



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 7, July 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com



Prediction of Crop Yield and Fertilizer Recommendation Using Machine Learning Algorithms

Gowtham D L¹, Veena B²

P.G. Student, Department of Master of Computer Applications, University B. D. T College of Engineering,
Davanagere, Karnataka, India¹

Assistant Professor, Department of Master of Computer Applications, University B. D. T College of Engineering,
Davanagere, Karnataka, India²

ABSTRACT: Machine learning is an emerging research field in crop yield analysis. Yield prediction is a very important issue in agriculture. Any farmer is interested in knowing how much yield he is about to expect. In the past, yield prediction was performed by considering farmer's experience on particular field and crop. The yield prediction is a major issue that remains to be solved based on available data. Machine learning techniques are the better choice for this purpose. Different Machine learning techniques are used and evaluated in agriculture for estimating the future year's crop production. This paper proposes and implements a system to predict crop yield from previous data. This is achieved by applying machine learning algorithms like Support Vector Machine and Random Forest on agriculture data and recommends fertilizer suitable for every particular crop. The paper focuses on creation of a prediction model which may be used for future prediction of crop yield. It presents a brief analysis of crop yield prediction using machine learning techniques.

KEYWORDS: Agriculture, Yield Prediction, Machine learning, Support Vector Machine, Random Forest, Soil Nutrients.

I. INTRODUCTION

From ancient period, agriculture is considered as the main and the foremost culture practiced in India. Ancient people cultivate the crops in their own land and so they have been accommodated to their needs. Since the invention of new innovative technologies and techniques in the agriculture field is slowly degrading. Due to these, abundant invention people are been concentrated on cultivating artificial products that is hybrid products where there leads to an unhealthy life. Nowadays, modern people don't have awareness about the cultivation of the crops in a right time and at a right place. Because of these cultivating techniques the seasonal climatic conditions are also being changed against the fundamental assets like soil, water and air which lead to insecurity of food. The machine learning learns the algorithm based on the supervised, unsupervised, and Reinforcement learning each has their importance and limitations. Supervised learning the algorithm builds a mathematical model from a set of data that contains both the inputs and the desired outputs. Unsupervised learning-the algorithm builds a mathematical model from a set of data which contains only inputs and no desired output labels. Semi-supervised learning- algorithms develop mathematical models from incomplete training data, where a portion of the sample input doesn't have labels. This paper aims to improve the yield of the crop in several ways and recommends fertilizer suitable for every particular crop.

Agriculture is regarded as India's primary and most significant community. Since ancient people grew crops on their own land, they were able to adapt to their needs. As a result, natural crops are grown and used by a number of species, including humans, livestock, and birds. The creature has taken the greenish goods created in the soil, which has resulted in a healthy and welfare life. The agricultural sector has been steadily degrading since the advent of new advanced technologies and techniques. People are concentrating on cultivating artificial goods, which are hybrid products, because of these plentiful inventions, which contributes to an unhealthy existence. Nowadays, most people are unaware of the importance of cultivating crops at the appropriate time and place. Seasonal climatic conditions are also being altered because of these cultivation methods, posing a challenge to fundamental assets such as soil, water, and air, resulting in food insecurity. By evaluating all these issues and challenges, such as weather, temperature, and several other variables, we have discovered that there is no suitable solution or technology to help us solve the situation we are

in. In India, there are many options for increasing agricultural economic development. There are numerous methods for increasing and improving crop yield and quality. Data mining can also be used to forecast crop yield production. Data mining, in general, is the methodology of analyzing information from different angles and synthesizing it into helpful information.

