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INTELLIGENT CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING

CH.BHAVYA SRI[1], S.K.ALISHA[2]

[1]MCA Student, B V Raju College, Kovvada, Andhra Pradesh, India.
[2]Associate Professor, B V Raju College, Kovvada, Andhra Pradesh, India.

ABSTRACT:

Socioeconomic fabrics of India are mainly dependent on agriculture. In recent times, as farmers are not appropriate in deciding what crops are best fit for the land using traditional and non-scientific methods, it has become a serious problem where approximately 58 percent of the population is involved in farming. Sometimes farmers failed to choose the right crops based on the soil conditions, sowing season, and geographical location. As a result farmers are seen committing suicide, quitting the agriculture field, moving towards urban areas for livelihood. To resolve this issue, our research work has given a system to guide the farmers in crop selection by considering all the factors like sowing season, soil, and geographical location.

Keywords: Crop, Agriculture, farmer, wrong crop.

1. INTRODUCTION

Agriculture is one of the major sources of livelihood for about 58% of our nation's population [14] [15]. As per the 2016-17, Economic survey the average monthly income of a farmer in 17 states is Rs.1700/- which results in farmer suicides, diversion of agricultural land for non-agricultural purpose. Besides, 48% of farmers don't want their next generation to take care of their agriculture, instead want to settle down in urban areas. The reason behind this is that the farmers often make wrong decisions about the crop selection [9] for example selecting a crop that won't give much yield for the particular soil, planting in the wrong season, and so on. The farmer might have purchased the land from others so without previous experience the decision might have been taken. Wrong crop selection will always result in less yield. If the family is fully dependent on this income then it's very difficult to survive. Both availability and accessibility of correct and up to date information hinder potential researchers from working on developing country case studies. With

resources in our reach, a system has been proposed to address this problem by providing predictive insights on crop sustainability and recommendations based on machine learning models trained considering essential environmental and economic parameters.In the proposed system the environmental parameters such as rainfall, temperature, and geographical location in terms of the state along with soil characteristics such as soil type, pH value, and nutrients concentration are being considered to recommend a suitable crop to the user. In addition to this, if the right crop is selected by the farmer then they will get the prediction about the yield also. The objective is to, 1. Build a robust model to give a correct and accurate prediction of crop sustainability in a given state for the particular soil type and climatic conditions. 2. Provide recommendations of the best suitable crops in the area so that the farmer does not incur any loss3. Provide profit analysis of various crops based on the previous year's data. The proposed system is implemented using machine learning which is one of the applications of Artificial Intelligence that allows the systems to learn and evolve automatically without being explicitly programmed by a programmer. Followed by that, the accuracy of the program will be improved without human intervention. Many researchers are researching this field to assist the farmers in the selection discussed as follows, to choose a suitable crop with its various factors like physical, environmental, and economic factors taken into consideration. Artificial Neural Network is taken into consideration to choose the crop with the high yield rate [1], before cultivation, the crops were ranked based on Decision Tree Learning-ID3 (Iterative Dichotomiser 3) and K Nearest Neighbors Regression algorithms [9]. Crop features were analyzed based on the random forest algorithm and BigML [10]. Machine learning algorithms were implemented to prevent the impacts from the water stress in plants and have given a set of decision rules used in plant's state prediction. Machine learning techniques were used to predict the cost of crops and smart systems were used to provide real-time suggestions. In this work, a survey has been made on several applications of machine learning algorithms in agricultural production systems. Further AI-enabled systems were used to provide

recommendations concerning crop management. Deep learning techniques can be used to yield better in crop cultivation . In this paper real-time monthly weather is taken into consideration to design an efficient yield forecasting mechanism. A non-parametric statistical model along with nonparametric regression methods was being used to implement the above-said forecasting mechanism.

