International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 06 | June - 2022 Impact Factor: 7.185 ISSN: 2582-3930

DHT11 SENSOR&KNN ALGORITHM BASED YEILDS SELECTION SYSTEM

Shruti Siddappa Sadar[1*], Prof. Md. Irshad Hussain B [2*]

[1]Student, Department of Master Applications,

University B.D.T College of Engineering, Davanagere, Karnataka, India

[2]Assistant Professor, Department of Master Applications,

University B.D.T College of Engineering, Davanagere, Karnataka, India

Abstract

The practise of analysing and extracting meaningful information from enormous Data mining is the process of analysing large amounts of data. Data mining is employed in a variety of businesses, including banking, retail, and pharmaceuticals. medicine, agriculture, and so on. In agriculture, To examine the different biotic and abiotic elements that impact crops, data mining is used. Agriculture is the most significant industry in India, and it provides the bulk of job opportunities. Choosing the correct crop for their land is one of the most prevalent problems that Indian farmers face. As a result, they are seeing a significant decrease in output. Precision agriculture has given a solution to this dilemma for farmers. Agriculture that is needle precise Precision agriculture is a contemporary farming technique that employs research data on soil characteristics, soil types, and crop yield statistics to advise farmers on the best crop to grow based on site-specific criteria.Precision agriculture is gaining popularity.

1.Introduction

Crop suggestion is a new generation bubble in agriculture that is mesmerising the public. Farmers are sometimes uninformed of the kind of crops that should be cultivated on their properties. This creates a great deal of ambiguity and has a negative influence on productivity. This is why we're focussing our efforts on selecting the best crop to grow in order to maximise output. We compiled a dataset by collecting data on rainfall,

climate, and fertiliser from a variety of sources across India.

When various environmental and geographical aspects are taken into consideration, we will have a better understanding of crop trends. This data may be used to train a machine learning model that will forecast the best crop to grow in a given region. The agriculture industry has the potential to be transformed by machine learning. By anticipating the correct crop to be farmed, we will aid farmers in deciding the raw materials and other resources necessary much sooner than they would have otherwise[1].

This would solve the problem of nutrient deficiency in fields caused by improper crop planting, which can affect production efficiency in a number of ways. India continues to fall behind in the development of modern solutions for agriculture, which

accounts for roughly half of the country's revenue. If India's agriculture industry wants to reach new heights, more scientific solutions must be promoted.

The model's main purpose is to give farmers the greatest crop-growing advise possible, taking into consideration factors like soil composition, climatic parameters like temperature, humidity, and rainfall, as well as geographical effect.

The rise of digital agriculture and related technologies has resulted in a slew of new learning possibilities. Remote sensors, cameras, and other associated devices will collect data throughout an entire farm or area 24 hours a day, seven days a week. These will, among other things, maintain track of plant health, soil conditions, temperature, and humidity. These sensors will create a vast quantity of data. Farmers may gain a better understanding of the situation on the ground by utilising cutting-edge technology to offer them with more exact and fast information about their position[2].

2.Literature survey

For this project's literature review, the team sought for and examined numerous patents, research papers, documents, newspapers, and magazine articles from various settings.
Sardar Maran[1] investigates the requirements and strategies for developing a software model for precision farming. It dives into the foundations of precision agriculture. The authors start with the basics of precision farming before going on to developing a model to back it up. This study proposes a paradigm for controlling variability on small, open farms at the individual farmer and crop level using Precision Agriculture (PA) ideas. The ultimate purpose of the concept is to deliver direct advising services to even the tiniest farmer at the level of his or her lowest crop plot, utilising the most accessible technologies available, such as SMS and email. This model was developed for Kerala, where the average holding size is substantially less than the rest of India. As a result, this model may be utilised in different areas of India with few modifications.

Pradeepa Bandara [2] looks at assortment algorithms and how well they function in precision husbandry yield prediction. These algorithms are used to anticipate a soya bean crop's production based on data collected over several years. The methods used in this article for yield prediction include Support Vector Machine, Random Forest, Neural Network, REPTree, Bagging, and Bayes. The result reached at the end is that bagging is the best algorithm for yield prediction among the above-mentioned algorithms since its error deviation is the least, with a mean absolute error of 18985.

