

# Smart Agricultural Crop Prediction Using Machine Learning

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## ABSTRACT

Choosing a best crop which gives maximum yield and profit is very important to every farmer in agriculture field. Thus, by implementing technology in agriculture results in higher yields and improved quality of final product. In this

paper, we propose a system based on machine learning algorithms which provide a best crop and its required fertilizers as a solution by which farmers will get more profit on growing system suggested crop. Our system can predict the best crop which is suitable to grow in the farmer specified location by accessing weather, temperature, rainfall information from the weather department and soil information from the agriculture department . Our system is designed in the form of web application which uses big data analytics ,prediction analysis and other techniques to predict the most suitable and profitable crop and its required fertilizers, predicts yield per hectare and also value of crop based on current market price taking into consideration of current weather and soil conditions. Thus, farmers will benefit by using our system which will improve crop productivity and profit of farmers.

**IndexTerms:**Maximum yield, Crop, Fertilizers, Machinelearning,Weatherforecast, Soil parameters, Data analytics, Prediction analysis, Profit margins, Market price.

## INTRODUCTION

Agriculture is very important because it produces food and feed which is necessity to animals and human beings. It fulfill the basic need of billions of people. It is one of the major contributor to the country's GDP and economic growth. Hence, it is widely practiced in India. Agriculture sector requires more workforce than any other sectors, nowadays there is huge decrease in the agricultural workforce . So, we need to fill that huge gap by making advances in agriculture with the help of technology. Thus, agricultural advancement results in gaining more profit by the farmers.

Big data analytics techniques are used to analyze data sets of temperature, humidity, rainfall and soil which are collected from the meteorological department. This type of required analysis is performed by using specific software tools, many of them available as open source. By using this tools and techniques the system will have information, by this processed information the system will take better decisions. Thus, ensuring better results.

Normally, farmers can guess the final yield by their experience of growing particular crop again and again. Farmers yield prediction accuracy is low and not cost effective. To meet the food requirements of the entire population of the country and for the export of some agricultural products to other countries, it is important to practice modern methods of farming by using technology instead of practicing traditional farming methods. Modern methods allows the farmers to cultivate the crops in small area with minimum amount of water ,fertilizers and pesticides ,which finally produces good yield and profit to the farmers.

Our system is developed based on the machine learning concepts and our system uses linear predictive model to predict yield and best crop suitable to grow. Our system gets the weather related data from weather department and soil data like soil nutrients and moisture from soil department and other required data from the government websites. With the data obtained from various resources it is divided into sample and verification data sets. Model is built based on this sample data set, our system is tested on verification data and the predicted values are compared to the actual values. Our system takes current location of farm land , number of hectares of land and crop decided by farmer to grow as an input from the farmer in the web application which is an interface between farmer and the system. By the provided data and earlier trained data, the system is well understood to produce solution. Thus, algorithm analyzes the final values and predicts the best

crop, list of fertilizers to be used, yield per hectare and total value of cultivated crop based on the current market price.

## LITERATURE REVIEW

[1] S.Veenadhari, D.Bharat Mishra, D C.Singh,: Data mining techniques are used in agriculture to study the data of weather and soil parameters. In this more emphasis is given to study the influence of climatic parameters on crop productivity using decision tree technique. The Decision trees are used for better understanding. This type of studies will help the researchers, policy makers and farmers in predicting crop yield in advance.

[2] N. Kumar, G, P.O. REDDY, S. CHATTERJI, D. SARKAR: Land Classification is described in detail in which soil units are created for effective utilization of farm land. In which planning makes easier and sustainable for agricultural practice and management. Machine learning systems are used in planning the use of farm land.

[3] M.S.Dahikar, D.V.Rode,: In this paper ,research is performed on climatic conditions of various parts of the world which directly affect the crop yield. This provides work on how to tackle the environmental conditions. Artificial neural networks have been used to study on the varying climate conditions day by day This work increases the effectiveness of the prediction solution.

[4] M. Kaur, H. Gulati, H. Kundra: For agriculture crop price analysis, Data mining techniques are very useful. This paper presents the applications and techniques of Data mining in agriculture. There are various data mining techniques such as K-Means, KNN, ANN and Support Vector Machines (SVM) which are used in yield and price prediction of the crops.

## EXISTING SYSTEM

- The existing systems only predict yield based on input of total area of farm land in hectares but this systems doesn't predict best suitable and profitable crop ,doesn't suggest fertilizers and doesn't calculate the total value of the crop.
- And also the accuracy of the existing system is low compared to our system.

## PROPOSED SYSTEM

The solution proposed allows us to predict best suitable and profitable crop, its required fertilizers, estimates yield, and calculates the total value of the crop.

The below mentioned are the hardware and software requirements of our project.

### HARDWARE REQUIREMENTS:

- System : Pentium IV 2.4 GHz.
- Hard Disk : 500 GB
- Ram :4 GB
- Any desktop / Laptop system with above level configuration or higher level.

### SOFTWARE REQUIREMENTS:

- Operating system : Windows XP / 7/8/10
- Coding Language : Python 3
- Technology Tools : Pandas , Numpy(AI Apis)
- IDE : Jet Brains PyCharm-2018, Visual Studio 2015

## METHODOLOGY

### 1.Solution to the problem:

Our system selects the best crop by analyzing the training data from verification data set to identify the list of crops and their annual yield based on the required environmental conditions. Based on both analyzed data and user given data, the system produces suitable and profitable crop as one of the solution to the farmer.

