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THE PREDICTION OF RICE HARVESTING BASED ON ARTIFICIAL NEURAL NETWORK

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ABSTRACT

Crops rice is a thing he could never expected for sure, but could have predicted data in of existing. The availability of data about the outcome of rice harvesting is very substantial for use as yardstick in estimate and predicts crops rice as a gesture to fix the next planting. Artificial neural network method backpropagation often used to settle trouble complex relating to identification, predictions, pattern recognition and so on. In this study, backpropagation processing the data affecting rice crops from 2014 until 2016 to predict crop of the future. After through process of training and testing and experiment some pattern architecture network, in the network get architecture best in a prediction. This study by prediction to a hypothetical the result rice harvest season is developed with a method of artificial neural network backpropagation with average error on the examination of 0.003487 then the system this was kind of a valid.

Keyword : Artificial Neural Network, MSE, Prediction of rice harvest.

1. Introduction

The rice plants (Oryza sativa, sp) are included the food crops that are very important and useful to the Indonesians. Currently, more than 50% of national rice production are derived from the Java Island. One of rice granary in Central Java is located in Sragen regency.

However, agricultural rice cannot be estimated, but it can be predicted based on the previously data. It is influenced by many factors, such as size of land, seeds, fertilizer, pH soil and rainfall. So Artificial Neuron Network method is the method that used to observe data pattern in hope it can do a prediction of agricultural products accurately.

On 2017, Indonesian rice productions are 81,557 tons which is increased by 2,199 tons (0.973 percent) as compared 2016. Whereas in Sragen region, the product of rice fluctuated. [1] [2] [3].

Effectiveness of rice production are depends on fertilizer, pesticides, labor, capital, land, irrigation system. The factor should be fulfieled to make production is effectively. [3]. However, the Sragen region has facing limitation of land crops are sminked. Moreover, the level of fertilized land is decreased significantly. To overcome the situations, rice production parameters are uses to predict, rice production based on artificial neural network algorithm. [6] [7] [8]. Therefore, land crops become shrinked, the level of fertilized land is decreased significantly, intensity of rainfall, availability of rice seed and fertilizer.

The purpose of the research are to conduct the prediction of production result based on previously data especially on the region of Pengkok Village in Sragen.

The application of rice harvest prediction using Least Square method has been discusses aby [1] based on desktop which is built in Microsoft Visual Basic 2010, moreover the rice harvest

predict in the next season is presented using land area, rainfall and pest parameters. The predictions of rice availability using fuzzy logical and artificial neural networks, is discussed by [2]. Which is propose pattern planting using Artificial Neural Network Backpropagation has been discusses by [3], the scheduling rule prediction is proposed during a certain period with neural network backpropagation. The prototype prediction system and rice harvest result in an area Digital Image Processing the using Sobel and Otsu Methods has been explains by [4]. The prediction of dried grains time using infrared has been developed by [5]. Moreover, Artificial Neural Network is used to determine its productions based on Radial Base Function (RBF) algorithm. Food commoditions production has been presented by [6] using Backpropagation Artificial Neural Network. Resilence is predicted food reserved is predicted using Backpropagation Artificial Neural Network algorithm. It is concluded that Artificial Neural Network especially Backpropagation algoritm is widely used to predict production of maters. In this paper rice harvest production could be predicted based on following parameters such are land size, seeds, fertilizer, pH soil, and rainfall bels. Backpropagation algorithm is conducted to predict the rice harvest production based on above parameters.

Data normalization 0 to 1, normalized is used as follows:

$$X' = \frac{0{,}8(x-a)}{b-a} + 0{,}1 \text{.....(1)}$$

De-normalisasi Testing

After training process and the patterns testing that is trained, this the result that testingof proposed patterns true or not. Whereas, de-normalization process to the original data form (before normalization), the formula is :

$$x = x' \frac{(0.8.a)}{b-a} + 0.1 \text{.....(2)}$$

X' = Value X which is done de-nominated

x = The value of predicted result

a = minimum value of initial data

b = maxsimal value of initial data

Table 1. Normalization data in 2014 the growing season to I

Farmer ID	Area (Ha)	Rice Seeds	fertilizer/Kg	soil pH	rainfall	Yield/kg
1	0,9	0,9	0,9	0,6	0,9	0,8
2	0,4	0,5	0,3	0,6	0,9	0,5
3	0,7	0,8	0,5	0,6	0,9	0,7
4	0,5	0,6	0,6	0,6	0,9	0,5
5	0,2	0,2	0,2	0,6	0,9	0,2
6	0,8	0,8	0,6	0,6	0,9	0,9
7	0,6	0,7	0,5	0,6	0,9	0,8
8	0,1	0,2	0,2	0,6	0,9	0,2
9	0,6	0,7	0,6	0,6	0,9	0,5
10	0,1	0,1	0,1	0,6	0,9	0,1

