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A Prediction on the fertile nature of crops in the delta regions of TN

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ABSTRACT

The rice images along the delta regions of Tamil Nadu (TN) are captured using a CCD sensor (Charge coupled device) and is fed in as input. The image's quality is improved using spatial resolution and capabilities like noise, blur etc. are removed using Digital Image Processing.. The RGB values are then estimated whose green pigment values are compared with a preconceived Leaf Color Chart (LCC) and hence the amount of K, N and P is determined along with the strength of the seedling. The features are extracted and threshold. Comparison is made between Back Propagation Algorithm and Fuzzy Clustering Algorithm for accuracy by training and testing the images. Thus the rice yield in delta regions of TN can be improvised and the farmer's resources are conserved.

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INTRODUCTION

Traditionally, in states like Tamilnadu, the rice crop's strength determines the approximate prophesied yield, which is mostly done by analyzing the color of the crop after roughly 14 days of transplanting the seedlings. While many farmers analyze by their predispositions, there are a few new approaches using latest technology. (Atsushi Hashimoto) An alternative method for determining the crop strength is by using a Leaf Color Chart (LCC). Leaf color chart is used to increase the N amount and thereby decreasing the amount of fertilizers used. This LCC helps to determine the N content demand in crops, so the nitrogen is added further avoiding the nitrogen wastage and for an healthy ecosystem. Large consumption of urea by plants leads to many problems- 1.Environment pollution. 2. The production cost increases drastically. 3. Quality of production decreases. 4. The major problem deals with the down rate of Nitrates reach about 10 milligram/liter then the water is made unsuitable for human. (Atsushi Hashimoto) Comparison of the topmost, fully expanded, and healthy leaf of each of the 10 randomly selected plants is done with the chlorophyll meter & Leaf color chart method. The middle part of the leaf on top of the LCC color strips are taken in count for comparison. This is not exposed to direct sunlight during readings. (Zhao *et al*., 2009) The chlorophyll meter method and LCC gives a somewhat vague sense of the plant's strength. And hence the determination of estimated amount of nitrogen (N), phosphorus (P) and potassium (K). (Aleta *et al*., 2014)A plant sample is analyzed and the amount of nitrate is determined. The sample is placed in a setup which has an outer layer as Aluminum block and the inner concentric setup as Pyrex feline Wyes tube which contains the sample. A small amount of the salt catalyst and a few drops of sulphuric acid is added and is heated. After the initial clearing, it is heated for minutes and at the boiling point, the sample is digested. The same values are obtained for the material containing 0.006 to 0.3 of NO3-N3 content as per the proposed and standard AOAC N values. If the values varied from0.87 to 1.10 then it indicates high nitrate concentration in the sample. By this method, sixty samples can be analyzed simultaneously to check the nitrogen content accurately.