### 2. Steps involve in data set processing

- Import the libraries.
- Import the data set.
- Get the basic information about the data set.
- Get the correlation parameter for the variables.
- If required plot and analyse the parameters.
- And also need to purify the data set.
- Check for nulls in the data set.
- If any drop those rows.
- Check for any special characters in the columns.
- Just convert them in to nulls and drop those rows.
- Now need to select the features for the project.
- Taking all the column as input and production, crop, fertilizers and total market value of crop as output.
- Now need to split the data set into sample and verification data set.
- And train the machine using the Linear model.
- And finally using this trained model we can create an application to work .
- To take the inputs from the user and display the result.

## SYSTEM ARCHITECTURE

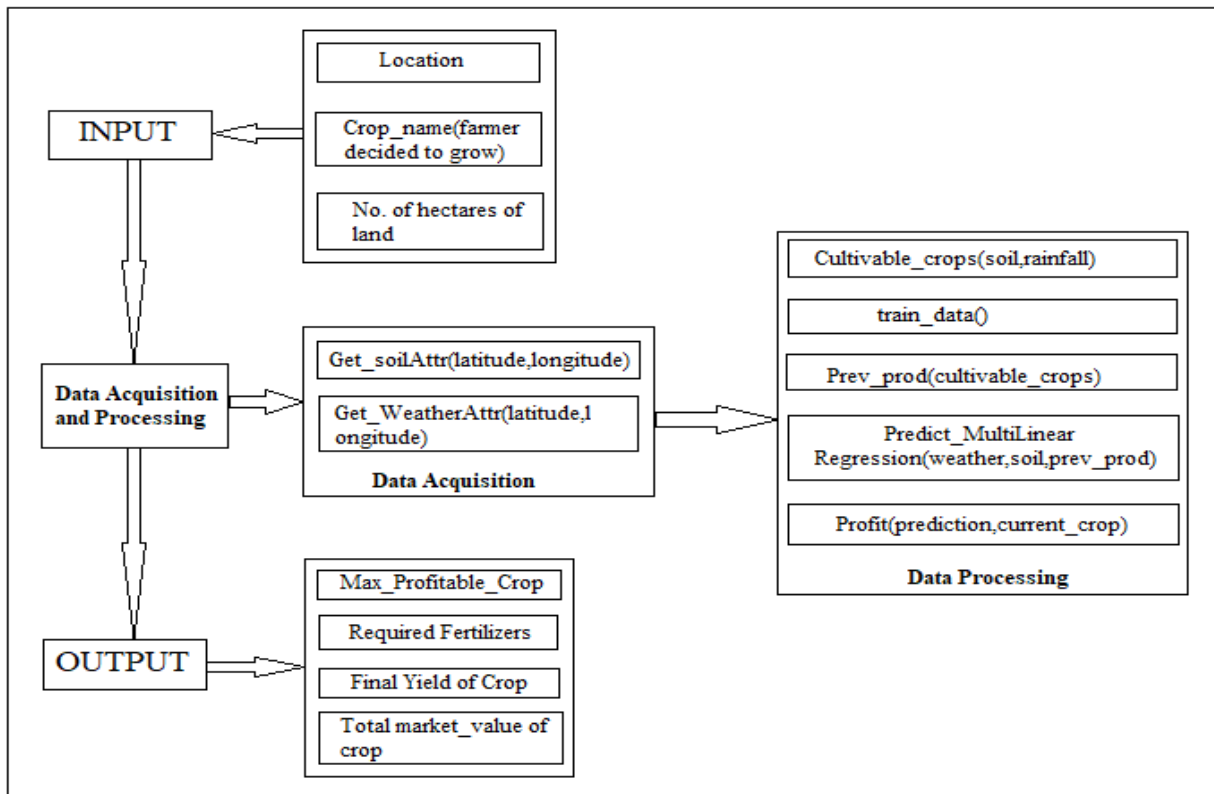


Fig 1: Block Diagram Of System Architecture

### System working

- The System takes input from user i.e. user location, crop decided to grow and no. of hectares of land.
- Based on the location and chosen crop, system takes previous years data (soil attributes, rainfall, weather etc) from the repositories and analyzes the data and predicts the results.
- The algorithm predicts the yield of crop and calculates the total value of the crop based on current market price.

d) Finally System produces the predicted output in the application.

## RESULTS

Our model has learned with the train datasets and test datasets to produce optimal solution. We are given input as farmers current farming land location, farmer decided crop, and number of hectares of land in the application. Our system analyzed the data and produced the predicted profitable crop and its required fertilizers list, overall yield per hectare and also shows total value of the crop based on current market price.

Our algorithm has an average accuracy of 85% on the given data set.

## CONCLUSION

Our system predicts the best crop and its required fertilizers making the farmer more confident about the crop and its yield and also our system will do marketing work by estimating total value of the crop based on current market price. In future,

we add some extra features to our system like we list all the new and modern equipments used for cultivating the predicted best crop. And based on location, we list the different policies and schemes released by the state and central governments which may provide financial aid to the farmers. And we are also looking into developing the system which provide real time monitoring of crops and their diseases by connecting different farm devices and sensors over the internet using Internet of things.



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