11	0,3	0,4	0,3	0,6	0,9	0,3
12	0,1	0,2	0,1	0,6	0,9	0,1
13	0,1	0,1	0,1	0,6	0,9	0,1
14	0,1	0,1	0,1	0,6	0,9	0,1
15	0,1	0,2	0,1	0,6	0,9	0,1
16	0,2	0,2	0,2	0,6	0,9	0,2
17	0,1	0,2	0,1	0,6	0,9	0,1
18	0,2	0,2	0,2	0,6	0,9	0,2
19	0,2	0,3	0,2	0,6	0,9	0,2
20	0,2	0,3	0,3	0,6	0,9	0,2

Table 1 showed the result of data processing using normalisation formula (1). All original data has been transformed to new value between 0 and 1.

2. METHOD

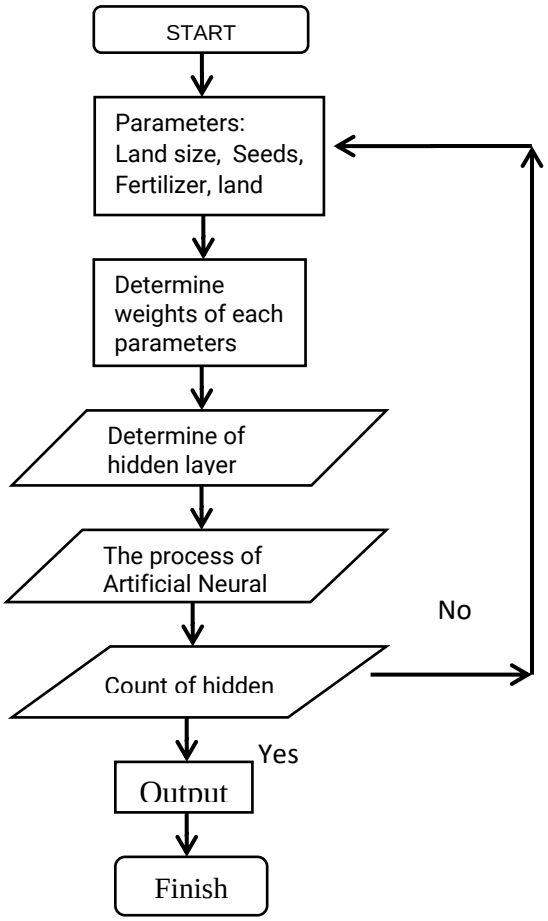

Figure 1. Prediction Flow Chart Diagram

Figure 1 showed the method has been used in this work. In order to determine the paramaters which are uses in this research. There are two proposed methods that able to collect data information about rice harvest production. The 1st method is interviewed the farmers and 2nd method data colleded from the goverment staff.

Therefore, the data could be combined from the resources. The following parameters is used such as land area, seeds, fertilizer, land pH and rainfall. Hidden layer should be determine which is influenced from the input output result using backpropagation artificial neural network. The hidden layer is choosed the best result is generated. Therefore, the data that could be used in artificial neural network program should give the saved weighted.

Artificial neural network:

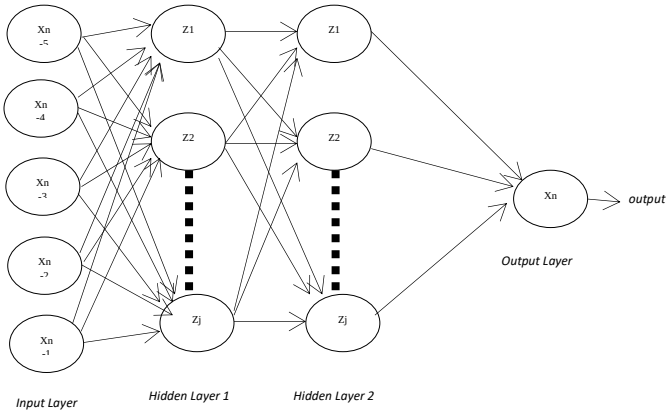

Figure 2. Architecture of artificial neural network

The designing of artificial neural network that used as follows:

- Input layer with 5 input data which are comprise of data normalization results with neuron represents which 1 data.
- Two hidden layers with the total neuron j and transfer function is logsig (sigmoid biner), because the data used after normalized have a range [0 1]. While output is generated purelin transfer function.
- One neuron of layer output which represents data 1 to n

3. RESULTS AND ANALYSIS

The following function rice harvest prediction in this research:

- ANN Training
  It is shown the training data graph on the 9th hidden experiences the for 1 to 10. The best hidden layer is 9th due to produce smallest MSE.
- ANN Testing
  It is shown the graph from the training results which is show at the 9th the hidden on the existing graph displayed.
- Rice Harvest Result Prediction
  The form that input the parameter that is needed predict the rice prediction. The forms are contained such as land size, seeds, fertilizer, land pH and rainfall. A suitable number is inserted into the form to fullfil prediction of next season.