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Fig. 1: Sample Rice image

Theoretical and experimental works were done to relate between resource availability and habitat invisibility. The non invasive annual grasses gave increased nitrogen content similar to invasive species. the logical assumptions obtained from the observation states that low availability of nitrogen will restore the invasive plant dominated system. Evaluation of degree to which the soil nitrogen management restoration does not have any quantitative synthesis even though it poses a serious threat to the no of perennial dominated ecosystems. (Brenda *et al*., 2014)The soil nitrogen management impact growth and competitive ability of both perennial and invasive grass seedlings is evaluated by meta analysis. In grass dominated communities the analysis was linked to the current theories and strategies to improve soil nitrogen management. (Funk.,2013) A study stated that the invasive annual grasses gave higher growth rate and greater biomass than the perennials irrespective of the nitrogen availability. the competitive interactions between the two types of grass seedlings gave no evidence on covering the nitrogen availability. (Gautam and S. Panigrahi)Under various conditions of nitrogen availability, the perennial targets obtained were similar. The inferences in the assumptions of restoration and soil nitrogen management were consistent with plant ecological strategy and community assembly theory. The native plant community is thus reassembled from the seed and soil nitrogen management will not have an effect on its establishment unless the priority effects are restrained in the first growing season invasive plants mostly occurs in resource rich environment based on water and light availability. (Elsa *et al*.,2013) These species often show characteristics linked with resources conservation like growth speed and tissue longitivity. The theory deals with general idea of invasive species. These are primarily derived from the environments having rich resources. We can come to the conclusion that high resources leads to the succeed of these invasive species. This theory clashes with the general idea that the invasive species derived primarily from high resource environments. From these studies we get the idea that invasive species can succeed through high resource acquisition. We can examine the physiological and morphological effects of invading species based on its resource acquisition and conservation. Climatic changes and disturbances in the ecosystem affect the resource availability. Invasive species may give away to retrieve the invaded ecosystems. The requirements of biological nitrogen fixation with end symbiotic associative and entophytic symbiotic gives a competitive advantage over non nitrogen fixing plants. as the regimes are well documented, in spite of the phylogenic an ecological differences among diastrophic bacteria and their hosts plant achieves a successful interaction. Presently researches are made to gain knowledge of molecular mechanisms in these relationships and some strategies leading to successive relationships between the hosts and the bacteria. The use of N can be evaded by making use of symbiosis as rated importance. The N content can be improved further by peer understanding of these non- legume crops. The evaluation of effective nitrogen plant growth enhancer corn stalks incorporates the accumulation of ammonia, nitrogen and nitrate. An effective nitrogen management was introduced to decrease the fertilizer nitrogen loss and soil inorganic nitrogen. We could infer that the amount of soil nitrogen inorganic nitrogen decreased constantly with sampling time. In comparison with the various nitrogen application rates we could conclude that maze straw addition declined significantly to the amount of nitrogen. These conclusions gave an idea that the combined application of fertilizers and organic manure reduces accumulation of fertilizer nitrogen and lower its loss. Expensive fertilizer containing nitrogen results in a more productive produce. The key importance is to improve the nitrogen efficiency. This efficiency depends on the cultivated plants or grain yields and it mostly depends on the inorganic nitrogen soil from

extraction and recycling organic nitrogen. Mechanisms like biochemical and enzymatic methodologies involved nitrogen intake model plants and its assimilations. In this study the elevation in the nitrogen use efficiency is the goal. The enzymes and regulatory processes manipulate these components. Inferences were obtained from quantitative characteristics were also discussed. Image segmentation is proposed using Fuzzy for image automation. The set here initially uses Fuzzy clustering technique. Image segmentation is proposed using fuzzy for image automation. The set function here initially uses fuzzy clustering technique. This paper proposed a new technique to predict the fertile nature of crops in the delta regions of TamilNadu. This methods proves for its accuracy and less time complexity with less error correction. In order to analyze the best, normal and poor quality of rice based on the fertility of soil, BPN and fuzzy clustering algorithms are implemented for testing and training of the data. the quality of rice is predicted automatically to determine the fertility of crop region. In order to analyze the best, normal and poor quality of rice based on the fertility of the soil, back-propagation and fuzzy logic technique is applied.

2. Existing Techniques:

1. Leaf Colour chart
2. Chlorophyll meter

3. Proposed Methods:

Pre-processing:

Input: Crop image

Output: Segmented of image input

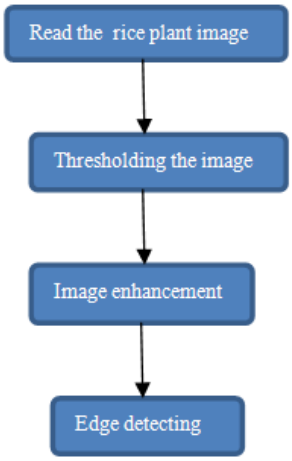

Fig. 3: preprocessing the image

Enhancement of image gives a visually better understanding of the image fed in. The unwanted parts/areas in an image can be neglected to the main area can be focussed by threasholding the image. The observation on the boundaries of the image plays a vital role for better results. This is achieved through Canny Edge detector which is the best suited and for this technique compare to all boundary detectors.