LITERATURE SURVEY

1) Crop Selection Method to maximize crop yield rate using machine learning technique Agriculture planning plays a significant role in economic growth and food security of agro-based countries. Selection of crop(s) is an important issue for agriculture planning. It depends on various parameters such as production rate, market price and government policies. Many researchers studied prediction of yield rate of crop, prediction of weather, soil classification and crop classification for agriculture planning using statistics methods or machine learning techniques. If there is more than one option to plant a crop at a time using limited land resources, then selection of crop is a puzzle. This paper proposed a method named Crop Selection Method (CSM) to solve crop selection problem, and maximize net yield rate of crop over season and subsequently achieve maximum economic growth of the country. The proposed method may improve net yield rate of crops

2) Efficient Crop Yield and Pesticide Prediction for Improving Agricultural Economy using Data Mining Agriculture is a business with risk. Crop production depends on climatic, geographical, biological, political and economic factors. Because of these factors there are some risks, which can be quantified when applying appropriate mathematical or statistical methodologies. Actually accurate information about the nature of the historical yield of crops is important modeling input, which are helpful to farmers & Government organizations for the decision making process in establishing proper policies. The advances in computing and information storage have provided vast amounts of data. The challenge has been to extract knowledge from this raw data; this has led to new methods and techniques such as data mining that can bridge the knowledge of the data to the

crop yield estimation. This research aimed to assess these new data mining techniques and apply them to the various variables consisting in the database to establish if meaningful relationships can be found.

3) Soil Data Analysis Using Classification Techniques and Soil Attribute Prediction Agricultural research has been profited by technical advances such as automation, data mining. Today, data mining is used in a vast area and many off-the-shelf data mining system products and domain specific data mining application software are available, but data mining in agricultural soil datasets is a relatively young research field. The large amounts of data that are nowadays virtually harvested along with the crops have to be analyzed and should be used to their full extent. This research aims at analysis of soil dataset using data mining techniques. It focuses on classification of soil using various algorithms available. Another important purpose is to predict untested attributes using regression technique, and implementation of automated soil sample classification.

4) Smart Farming Using Machine Learning Agriculture plays an important role in the Indian economy. But nowadays, agriculture in India is undergoing a structural change leading to a crisis situation. The only remedy to the crisis is to do all that is possible to make agriculture a profitable enterprise and attract the farmers to continue the crop production activities. As an effort towards this direction, this research paper would help the farmers in making appropriate decisions regarding the cultivation with the help of machine learning. This paper focuses on predicting the appropriate crop based on the climatic situations and the yield of the crop based on the historic data by using supervised machine learning algorithms. In addition, a web application has been developed.

Existing system:

Agriculture is one of the major sources of livelihood for about 58% of our nation's population. As per the 2016-17, Economic survey the average monthly income of a farmer in 17 states is Rs.1700/- which results in farmer suicides, diversion of agricultural land for non-agricultural purpose. Besides, 48% of farmers don't want their next generation to take care of their agriculture, instead want to settle down in urban areas. The

reason behind this is that the farmers often make wrong decisions about the crop selection, for example selecting a crop that won't give much yield for the particular soil, planting in the wrong season, and so on. The farmer might have purchased the land from others so without previous experience the decision might have been taken. Wrong crop selection will always result in less yield. If the family is fully dependent on this income then it's very difficult to survive. The existing system housed a random forest algorithm. but we cannot predict the exact recommended crop.

PROPOSED SYSTEM

The proposed system implemented here is to improve the accuracy of yield rate by recommending proper crops based on soil conditions, sowing seasons,physical, environmental, and economic factors ,weather conditions and crops that are in demand which in result provides support to farmers by using machine learning. This technology allows the systems to learn and evolve automatically without being explicitly programmed by a programmer. The accuracy of the program will be improved without human intervention. Many researchers are researching to assist the farmers in the selection of crops as follows, to choose a suitable crop with its various factors like physical, environmental, and economic factors taken into consideration. mechanism. A non-parametric statistical model along with nonparametric regression methods was being used to implement the above-said forecasting mechanism. In this project Various datasets collected from the government website and Kaggle are fed into the system. After the preprocessing step, the data-set stored is used to train different machine learning models to attain accuracy as high as possible.

2. MODULES DESCRIPTION:

User: The User can register the first. While registering he required a valid user email and mobile for further communications. Once the user registers, then the admin can activate the user. Once the admin activates the user then the user can login into our system. Users can upload the dataset based on our dataset column matched. For algorithm execution data must be in integer or float format. Here we took a ph. And Climatic conditions repository dataset for testing purpose. Users can also add the new data

for existing dataset based on our Django application. Users can click the Data Preparations in the web page so that the data cleaning process will be started. The cleaned data and its required graph will be displayed.

