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# Crop Yield Prediction

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ABSTRACT

The fast pace of urban development minimize the agricultural lands. Owing to poor rainfall and drastic climatic changes farmers often face challenges to sustain cultivation of crops with respect to crop cycle. With growing economic competition and rising population, governmental agencies design long term plans which rarely address the farmer's needs. To meet the global demands agriculturist needs to investigate every opportunity that could improve agricultural production and growth. Whether to expand agricultural lands or to improve the production farmers needs to assess the suitability between land and crops. The investigation of land suitability and crop suitability has attracted many researchers to utilize latest technology such as remote sensing, geographical information systems etc. This paper aims to survey on recent researches on crop and land suitability using data mining techniques.

**Keywords :** Crop Suitability, Land Suitability, Data Mining, Classification, Agricultural Data Mining

## I. INTRODUCTION

Agriculture is the backbone of every economy. In a country like India, which has ever increasing demand of food due to rising population, advances in agriculture sector are required to meet the needs. From ancient period, agriculture is considered as the main and the foremost culture practiced in India. Ancient people cultivate the crops in their own land and so they have been accommodated to their needs. Therefore, the natural crops are cultivated and have been used by many creatures such as human beings, animals and birds. The greenish goods produced in the land which have been taken by the creature leads to a healthy and welfare life. Since the invention of new innovative technologies and techniques the agriculture field is slowly degrading. Due to these, abundant invention people are been concentrated on cultivating artificial products that is hybrid products where there leads to an unhealthy life. Nowadays, modern people don't have awareness about the cultivation of the crops in a right time and at a right place. Because of these cultivating techniques the seasonal climatic conditions are also being changed against the fundamental assets like soil, water and air which lead to insecurity of food. By analyzing all these issues and problems like weather,

temperature and several factors, there is no proper solution and technologies to overcome the situation faced by us. In India there are several ways to increase the economical growth in the field of agriculture. There are multiple ways to increase and improve the crop yield and the quality of the crops. Data mining also useful for predicting the crop yield production. Generally, data mining is the process of analyzing data from different perspectives and summarizing it into useful information. Data mining software is an analytical tool that allows users to analyze data from many different dimensions or angles, categorize, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. The patterns, associations, or relationships among all this data can provide information. Information can be converted into knowledge about historical patterns and future trends. For example, summary information about crop production can help the farmers identify the crop losses and prevent it in future. Crop yield prediction is an important agricultural problem. Each and Every farmer is always tries to know, how much yield will get from his expectation. In the past, yield prediction was calculated by analyzing farmer's previous experience on a particular crop. The Agricultural yield is primarily depends on weather conditions, pests and planning of harvest operation. Accurate information about history of crop yield is an important thing for making decisions related to agricultural risk management. Therefore, this paper proposes an idea to predict the yield of the crop .The farmer will check the yield of the crop as per the acre ,before cultivating onto the field.

## II. RELATED WORK

Several techniques were proposed by various authors for crop yield prediction and a few of them are explained below:E.I. Papageorgiou et al [12] have investigated the process of yield prediction in cotton crop production using the soft computing technique of fuzzy cognitive maps. Fuzzy cognitive map (FCM) was a fusion of fuzzy logic and cognitive map theories, and was used for modeling and representing experts' knowledge. It was capable of dealing with situations including uncertain descriptions using similar procedure such as human reasoning does. It was a challenging approach for decision making especially in complex processing environments. Xiaoqin Dai et al[13] have proposed simulation for response of crop yield to soil moisture and salinity with artificial neural network. In saline fields, irrigation management often requires understanding crop responses to soil moisture and salt content. Luke Bornn and James V. Zidek [14] have describes how spatial dependence could be incorporated into statistical models for crop yield along with the dangers of ignoring it. In particular, approaches that ignore thisdependence suffer in their ability to capture the underlying phenomena. By judiciously selecting biophysically based explanatory variables and using spatially determined prior probability distributions, a Bayesian model for crop yield was created that not only allows for increased modeling flexibility but also for improved prediction over existing least-squares methods. The impact of climate change on cotton yields in seven main arable crop sites in Greece was investigated by Dimitrios Voloudakis et al [15]. The FAO AquaCrop (v.4) water driven model was used as a crop growth simulation tool under eight climatic models based on IPPC's A1B emission scenario. Predicting annual crop yields is of interest for many agricultural applications. David Gouache et al [16] have presented a prediction scheme at the departmental level, circa 100 km by 100 km, of winter wheat yields in France, applied for 23 departments, using official yield statistics from 1986 to 2010. Each model was a linear combination of 5–7 variables, selected from an initial pool of over 250 candidates. Variable selection was carried out with forward stepwise regression methods. The variable selection process was cross-validated, so as to select

robust variables. Model prediction performance was also evaluated by cross-validation.

