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# Implementation of Rule-Based and Internet Methods of Things for Optimizing Water Management for Improving Seed Quality

**Yana Aditia Gerhana[1], Deden Suparman[2]**
[1,2]UIN Sunan Gunung Djati Bandung, Indonesia

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**ABSTRACT**

System hydroponics Nutrients Film Technique (NFT) is one of the increasingly popular plant cultivation techniques used because it can increase the efficiency of water and nutrient use as well as crop yields. The NFT Hydroponic System has problems that are often faced in the form of control that must be optimal for important parameters like pH, temperature water, And concentration nutrition, so that can influence plant health and growth and need a good environment controlled To avoid decline quality plant or withering plant. Study This design uses Arduino Uno as a center controlsystem monitoring hydroponics NFTs Which in add sensors pH For read value from pH water, sensors TDS used For read densitynutrition, sensors temperature DS18B20 used For read temperature water Because own waterproff and water sensor features flow to read the amount of water flow. Data is read by the sensor and Then sent to Firebase through module NodeMCU which has been connected to the Arduino Uno then from Firebase it is created output form information to the user through the application mobile. Results testing done with the use 3 media Which were different as much 60 time experienced 58 successes and 2 failures resulted in a score accuracy of 96.6% of the total testing.

***Corresponding Author:***

Yana Aditia Gerhana
Informatics Department, Faculty of Science & Technology, UIN Sunan Gunung Djati Bandung
Jl. A. H. Nasution No. 105, Cibiru, Bandung, Indonesia. 40614
Email: yanagerhana@uinsgd.ac.id

## 1. INTRODUCTION

Information Technology especially the Internet Technology of Things (IoT), provides opportunities for the management And production seed suitable coffee with the expected soil characteristics. Through technology (IoT) you can give treatment to seed, so sown seeds Can adapt to soil characteristics such as level of humidity soil, temperature, substance nutrients, etc. Currently, research on IoT Technology has Lots carried out [1]. Study the Can adopted And implemented For interest progress agriculture public village. Hydroponics NFTs utilise circulation water Whichcontains nutrients needed by plants. Nutrient hydroponic system Film Technique (NFT) is also a plant cultivation technique It is increasingly popular because it can increase the efficiency of water use And nutrition as well as higher crop yields [2]. Compared to agriculture Which uses medialand, the NFT system has several superioritys namely, availability of nutrition And oxygen on eternal roots abundant. However, obstacles are frequently faced in system hydroponics NFTs is control Which optimal parameters important like pH, temperature water, And concentration nutrition, so thatcan influence the health And growth of plants as well as very need controlled environment To avoid decline quality plants or withered plant. Method rule-based and Internet of Technology Things (IoT) become alternative solutions For overcoming constraints in control of important parameters on system hydroponics NFTs. Method rule-based can used as an approach For developing rules control Which is appropriate based on the measurement data obtained from the installed sensors on system hydroponics NFTs. Whereas technology IoT can possiblereal-time data collection from the installed sensors on system hydroponics

NFTs, which makes it easier to control parameters important based on the results of data analysis which is obtained.

## 2. METHOD

*Asset* Approach *Based Communities Development* (ABCD) is used as an approach
Figure 1. ABCD method process (nurturedevelopment.com, 2018)

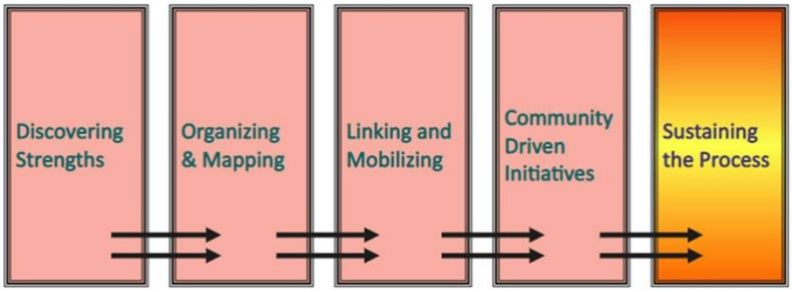


Figure 1. ABCD method process (nurturedevelopment.com, 2018)

## 3. RESULT AND DISCUSSION

System Architecture is a description of the system that will be built, This image also includes all related entities of the system to be built on research on this hydroponic monitoring system.

