RESEARCH ARTICLE OPEN ACCESS

CROP RECOMMENDATION SYSTEM BASED ON PRODUCTIVITY USING MACHINE LEARNING ALGORITHM

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***Abstract*—** As a coastal state, Tamil Nadu has agricultural instability, which reduces its output. More productivity should be possible with more people and land, but it is not possible. Farmers used to rely on word-of-mouth, but due to climate reasons, they can no longer do so. Agricultural elements and parameters are used to provide data that can be used to learn more about Agri-facts. The advancement of information technology has led to some breakthroughs in agriculture sciences, which will benefit farmers by providing them with accurate agricultural data. In the current situation, it is desirable to have the ability to apply modern technical methods in the sector of agriculture. ML Techniques use dataset to create a well-defined model that help to predict the result. Crop forecast, rotation, water demand, fertilizer need, and protection are all challenges that can be resolved in agriculture. Due to the environment's fluctuating climatic elements, an efficient technique to aid crop cultivation and assist farmers in their production and management is required. This could benefit aspiring agriculturalists. With the use of data mining, a farmer can receive a system of recommendations that will assist them in crop production. Crops are recommended based on I to adopt such a method. With the use of data mining, a farmer can receive a system of recommendations to assist them in crop production. Crops are recommended depending on climatic parameters and quantity to apply such an approach. Data analytics provides the path for more meaningful information to be extracted from agricultural databases. Crop Dataset has been evaluated and crop recommendations

depending on production and weather conditions have been made.

Keywords— Machine Learning and Data Science, Knowledge Discovery in Databases, Naive Bayes, Recommender System.

I INTRODUCTION

Tamil Nadu is India's seventh-largest state, with the sixth-largest population. It is the world's biggest manufacturer of agricultural goods. Tamil Nadu's predominant supply of earnings is agriculture. In today's competitive world, agriculture has a strong voice. Cauvery is the primary water source. The region of Cauvery delta is called as Rice Bowl of state called Tamil Nadu. Sugarcane, coconut, Paddy and peanuts are among the other crops farmed. Bio-fertilizers are manufactured in a cost-effective manner [1]-[5]. In India, Farming is an important source of income in many State. Agriculture has a significant impact on a country's economy. Agriculture cultivation is degrading these days due to changes in natural causes. Agriculture is directly influenced by environmental elements including sunlight, humidity, soil type, rainfall, Maximum and Minimum Temperature [6] [7], climate, fertilizers, pesticides, and so on. In order for agriculture to flourish, knowledge of effective crop harvesting is required [8] [9]. India has seasons of,

1. From December to March, there may be a Winter which occurs.

2. April to June is the summer season.

3. The monsoon season, often known as the rainy season, lasts from July through September.

4. From October to November, the post-monsoon or fall season takes place.

The valuation of acceptable crops to farm is essential due to the variation of seasons and rainfall. Crop supervision, predicted crop output, and destructive harvest from crops are all key issues for farmers. Farmers and cultivators want good assistance with crop cultivation, as many young people are interested in agriculture these days [10]-[14].

The effect of the IT area on evaluating real-world problems is increasing. In the realm of agriculture, data is growing by the day. There are ways to grab big data in the sphere of agriculture with the arrival of the Internet of Things. Here is a need for a system that can clearly assess agricultural data and mine or use important facts from the information. It is necessary to learn how to extract insights from data [15][16].

1.1 KNOWLEDGE DISCOVERY IN DATABASES

Mining is the technique of deriving details from a large dataset. Its goal is to provide farmers with reliable findings. It searches for hidden patterns. It extracts meaningful information from a massive data set. It is a part in database knowledge discovery (KDD) [17] [18].

Apart from the KDD technique, with recent advancements in the IT sector, Machine Learning (ML) takes evolved to manage large volumes of information and also requires high-performance computing. The growth of ML is

increasing in every day. Crop supervision, animal managing, water managing, and soil organization all use modern day technologies like IOT and Machine Learning approaches [19][20].