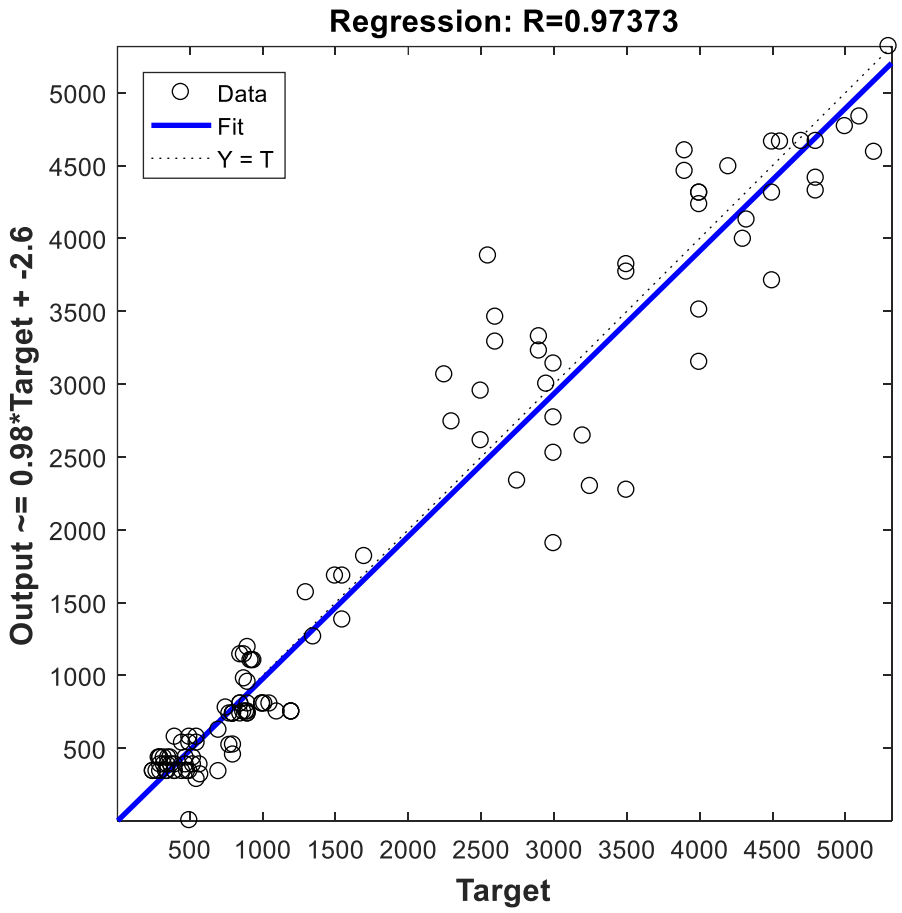

Figure 4. Regression value on 9th hidden layer trains

According to figure 4 , at data training of 9th hidden layer, the output shows that correlation coefficient (R) has 0.97373, which the best result become 1. Dot circle is the input parameters, whereas the blue line is the regression output input. The best value of regression if approached the 1.

Dot circle is the input variables that were used to prediction their crops rice. Their crops rice in estimates between 250kg until 5750kg