M. Heibloem [3] discusses the importance of crop selection as well as the elements that influence it, such as production rate, market price, and government policy. This work provides a Crop Selection Method (CSM), which addresses the crop selection problem while also increasing the crop's net yield rate. It recommends a series of crops to be planted throughout the course of a season, taking into account weather, soil type, water density, and crop type. The accuracy of CSM is determined by the expected value of influential parameters. As a result, a prediction approach with increased accuracy and performance is required.
Prof. Rakesh Shirsathand's study [4] established a framework that allows clients to choose which crop to cultivate. The system is a membership-based system with individualised information for each enrolled rancher. A module in the framework retains information from past harvests obtained from various sources and provides a coordinated crop that can be planted. The entire procedure is accomplished out using fictional neutral processes. Finally, a criticism framework is included so that the designer may make any

required changes if the rancher runs into any problems when utilising the framework.

As explained in article [5, RSF is a proposal framework for farmers that incorporates an area location module, an information investigation and capacity module, a trim developing database, and a physiographic database. The comparable area discovery module finds places that are similar to the client's and compares the harvests that have been planted in those areas. Similarly, the client's ideas are developed utilising the comparability framework. The area identification module uses the Google API APIs to get the client's current location in order to find comparable locales. The framework, on the other hand, discourages clients from providing feedback in order to enhance the process.

As a result of globalisation, Rishit Hemant Dabhade [6] highlights the need and why they are moving towards precision agriculture [7]. Precision agriculture is the practise of farming on a site-by-site basis. Despite the fact that precision agriculture has progressed over time, it still faces challenges. As previously said, in order to obtain a better outcome, site-specific techniques of such systems must be controlled. Only a few of the outcomes are assigned a numerical value. Nonetheless, farming is vital since any failure or error might result in catastrophic resource and plant destruction.

This research presents a way in which all of the relevant factors are addressed simultaneously and a solution is developed so that the system is not unduly complicated for the user. Unlike other models proposed by previous researchers, this system considers all of the major factors that are essential for plant growth and processes them all at the same time using various algorithms, whereas other models consider only parameters at a time while keeping the other factors constant, as stated earlier in the sentence..

Some tests, for example, are carried out to assess the rate of evaporation and how limited water affects plant development. As a consequence, we get a derived equation[8].

$$ETo = K\,pan \times E\,pan$$

ETo: reference crop evapotranspiration

Kpan: pan coefficient E pan: pan evaporation

There are considerable constraints despite the availability of an equation [9]. This is most likely to be done for a smaller piece of property. This is not suitable for commercialization since if the cultivation area is lowered, the profit will be limited. The second restriction is Sri Lanka's average rainfall, which is typically sufficient for a wide range of crop kinds to thrive without a lack of water. As a result, while the water level isn't the most pressing issue, other difficulties are. Because the essential environmental variables have a reciprocal relationship in plant growth, it would be a problem if there was enough water for plants but no warmth.
The goal of previous research has also been to forecast the optimal crop kind. After the farmer or user has grown the anticipated crop kind, the system's work is completed. The technique proposed in this paper, however, includes a feedback mechanism. Even after selecting the best crop kind, the system can watch plant development and offer feedback if the farm is undernourished. To allow the user to take the necessary precautions ahead of time.

3. Methodology

3.1 Dataset Collection

A healthy plant requires a specific temperature, humidity, soil pH, sunlight, and soil moisture. In order to have a successful

harvest, certain criteria must be satisfied. Such requirements, however, may vary based on the plant type. Sources for the initial data collection included the Department of Agriculture [2], numerous agriculture books, agricultural web sites [1], and other publications and research papers. By training the crop recommendation model with this data set, the accuracy of the crop recommendation model was improved.

Crop	Temp	Hum	pH	Rain	Moist
Bean	26	63	7	8	63
Lettuce	23.8	60	6.5	8	60
Carrot	26	98	6.5	8	98
Cabbage	29.4	95	7.1	5	95
Onion	27	98	7.4	5	96
Beet	30	99	6.5	6.5	6.5

Table 1.Sample data set

This research presents a way in which all of the relevant factors are addressed simultaneously and a solution is developed so that the system is not unduly complicated for the user. Unlike other models proposed by previous researchers, this system considers all of the major factors that are essential for plant growth at the same time and processes them all at the same time using various algorithms, whereas other models consider only parameters at a time while keeping the other factors constant.