II. RELATED WORK

- [1] Shivanth Ghosh, et al. (2014) In this paper machine learning system is divided into three steps, first sampling (Different soil with same number of properties with different parameters) second Back Propagation Algorithm and third Weight updating.
- [2] P. Vinciya, et al. (2016) This paper mainly focused on analyzing the agriculture analysis of organic farming and inorganic farming, time cultivation of the plant, profit and loss of the data and analyzes the real estate business land in a specific area. This work goes for finding reasonable information models that accomplish a high precision and a high consensus as far as yield expectation abilities.
- [3] Zhihao Hong, et al. (2016) This paper proposes an information driven approach on structure PA answers for gathering and information demonstrating frameworks. Soil dampness, a key factor in the yield development cycle, is chosen for instance to exhibit the viability of our information driven methodology. On the accumulation side, a responsive remote sensor hub is built up that expects to catch the elements of soil dampness utilizing soil dampness sensor. The prototyped gadget is tried on field soil to show its usefulness and the responsiveness of the sensors. On the information examination side, a one of a kind, site-explicit soil dampness expectation system is based over models produced by the AI procedures Support Vector Machine and Relevance Vector Machine. The structure predicts soil dampness n days ahead dependent on a similar soil and natural characteristics that can be gathered by our sensor hub.
- [4] Sabri Arik, et al. (2016) In this paper, we propose a method for predicting functional properties of soil samples from a number of measurable spatial and spectral features of those samples. The method used is based on SavitzkyGolay filter for pre-processing and a relatively recent evolution of single hidden-layer feed-forward network (SLFN) learning technique called extreme learning machine (ELM) for prediction.
- [5] Vaneesbeer Singh, et al. (2017) This work presents an approach which uses different Machine Learning techniques in order to predict the category of the yield based on macro-nutrients and micro-nutrients status in dataset. The dataset considered for the crop yield prediction was obtained from Krishi Bhawan (Talab-Tillo) Jammu. The parameters present in the data are Macro-Nutrients (ph, Oc, Ec, N, P, K, S) and Micro Nutrients (Zn, Fe, Mn, Cu) present in samples collected from different regions of Jammu District. After analysis Machine learning algorithms are applied to predict the category of yield. The category, thus predicted will specify the yield of crops. The problem of predicting the crop yield is formulated as Classification where different classifier algorithms are used.
- [6] E. Manjula et al. (2017) This paper chooses Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Iron, Zinc, and so forth, nutrients for investigating the soil supplements utilizing Naïve Bayes, Decision Tree and hybrid approach of Naïve Bayes and Decision Tree. The performance of the classification algorithms are compared based on accuracy and execution time.
- [7] Rohit Kumar Rajak et al. (2017) This method is characterized by a soil database collected from the farm, crop provided by agriculture experts, achievement of parameters such as soil through soil testing lab dataset. The data from soil testing lab dataset given to recommendation system it will use the collect data and do ensemble model with majority voting technique using support vector machine and ANN as learners to recommend a crop for a site specific parameter with high accuracy and efficiency.
- [8] M. G. Ananthara et al. suggested the CRY algorithm for crop yield using beehive clustering techniques as a prediction model for agricultural datasets. Agricultural research around the world emphasizes the need for a reliable system to forecast and boost crop growth. There is a clear need for a prophetic modelling system with efficient predictive yield management methodology due to multi-dimensional variable metrics and also the lack of a prophetic modelling approach, which leads to crop yield loss. Using a dynamically updated historical crop information set, this paper proposes a crop yield prediction model (CRY) that employs an adaptational cluster approach to predict crop yield and enhance exactness agriculture decision-making employing a dynamically changed historical crop knowledge assortment. CRY analyses and classifies crops using a beehive simulation approach based on crop growth trend and yield. Clementine was used to measure the CRY classified dataset against established crop domain information.
- [9] Awan, A. M. et al. suggested creating a software program framework for prognostication crop yield primarily based totally on weather and plantation information. The core of this scheme is an approach for unattended data partitioning for locating spatio-temporal trends in climate knowledge using kernel strategies, which provides strength in dealing with complicated data. For this purpose, a strong weighted kernel k-means formula with spatial constraints is given. The algorithm can efficiently manage noise, outliers, and autocorrelation in spatial data for successful and efficient data



analysis, and so are often accustomed to predicting oil-palm yield with the aid of using different studying factors affecting yield.

