ARTIFICIAL NEURAL NETWORK: PHYSICO-CHEMICAL AND MACRONUTRIENTS IN AN AQUAPONIC SYSTEM

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2020

AUTHOR'S DECLARATION

I declare that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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SUPERVISOR'S CERTIFICATION

We declared that we read this thesis and in our point of view this thesis is qualified in terms of scope and quality for the purpose of awarding the Bachelor of Chemical Engineering (Environment) with Honours.

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ACKNOWLEDGEMENT

I'm very grateful for the completion Final Year Project II as one of the requirement that need to be accomplish to complete the total credit for Semester 8. Therefore, I would like to express our deepest appreciation to all those who help, guide and give knowledge either directly or indirectly even during the COVID-19 pandemic.

Firstly, I'm are deeply indebted to T.s Mohamed Syazwan Osman as my supervisor who always helps me improving and advising me a lot of things in completing my project report and gives an idea in enhancing the quality of my project with determinant and integrity.

Special thanks to my mom for supporting me when I lost my motivation and having difficulties to complete FYP II report.

This report has been prepared with the cooperation and support from many people. Lastly, I would like to thank to people who support and give me inspire to help to finishing my final year project. Without their support this FYP II report are impossible to be completed. These commitments enabled me to succeed in completing this report on time and also helps me to improve my engineering knowledge and practice as an engineer. Thank you for your support.

ABSTRACT

Aquaponics system which integrates conventional aquaculture and hydroponic in one closed-loop system plays a significant role as an alternative way to produce very least waste effluent to the environment by recycling back the nutrients (fish waste) for plant growth. Prediction of water quality parameter in wastewater using conventional mathemical modeling is very complex to simulate and model out the system. Therefore, this paper proposed ANN model to evaluate graph comparison between the performances of the actual data from aquaponics activity and forecast data from simulated artificial neural network (ANN). Then, the best algorithms will be selected in a variety of neuron numbers of the ANN's model. The parameter such as pH, DO, TAN and percent total sludge of Phosphorus (P) and Nitrogen (N) were investigated by taking the input and target data value from the selected research paper covering the fields of aquaponic. In this study, the Artificial Neural Network (ANN) involving Levenberg-Marquardt (LM) and Scaled Conjugate Gradient (SCG) training function were used to measure those parameters to obtain the predict value. For parameter pH, DO, TAN, ranges hidden neurons of 4, 6, 8, 10, 12, and 13 were studied. Meanwhile, ranges hidden neurons of 3, 4, 6, 9, and 12 were studied for total sludge (P and N). Different range neurons value was used for pH, DO, Tan and Total Sludge (P and N) due to different input data found in literature. The outputs from the model of the training function LM show the most optimum neuron number for each parameter of pH, DO, TAN at neuron 6. As for total sludge (Nitrogen and Phosphorus), the most optimum neuron number at neuron 3. For the training function SCG, the most optimum neuron number at neuron 4 for each parameter of pH, DO, TAN and at neuron 9 and neuron 4 were the most optimum neuron number for parameter Total Sludge (N and P). The result for the most optimum neuron number can be explained by the value of Sum Squared Error (SSE) Mean Absolute Percentage Error (MAPE%) with the lowest value. The investigated forecast parameters of the trained neural network according to correlation coefficient (R) and Mean Square Error (MSE) showed LM performed better rather than SCG.