In Machine Learning there is an algorithm for recommendation which is used to recommend the best idea based on historical data. In E-Commerce, they offer customized items. In this study, they provide things that are made to order. These recommendation principles are used in agriculture in this study to suggest crops to grow. A crop dataset is subjected to simple data analytics, and farmers are instructed to customize their agricultural products [21].

1.2 RECOMMENDATION SYSTEM

Users have been given the ability to choose things they enjoy thanks to recommender systems. The strategy to providing ideas to users of their interest is known as a recommendation system. This is also something that may be used in agriculture.

Farmers are provided with ideas for their production procedure based on agricultural elements. It is also possible to offer new ways for increasing crop production. Pesticides and fertilizers may be prescribed as well. Hybridization The recommender system for agricultural goods developed by Agaji Iorshase [14] addresses issues such as serendipity, ratio diffusion, and ramp-up.

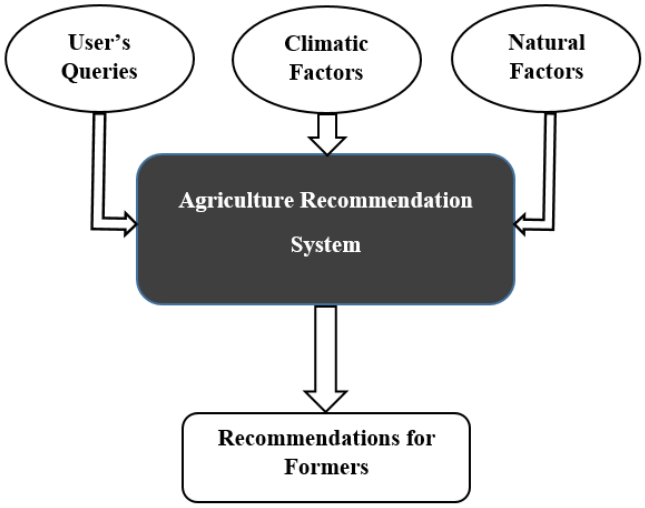

Figure 2. Graphical representation of Agricultural Recommendation system.

The proposed recommender system employs in cooperation of collective and a content-based sifting method [22]. Datasets are being gathered for the food items of Nigeria's Benue State. The presented method is of higher quality.

1.3 METHOD FOR AGRICULTURAL RECOMMENDATION SYSTEM.

Numerous amount of crop yield forecast techniques have been created. Grouping methods such as k-means and k-means++ are used to organize information into groups in order to forecast agricultural harvest [23]. Tripathy et al. [24] developed a data mining-based method for pesticide control in agricultural production.

The type of the soil is an important component in agricultural study. In India, there are many different types of soil. Crops are grown in different ways based on the soil category. The importance of soil in agricultural production is highlighted in [24]. The soil

parameter is examined with the utilization of data mining algorithms.

The JRip, J48, and Naive Bayes approaches [25] are used to analyze red and black soil, yielding more trustworthy findings. The impact of agricultural characteristics on crop management is being investigated in order to boost production [26]. The agricultural aspects are being investigated using neural networks, soft computing, big data, and fuzzy logic methodologies. Pritam Bose [27] created an SNN model for spatiotemporal analysis and crop estimation.

In [28], the author Using grouping methods to get the information and apply it by farmers in harvest farming, an autonomous system was designed to wrinkle data about soil environment and meteorological situations [29].

In today's environment, interactive through ICT bonds the gap between agriculturists, e.g., mobile technologies, which exchange knowledge swiftly. Farmers may learn about harvest concepts in a short amount of time using Semantic Web-based Architecture [30] and GIS technology. GIS transmits information on climatic and geographic circumstances. Farmers may then access this information using any ICT device. GIS and spatial technology may be used to learn about the universe's economic development [31].

Appropriate strategies must be employed to extract knowledge from a vast agricultural knowledge collection [32]. Data Mining is widely used to extract the essential data from dataset. Mining may be used to extract hidden important knowledge as well as make future forecasts. The information gathered is grouped into two categories: associated and clustered [33], with the goal of assisting farmers in making crop choices, acquiring new farmers, and correlating crops [34].