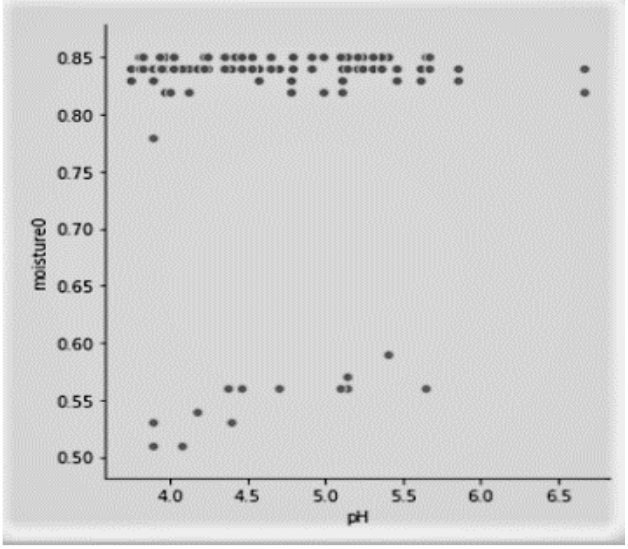

Fig 1: Data plot of soil moisture using Linear Algorithm

The graph shows soil-specific characteristics collected from the Polytest Laboratories soil testing lab in Pune, Maharashtra, India. Marathwada University also provides comparable broad crop data sources. Our model looks at groundnut, legumes, cotton, vegetables, banana, rice, sorghum, sugarcane, and coriander, among other crops. The number of instances of each crop in the training dataset is shown. The following characteristics were assessed: depth, texture, pH, soil colour, permeability, drainage, water holding capacity, and erosion.

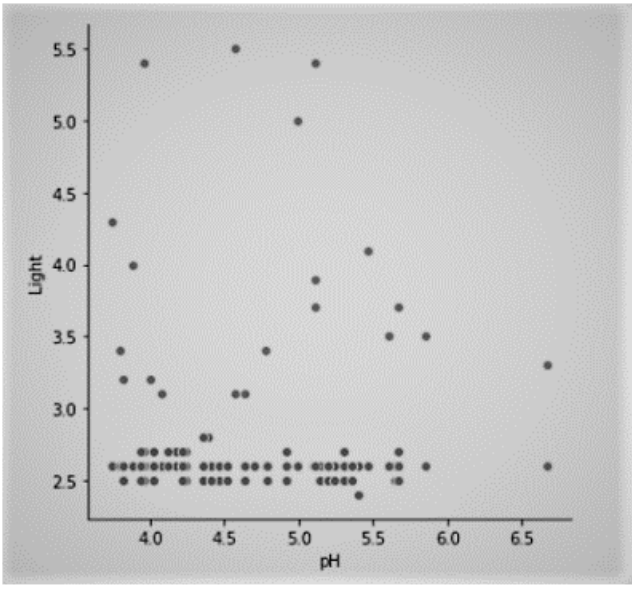

Fig 2: Data plot of Sunlight (lux) using Linear Algorithm

3.2 Crop Prediction

Because climatic conditions differ by area, a machine learning model is used to predict the best crop variety for the given plot of land. Machine learning methods [8] are used to train the crop suggestion model using data from the Arduino sensors in order to choose the ideal crop to cultivate with the best chance of growing. The Nave Bayes and Support vector machine approaches are used to select the best crop type.

This model was used to determine what sort of crops the farmer should grow. This is achieved by examining variables like as humidity, temperature, soil moisture, pH level, and sunshine. The system basically proposes four crop kinds based on the above-mentioned criteria using two machine learning methods.

Naive Bayes [9] - Naive Bayes is a model-building approach for classifiers that gives class labels to issue situations represented as vectors of feature values, with the class labels chosen from a finite set.

The support vector machine approach (SVM) [10] aims to find a hyperplane in N-dimensional space (N = the number of attributes) that categorises the input points clearly.

3.3 Collecting Environment Factors

To compare and predict the original data set, the ambient factors must be acquired. Environmental data is collected using Arduino microcontrollers. Data is obtained using four sensors since the temperature and humidity sensors are each made up of a single microcontroller. The sensors are a sunlight intensity sensor, a soil moisture sensor, a soil pH sensor, and a humidity and temperature sensor. The sensors are connected to an Arduino Wi-Fi module, which sends the data to a database. Before being passed on to the next component of crop advice and stored in a database, the data is cleaned and processed using clustering and other techniques.

