Web Portal Analysis Of Agriculture As Vertical Center Smart Investment Information Hydroponic

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1. Introduction

1.1 Background

The level of fruit and vegetable consumption per capita in Indonesia amounted to only 34,55kg / year and 40,35kg / year, far below the recommendation *food and Agriculture Organization* (FAO). To meet the needs of vegetables in Indonesia needed improvements to agricultural crops. While the land area affect agricultural crops. Currently in Indonesia increasingly narrow land, especially in urban areas. Not a few residents of the city who have interest in farming. But with the condition of the land of the narrow and limited time availability dissuade make urban residents to grow crops. Not a few people who do not want to bother to grow crops. The solution to overcome these problems a hydroponic system is used.

Hydroponics is the technique of farming with water media that works as a soil substitute alternative media. Hydroponics is derived from the Greek, *Hydroponic* meaning *hydro* means water and *polo us* meaning full work. There are several types of hydroponic techniques used by urban dwellers include, *Flow System, Wick System, aeroponic system, Drip System, Water Culture System* and NFT *(Nutrient Film Technique).* One type is the most widely used is the NFT. *Flow System* a growing medium is placed in a container which is then filled with the nutrient solution. Then the nutrients are returned to the shelter, and so on. These systems require a pump connected to a timer. *Wick System* is the simplest technique popularly used by beginners. The system includes a passive and nutrients to flow into the growth medium of the container using a type of wick. *Wick System* works well for small plants and herbs. The hydroponic system does not work well for plants that need a lot of water. *System aeroponic* hydroponic technique allows plant owners to obtain good results and the fastest compared to other hydroponic systems. It is caused by a nutrient solution comes in the form mist directly into the roots, making the plants more easily absorb the nutrients it contains a lot of oxygen. NFT *(Nutrient Film Technique)* is a special type in hydroponics was first developed by Cooper DR.AJ Glasshouse Crops Research Institute in Little hampton, England in the late 1960s and developed in the early 1970s commercially. The basic concept of the type of NFT Hydroponics is a method of cultivating plants with roots of plants growing in hydroponic nutrient layer shallow and to circulate so that the plants can get enough water, nutrients and oxygen. Plants grown in a layer of *polyethylene* with plant roots submerged in water containing a nutrient solution is circulated continuously with a pump. The root zone in a nutrient solution can evolve and grow in the shallow nutrient solution so that the top of the roots of plants are on the surface between nutrition and *story foam,* their roots in the air passage allows oxygen can still be fulfilled and sufficient for normal growth. Factors - factors that affect the growth of hydroponic plants are temperature, nutrients, acidity (pH). (how-plant-hydroponic-systems-NFT-html, 2015)

Hydroponics are there in the community in general are still using manual systems and relatively expensive in terms of time, among others, to measure the content of acidity (pH) in the water, measurements of Nutrition (PPM) and know that plants need water temperatures suitable for plants to grow well. Here are the data requirements of pH and nutrients required by plants in Table 1.1.

Table 1. Data Terms Nutritional Requirements and pH

Plant Names	pH	PPM
Lettuce	3.5-6.5	560-840
Kale	3.5-6.5	1050-1400
Pakchoy	4.0	1050-1400
Spinach	3.5-6.6	1260-1610

	Strawberry	3.5-6.5	1260-1540

To help system the hydroponic automation can be used in the measurement and control of plant growth by using Microcontroller. A microcontroller is the brain of an electronic system such as micro proccessor as the brain of the computer. A plus for micro controller is the presence of memory and Port *Input / Output* in a compact IC packaging. This capability is *programmable,* comprehensive features (internal ADC, internal EEPROM, I / O ports, Serial Communications, etc.) and also an affordable price allows the microcontroller used in various systems electronically, such as robots, automation of industrial, alarm systems, telecommunications equipment, to household appliances. In addition to the development of technologies such as microcontrollers needed IOT *(Internet of Things).* IOT became a separate research field since the development of internet technology AND other communication media, the growing human use of technology, the more research that will be present, *the internet of things* one of the ideas of the researchers that optimize several such tools sensor media, *radio frequency identification* (RFID), *wireless sensor networks* and *smart object* other that allows people easily interact with all the equipment that is connected to the Internet network. According *Q. Zhou & Zhang,*2011,the IOT application can identify, locate, track, monitor objects and trigger the corresponding event automatically and in real time. (Junaidi, 2015)

With the adoption of automation technology in hydroponics can control some aspects such as water temperature, acidity and alkalinity of the water (pH), nutrition and the development of hydroponic plants. IOT facilitate their control activities can be carried out remotely via *the web* or apps. *Mobile* Controlling can be done in the form of an estimate on the number of harvest, determine suitability plant more than one plant that can be grown in a hydroponic same and to know the plant data. With this technology is expected to be more effective and facilitate the work of the urban population. Based on this background the authors do an analysis of the hydroponic system that has been made by previous researchers. However the existing system there are still some shortcomings such as lack of precise detection of plants that do camera. Yields have not been as expected. Websites that have made the safety level is still *low.* This above is the background for the author's take on the topic of hydroponics system and do an analysis on the website hidroponik.ubl.ac.id in the preparation of scientific writing, entitled **"WEBPORTAL ANALYSIS OF AGRICULTURE AS VERTICAL CENTER SMART INVESTMENT INFORMATION HYDROPONICS".**