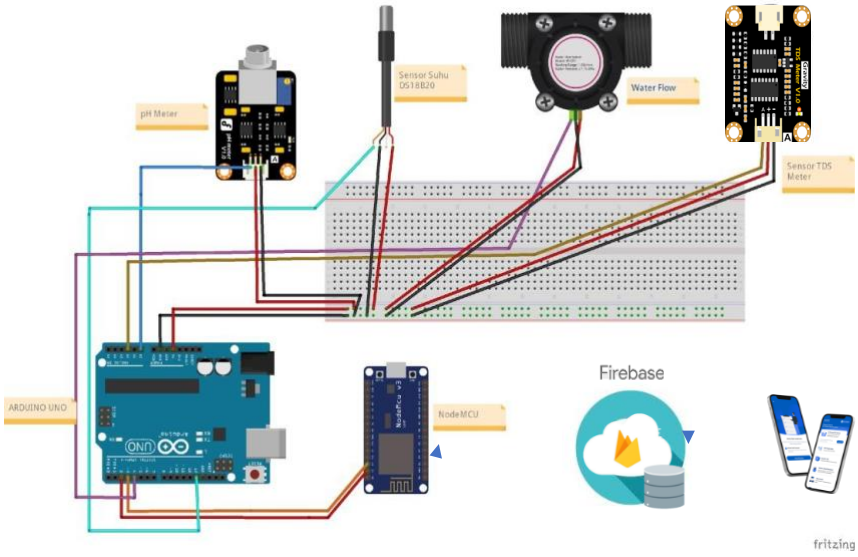


Figure 2. Architecture System

The sensors used confirmed that they have been calibrated and were formerly applied in the field.

1. **Censorship pH**: calibration sensors pH done with the useof buffers pH, or pH meters Which Already calibrated. The formula used To measure the pH of wateris as follows:
   voltage = 5 / 1024. PinValue ; ph = 7 + ((2.5 - voltage)/0.18);

   Information:

   a. Mark Pin : Mark pin which is read sensors
   b. Voltage : the voltage generated from the marking pin Which is read by sensors
   c. pH : Mark Ph Which generated sensors

2. **Censorship *Water Flow***: calibration of the sensor's *water flow* done with the method measuring water Which skipped the sensor's *water flow* withglass measuring Then compare a value with the mark obtained from *the water sensor flow [3].* The formula used to measure *water flow* is as follows:

liters Per hour = (sensor_pulse *1/7.5);

Information:

a. Liters per hou: Mark water flow during 1 hour
b. Pulse_sensor : Mark obtained from sensors water flow

3. **TDS Sensor**: TDS sensor calibration is carried out to measure the value of the concentration level of solid objects contained in water (TDD Value). The formula used to measure the TDS valuewater are as follows:

Voltage = PinValue *(5.0/1023);

TDS = (211.2254* voltage) - 144.1466;

Conductivity = (0.3442 * Voltage) - 0.253;

Information:

a. Mark Pin : mark pin which is a read sensors
b. Voltage : voltage Which generated from mark pinWhich be read by sensors
c. TDS : Mark TDS on water.
d. Conductivity : Mark conductivity in water

4. **DS18B20 Temperature Sensor**: DS18B20 temperature sensor calibration is by comparing the sensor measurement results with results thermometer measurements / other temperature measuring devices.
5. **RTC (*Real Time)* Module *Clock:*** RTC module calibration iswith adapt time on At the moment on *the sketch* Arduino.
   a. Change format data received by Arduino become JSON,so that Can sent to firebase.
   b. Nodemcu accept parse data from Arduino form formatJSON, which is then sent to firebase.
   c. Data Which Already saved in databases firebase Then inget by system applications pond water monitoring.
   d. Data Which Already in get processed use rule-basedFor then displayed on application.

### *3.1. Implementation Prototype*

Process implementation prototype This is process development prototype from system Which real. Prototype This built usea series of tools and sensors built according to existing designs built on the system architecture found in chapter 3, a series of tools andThe sensors used are: Arduino Uno R3, NodeMCU ESP8266, sensorspH , TDS sensors, temperature sensors, water sensors flow as well RTC module.