Admin: Admin can login with his login details. Admin can activate the registered users. Once he activates then only the user can login into our system. Admin can view the overall data in the browser. He can also check the algorithms ROC Curve, confusion matrix and accuracy. The comparison accuracy bar graph is also displayed here. All algorithm execution completes then the admin can see the overall accuracy in the web page.

Data Preprocessing: A dataset can be viewed as a collection of data objects, which are often also called as a records, points, vectors, patterns, events, cases, samples, observations, or entities. Data objects are described by a number of features that capture the basic characteristics of an object, such as the mass of a physical object or the time at which an event occurred, etc. Features are often called as variables, characteristics, fields, attributes, or dimensions. The data preprocessing in this forecast uses techniques like removal of noise in the data, the expulsion of missing information, modifying default values if relevant and grouping of attributes for prediction at various levels.

Machine learning: Based on the split criterion, the cleansed data is split into 60% training and 40% test, then the dataset is subjected to five machine learning classifiers such as Logistic Regression (LR) with pipeline, Support Vector Machine (SVM), Decision Tree (DT), Random Forest (RF). The accuracy of the classifiers was calculated using the confusion matrix. The classifier which bags up the highest accuracy could be determined as the best classifier.

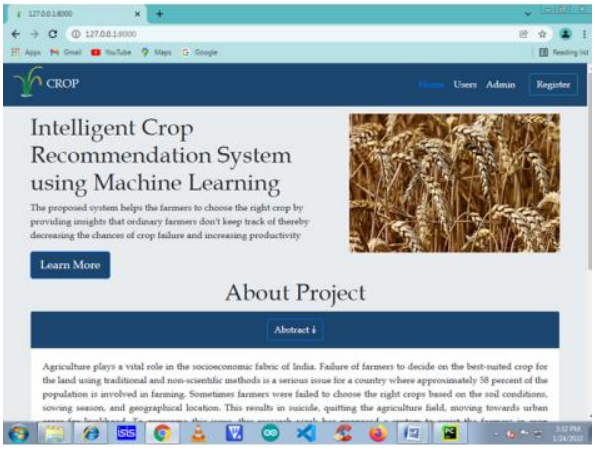

Fig.1. Home page.

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Fig.2. Crop grow materials.

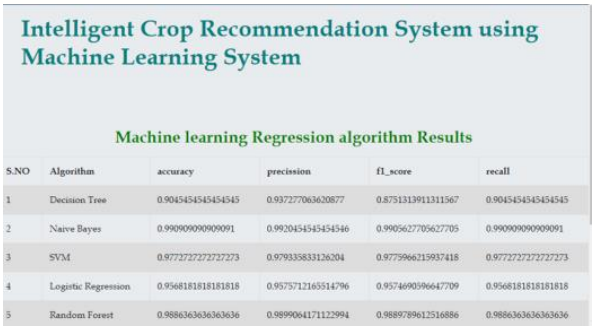
Fig.3. Dataset.

	N	P	K	temperature	humidity	ph	rainfall	CEC	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	44	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	42	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	33	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	32	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	35	rice
5	69	37	42	23.058049	83.370118	7.073454	251.055000	31	rice
6	69	55	38	22.708838	82.639414	5.700806	271.324860	30	rice
7	94	53	40	20.277744	82.894086	5.718627	241.974195	25	rice

Fig.4. Crop recommendation.

	N	Phosphorous	Potassium	Ph	Soil_Moisture	CEC	SEASON	Suitable_Label
0	90	42	43	6.502985	5.5	44	Kharif	rice,muskmelon,mango
1	85	58	41	7.038096	5.5	42	Kharif	maize,grapes,blackgram
2	60	55	44	7.840207	5.5	33	Kharif	chickpea,kidneybeans
3	74	35	40	6.980401	5.5	32	Whole Year	pigeonpeas,apple,coffee
4	78	42	42	7.628473	5.5	35	Whole Year	banana,mothbeans,mungbean
5	69	37	42	7.073454	5.5	31	Whole Year	lentil,pomegranate,watermelon

Fig.5. Crop sustainability.



