

Survey on Improving the Prediction of Soil Classification and Crop Suggestion

*Dr K. A. Waghmare, Sheetal A. Jhare**

Department of Computer Science, Government College of Engineering, Amravati, India

**Corresponding Author*

E-mail Id:-Sheetal.jhare@gmail.com

ABSTRACT

Agriculture plays an important role in the Indian economy. It remains the major provider for employees and source of revenue of our country. The main focus of this survey is on how to improve the soil quality and crop production. We are going to study the classification problem and prediction of village wise soil parameters. Both are dependent on soil testing samples for finding soil fertility indices and pH values which represent a detail overviewing on application of machine learning in agriculture base. Mostly above problems are solved using machine learning technique which also achieve better accuracy in these areas. By applying machine learning in real time data which enabled program to present high testimonial and deep perceptivity for experts and farmers to make correct decision and take proper action.

Keywords:- *Machine learning techniques, soil parameters, pH values, classification problem, crop prediction.*

INTRODUCTION

India is still practicing agriculture, but the tendency of agriculture has effectively developed due to globalization. Number of factors have affected soil quality and crop production. Figure 1 explained the main reasons that arise during soil erosion is the excess use of chemical fertility that may reduce soil quality and also damage the crops. Most of the time redundant use of improper amount of soil nutrient added during cultivation, causes many problems. The major focus is in classifying soil nutrient that develop crop productivity, reduce experts analyze efforts and save time for maintenance and improving in energetic soil quality and there important mechanism. About 60% of lands in the country used for agriculture in order for survival of billions of people. In past year yield prognostication was executed by considering the farmer's experience in particular lands and focus on profit ascends in crop production. In India, agriculture is highly influenced by

geological attributes such as rain water, flood, dryness which are highly unpredictable. So, India is now rapidly progressive towards different technology and highly focuses on development. Thus, technology will prove to be beneficial which will increase soil quality and crop productivity resulting in better yield to the farmer. Organic matter and pH value are important soil parameters that indicates various soil fertility indices which are essential components in soil quality evaluation as all farmers depends on these mechanisms and the latter to food security.



Fig.1:-Describe the soil erosion problem

Timely detection and proper controlling toward agriculture problem connected with crop yield enable the agriculture expert and farmer to take correct decision on pertinent soil resources and crop production management.

Mostly crop prediction, clustering and classification problem are efficiently managed by different algorithms which are based on Machine learning techniques. ML is the huge growing technology in agriculture sector which emphatically minimize the problems lookout by expert which finally gave the best optimal solution. Dhivya B H1 *et al.*[1] work on soil parameters such as soil fertility indices, soil moisture and selection of suitable crops depends on relevant soil using different machine learning algorithms such as Random forest, Naïve biases which entirely considering soil quality and micro nutrients for selecting the suitable crop required for relevant soil. Juhi Reashma *et al.*[2] In past few year Machine learning techniques such as Artificial neuron network was used to predict soil fertility. Classification are really effective in many fields of science technology to develop some fundamental terminology and also help for finding the connection between the objects and concept. Jacob Kaingo *et al.*[8] Classification of soil philosophies follows some deep understanding over agriculture and there functional objectives. Here, we are going to study three section: Section I gave brief introduction based on present agriculture. Section II describes the related work in Soil classification and Crop production. Finally, in Section III present the conclusion.

RELATED WORK

In recent year Machine learning has become a popular research area. There has been some work in the area of Agriculture. The most relevant published papers that are analyzed are listed below:

Dhivya B H1 *et al.* discuss about Knowledge Discovery process and various data mining algorithm such as association, precision agriculture, Majority voting techniques such techniques are used for crop prediction. With the help of Data mining, Crop yield can be predicted by considering useful insight from these agriculture sector that enable the farmers to decide suitable crop for relevant soil[1].

According to Juhi Reashma S R K, *et al* presented a work mainly focused on Edaphic factor which is abiotic factor relating to the chemical composition of the soil found in the particular areas. ML techniques are applied on different algorithm for predicting the suitable crop for related soil types, soil nutrient and soil fertility indices[2].

M.S.Sirsata *et al.* have applied different algorithms such as neuron network, random forest, naïve biased, SVM which provide high performance and better accuracy using which ten classification problem are solved [3].

A study was carried out by G. Vishwal *et al.* various factor affected to Agriculture such as seasonal, economy and biological factors which influence the crop production and if in case changes occurred that lead to great loss to farmer and this will directly affected to our economy [5].

Subhadra Mishra1 *et al.* was used chemical soil measurement for analyzing soil moisture, pH values and soil quality based on soil parameters like available phosphorus(P), Organic carbon (OC), Nitrogen oxide(N₂O), Magnesium (Mg) to prefer a correct soil fertility and suggestion relevant crops. This model work on RF algorithm to achieve the best performance from overall problem and get up to 90% of accurate result[7].

