AGRICULTURAL CROP RECOMMENDATIONS BASED ON PRODUCTIVITY AND SEASON USING RAINFALL

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ABSTRACT:
Tamil Nadu's agriculture is uncertain, which reduces production. More productivity should be possible with more people and land, but it is not. In earlier decades, farmers relied on word-of-mouth advertising, but climate change has rendered it obsolete. The data used to gain insight into the agricultural facts are made by agricultural factors and parameters. With the data, machine learning techniques create a well-defined model and assist us in making predictions. There are solutions to agricultural problems like crop prediction, rotation, the need for water, the need for fertilizer, and protection. It is necessary to have an effective method to facilitate crop cultivation and assist farmers in their production and management due to the environment's variable climatic factors. This might make agriculture better for the next gen eration of farmers. Crops are suggested based on their quantity and climatic factors for this approach. After analyzing the crop data, crops are recommended based on productivity and season. The various algorithms, such as Support vector regression, linear regression, and the Adaptive Neuro Fuzzy Inference System, provide a comparison of accuracy and assist farmers in selecting the appropriate crop for a variety of climates.
Keywords: SVR, LR, ANFIS

1.INTRODUCTION

Tamil Nadu occupies the seventh largest area. It is the most successful producer of agricultural goods. The primary occupation of the people of Tamil Nadu is agriculture. In this hypothetical world, agriculture has a positive outlook. The main source of water is Cauvery. The Cauvery delta is referred to as the "rice bow" of Tamil Nadu. In Tamil Nadu, rice is the most commonly grown crop. Paddy, sugarcane, cotton, coconut, and groundnut are among the other crops grown. The production of biofertilizers is quick and easy. Farming is a major source of employment in many areas. A nation's economy is dramatically impacted by agriculture. Nowadays, agriculture farming is deteriorating as a result of changes brought on by natural factors. Environmental factors like sunlight, humidity, soil type, rainfall, , maximum and minimum temperatures, climate, fertilizers, pesticides, and others have a direct impact on agriculture. In order for agriculture to flourish, knowledge of proper crop harvesting is required. India has winter months that run from December to March. The summer months of April through June The monsoon, also known as the rainy season, occurs from July to September. The autumnal or post-monsoon season that lasts from October to November. Assessment of suitable crops to cultivate is necessary due to the variety of seasons and rainfall.

1.1SMART AGRICULTURE

Tools that digitally collect, store, analyze, and share electronic data and/or information in

agriculture are referred to as digital agriculture, also known as smart farming or e-agriculture. The digitalization of agriculture has been referred to as the digital agricultural revolution by the Food and Agriculture Organization of the United Nations. The significance of digital technology in the improvement of food systems is also emphasized in other definitions, such as those from Cornell University, Purdue University, the United Nations Project Breakthrough, and others. Precision agriculture is a part of digital agriculture but is not the only type. Digital agriculture, in contrast to precision agriculture, has an effect on the entire agri-food value chain—before, during, and after production on the farm. Therefore, precision agriculture and digital agriculture encompass on-farm technologies like yield mapping, GPS guidance systems, and variable-rate application. Digital technologies, on the other hand, such as those used in e-commerce platforms, e-extension services, warehouse receipt systems, blockchain-enabled food traceability systems, and apps for renting tractor, among other things. fall outside of the scope of precision agriculture but into the category of digital agriculture. Digital innovations have the potential to revolutionize conventional agricultural practices. This shift has been referred to as a revolution by the United Nations Food and Agriculture Organization: The most recent development, known as a "digital agricultural revolution," has the potential to assist in ensuring that agriculture will continue to meet the requirements of the global population into the foreseeable future.

1.2 YIELD

We will talk about yield loss mechanisms, yield analysis, and common physical design methods for increasing yield in this chapter. The ratio of the number of products that can be sold to the number that can be made is known as yield. The typical cycle time for production is over six weeks. A single wafer costs several thousand dollars. For a quicker time to profit, consistent high yield is necessary given the enormous investments. A catastrophic loss of yield. These are malfunctions that prevent the component from functioning at all, such as open or short circuits. The most common reasons for these failures are extra or missing material particle defects. This kind of yield loss can be predicted using critical area analysis, which will be discussed further on in this chapter. Loss of parametric yield. In this case, the chip works as intended, but it doesn't meet certain power or performance requirements. Parametric failures are caused by variations in one or more circuit parameters that cause a design to fall outside of specifications due to their specific distribution. Parts, for instance, may function within a certain VDD range but not the entire required range. Leakage in deep submicron technologies is yet another example of a source of parametric yield loss. Variations in the process can result in parametric failures. Speed-binned integrated circuits are classified according to their performance. Microprocessors are a typical illustration of this kind of design, where parts with lower performance are sold at lower prices