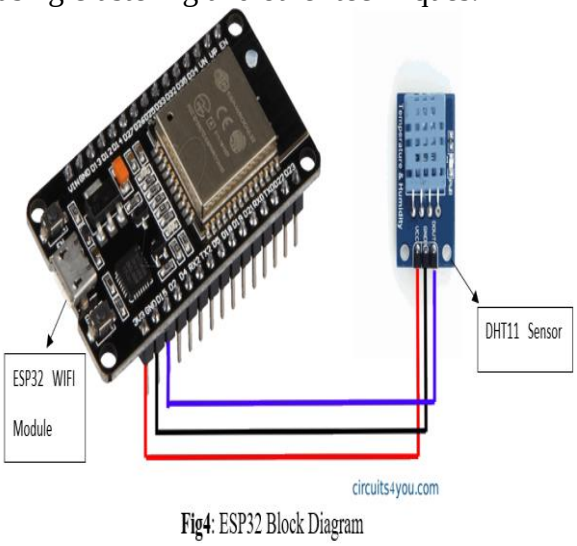

Fig4: ESP32 Block Diagram

Fig4: ESP32 Block Diagram

The ESP32 comes with a hall effect sensor. The hall effect sensor can detect magnetic field changes in its surroundings. The sensor's results can change positive or negative depending on which magnet pole confronts the sensor.

3.4.1 Soil Moisture Sensor

Soil moisture sensors assess the volumetric water content of the soil. Soil moisture sensors indirectly measure the volumetric

water content by using another property of the soil as a proxy for the moisture content, such as electrical resistance, dielectric constant, or neutron interaction, because direct gravimetric measurement of free soil moisture necessitates the removal, drying, and weighing of a sample.
The link between the measured property and soil moisture must be calibrated, and it might vary based on environmental factors such as soil type, temperature, and electrical conductivity. Reflected microwave radiation, which is used for remote sensing in hydrology and agriculture, is affected by soil moisture. Portable probing instruments are useful for farmers and gardeners.

Soil moisture sensors are sensors that measure the volumetric water content of soil. Soil water potential sensors are a different type of sensor that monitors another aspect of moisture in soils called water potential. Tensiometers and gypsum blocks are examples of these sensors.

3.4.2 Temperature And Humidity Sensor

Temperature and humidity sensors are the most often used environmental sensors. Humidity sensors, often called hygrometers, are one sort of humidity sensor. These devices are used to determine the actual level of humidity in the air at any given time or location. These devices are commonly used in environments where air quality is poor or when air quality must be managed for a number of reasons.

Humidity refers to the presence of water in the air. Not only may the amount of water vapour in the air affect human comfort, but it can also affect numerous production processes in industrial environments. In the semiconductor industry, for example, moisture or humidity levels must be carefully regulated and monitored to enable effective wafer fabrication. Humidity control is beneficial to incubators, respiratory devices, sterilisers, and biological goods. In addition, the presence of water vapour can affect a range of chemical, biological, and physical processes.

3.5 Monitoring and Feedback

This suggested system product would primarily identify four sorts of crops based on the environmental characteristics of the specified piece of land. The soil condition or any other changes in the chosen land, on the other hand, would be the explanation for the above-mentioned crops having a probability of higher than 90%. However, the system incorporates the farmer's feedback mechanism to prevent these factors from impacting crop forecast.

Following a crop type suggestion, the farmer is requested for extra information and feedback on a regular basis via the mobile application, which is utilised to advise the farmer with important protections. The feedback mechanism is used in the mobile application to offer the relevant input by selecting the crop type. As a result, the general accuracy and dependability of the product improves over time.