S.NO	Algorithm	accuracy	precission	f1_score	recall
1	Decision Tree	0.9045454545454545	0.937277063620877	0.8751313911311567	0.9045454545454545
2	Naive Bayes	0.990909090909091	0.9920454545454546	0.9905627705627705	0.990909090909091
3	SVM	0.9772727272727273	0.979335833126204	0.9775966215937418	0.9772727272727273
4	Logistic Regression	0.9568181818181818	0.9575712165514796	0.9574690596647709	0.9568181818181818
5	Random Forest	0.9886363636363636	0.9899064171122994	0.9889789612516886	0.9886363636363636

Fig.6. ML based algorithm results.

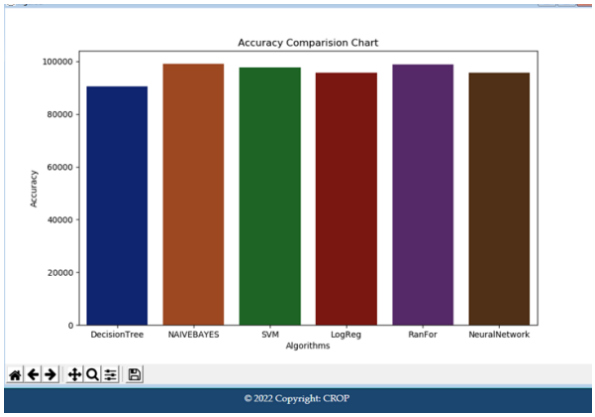


Fig.7. Output results.

3. CONCLUSION

The proposed system helps the farmers to choose the right crop by providing insights that ordinary farmers don't keep track of thereby decreasing the chances of crop failure and increasing productivity. It also prevents them from incurring losses. In the future, it has been planned to incorporate a web interface as well as a mobile app to provide the recommendations of crop cultivation to the farmers that can be accessed by millions of farmers across the country.

REFERENCES

[1] R. Kumar, M. P. Singh, P. Kumar, and J. P. Singh, "Crop Select ion Method to

maximize crop yield rate using machine learning technique", 2015 International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy, and Materials (ICSTM), Chennai, 2015, pp. 138-145, DOI: 10.1109/ICSTM.2015.7225403.

[2] H. Lee and A. Moon, "Development of yield prediction system based on real-time agricultural meteorological information", 16t h International Conference on Advanced Communication Technology, Pyeongchang, 2014, pp. 1292- 1295, DOI: 10.1109/ICACT.2014.6779168.

[3] T.R. Lekhaa, "Efficient Crop Yield and Pesticide Prediction for Improving Agricultural Economy using Data Mining Techniques", International Journal of Modern Trends in Engineering and Science (IJMTES), Volume 03, Issue 10, 2016.

[4] Jay Gholap, Anurag Ingole, JayeshGohil, ShaileshGargade and Vahida At t ar, " SoilData Analysis Using ClassificationTechniques and Soil Attribute Prediction", International Journal of ComputerScience Issues, Volume 9, Issue 3,2012.

[5] S. R. Rajeswari, ParthKhunteta, Subham Kumar, Amrit Raj Singh, Vaibhav Pandey, "Smart Farming Prediction using 76 Machine Learning", International Journal of Innovative Technology and Exploring Engineering, 2019, Volume-08, Issue07.

[6] Z. Doshi, S. Nadkarni, R. Agrawal, and N. Shah, "AgroConsultant : Intelligent Crop Recommendation System Using Machine Learning Algorithms", Fourth International Conference on Computing Control and Automation (ICCUBEA), Pune,India, 2018, pp. 1-6, DOI: 10.1109/ICCUBEA.2018.8697349.

[7] S. Pudumalar, E. Ramanujam, R. H. Rajashree, C. Kavya, T. Kiruthika and J. Nisha, "Crop recommendation system for precision agriculture," Eighth International Conference on Advanced Computing (ICoAC), 2017, pp. 32-36, DOI: 10.1109/ICoAC.2017.7951740.

[8] Konstantinos G. Liakos, PatriziaBusato, DimitriosMoshou, Simon P earson and Dionysus Bocht is, "Machine Learning in Agriculture: A Review", Article on sensors, 2018, pp 1 -29, doi:10.3390/s18082674.

[9] M. T. Shakoor, K. Rahman, S. N. Rayta and A. Chakrabarty, "Agricultural production output prediction using Supervised Machine Learning techniques", 1st International Conference on Next Generation Computing ions (NextComp), Mauritius, 2017, pp. 182-187, DOI: 10.1109/NEXTCOMP.2017.8016196.