

# Implementation of Forward Chaining Estimation of Ideal PH for Plant in Hydroponics Assistant Based on IoT

Eki Kesuma Muhammad\*, M. Nurkamal Fauzan , and M. Harry K Saputra

Politeknik Pos Indonesia

Jalan Sariosih No.54, Sarijadi, Sukasari, Kota Bandung, Jawa Barat 40151

\*e-mail: kesumaeki1@gmail.com

## Abstract

*Hydroponics is a method of planting crops through a medium of water that can live indoors or outdoors, hydroponic plants using NFT techniques (Nutrient Film Technique), where water and nutrients can circulate through plant roots. PH is the measurement of nutrient solution in acid or base state. Water pH can affect plant growth rates in hydroponic cultivation. In the PH study can survive at the value of 5.6-5.7, but some plants require different PH values. Therefore, a tracking is needed to determine the ideal plant type used in PH value between 5.6-5.7. This study aims to determine the ideal PH for plants on hydroponics. Forward Chaining is a forward search that begins to collect some facts by searching for the same rules with the existing hypothesis to the conclusion. This model is used to determine the type of plant in hydroponics that corresponds to PH that can survive in previous studies. Observations showed good PH values for hydroponic plant species. This research is used to find out the ideal PH for plant type in hydroponics using Forward Chaining method.*

**Keywords:** NFT, Hydroponics, Forward Chaining, dan PH

*Copyright © 2013 Universitas Ahmad Dahlan. All rights reserved.*

## 1. Related Works

The hydroponics is a method of planting crops through a medium of water that can live indoors or outdoors, hydroponics plants using NFT techniques (Nutrient Film Technique), where water and nutrients can circulate through plant roots. In a hydroponic system, fertilizer is used mixed with water, which is then referred to as hydroponic nutrition or nutrient solution. [1] There are five sensors used in hydroponic development, eg PH, EC (Electrical Conductivity), water temperature, and water level. Temperature and ultrasonic PH sensor taking Value of nutrient acid acidity solution, EC sensor taking Value of water-soluble nutrients, Temperature sensor take the value of water temperature in the nutrient tank, and ultrasonic sensor takes the value of water level in the nutrient tank. PH sensor is used to monitor PH level of wireless sensor network-based solution. The PH sensor is used to measure the PH level in aqueous solution and transfer a compatible signal to the microcontroller to process and provide an output signal to the valve to drop the adjuster PH solution.[2] Difficulty determining the solution of nutritional conditions for plant growth, then to maintain PH with water pump (to drain pH up solution, down pH solution, water, nutrient solution, nutrient B solution) Integrated with web cloud service and mobile application System will be implemented connected with internet using ESP8266 module Based on the collected knowledge base can be made decision tree by forward chaining method. The search is done for each condition The decision tree will be used to help the process create a rule base which will ultimately be used to determine the conclusion and the solution there is a condition The number in the tree represents the state of nutrients Conditions, if the conditions are true then will be sought to proceed by following 'yes' to the next state, not if the state is not true the search will continue by following 'no' to the next state Search will end when the search process is up roots poh on, the last situation. So, it will be concluded in the last state with 'K' ID means Condition ID.[3]

Emphasis is placed on the process of identifying and analyzing design and application testing, documentation and maintenance issues. With literature study and consultation with experienced quail breeders Inference Engine Concept is done using Production Rules IF, AND, THEN mechanism through forwarding Chaining. The concept of user interference and dialogue that flourishes with manufacturing interface User-friendly for easy filling of data and facts Output is presented in the form of information whose confidence value is diagnosed Disease attacking quail, while the validity of comparative test results with quail experts Farmers. In addition, development application tools use JAVA as the language of construction.[4] Forward Chaining is a search technique that begins by collecting known facts, then adjusting the known facts using the IF function part of the IF-THEN rule. This method of forwarding chaining has two inference techniques such as Backward Chaining backward tracking which initially begins with the reasoning of a hypothesis of a reality that has the conclusion of the process. And the second is Forward Chaining which is the reverse of backward Chaining Backward tracking which is where in process starts from the set of data to a conclusion.[5] The Forward Chaining method can provide accurate information and results from the resulting diagnostic conclusions. The process of using Forward Chaining method by determining the rules and calculations based on the facts that appear, and referred to as symptoms. There are several things that need to be considered in using Forward Chaining method using the following rule syntax:

IF E THEN H

E: Evidence (Facts)

H: Hypothesis (Conclusion)

The evidence rule has more than one connection by a combination of AND or OR, and a combination of both. But it should avoid using AND and OR on one rule.[6]

In the PH study can survive at the value of 5.6-5.7, but some plants require different PH values. Therefore, a tracking is needed to determine the ideal plant type used in the PH value between 5.6-5.7. This study aims to determine the ideal PH for plants on hydroponics. Forward Chaining is a forward search that begins to collect some facts by looking for the same rules with the existing hypothesis to the conclusion. This model is used to determine the type of plant in hydroponics that corresponds to PH that can survive in previous studies. Observations showed good PH values for hydroponic plant species. This research is used to find out the ideal PH for plant type in hydroponics using Forward Chaining method. This model is used to determine the type of plant in hydroponics that corresponds to PH that can survive in previous studies. Observations showed good PH values for hydroponic plant species. This research is used to find out the ideal PH for plant type in hydroponics using Forward Chaining method.

## References

- [1] Helmy, M. G. Mahaidayu, A. Nursyahid, T. A. Setyawan, and A. Hasan, "Nutrient film technique (nft) hydroponic monitoring system based on wireless sensor network," in *2017 IEEE International Conference on Communication, Networks and Satellite (Commnetsat)*, Oct 2017, pp. 81–84.
- [2] D. Eridani, O. Wardhani, and E. D. Widiyanto, "Designing and implementing the arduino-based nutrition feeding automation system of a prototype scaled nutrient film technique (nft) hydroponics using total dissolved solids (tds) sensor," in *2017 4th International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE)*, Oct 2017, pp. 170–175.
- [3] S. E. Wortman, "Crop physiological response to nutrient solution electrical conductivity and ph in an ebb-and-flow hydroponic system," *Scientia Horticulturae*, vol. 194, pp. 34 – 42, 2015. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S0304423815301199>
- [4] C. Fiarni, A. S. Gunawan, Ricky, H. Maharani, and H. Kurniawan, "Automated scheduling system for thesis and project presentation using forward chaining method with dynamic allocation resources," *Procedia Computer Science*, vol. 72, pp. 209 – 216, 2015, the Third Information Systems International Conference 2015. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S1877050915035942>

- [5] R. E. Saputra, B. Irawan, and Y. E. Nugraha, "System design and implementation automation system of expert system on hydroponics nutrients control using forward chaining method," in *2017 IEEE Asia Pacific Conference on Wireless and Mobile (APWiMob)*, Nov 2017, pp. 41–46.
- [6] B. H. Hayadi, K. Rukun, R. E. Wulansari, T. Herawan, D. Dahliyusmanto, D. Setaiwan, and S. Safril, "Expert system of quail disease diagnosis using forward chaining method," *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 5, no. 1, pp. 206–213, 2017.