Crop predictions are made based on previous years' experience by farmers. Agricultural parameters have altered to an incredible degree, despite the fact that farmer knowledge continues to grow. In crop forecast, it becomes necessary to use the engineering effect. In agriculture research, data mining plays a unique function [35]. Neural networks and KNN are two strategies used in this discipline to anticipate based on historical data. The K-means algorithm forecasts depending on the computing hubs of the samples and forms groups without using past data. The computational cost of an algorithm is a significant problem [36] [37].

The use of Artificial Neural Networks in agriculture is a benefit since they calculate accurately even with additional input. [38] [39] Built an architecture that takes input, picks needed characteristics, and does classification and association rule mining before visualizing the results [40].

Bangladesh has a large rice output. Its agricultural productivity has been predicted using statistical methodologies. Shakil Ahamed [41] [42] used clustering and classification algorithms to propose agricultural production and planting in 15 Bangladeshi areas. Crop

yield factors were taken into account [43]. They are,

- Environmental factors – Weather condition, Moisture, low and high temperature
- Biotic factors-soil pH and salinity
- Location factor -irrigated or cultivated [44].

Their prediction accuracy ranges from 90% to 95%, nevertheless they still require a huge dataset for effective recommendation system. Shreya S.Bhamose's Crop and Yield Prediction Model [45] was utilized. Crop harvest quantity and water needs are predicted using a modified k-means clustering method. In addition, a illness prediction component for the tomato harvest is being created, that detects disease in tomatoes and alerts farmers [46] [47].

The recommendation system serves as an excellent engine for recommending appropriate things to consumers based on a variety of characteristics. This is now extended to include agricultural support [48]. Combining the IOT with this recommendation engine allows farmers to quickly get agricultural recommendations. Temperature, NPK, soil moisture, and humidity sensors have been installed. It has been centered on a content-based recommendation approach that forecasts and supports farmers in determining "which" crop to pick and "how" to grow it [49].

Kiran Shinde [50] created a web-based recommendation system to help farmers pick crops for rotation and fertilizers. For crop identification, a Random Forest Algorithm with a grading method is applied, which a 90 percent accurateness for the test data has obtained. The FP-Tree is designed to help you figure out which harvests to plant in the field. It uses crop yield as an input to recommend the best crop for farmers. Fertilizers including Nitrogen, Phosphorus, Potash, and Sulphur have been advised to farmers based on the soil study result [51].

2. PROPOSED SYSTEM

Many agricultural researchers have used this ensemble boost method. XGBoost uses decision trees as foundation learners and combines many weak learners to generate a strong learner. Consequently, it is called an ensemble learning approach, because the final prediction integrates the outputs of numerous models. It works well on small and medium sized datasets.

2.1 CROP RECOMMENDATION BASED ON PRODUCTION

Crop output is influenced by a variety of agricultural factors. The proposed effort is based on prior agricultural output, and harvests can be recommended to farmers. This type of advice will allow farmers to determine whether a certain crop has produced well in recent years. Crop production may be reduced as a result of crop disease, water shortages, and other issues.

Farmers may learn which harvest is in great demand in the marketplace that year when thinking about production. Farmers can make decisions based on this information about recent crop trends. Farmers will be advised based on crop output season. We took

roughly 1,20,000 entries from the Tamil Nadu Agriculture Dataset. Harvest year, harvest name, district, season, farmed area, and production are among the fields in this table. The user was provided recommendations based on crop yield and the season during which the crops were farmed.