The following Figure 3 is a series of systems or prototypes system hydroponic optimization Nutrient film technique (NFTs).

Figure 3. Description Prototype System

### *3.2. Testing System use water AB Mix*

The first test is by using water that has been given AB Mix mixture which is a nutrient used for growth Plant flowers are well maintained, giving AB Mix has been measured with a predetermined dose to produce the right nutrition for plants according to the age of the plant [6]. Testing using AB Mix water is carried out to determine the accuracy of the reading results sensor by reading the value that will be produced by the Ph sensor, Sensor TDS, Temperature Sensor and *Water flow Sensor.*

Table 1 Following is data results testing with usewater which has been mixed AB Mix .

Table 1. Testing use water AB Mix

| No | Time | pH | TDS (ppm) | Temperatur | Water Flow(L/M) | Application |
|---|---|---|---|---|---|---|
| 1 | Saturday, 12:55:05 | 6.97 | 1257 | 27,20 | 1.75 | Sent |
| 2 | Saturday, 13:00:05 | 7.01 | 1268 | 27.14 | 1.78 | Sent |
| 3 | Saturday, 13:05:05 | 7.23 | 1310 | 27.14 | 1.90 | Sent |
| . | Saturday, 13:10:05 | 7.12 | 1287 | 27.10 | 1.95 | Sent |
| . | Sunday, 11:52:23 | 7.14 | 1302 | 26.48 | 2.04 | Sent |
| . | Sunday, 11:57:23 | 6.98 | 1288 | 26.76 | 2.10 | Sent |
| | **Mark Average** | **7.05** | **1278** | **26.68** | **1.96** | |

### *3.4. Discussion Results Testing*

According to Subagyo in effectiveness is suitability between the output and the set goals. Effectiveness must be rated above based on goals that can be implemented, not based on the concept of goals maximum. Effectiveness can be measured using appropriate standards concerning the Ministry of Home Affairs' Research and Development in [4] as in the table under :

Table 2. Table Effectiveness

| Ratio Effectiveness | Level Achievements |
|---|---|
| Under 40 | Very No Effective |
| 40 – 59.99 | No Effective |
| 60 – 79.99 | Enough Effective |
| On 80 | Very Effective |

After carrying out various kinds of tests on systems with use 3 media Which different that is media water AB Mix , water faucet And watersoap (detergent). Then data can be taken from all the tests in the data andlook for percentage test result.

### 3.5 Testing Method Rule-Based

*Rule-based* method testing This aims to determine performance from the method used, what is the input value taken by the sensor with the output displayed by the mobile application by the rules Which made on method *rule-based* . Testing method *rule-based* This done as much 21 time with 3 media testing Which different that is waterAB Mix , tap water and water soap [8].

Table 3 Under This is results testing *rule-based* method *.*

Table 3. testing method rule-based

| No | Media | Mark pH | Mark TDS | Temperature | Water Flow | Results Outputs | |
|---|---|---|---|---|---|---|---|
| | | | | | | Correct | Wrong |
| 1 | Water AB Mix | 7.13 | 1263 | 26.54 | 1.80 | ✓ | |
| 2 | Water AB Mix | 7.09 | 1259 | 26.70 | 1.89 | ✓ | |
| 3 | Water AB Mix | 7.20 | 1241 | 26.30 | 2.11 | ✓ | |
| . | Water AB Mix | 7.15 | 1300 | 26.32 | 2.14 | ✓ | |
| . | Water AB Mix | 7.13 | 1297 | 26.32 | 2.09 | ✓ | |
| . | Water AB Mix | **7.09** | **1268** | **26.29** | **2.09** | ✓ | |

## 4. CONCLUSION

Study about Optimization system Hydroponics Nutrients Film This technique has been successfully implemented. This research was conducted to help farmers in optimizing the Hydroponic System from a monitoring perspective so that grow flower plants can on the beach optimally, besides That Also flowing water conditions containing pH levels , nutrient concentration, temperature and amount debit current water can noticed Where just through application Which built.

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