# A Survey on Expert System for Yield Prediction

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*Abstract* - **The ability of artificial neural network technology to be used for the approximation and prediction of crop yields at rural district and federal state scales in different climate zones based on reported daily weather data. This research is to develop a farmer prediction system to identify crop suitable for particular soil. Neural Network should be trained to perform correct prediction for farmers. Previous research has established that large-scale climatological phenomena influence local weather conditions in various parts of the world. These weather conditions have a direct effect on crop yield. Consequently, much research has been done exploring the connections between large-scale climatological phenomena and crop yield. Artificial neural networks have been demonstrated to be powerful tools for modeling and prediction, to increase their effectiveness. In this project Crop prediction methodology is used to predict the suitable crop by sensing various parameter of soil and also parameter related to atmosphere. Parameters like type of soil, PH, nitrogen, phosphate, potassium, organic carbon, calcium, magnesium, sulphur, manganese, copper, iron, depth, temperature, rainfall, humidity. For this purpose we are going to proposed this system based on back propagation feed forward neural networks was best suited for effective crop prediction.**

**Index Terms— Back Propagation , Crop prediction, Learning algorithm, Neural Network.**

## I. INTRODUCTION

Achieving maximum crop yield at minimum cost is one of the goals of agricultural production. Early detection and management of problems associated with crop yield indicators can help increase yield and subsequent profit. By influencing regional weather patterns, large-scale meteorological phenomena can have a significant impact on agricultural production. Large-scale weather patterns such as the El Niño Southern Oscillation (ENSO) and the Pacific-North American pattern have been linked by research to local weather patterns in various locations around the world. In turn, specific climatic conditions such as fluctuations in precipitation have been shown to have strong influences on crop failures, demonstrating that weather patterns may be valuable for modeling and predicting crop yield. Such predictions could be used by crop managers to minimize losses when unfavorable conditions may occur. Additionally, these predictions could be used to maximize crop prediction when potential exists for favorable growing conditions.

Prediction of crop yield mainly strategic plants such as wheat, corn, rice has always been an interesting research area to agro meteorologists, as it is important in national and international economic programming. Dry farming crop production, apart from relationship to the genetic of cultivator, adaphic terms, effect of pests and pathology and weeds, the management and control quality during the growing season and etc. is severely depend to climatic events. Therefore it is not beyond the possibility to acquire relations or systems which can predict the more accuracy using meteorological data. Nowadays, there are a lot of yield prediction models, that more of them have been generally classified in two group : a) Statistical Models, b)Crop Simulation Models (e.g. CERES). Recently, application of Artificial Intelligence (AI), such as Artificial Neural Networks (ANNs), Fuzzy Systems and Genetic Algorithm has shown more efficiency in dissolving the problem. Application of them can make models easier and more accuracy from complex natural systems with many inputs. In this research it has been tried to develop a wheat yield prediction model using ANNs. If we design a network which correctly learn relations of effective climatic factors on crop yield, it can be used to estimate crop production in long or short term and also with enough and useful data can get a ANNs model for each area. Furthermore using ANNs can find the most effective factors on crop yield. Therefore some factors that their measurements are difficult and cost effective can be ignored. In this the effect of climatic factors on wheat yield has only been applied.

## II. LITERATURE REVIEW

Literature presents with the number of researches for the prediction of crop in varied types of yield. We drive motivation from some of those previous works available in the literature. A selected few noteworthy contributions are given below. Various types of method are proposed in literature reviews which are used for yield prediction.

Rama Krishna Singh and Prajneshu [1,2] described the methodology has been illustrated by considering maize crop yield data as response variable and total human labor, farm power, fertilizer consumption, and pesticide consumption as predictors. It is hoped that, in future, research workers would start applying not only MLFANN but also some of the other more advanced ANN models, like 'Radial basis function neural network', and 'Generalized regression neural network' in their studies.

Hojjat Yazdanpanah described [3,4] the best model in order to estimate the amount of wheat with the help of the six stages combination of climatic factors. Include of hot stress, rainy day, temperature, evaporation and precipitation. Considering the model accuracy since there is some error in précising the existing data to the different models so in this research that is normal to have errors of the model errors because of the influence of all environmental factors.

Martin C.M. , R.W. McClendon and G. Hoogenboom [5,6,7] described the correlations between various climate indices and crop yield has been performed. The initial development of ANN models used for predicting crop yield. The goal of the research presented in this thesis was the development of ANN models using GA-selected inputs for the prediction of maize yield in the southeastern US based on indices of large-scale meteorological phenomena.

B. J I 1,2, Y. SUN2, S.YANG1* AND J. WAN1[8,9,10] described the rice production is affected by sets of varietals and environmental parameters, including genetic characteristics, soil, weather and cultivation



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management. The development of artificial neural network models as an alternate and more accurate technique for yield prediction in Fujian province. It has led to a need for simple and accurate techniques to estimate crop yields.