2.LITERATURE REVIEW

2.1 DATA MINING AND WIRELESS SENSOR NETWORK FOR AGRICULTURE PEST/DISEASE PREDICTIONS

This paper has proposed by A. K. Tripathy and others that aspects of data-driven precision agriculture, particularly the management of pests and diseases, necessitate dynamic crop-weather data. Using wireless sensor and field-level surveillance data on the closely related and interdependent dynamics of pest (Thrips) and disease (Bud Necrosis) dynamics of groundnut crop, an experiment was carried out in a semiarid region to comprehend the relationships between crop, weather, pest, and disease. The data were turned into useful information, knowledge, relationships, trends, and correlations of the crop-weather-pest-disease continuum using data mining techniques. The mathematical models that were used to train these dynamics and validate them were verified using the appropriate surveillance data. A real-to-near-real-time decision support system for pest/disease predictions could be developed using data from the kharif (monsoon) and rabi (post-monsoon) seasons. Peasants have lost a lot of money as a result of crop diseases and insect pests spreading throughout a large area in recent years and increasing in severity. Crop misfortunes because of bugs and illnesses are very extensive, especially in the Indian semi-bone-dry circumstances [Reddy]. The weather is a big factor in how much food is

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produced in agriculture. In weather-based fragile agriculture systems (semi-arid regions), oilseed crops are more common

2.2 ANALYSING SOIL DATA USING DATA MINING CLASSIFICATION TECHNIQUES

This paper proposed by V. Rajeswar and others that soil is a crucial component of agriculture. The work aims to use data mining classification methods to predict the type of soil. Methods/Analysis: Data mining classification techniques like JRip, J48, and Naive Bayes are used to predict the type of soil. These classifier algorithms are used to extract information from soil data, and two types of soil, Red and Black, are taken into consideration. Findings: Data Mining and agricultural Data Mining are summarized in this paper. The forecast's Kappa Statistics were raised, indicating that the JRip model can provide results from this data that are more trustworthy. Application/Improvement: Effective methods that make use of Data Mining to improve the accuracy of soil data classification can be developed for resolving Big Data issues. For crop and pest management, wasteland management, and soil classification, Data Mining (DM) gains traction in the agricultural sector. In order to predict meaningful relationships and provide association rules for various soil types used in agriculture, we evaluated the variety of DM association techniques and applied them to the database of soil science. In a similar vein, various data mining methods have previously been utilized to analyze agriculture prediction, disease detection, and pesticide optimization. Predicting the soil fertility rate with high accuracy using the analyzed classification algorithm .

2.3 THE IMPACT OF DATA ANALYTICS IN CROP MANAGEMENT BASED ON WEATHER CONDITIONS

In this paper, has proposed by A.Swarupa Rani and others that agriculture is the most important application area, especially in developing nations like India. When making decisions about a number of issues pertaining to the agricultural sector, data mining plays a crucial role. The process of data mining aims to extract information from an existing data set and convert it into a singular, human-readable format for future use. Because climate can have a significant impact on crop productivity, crop management in a particular agriculture region is influenced by its climatic conditions. Good crop management can be made possible with the help of real-time weather data. Automation of significant data extraction in the pursuit of knowledge and trends is made possible through the use of information and communications technology. This makes it easier to extract data directly from electronic sources, transfer it to a secure electronic system of documentation, and reduce production costs, increase yield, and raise market prices. It was also discovered how data mining aids in the analysis and prediction of useful patterns from enormous, dynamically changing climatic data. Fuzzy logic, artificial neural networks, genetic algorithms, decision trees, and support vector machines have all been used by researchers and engineers in agricultural and biological engineering to study the soil, climate, and water regimes that influence crop growth and pest management in agriculture. This paper provides a synopsis of the methods of data mining, neural networks, support vector machines, big data analysis, and soft computing that are utilized in the agricultural sector in response to weather conditions. Farming is the foundation of all economic activity. The climatic, geological, natural, political, and financial factors that affect horticulture's yield generation are, for the most part, independent of one another.

2.4 SPIKING NEURAL NETWORKS FOR CROP YIELD ESTIMATION BASED ON SPATIOTEMPORAL ANALYSIS OF IMAGE TIME SERIES

This paper proposed by Pritam Bose and others spiking neural networks (SNNs) for remote sensing spatiotemporal image time series analysis that make use of neuromorphic hardware platforms that are both highly parallel and low-power. The first SNN computational model for crop yield estimation from normalized difference vegetation index image time series is presented in this paper to demonstrate this idea. It describes the creation and testing of a methodological framework for training an SNN to accurately predict crop yield using historical crop yield data and the spatial accumulation of time series from Moderate Resolution Imaging Spectroradio Meter 250-m

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resolution data. An analysis of the optimal number of features required to maximize the results from our experimental data set is also included in the research. The yield of winter wheat (Triticum aestivum L.) in Shandong province, one of China's main growing regions, was estimated using the proposed method. Our technique had the option to foresee the yield close to about a month and a half before gather with an exceptionally high precision.