1) Width
2) Upper threshold
3) Lower threshold

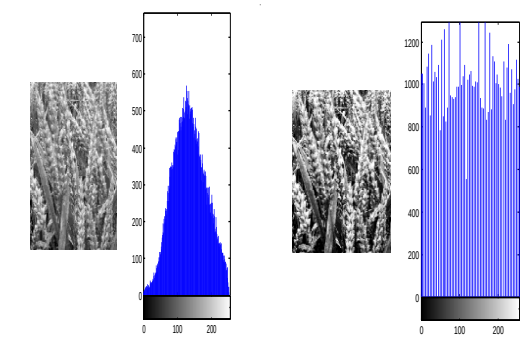

Fig. 4: Displays the rice image with segmented and histogram equalization

Steps for predicting the quality of rice using artificial techniques:

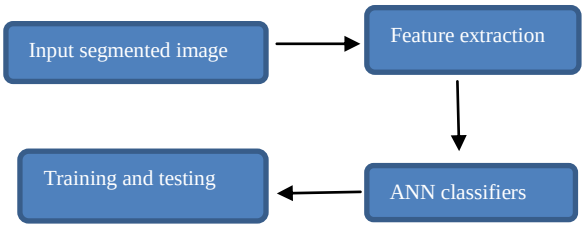

Fig. 5: Flowchart shows to predict the quality of rice

3.1 Preprocessed image:

The preprocessed image is segmented. The segments of the image are obtained by dividing the image into two divisions. They are

1.Region of interest (ROI) 2.Background.

Threshold range studies from 0 to 1. The range of values obtained the range of values obtained as results vary from .52mm to .90mm in case of normal crops. For abnormal crops the threshold value is seen to be -2.5mm.

This study has generated the output for both normal and abnormal crops separately.

3.2 Feature Extraction:

The features of the crops extracted. Here, the properties of the crop like height of the crop, Width of the crop, texture and color of the crops are extracted. These extracted features are then fed-in as input at the input pits of the network.

Artificial Neural Network techniques:

Ann techniques are applied to test and train the system. The neural network techniques implemented here are Back propagation algorithm and Fuzzy clustering technique. The training and testing of the images is done and is presented as output from the output pits of the network.

3.3 Back propagation algorithm:

Back propagation network proved to be the most efficient and significant algorithm to train the networks with minimum error corrections. It consists of three layers. They are 1. Input layer 2.Hidden layer 3.Output layer in which all the three layers are interconnected. The output is again fed-back to the input layer. This feedback process continues till the accurate results are obtained. Here it is a feed forward network. The hidden layer hides the unimportant information from the user, this also increases the security of the networks.

Training:

The generalized delta rule is implemented here to train the networks. It uses a gradient descent for training the networks. The errors are minimized by adjusting the weights. This is done by taking into account the actual and desired output difference. Based upon the difference the network weights are adjusted for obtaining minimal error and accuracy.

Steps for training the image:

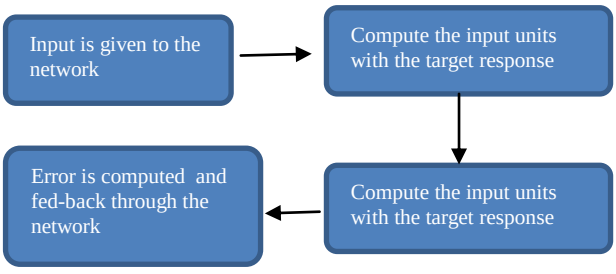

Fig. 6: Flowchart shows to minimize the overall error

Testing:

1. Segmented image is read.
2. Processed with desired output of BPA.
3. Final output is obtained.

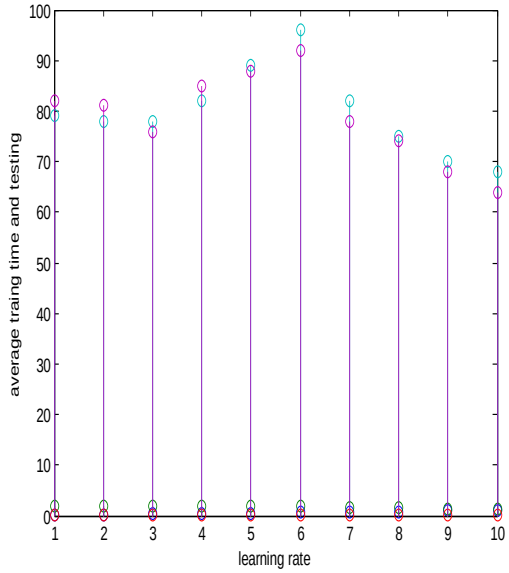

Fig. 7: Training for 60 image is done. The graph is obtained for the learning rate against the average time and training for about 10000 iterations.