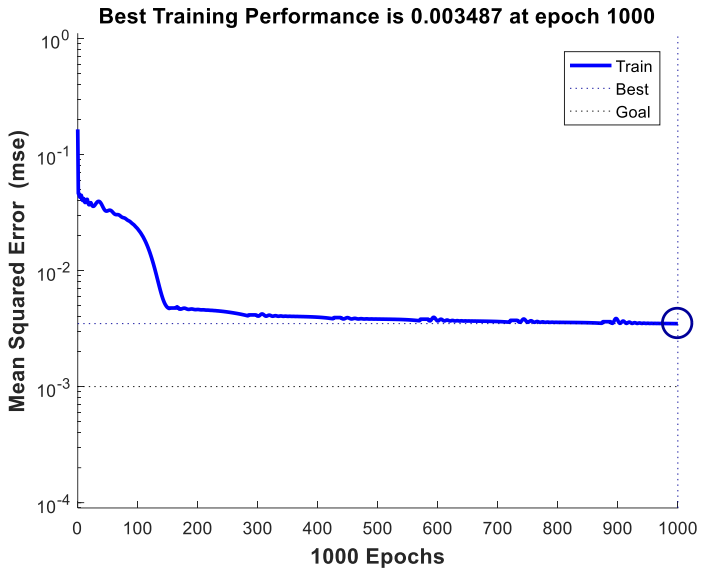

Figure 5. The value of MSE the 9th hidden layer training

According to figure 5, shows the learning process in each epoch. The iteration process should be stopped if epoch has reach 1000. Due to the limitation epoch has been reached. Moreover, MSE is less than < 0.01. Therefare , there is a chart above also shows the MSE there is no increasing after epoch 200 and charts stable until epoch 1000.

The difference between 10^{-1} and 10^{-0} because epochs between range 0 to 1000, if is not between the range there will be diffrence that are too far apart. A graph better if approaching a line in the 10^{-3} if less than that can be attributed to several factors variable it is.

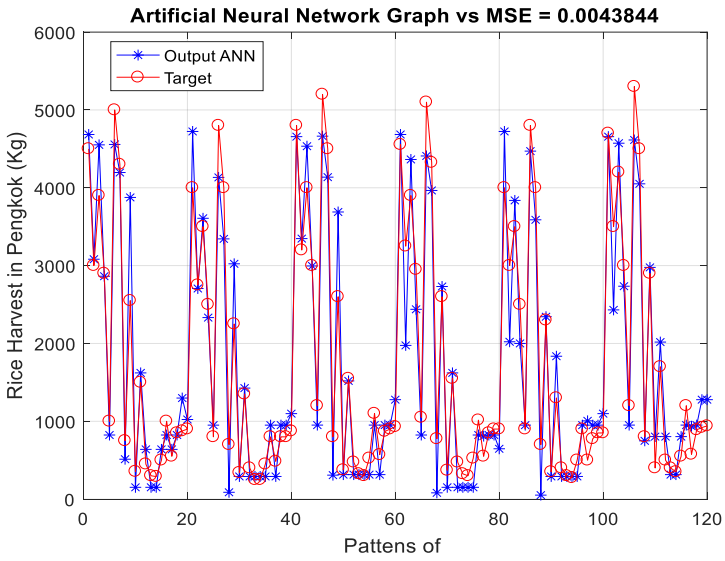

Figure 6. Artificial neural network graph vs MSE the 9th hidden layer training

According to the figure 6 the comparative target with the networks at training data. Almost half at the networks output with remarks has been occupied the some position. The best result is showned if the target and input output is occupied the same position. However, there is some condition that not have been occupied the same position due the significant error doing training.

The result in a pattern of training or data more than 100 targets and results ouput ANN same or approaching because variables affecting during the training, on the orther hand if the result of the output ANN and target less of a pattern or data to 100 in variable are caused by been influence it is.

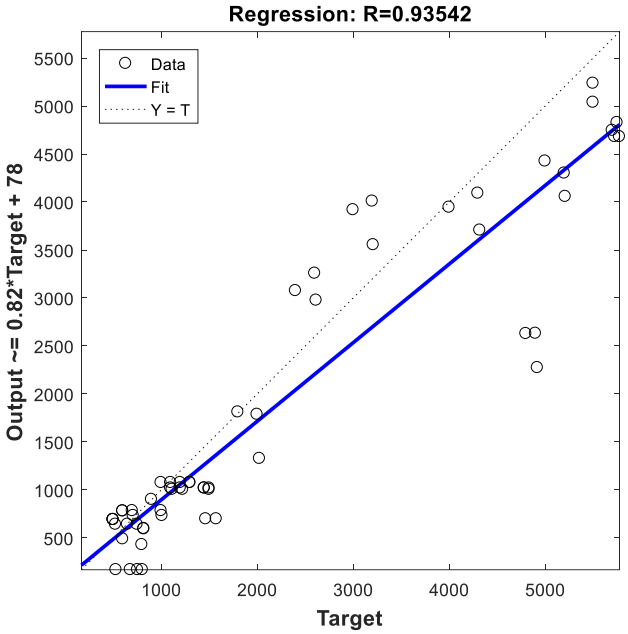

Figure 7. Regression value on the 9th hidden layer testing

Figure 7. Shown that regression value is deviated from the target because of between Fit, Y=T and data ensued variation to variable parameters used as data input so that data if adjacent to Fit or Y=T the small value the variables of parameters that is.