2.5 SMART FARMING SYSTEM USING DATA MINING

This paper proposed by Priyanka P. Chhandak and others a smart farming system as an autonomous and sophisticated mechanism that will help increase agricultural yields by employing cutting-edge farming practices without the need for human intervention. An overview of the most recent smart farming software solutions is provided in this paper. The proposed system uses techniques for data mining and data from satellite data, the Internet, and soil testing reports that are fed into existing databases. It uses clustering algorithms in an elegant way to make decisions based on weather changes, keeping track of crop growing stages, making good use of water, and choosing the right fertilizer and pesticide to use for each stage of the crop to protect it from diseases and insects. This framework is fit for expanding the efficiency of fields by overseeing ranch activities intelligently. While irrigation consumes approximately 70% of all water consumed worldwide, agriculture uses the most water. 10 percent and 20 percent, respectively, come from the domestic and industrial sectors, though these percentages vary greatly from country to country. The demand for food is also increasing as the population grows each day. There are additional factors that affect crop yield, such as farmer ignorance of newer technologies that can be used to increase agricultural gross profit and environmental factors like erratic weather that results in crop loss.

3.EXISTING SYSTEM

The data used to gain insight into the agricultural facts are made by agricultural factors and parameters. Some highlights in agriculture sciences are driven by the expansion of the IT industry to provide farmers with useful agricultural information. In the current scenario, it is desirable to have intelligence in the application of cutting-edge technological strategies to the agricultural sector. With the data, machine learning techniques create a well-defined model and assist us in making predictions. There are solutions to agricultural problems like crop prediction, rotation, the need for water, the need for fertilizer, and protection. It is necessary to have an effective method to facilitate crop cultivation and assist farmers in their production and management due to the environment's variable climatic factors. This might make agriculture better for the next generation of farmers. With the help of data mining, a farmer can get a set of recommendations to help them grow crops.

4.PROPOSED SYSTEM

Presently, AI (ML) strategies are being utilized in different fields to achieve commonsense and useful arrangements. The crop yield can be predicted using a variety of ML-based algorithms based on classification, clustering, and neural networks. Based on support vector regression, linear regression, and the Adaptive Neuro Fuzzy Inference System algorithm, we propose a method for predicting the most suitable crop for cultivation in response to weather conditions. Our algorithm takes into account data on weather and crops. Furthermore, our method recommends fertilizer based on the anticipated crop. The results of the tests show that our method accurately predicts crop selection and yield, which is extremely beneficial to farmers.

5.INPUT DATA

Mining is the process of extracting information from a data set. It aims to provide farmers with accurate results. It identifies hidden patterns. It extracts useful information from the enormous data set. In addition to the Knowledge Discovery and Discovery in Databases (KDD) process, Machine Learning has emerged in recent years to handle large amounts of data and incorporate high-performance computing. The use of machine learning in agriculture is growing at an alarming rate. Crop management, livestock management, water management, and soil management are all applications of machine learning techniques. Using a recommendation algorithm is one type of machine learning technique. They give customized items in Online business. This paper employs these recommendation ideas in agriculture to provide seeds. On the crop dataset, Simple Data

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Analytics is used, and farmers are offered suggestions for personalizing agricultural crops. we assigned the agricultural season/s. After this, depending upon the season assigned, we have parsed through our data to collect the best yield of three crops in the selected input region and state. Besides this, we have extracted the top three crops giving the best yield throughout the year.

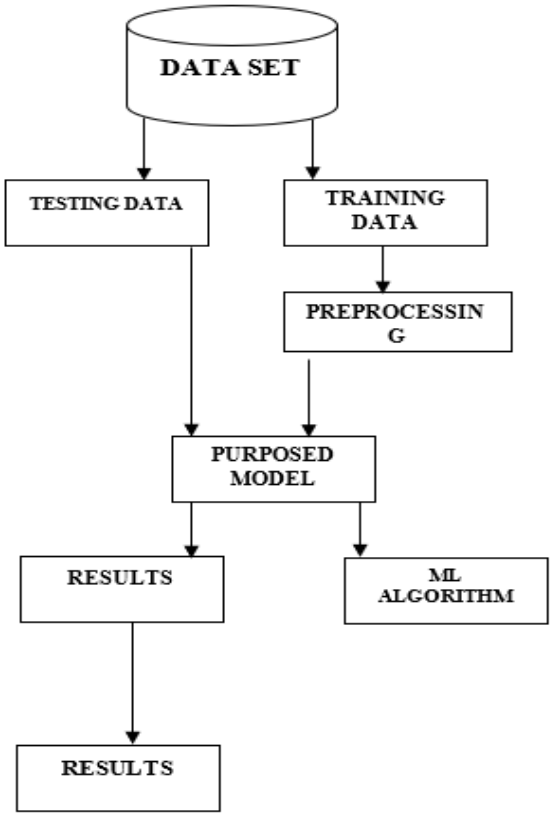


Fig 1 architecture

6.DATASET PREPROCESSING

To get the most out of the predicted model, data preprocessing is a necessary setup. There are some irrelevant and less dependent attributes in the data set. In order to make use of the processing time, we remove some attributes. In this project, we apply the classifier by using some missing values.