3.4 Fuzzy Clustering Algorithm:

Fuzzy clustering consists of a set of clusters each assigned a grade of membership. Clustering is generally classified as hard or soft clustering. Fuzzy is also called as soft clustering. Each cluster belongs to the particular object of a class. They are a group of objects belonging to some particular class. The objects or clusters belonging to the same class exhibit similar properties when compared with the clusters of another class. Many numbers of clusters can be categorized under the same class.

Clustering in fuzzy system involves three steps:

1 .Resultant Data
2. Root Mean square Error
3 .Evaluation

Input and output data:

About 60 samples of the crops are considered as input and is predicted for its N, K, P values and its RGB values using the 2 techniques and the desired and accurate output is generated.

Error:

The error is calculated using the root mean square error value (RMSE).

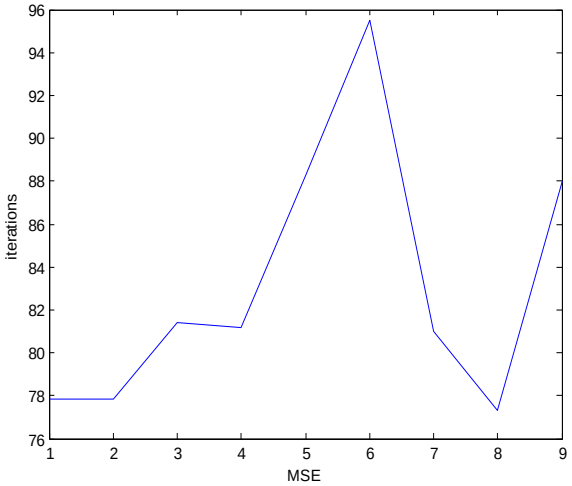

Fig. 8: RMS error is represented above by plotting MSE Vs. number of iterations. The iterations required for the trained data set here is 10000.

Training and testing:

The representation shown here is learning rate vs. average training and testing.

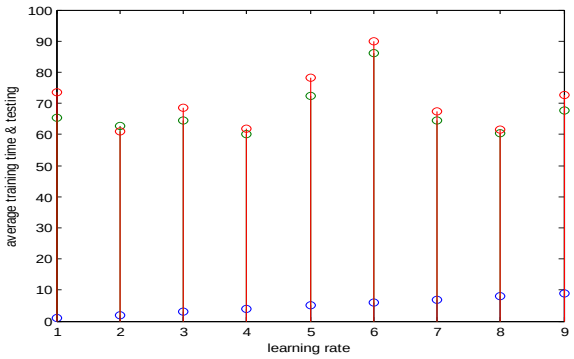

Fig. 9: shows the testing and training relationship for 10000 iteration.

Experimental Result:

The quality is of the rice crop detected effectively using ANN techniques. A comparison was made between BPN and clustering algorithms. The same data is given as input to both the algorithms and it was seen that BPN works accurately with less error values and also works well in all cases. The same had been validated using confusion matrix which reveals that the time and cost complexity in BPN is less and hence predicts that BPN works efficiently and effectively well compared with Clustering.