[10] Chawla, I. et al. Fuzzy logic-based Crop Yield prediction using Temperature and Rainfall parameters predicting through ARMA, SARIMA and ARMAX models: Agriculture is extremely important in India's economy. As a result, crop yield forecasting is an essential task for India's development. Crops are affected by a variety of weather conditions, including temperature and rainfall. As a result, when forecasting a crop's yield, it's important to take these factors into account. Forecasting the weather is a difficult task. Three forecasting methods are used in this study: ARMA, SARIMA, and ARMAX (Auto Regressive Integrated Moving Average) (ARMA with exogenous variables). The three models' output is compared, and the best model is used to forecast rainfall and temperature, which are then used to forecast crop yield using a fuzzy logic model.

[11] Crop Yield prediction using data analytics and hybrid approach: Agricultural data is constantly and massively generated. As a result, the age of big data has arrived for agricultural data. Data collection via electronic devices is aided by smart technologies. We will analyze and mine this agricultural data in our project to obtain useful results using technologies such as data analytics and machine learning, and this information will be provided to farmers in order to improve crop yield in terms of production and productivity.

III. METHODOLOGY

The works done till now only concentrated on crop prediction using different soil properties and Data Mining Techniques. Fertilizer Recommendation is not taken into consideration. So, it is necessary to develop crop yield prediction and fertilizer recommendation system which predicts crop yield based on soil nutrients crop yield data and recommend fertilizer for selected crop based on different datasets like fertilizer data, location data and crop yield data.

PROPOSED WORK

To design an application where we compare the different machine learning to predict the crop yield. We build a new decision system using ensemble regression system. The user would provide input of season type, year of production, area of production, crop type, cloudburst, climate condition, located yield within side the remaining and the system would predict the yield and relying at the value set, the crop may be classified and attain the results. In the first step it allows the admin to login and load the data. Second, it allows the admin to perform analysis by considering all the input conditions. Finally, a report is generated for the crop yield and the accuracy of the models are also generated. The accuracy which is near to 1 is considered as an ideal model and the model which has accuracy near to 0 are considered as unideal model. The input for the system will be a season, rainfall, area of production, crop type, district name, state name and output will be the production of crop yield and accuracy of each model.

The aim of proposed system is to help farmers to cultivate crop for better yield. The crops selected in this work are based on important crops from selected location. The selected crops are Rice, Jowar, Wheat, Soyabean, and Sunflower, Cotton, Sugarcane, Tobacco, Onion, Dry Chili etc. The dataset of crop yield is collected from last 5 years from different sources. There are 3 steps in proposed work

There are 3 steps in proposed work. 1) Soil Classification: Soil classification can be done using soil nutrients data. Two Machine learning algorithms used for soil classification are Random Forest and Support Vector Machine. The two algorithms will classify, and display confusion matrix, Precision, Recall, f1-score and average values, and at the end accuracy in percentage as output.

2) Crop Yield Prediction: Crop Yield Prediction can be done using crop yield data, nutrients and location data. These inputs are passed to Random Forest and Support Vector Machine algorithms. These algorithms will predict crop based on present inputs.

3) Fertilizer Recommendation: Fertilizer Recommendation can be done using fertilizer data, crop and location data. In this part suitable crops and required fertilizer for each crop is recommended.