7.FEATURE EXTRACTION

The same datasets cannot be used by the machine learning algorithm. In order to maximize classifier accuracy and prepare the appropriate input for the particular algorithm, we must transform the data set into a corresponding algorithm. We employ a variety of feature extraction methods. Class attributes now have values in alphabetical order rather than numbers. The performance class is clustered according to the relevant range. Students who achieve an Excellent score fall into one of three categories.

8.CLASSIFIER

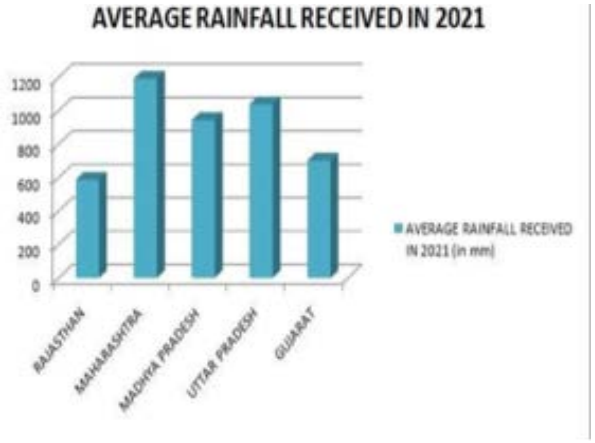
We use a different classifier on the processed data set to achieve maximum accuracy. Support vector regression, linear regression, and the Adaptive Neuro Fuzzy Inference System are just a few of the machine learning algorithms we employ.

9.PROPOSED MODEL

Support vector regression, linear regression, and the Adaptive Neuro Fuzzy Inference System are machine learning algorithms that use a large number of decision trees to predict crop yields based on various weather conditions with the highest accuracy. In a predicted model, each tree combines the total number of dependencies and represents the dependencies on a single variable.

10.RESULT ANALYSIS:

The super dataset is used to find the relation between produce per area and a particular crop using a bar graph and scatter plot for a particular region. It can be seen in the bar graph represented in that sugarcane has the highest production per area in North and Middle Andaman Region. In the scatter plot of the same region is made to plot the initial produce per area and the crops before clustering to differentiate before and after the k-means clustering algorithm.



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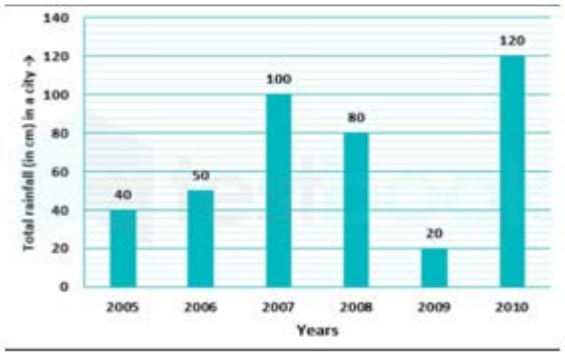

Fig 2

ALGORITHM	ACCURACY
K-MEANS CLUSTERING	77
NAIVE BAYES	70.9
ANFIS	89

Table 1

11.CONCLUSION AND FUTURE SCOPE:

The significance of crop management was the subject of extensive research. To grow their crops, farmers require assistance with cutting-edge technology. Appropriate forecast of harvests can be educated to agriculturists in time premise. The parameters of agriculture have been analyzed using any Machine Learning methods. A literature review examines some agricultural techniques in various fields. Soft computing techniques, such as blooming neural networks, play a significant role in providing recommendations. Farmers can receive more individualized and pertinent recommendations that encourage them to produce a high volume of food by taking into account factors like production and season. The Support Vector Regression, Linear Regression, and Adaptive Neuro Fuzzy Inference System, which provides the highest level of accuracy in the various algorithm comparisons This work can be further improved to eliminate the requirement ratio if an aspect of humidity, wind speed can be added for all the regions and will give a more accurate recommendation. Factors like soil moisture, cloud cover etc. may be included in the system to refine its output. Also, the recommender can be modified to warn about the diseases that can occur in a crop in a particular season and suggest the types of fertilizers or nutrients needed in the soil for the crop to grow and give its best yield.

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