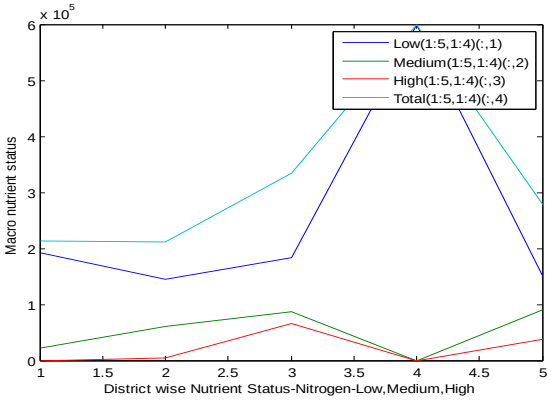

Fig. 10: Soil ratio of Nitrogen

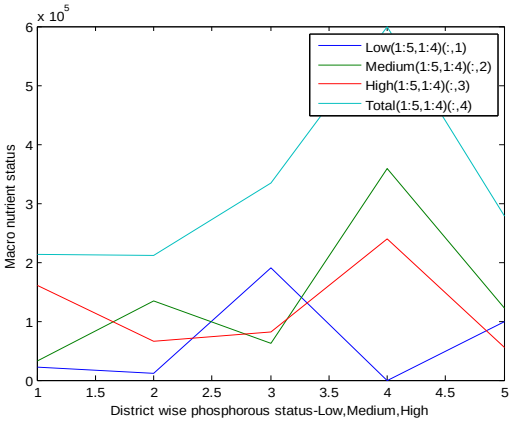

Fig. 11: Soil ratio of Potassium

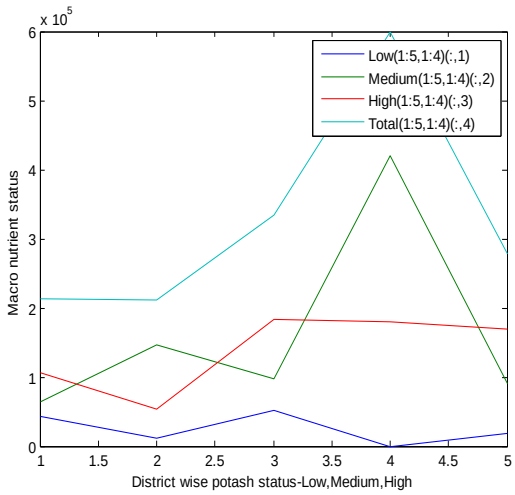

Fig. 12: Soil ratio of phosphorus

Table 1: District wise nitrogen content in the soil
Nitrogen

Low	Medium	High	Total
192139	21348	0	213487
145490	60194	5190	210874
182529	87160	65011	334700
599023	0	0	599023
150439	90071	36980	277490

Table 2: District wise potassium content in the soil
Potassium

Low	Medium	High	Total
21349	32023	160115	213487
11034	134820	65020	210874
190870	62718	81112	334700
0	359414	239609	599023
99645	122554	55291	277490

Table 3: District wise phosphorous content in the soil
Phosphorous

Low	Medium	High	Total
42698	64046	106743	213487
12084	145766	53024	210874
52348	98238	184114	334700
0	419316	179707	599023
18770	89490	169230	277490

Fig.10 district wise nutrient status of nitrogen in the soil was collected and given as input. A graph is plotted between the N ratio (low, medium, high) and the macro nutrient status. The

Line represents the low, medium, high and total ratio of N

Present in the soil respectively.

Fig.11 shows the district wise potassium content in the soil is collected and the same is given as input for a perfect study and a best output. Here the graph is plotted against the K content (low, medium, high) and the macro nutrient status of various districts. The line represents the low, medium, high and total content of K respectively.

Fig 12 shows the phosphorous content in the soil was collected district wise and is given as input. The graph here is plotted for the P content in the soil (low, medium, high) against the macro nutrient status present in the soil. The lines in the graph represent the low, medium, high and total ratio of the P content in the soil respectively.

Table 1,2&3. Tabulates the Nitrogen, Potassium& phosphorous contents in the soil respectively. This gives the approximate values of these contents District wise. We categorized these values into table and the output of this is generated through computerized system by applying the edge detection and the classification is made using fuzzy clustering and back propagation algorithm. The

proposed techniques detects the different quality of fertility. Also to construct a fully automated system based on the technique proposed which fullfils the farmers needs by increase in the production and yield of best quality crops. This is to be implemented in real time, so that India can stand first in the production of quality and cost efficient rice crops. Our future aim is to test this system on images made by some other techniques. As a final remark, we want to point out that in addition, that this proposed technique works well in all situations.

Conclusion:

The survey is made from the delta regions of Tamilnadu and collected sample pictures from those places and measures taken to improve the fertility of the crops by detecting the ratio of N, K, and P in soil content. This helps to improve the systematic approach to use pesticides for their area as per their deficit in nitrogen, phosphorus and potash. The classification of poor, better and best quality of crops is presented using BPN & fuzzy clustering algorithm. The fertility in crops is increased thus increasing the quality production of rice crops. This improves the yield of rice crops in Tamilnadu.

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