Figure 1 - System Model of the Proposed Crop Favor System

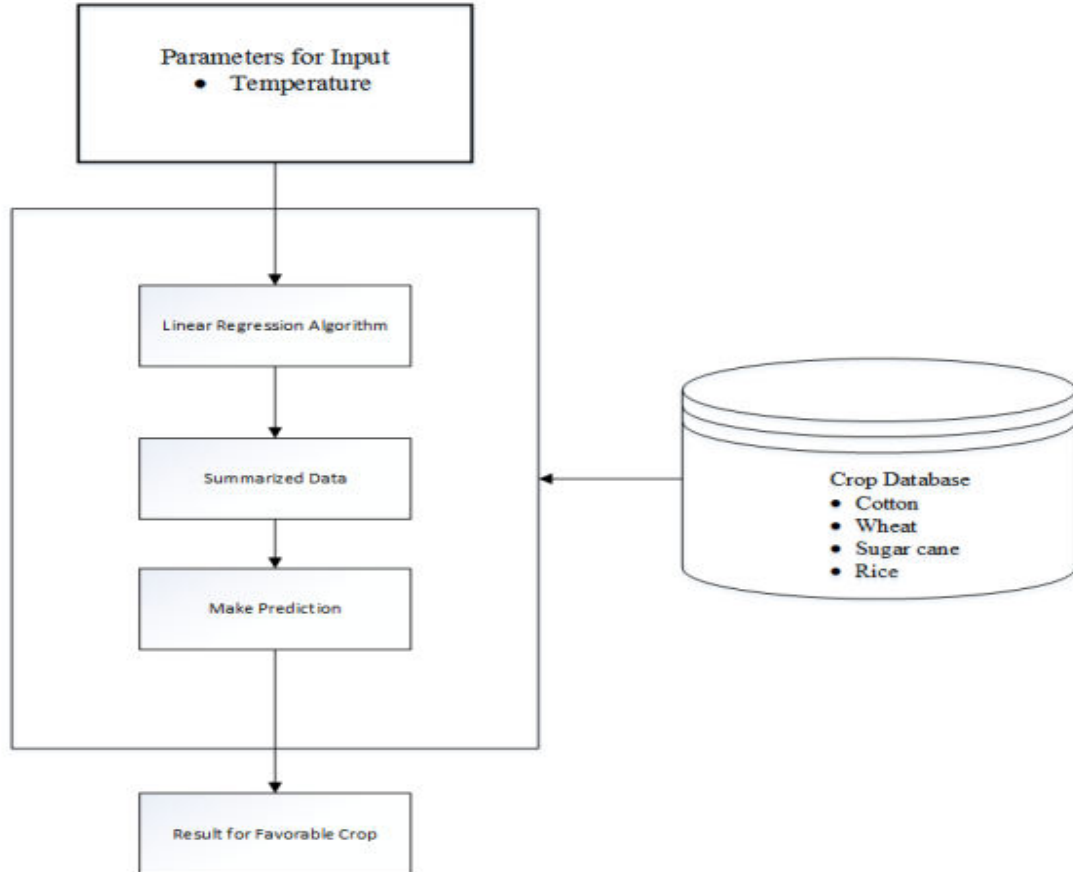
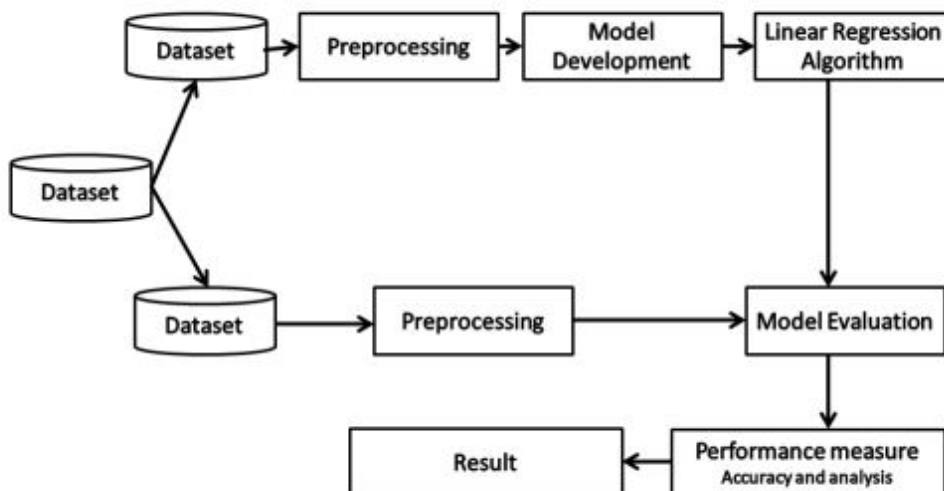