## III. PROPOSED SYSTEM

Crop yield prediction can help agricultural departments to have strategies for improving agriculture. Crop production depends on climatic, geographical, biological, political and economic factors. Because of these factors there are some risks, which can be quantified when applied appropriate mathematical or statistical methodologies. Actually accurate information about the nature of historical yield of crop is important modeling input, which are helpful to farmers & Government organization for decision making process in establishing proper policies. In this paper we have intend to propose a method for crop yield prediction using classifier. The proposed crop yield prediction consists of three phases namely, preprocessing, feature reduction and prediction. Here the proposed method use input data as real world data. Real world data is often incomplete, inconsistent, and/or lacking in certain behaviors or trends, and is likely to contain many errors. Data pre-processing is a proven method of resolving such issues. A good data preprocessing helps to create better model and will consume less time. Next phase of the proposed method is feature reduction; here we use multilinear principal component analysis (MPCA) for feature reduction phase. Finally the proposed method is use to predict the crop yield by means of classifier. The prediction is done based on the Optimal Neural Network classifier (ONN). The performance of the proposed method is evaluated by prediction accuracy and error value.

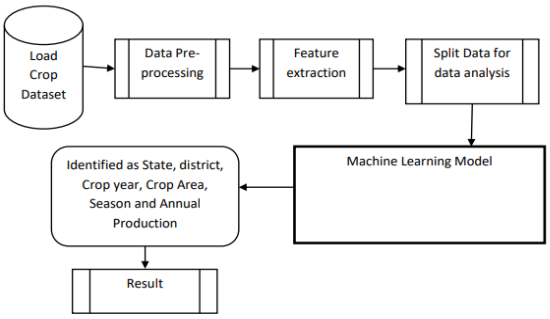
In this paper the statistical method namely Multiple Linear Regression technique and Data Mining method namely Density-based clustering technique were take up for the estimation of crop yield analysis.

### 3.1 Multiple Linear Regression

A regression model that involves more than one predictor variable is called Multiple Regression Model. Multiple Linear Regression (MLR) is the method, used to model the linear relationship between a dependent variable and one or more independent variables. The dependent variable is sometimes termed as predictant and independent variables are called predictors.Multiple Linear Regression (MLR) technique is based on least squares and probably the most widely used method in climatology for developing models to reconstruct climate variables from tree ring services. This crop yield prediction model is presented with the use of Multiple Linear Regression (MLR) technique where the predictant is the Production and there are seven predictors namely Year, Rainfall, Area of Sowing, Yield and Fertilizers (Nitrogen, Phosphorous and Potassium)

### 3.2 Density-based Clustering Technique

The primary idea of Density-based clustering techniques is that, for each point of a cluster, the neighborhood of a given unit distance contains at least a minimum number of points. In other words the density in the neighborhood should reach some threshold. However, this idea is based on the assumption that the clusters are in the spherical or regular shapes. These methods group the objects according to specific density objective functions. Density is usually defined as the number of objects in a particular neighborhood of data objects. In these approaches, a given cluster continues to grow as long as the number of objects in the neighborhood which exceeds some parameter. This is considered to be different from the idea in partitioning algorithms that use iterative relocation of points that give a certain number of clusters.




SYSTEM ARCHITECTURE

## IV. CONCLUSION

Initially the statistical model Multiple Linear Regression technique is applied on existing data. The results so obtained were verified and analyzed using the Data Mining technique namely Density-based clustering technique. In this procedure the results of two methods were compared according to the specific region i.e. East Godavari district of Andhra Pradesh in India. Similar process was adopted for all the districts of Andhra Pradesh to improve and authenticate the validity of yield prediction which are useful for the farmers of Andhra Pradesh for the prediction of a specific crop.

In the subsequent work a comparison of the crop yield prediction can be made with the entire set of existing available data and will be dedicated to suitable approaches for improving the efficiency of the proposed technique.

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