4.Summary of existing approach

SNO	AUTHOR	TITLE	MDETHODOLOGY USED	RESULT
01	M.V.R. Vivek	Precision Agriculture Crop Recommendation System	1. A haphazard tree 2. CHAID 3. KNN 4. Naïve Bayes 5. Use the WEKA tool	1. Data pre-processing 2. Missing and out-of-range values handling 3. Extraction of features 4. ensemble
02	Pradeepa Bandara	Crop Yield Prediction Using Various Data Mining Techniques	1. Attribute selection 2. Multiple Linear Regression 3. Decision Tree using ID3 4. SVM 5. Neural Networks 6. C4.5 8. K-means and KNN	1. Selection of agricultural field 2. Selection of crop previously planted 3. Input from user 4. Preprocess 5. Attribute Selection
03	Dhruv Piyush Parikh	RSF: A Recommendation System for Farmers	1.Location Detection 2.Data analysis and storage 3.Similar location detection 4. Recommendation generation module.	1. Physiographic, thermal, crop growing period, crop cropion rate 2. Seasonal crop database 3. Similar location detection
				4. Generating the set of crops 5. Similarity between the crops planted in a region
04	Rohit Kumar Rajak	Data mining is being used to help agricultural decision-making.	1.Subscription based system 2. ANN 3. Android application 4. Personalized	1. Android app with a login module 2. Previously planted crops known to system 3. User feedback mechanism 4. Maintenance of crop.
05	Kamatchi	Application of Big Data Analysis Technology in Agricultural Intelligence Decision Systems	1.Inference engine 2.Domain expertise 3.Knowledge engineering 4.Knowledge acquisition module 5.Knowledge base for recommendation system	1. Large database of crops 2. Processed using Hadoop 3. Professional knowledge 4. Past experiences 5. Feature selection using HDFS 6. Future Scope: Using Hadoop with Artificial Neural Networks.
06	Dhruvi Gosai	Crop Yield Prediction Using Data Mining	1. J48 2. LAD tree 3. LWL 4. IBK algorithm	1. WEKA tool 2. LAD tree showed the lowest accuracy 3. Errors can be minimized by pruning the tree 4. IBK was observed to achieve higher accuracy
07	Vijay S. Rajpurohit	Crop Recommendation System for Precision Agriculture Data Mining Decision Support System	1.Inference engine 2.Domain expertise 3.Knowledge engineering 4.Knowledge acquisition module 5.KNN 6.SVM	1. Classification algorithm on data 2. Crop is recommended 3. Large database of crops 4. Similar location detection 5. Pre-processing of data

Table 4: Summary of the recent existing approaches

5.Conclusion

Our study will help farmers improve agricultural output, avoid soil degradation on cultivated land, reduce chemical usage in crop production, and better utilise water resources. Our future efforts will be focused on improving the data set by adding more characteristics and including yield prediction.

In a modern context with less area and less understanding of agriculture, all factors are studied from the perspective of the farmer and the plant, and the farmer is suitably directed until harvesting. Before picking a plant to grow, it is necessary to have knowledge and understanding of the elements that govern plant culture, as well as how to manage or regulate them. This technology evaluates these characteristics automatically before selecting the crop type to be planted.

On a monthly basis, the farmer is asked for feedback on the plant's cultivation. As a result of the feedback, the system self-trained, and its accuracy increased over time as more data was acquired. This method removes the requirement for a specialist's assistance while also lowering the amount of maintenance necessary. As a consequence, no additional financial expenditures will be incurred by the user as a result of using this system.

The investigation shows how various computers can anticipate a variety of climatic phenomena, including temperature, rainstorms, and precipitation, and finds that genuine systems can do so. We present a method for analysing soil data utilising multiple computations and forecasting methodologies in this paper. We feel that further research is needed in the agriculture business to increase accuracy, based on the findings of this study. Using group ways to guarantee that the framework is more accurate is a good way to go. We may also utilise SVM if we just need to evaluate a single

computation for the proposal framework because to its basic computing needs..

6. Future Work

It can contribute to the system's functionality in a variety of ways. It now uses important environmental components as inputs and proposes a crop for production that is well matched to the environment. The Automation component, on the other hand, might be used as a feedback response system as a next step. Based on the farmer's demands, this may be altered to change humidity, water level, and other things. It presently accepts all environmental components as inputs, but as an extra feature, an algorithm may be constructed to predict one factor using two other factors. As a result, the sensors' initial installation costs will be reduced, and they will be easier to maintain.

In terms of future score, farmers may have issues or disease crops before harvesting when they seed a certain crop. The crop photographs and the soil report can then be uploaded. The AI model may then recognise the problems and make recommendations for possible fixes.

We may also provide IoT solutions through APIs or virtual agents that connect farmers with raw material merchants who can provide them with the items they want, such as seeds and fertilisers, based on the crop predicted by the model.