Figure 2 - Diagram of Model Training





IV. CONCLUSION

The prediction of crop yield based on location and proper implementation of algorithms have proved that the higher crop yield can be achieved. From above work I conclude that for soil classification Random Forest is good with accuracy 86.35% compare to Support Vector Machine. For crop yield prediction Support Vector Machine is good with accuracy 99.47% compare to Random Forest algorithm. The work can be extended further to add following functionality. Mobile application can be build to help farmers by uploading image of farms. Crop diseases detection using image processing in which user get pesticides based on disease images. Implement Smart Irrigation System for farms to get higher yield.

REFERENCES

- [1] Rushika G., Juilee K, Pooja M, Sachee N, and Priya R.L.(2018). Prediction of Crop Yield using Machine Learning, Issue 02 IRJET (pg 2337-2339).
- [2] Ruchita T, Shreya B, Prasanna D, and Anagha C (2017). Crop Yield Prediction using Big Data Analytics, Volume 6, Issue 11, IJCMS.
- [3] Monali P, Santosh K, Vishwakarma, and Ashok V (2015). Analysis of Soil Behaviour and Prediction of Crop Yield using Data Mining Approach, ICCICN 2015.
- [4] Mrs. N. Hemageetha, and Dr. G.M. Nasira (2016). Analysis of Soil Condition based on pH value using Classification Techniques, IOSR-JCE, Issue 6, (pp.50-54).
- [5] E. Manjula, and S. Djodiltachoumy (2017). Data Mining Technique to Analyze Soil Nutrients based on Hybrid Classification. IJARCS.
- [6] Rohit Kumar Rajak, AnkitPawar, MitaleePendke, PoojaShinde, Suresh Rathod, and AvinashDevare (2017). Crop Recommendation System to maximize Crop yield using Machine Learning. Issue 12 IRJET.
- [7] S. Veenadhari, Dr. Bharat Misra, Dr. CD singh (2014). Machine Learning Approach for Forecasting Crop Yield based on Climatic Parameters. ICCCI-2014.
- [8] "data.gov.in." [Online]. Available: <https://data.gov.in/>
- [9]. Ananthara, M. G., Arunkumar, T., &Hemayathy, R. (2013, February). CRY- an improved crop yield prediction model using beehive clustering approach for agricultural data sets. In 2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering.
- [10]. Awan, A. M., & Sap, M. N. M. (2006, April). An intelligent system based on kernel methods for crop yield prediction. In Pacific- Asia Conference on Knowledge Discovery and Data Mining (pp. 841-846).Springer, Berlin, Heidelberg.
- [11]. Bang, S., Bishnoi, R., Chauhan, A. S., Dixit, A. K., &Chawla, I. (2019, August). Fuzzy logic-based Crop Yield Prediction using Temperature and Rainfall parameters predicted through ARMA, SARIMA and ARMAX models. In 2019 Twelfth International Conference on Contemporary Computing (IC3) (pp. 1-6). IEEE.
- [12] Bhosale, S. V., Thombare, R. A., Dhemey, P. G., &Chaudhari, A. N. (2018, August). Crop Yield Prediction using data analytics and hybrid approach.In 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA) (pp. 1-5).IEEE.
- [13]. Gange, Y. (2017, December). A study on various data mining techniques for crop yield prediction.In 2017 International Conference on Electrical, Electronics, Communication, Computer and Optimization Techniques (ICEECCOT) (pp. 420-423).IEEE.
- [14]. Gandhi, N., Petkar, O., & Armstrong, L. J. (2016, July). Rice crop yield prediction using artificial neural networks.In 2016 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR) (pp. 105-110).IEEE.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details