III. RESULT DISCUSSION

The main aims of this research work is to predict the yield of crop in a specific climate condition. At first, we are going to collect the data and on that datasets we are applying four algorithms to check the accuracy of the algorithm. We are taking linear regression, Decision tree regression, Random Forest Algorithm and XG Boost algorithm

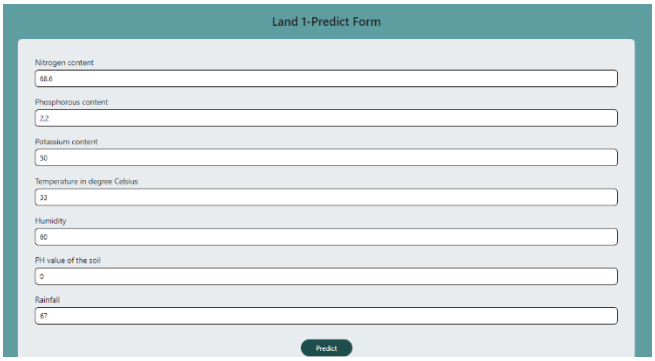

Fig 1.1

Fig 1.2

The Fig 1.2 show to Disease Details Termeric Disease Name-Leaf spot,Medicine Details-Leaf spot can be controlled by spraying Carbendazim 500 g/ha or Mancozeb 1 kg/ha or Copper oxychloride 1.25 kg/ha

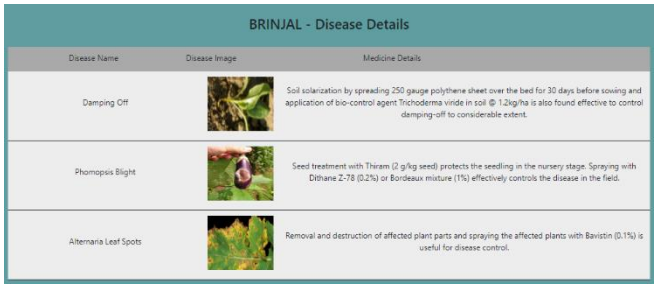

Fig 1.3

The Fig 1.3 show to Disease details Birinjal Disease Name-Damping Off, Medicine Details-Soil solarization by spreading 250 gauge polythene sheet over the bed for 30 days before sowing and application of bio-control agent Trichoderma viride in soil @ 1.2kg/ha is also found effective to control damping-off to considerable extent.

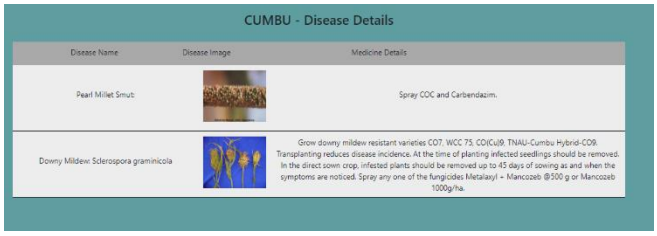

Fig 1.4

The Fig 1.4 show to Disease details Cumbu Disease Name-Pearl Millet Smut, Medicine Details-Spray COC and Carbendazim.

Analysis

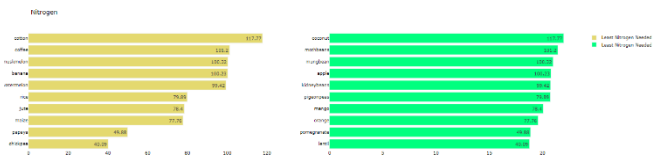

Fig 2.1-Nitrogen content

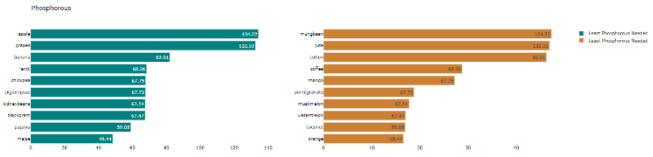

Fig 2.2-Phosphorous content

IV .CONCLUSION

The importance of crop management was extensively examined in this research. Farmers require aid from modern technologies in order to raise their crops. Agriculturists can be updated about crop predictions in real time. The agriculture factors were analyzed using a variety of Machine Learning approaches. A literature review examines some of the strategies used in many parts of agriculture. Soft computing approaches, such as Blooming Neural Networks, play an important role in delivering suggestions. More tailored and appropriate advice may be offered to farmers based on parameters such as productivity and season, allowing them to produce a higher capacity of goods.

V.FUTURE WORK

In future work, we decided to add more feature of the system. For example, we have decided to add disease prediction in the plants.

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