7.Reference

[1] M.V.R. Vivek, D.V.V.S.S. Sri Harsha, P. Sardar Maran, “A Survey on Crop Recommendation Using Machine Learning”, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-5C, February (2019):120-125

[2] Pradeepa Bandara, Thilini Weerasooriya, Ruchirawya T.H., “Crop Recommendation System”,International Journal of Computer Applications (0975 – 8887) Volume 175– No. 22, October (2020):22-25

[3] C. Brouwer and M. Heibloem, Irrigation Water Management: Irrigation Water Needs, manual 6 Reading, ITALY: Food and Agriculture Organization of the United Nations, 1987.

[4] Dhruv Piyush Parikh, Jugal Jain, Tanishq Gupta and Rishit Hemant Dabhade.“ MachineLearning Based Crop RecommendationSystem”,International Journal of Advanced Research in Science, Communication and Technology (IJARSCT),Volume 6, Issue 1, June (2021):891-897

[5]Dhruvi Gosai, Chintal Raval, Rikin Nayak, Hardik Jayswal, Axat Patel, “CropRecommendation System using Machine Learning”,International Journal of Scientific Research in Computer Science, Engineering and Information Technology,May-June-2021, Volume 7, Issue 3
Page Number: 554-557

[6] Rohit Kumar Rajak, Ankit Pawar, Mitalee Pendke , Pooja Shinde, Suresh Rathod, Avinash Devare, “ Crop Recommendation System to Maximize Crop Yield using Machine Learning Technique”,International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 12 | Dec-2017:950-953

[7] . Kamatchi, S. Bangaru, and R. Parvathi. "Improvement of Crop Production Using Recommender System by Weather Forecasts." Procedia Computer Science 165 (2019): 724-732.

[8] . Medar, Ramesh, Vijay S. Rajpurohit, and Shweta Shweta. "Crop yield prediction using machine learning techniques." In 2019 IEEE 5th International Conference for

Convergence in Technology (I2CT), pp. 1-5. IEEE, 2019.

[9] . Jain, Sonal, and Dharavath Ramesh. "Machine Learning convergence for weather based crop selection." In 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), pp. 1-6. IEEE, 2020.

[10] .Gandge, Yogesh. "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, 2017.

[11] . Suresh, A., P. Ganesh Kumar, and M. Ramalatha. "Prediction of major crop yields of Tamilnadu using K-means and Modified KNN." In 2018 3rd International Conference on Communication and Electronics Systems (ICCES), pp. 88-93. IEEE, 2018.

[12] . Kamatchi, S. Bangaru, and R. Parvathi. "Improvement of Crop Production Using Recommender System by Weather Forecasts." Procedia Computer Science 165 (2019): 724-732.

[13] . Bondre, Devdatta A., and Santosh Mahagaonkar. "Prediction of Crop Yield and Fertilizer Recommendation Using Machine Learning Algorithms." International Journal of Engineering Applied Sciences and Technology 4, no. 5 (2019): 371-376.

[15] Satish Babu (2013), 'A Software Model for Precision Agriculture for Small and Marginal Farmers', at the International Centre forFree and Open Source Software (ICFOSS) Trivandrum, India.

[16] Anshal Savla, Parul Dhawan, HimtanayaBhadada, Nivedita Israni, Alisha Mandholia , Sanya Bhardwaj (2015), 'Survey of classification algorithms for formulating yield prediction accuracy in precision agriculture', Innovations in Information,Embedded and Communication systems (ICIIECS).

[17] Rakesh Kumar, M.P. Singh, Prabhat Kumar and J.P. Singh (2015), 'Crop Selection Method to Maximize Crop Yield Rate using Machine Learning Technique', International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM).

[18] Liying Yang (2011), 'Classifiers selection for ensemble learning based on accuracy and diversity' Published by Elsevier Ltd. Selection and/or peer-review under responsibility of [CEIS].

[19] A.T.M Shakil Ahamed, Navid Tanzeem Mahmood, Nazmul Hossain, Mohammad Tanzir Kabir, Kallal Das, Faridur Rahman, Rashedur M Rahman (2015) , 'Applying Data Mining Techniques to Predict Annual Yield of Major Crops and Recommend Planting Different Crops in Different Districts in Bangladesh' , (SNPD) IEEE/ACIS International Conference .