S.R.Rajeswari *et al.* explained numerous

studied which are applied on ML techniques for finding various agriculture problem related to soil quality and land types. These modelwork with different algorithm to overcome the above problem such algorithm are RF, Regular RF, Generalized boosting regression model which can achieve acceptable prediction accuracy and also explain below mentioned Figure 2 which describes overall criteria of farmer in country[9].

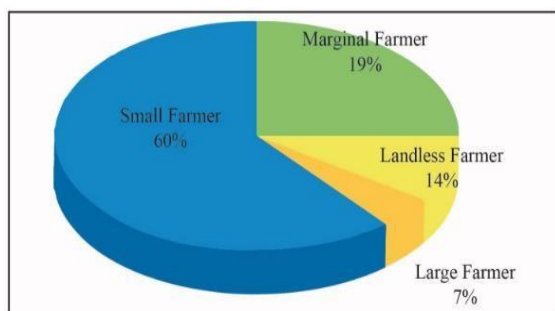


Fig.2:-Show overall scenario of farmers

According to Mo Zhang *et al.* which focused on Digital soil mapping using ML technique for predicting more quantitative output than traditional soil mapping. Here five ML algorithms with three log ratio approaches are used for achieving highest accuracy among them[10].

Kodimalar Palaniv el *et al.* this approach work on crop yielding process for selecting and predicting suitable crop using ML techniques in big data which reduce expert time and increase profitability for overcomes. The current challenges faced by farmer such as water shortages, uncontrolled cost and weather uncertainty[11].

EI-Sayed Ewis Omran *et al.* have applied various interpolation(kriging) techniques for Geo-statistics which provides tools to characterize the spatial pattern and classify soil.

Method Analysis: This method present a new approach toward crop production in

which prediction of suitable crop analyze through some Method analysis process is to select correct crops for related soil which will result in huge amount of profit in production and it is effectively dependent on various policies which are explained in this paper [12].

According to S.Kodur describe that Evaporation of soil is crucial factor that may arise due to heavy loss in water during dryland farming for overcoming these problems. The impact of above mechanism will reduce the moisture effects and achieve better accuracy and various factors in these model that apply identical algorithms for achieving better output. When two dynamical real-time dataset are used for unique factors and the modeling error are greater in many region so it will provide high soil moisture capacity and sandy soil[14].

S.Pudumalar *et al.* describe a model that is applied in data mining techniques for precision agriculture. This technique was used only to select right crops based on their soil requirements which minimize the incorrect selection of crops, maximize crop production. Here, author proposed different suggested models through which different Ensemble models are used as learner to suggest a correct crop for relevant land types with high accuracy and efficiency[15].

Meihua Yang these models were undertaken to develop Machine learning algorithm with some activation function such as sine-squared, hyperbolic tangent and extreme learning machine were used to distinguish the accuracy and select the best one from them [18].

Vrushal Milan Dolas *et al.* this model applied on data mining approaches in which different algorithm is used. The model is tested with data set of soil samples which we collected from soil

testing laboratory. The tested model has proven that the modified decision tree algorithm has higher classification accuracy than C4.5 and CART algorithms. Classification of soil is the separation of soil into classes or small groups each classes or groups having similar behavior and characteristics. Classification of soil is very essential for farmer that provide the knowledge to know the soil types and they can plough the crops depending on soil types and behavior[19].

Sk Ai Zaminur Rahman *et al.* this model was focused on agriculture is major revenue producing sector in India. Different factor may have affected on the related area such as market, season, bio-logical pattern influences the crop production. Weather and crop type can be predicted using useful data collected from farmer by suggesting maximize profitable crop to grow. This paper focus on the algorithms which predict crop yield, crop production cost. All this can be achieved by considering smart farming [20]

CONCLUSION

According to various authors, agriculture is the backbone of our country. Now a days, a growing number of applications of machine learning techniques in agriculture are required for which large amount of data that is currently available from many resources can be analyzed for predication or for gaining important knowledge. This is an advanced technology and will be expected to grow in future. Number of authors presented the way to improve soil fertility indices and suggested a suitable crop yield for relevant soil using different ML algorithms and data mining techniques for soil image recognition. These models are applied in many regions for analyzing soil quality and crop production. Also, any districts region wise research will be essential. These models will be applied in any agriculture area to overcome the problem and added some better features to

make these models more reliable and accurate. The result of these survey is useful for Indian government for recommendation of soil fertility degradation and provide high profit in productivity and maintain the soil management strategies.