Sudhanshu Sekhar Panda 1, *, Daniel P. Ames 2 , and Suranjan Panigrahi 3[11,12] described the four widely used spectral indices, including GVI (Green vegetation index), NDVI (Normalized difference vegetation index), PVI (Perpendicular vegetation index), and SAVI (Soil adjusted vegetation index) were investigated in the study of irrigated corn crop yield estimation. PVI, a distance-based VI technique, was found to be better than other individual VI techniques for yield prediction of corn, as it reduced the interference caused by the bare soil information present in the aerial image.

Er. Lavina , Er. Pankaj Dev Chadha [13,14] described Predicting is making claims about something that will happen, often based on information from past and from current state. Neural networks can be used for prediction with various levels of success. The advantage of then includes automatic learning of dependencies only from measured data without any need to add further information (such as type of dependency like with the regression). The neural network is trained from the historical data with the hope that it will discover hidden dependencies and that it will be able to use them for predicting into future. By harnessing the latest advances in artificial intelligence and neural network technology, more advance and fast prediction can be made.

## III. SYSTEM ARCHITECTURE

. In this project we shall examine one of the most common neural network architectures, the feed forward back propagation neural network. This neural network architecture is very popular, because it can be applied to many different tasks.

The first term, "feed forward" describes how this neural network processes and recalls patterns. In a feed forward neural network, neurons are only connected foreword. Each layer of the neural network contains connections to the next layer (for example, from the input to the hidden layer), but there are no connections back.

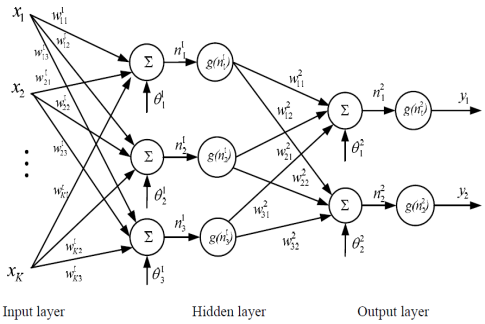


**Fig: Layer and connection of a feed forward back propagating ANN**

The back propagation and feed forward algorithms are often used together; however, this is by no means a requirement. It would be quite permissible to create a neural network that uses the feed forward algorithm to determine its output and does not use the back propagation training algorithm. Similarly, if you choose to create a neural network that uses back propagation training methods, you are not necessarily limited to a feed forward algorithm to determine the output of the neural network. Though such cases are less common than the feed forward back propagation neural network.

In soil there are many types of nutrients are nitrogen(N), phosphorus(P), potassium(K), Zinc(Zn), Boron(B), Iron(Fe), Copper(Cu), Manganese(Mn), Molybdenum(Mo),Calcium, Phosphorous, Sulphur. In this project we first sense these nutrients in the soil and according to that we will provide the required amount of these nutrients to that particular crop. All these nutrients are used for the prediction of crop. The different applications are it is used for research work for easily predict the suitable crop. It is also used for analyzing crop productivity for different soil. This system is mobile and can carry in rural areas also where progress is yet to develop.

Following table shows the quantity of nutrients for different crops. The reading material acquired from the Shivaji Agriculture College, Amravati. As the reading collected for our study is likely to contain noises, it is to be preprocessed. All of the given reading of prediction systems considered for study are meant to predict different values for different crops.

| Crop | PH | N | P | K | Organic Carbon | Zn | B | Mo | Depth | Temp. | Rainfall |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chilly | 7.5-8.0 | 60 | 20 | 20 | 0.41-0.60 | 4 to 8 | 2.4 | 1 | 20-25cm | 25-30 | 450-700mm |
| Sunflower | 6.5-8.5 | 35 | 25 | 25 | 0.41-0.60 | 4 to 8 | 2.4 | 1 | 15-20cm | 25-33 | 700-1000mm |
| Bajara | 7.0-8.5 | 25 | 15 | 5 | 0.41-0.60 | 4 to 8 | 2.4 | 1 | 15cm | 28-32 | 400-750mm |
| Corn | 7.5-8.5 | 50 | 25 | 12 | 0.41-0.60 | 4 to 8 | 2.4 | 1 | 5cm | 13-30 | 500-600mm |
| Groundnut | 6.0-7.5 | 10 | 30 | 12 | 0.41-0.60 | 4 to 8 | 2.4 | 1 | 20cm | 24-27 | 500-1250mm |

**Table1: Quantity of nutrients for different crop**

## IV. CONCLUSION

The goal of yield prediction is the models were developed and tested for at the province regional and local spatial levels. This research also verified the utility of ANN application and data transfer technique as tools for crop yield prediction with high accuracies. Prediction is making claims about something that will happens, often based on information from past and from current state. By influencing regional weather patterns large scale meteorological phenomena can have a significant impact on agriculture production.

For future scope adding a different parameter to limited number of nonlinear models, while in this study different expert nonlinear models have been used for crop yield estimations, which could be a valuable source of information for other researchers. ANN and ANFIS techniques could be used in many fields including scheduling, design, and various other analyses. These models can also be integrated into modules for application in general economic models.

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