of machine learning techniques in agricultural crop production|,2020 Indian Journal of Science and Technology
- [5] Dr.Y Jeevan Kumar,|Supervised Learning Approach for Crop Production|, 2020 5th International Conference on Communication and Electronics Systems (ICCES)
- [6] RameshMedar,Vijay S, Shweta, —Crop Yield Prediction using Machine Learning Techniques|, 2018 International Journal of Engineering Sciences & Research Technology (IJESRT)
- [7] Ranjini B Guruprasad, Kumar Saurav, Sukanya Randhawa,|Machine Learning Methodologies for Paddy Yield Estimation in India: A CASE STUDY|, IGARSS 2019 - 2019 IEEE International Geoscience and Remote Sensing Symposium
- [8] [https://en.wikipedia.org/wiki/Crop\\_yield](https://en.wikipedia.org/wiki/Crop_yield)
- [9] [https://en.wikipedia.org/wiki/Random\\_forest](https://en.wikipedia.org/wiki/Random_forest)
- [10] [https://en.wikipedia.org/wiki/Knearest\\_neighbors\\_algorithm](https://en.wikipedia.org/wiki/Knearest_neighbors_algorithm).