REFERENCES

1. Dhivya B H, Manjula R, Siva Bharathi S, Manjula R, Madhumathi R. *A Survey on Crop Yield Prediction based on Agriculture Data*. www.ijirset.com. 2017.6(3).
2. Juhi Reahma S R K, Anitha S. Pillai. *Edaphic factors and crop growth using Machine learning – A Review*. International Conference on Intelligent Sustainable System. 2017.22.
3. M.S. Sirsat, E. Cernadasa, M.Fernandez-Delgado*, R.Khan. *Classification of agriculture soil parameters in India*. <https://www.esearchgate.net>. April 2017.10.(14)
4. M.S. Sirsat, E. Cernadas, M. Fernanadez-Delgado*, S.Barro. *Automatic prediction of village-wise soil fertility for several nutrients in India using a wide range of regression method*. <http://www.researchgate.net>. Oct 2018.16.
5. G. Vishwal, J. Venkatesh, Dr. C.Geetha. *Crop Variety Selection Method using Machine Learning*. International Journal of Innovation in Engineering and Technology (IJJET). March 2019.12(4).
6. Jay Gholap, Anurag Ingole, Jayesh Gohil, Shailesh Gargade, Vahida Attar. *Soil Data Analysis Using Classification Techniques and Soil Attribute Prediction*. IEEE International Conference, Issue 2017.
7. Subhadra Mishra, Debahuti Mishra and Gour Hari Santra Siksha 'O' Anusandha, "Applications of Machine Learning Techniques in Agricultural Crop Production: A Review Paper", Indian Journal of Science and

- Technology. Issue October 2016.9(38).
8. Jacob Kaingo, Siza D. Tumbo, Nganga I. Kihupi, and Boniface P. Mbilinyi. *DEST Prediction of Soil Moisture-Holding Capacity with Support Vector Machines in Dry Subhumid Tropics*. Applied and Environmental Soil Science Volume 2018.29(Aug2018).
 9. S.R.Rajeswari, Parth Khunteta, Subham Kumar, Amrit Raj Singh, Vaibhav Pandey. *Smart Farming Prediction Using Machine Learning*. International Journal of Innovative Technology and Exploring Engineering (IJITEE), May, 2018.8.(7).
 10. Mo Zhang, Wenjiao Shi. *Systematic comparison of five machine-learning methods in classification and interpolation of soil particle size fractions using different transformed data*. <https://doi.org/10.5194/hess-2018-584> Manuscript under review for journal Hydrol. Earth Syst. Sci. February 2019.11.
 11. Kodimalar Palanivel, Chellammal Surianarayanan *An Approach for Prediction of Crop Yield Using Machine Learning and Big Data Techniques*. International Journal of Computer Engineering and Technology (IJCET). May-June 2019.1(3).
 12. El-Sayed Ewis Omran. *Improving the Prediction Accuracy of Soil Mapping through Geostatistics*. International Journal of Geosciences.2012.3(July).
 13. Mareike Ließ, Johannes Schmidt, Bruno Glaser. *Improving the Spatial Prediction of Soil Organic Carbon Stocks in a Complex Tropical Mountain Landscape by Methodological Specifications in Machine Learning Approaches*. PLoSONE 11(4): e0153673. doi:10.1371/journal.pone.0153673.
 14. S.Kodur. *Improving the prediction of soil evaporation for different soil types under dryland cropping*. www.elsevier.com/locate/agwat. July 2017.24.
 15. S.Pudumalar, E.Ramanujam, R.Harine Rajashreeñ, C.Kavyań, T.Kiruthikań, J.Nishań. *Crop Recommendation System for Precision Agriculture*. IEEE Eighth International Conference on Advanced Computing (ICoAC), Issue-2016.
 16. Prof. D.S. Zingade, Omkar Buchade, Nilesh Mehta, Shubham Ghodekar, Chandan Mehta. *Crop Prediction System using Machine Learning*. International Journal of Advance Engineering and Research Development Special, Dec.-2017.(4-5)
 17. Konstantinos G. Liakos, Patrizia Busato, Dimitrios Moshou, Simon Pearson ID and Dionysis Bochtis. *Machine Learning in Agriculture: A Review*. www.mdpi.com. 2018.18.
 18. Meihua Yang, Dongyun Xu, Songchao Chen, Hongyi Li, Zhou Shi. *Evaluation of Machine Learning Approaches to Predict Soil Organic Matter and pH Using vis-NIR Spectra*. www.mdpi.com. January 2019.11.
 19. Vrushal Milan Dolas et al. *A Novel Approach for Classification of Soil and Crop Prediction*. International Journal of Computer Science and Mobile Computing. March-2018.7(3).
 20. Sk Al Zaminur Rahman Kaushik Chandra Mitra, S.M. Mohidul Islam. *Soil Classification using Machine Learning Methods and Crop Suggestion Based on Soil Series*. International Conference of Computer and Information Technology (ICCIT). 2018.(December)