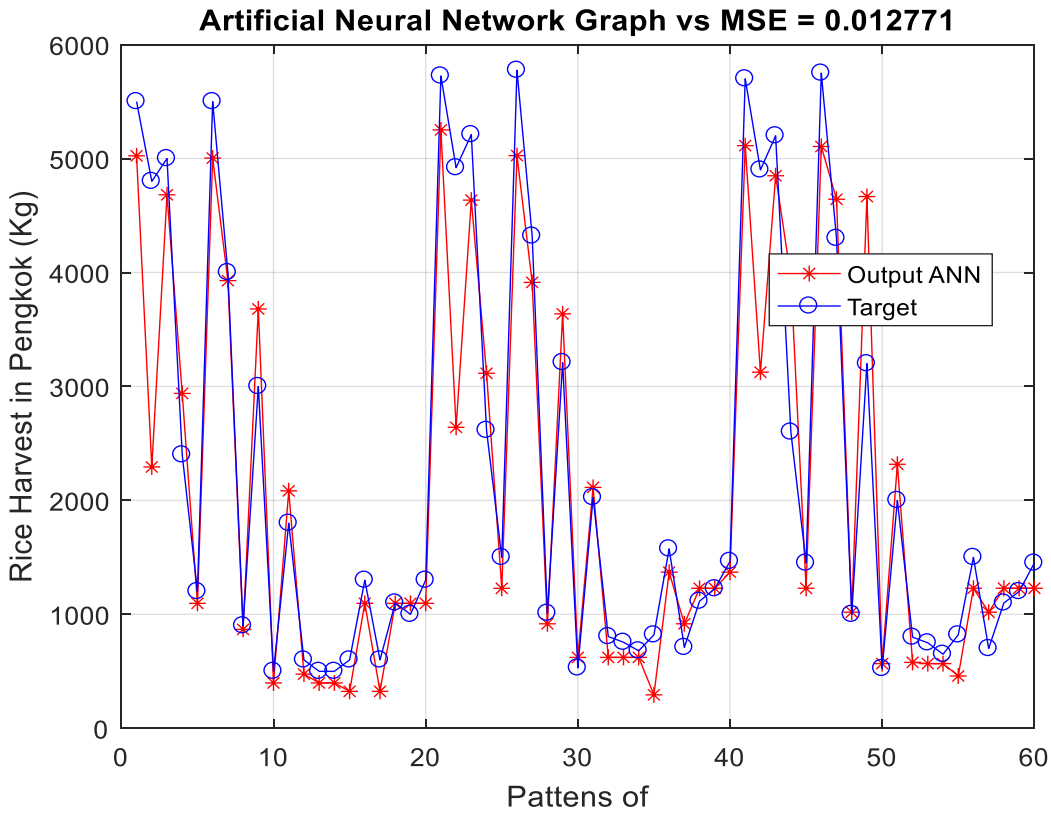

Figure 8. Artificial Neural Network graph vs MSE value on the 9th hidden layer testing

Figure 8. For differing between output ANN and target caused the diffrence variables for which there are in the used. The many variable parameters used the small deviation occcurring, if variable parameters used the less so deviation occuring the bigger.

Table 2. Training Results and Testing of Artificial Neural Networks

Hidden Layer	Regresi		MSE		Epoch
	Training	Calibration	Training	Calibration	
1	0.9653	0.9350	0.0049	0.0142	997
2	0.9549	0.9262	0.0062	0.0180	1000
3	0.9642	0.9266	0.0050	0.0154	1000
4	0.9573	0.9172	0.0053	0.0158	1000
5	0.9534	0.9300	0.0063	0.0144	996
6	0.9614	0.9210	0.0049	0.0163	988
7	0.9624	0.9330	0.0049	0.0143	998
8	0.9604	0.9462	0.0053	0.0144	985
9	0.9737	0.9354	0.0035	0.0160	1000
10	0.9669	0.9342	0.0045	0.0157	999

After training done, and patterns testing trained, it is obtained the result on table. The best result on the 9th hidden layer because the value of MSE training 0.003487 and epochs reached maximum 1000.

4. CONCLOUSION

Artificial neural network backpropagation can be used to was build the system of the prediction of the result rice harvest season. This can be seen from the results of the study by prediction to a hypothetical the result rice harvest season is developed with a method of artificial neural network backpropagation with average error on the examination of 0.003487 then the system this was kind of a valid.

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