2. Literature Review
2.1 Literature
To support this study used several relevant theoretical basis and related to the subject as follows:
2.1.1 Research conducted by Ida Syamsu Roidah "Land Use Using Hydroponics System"
Agriculture is a sector that very important for the people of Indonesia. The agricultural sector as a source of income for the community, because most of Indonesia region is agricultural land. Farmers traditionally use the land for the media. Seeing the number of land that is not used by the public for agricultural land, it is currently done in the development of agriculture. Technological developments in the field of agriculture the more years of growing rapidly, so that the public, especially farmers left behind in utilizing technological advances will not get the maximum benefit from doing business activities. One viable technology disseminated is hydroponics, this is due to the increasing scarcity of agricultural land as a result of many industrial and services sectors, so that conventional agricultural activities increasingly uncompetitive because of the high price of land. Agricultural cultivation technology with a hydroponics system is expected to be an alternative for people who have limited space, so it can serve as an adequate source of income. Hydroponics is a method of farming using planting medium other than soil, such as pumice stone, gravel, sand, coconut fiber, wood or foam pieces. This is done because the function of the soil to support plant roots and intermediaries can be replaced with a nutrient solution or increase the flow of nutrients, water and oxygen through the media.
2.1.2 The Second Study Was Conducted By Muhammad Rivai, Rudy Dikairono And Adi Tomi About "Phand Temperature Monitoring System Water with Transitional Data Wireless"

There are several methods to measure acidity (pH) and temperature from a solution, such as that with the conventional method , In the measurement of pH using litmus paper or pH paper. This method is less practical and measurement results with this method is less accurate and can only be used for one measurement only. This means for measuring the pH of the solution that is much in need of litmus paper that much so costs are also getting bigger. The measurement method is by using electronic tools *LM35* to measure the temperature of the water and the pH meter with the sensor of the electrode (probe) which is able to measure the acidity with faster, more accurate and precise than with conventional methods. However, for the purposes of monitoring is not effective because the owner of a fish farm should come at any time to check the levels of acidity (pH) tambaknya.oleh therefore necessary to attempt to devise a system of monitoring the acidity (pH) is effective without having to come to the place the fish breeding pond. For monitoring the pH and the temperature at the required wireless remote place as the sender of data to be monitored without having to come to the nursery fish *wireless* used is a *RF Type 802.13.4 Modules X Bee Pro* is able to transmit data at a considerable distance of about 48 m without obstructions , The results of measurements of pH sensor voltage linear with respect to the levels of PH. Where to pH below 7 has a positive voltage for pH 7 (neutral) output is close to 0 volts and to a pH greater than 7 has an output voltage that is negative. To open the lid valve control *valve* used control *window* and *PWM* made in the program the microcontroller. Circuit *PWM* can work well to control the opening of the valve.

2.1.3   The Third Study Was Conducted By Apri Junaidi About The "Internet Of Things, History, Technology And Practice"

The use of computers in the future be able to dominate the work of man and beat the man computing capabilities such as remote control devices using the internet, IOT *(Internet of* Things) allows users to manage and optimize electronic and electrical equipment that uses the internet. In the near future communication between the computer and electronic equipment capable of exchanging information between them, thereby reducing human interaction. It also will make Internet users is increasing with various facilities and internet services. IOT emerged as a major *Internet issue.* It is expected that the billions of physical things or objects will be equipped with various types of sensors connected to the Internet through a network and support technologies such as embedded sensors and actualization, *radio frequency identification* (RFID), wireless sensor networks, real-time and web services, IOT actually *cyber* physical system or a network of networks. With the huge number of things / objects and sensor / actuators are connected to the internet, magnitudes and in some cases real-time stream will be automatically generated by the things that are connected and the sensors. Of all the activities in the IOT is to collect raw data right in an efficient manner, analyze and process the raw data into valuable information. *Internet of Things* in the application can identify, locate, track, monitor objects and trigger the corresponding event automatically and in *real-time.* Development and application of computer, *Internet* and other Information and Communication Technology (ICT) have a great impact on society of economic management, production operations, social management and even personal life.

2.1.4   The Fourth Study Conducted By Fanny Astria, Mery Subito And Deny Wiria Nugroho Entitled " Design Of PH And Temperature Measuring Instrument Based Short Message Service (SMS) Gateway"

*C*ommunication technology these days is growing rapidly. It is certainly easier for humans to communicate and get the latest information easily from any location. Seeing the current conditions, the use of communications technology in the monitoring system is already widely used even though there were many obstacles in the process of sending and receiving data. One form of modern communication technology utilization is how to monitor the pH and temperature of a fish farming in order pH and temperature information can be displayed on the computer. Measurement of acidity (pH) and temperature in the water is something very important in fish farming. So it is very important to keep the water temperature in the PH and levels remained stable. There are several conventional methods, using litmus paper or paper (pH). This method is less practical and less accurate measurement results and can only be used for one measurement only. This means it will increase

costs. By looking at these conditions created a new breakthrough ideas, to maximize the harvest of fish, it should be made a tool that monitors the levels (pH) and the water temperature in fish farms. So much easier for employers pond in monitoring levels (pH) and the temperature of the pond water. Based on these ideas, the authors raised the thesis title is *"Designing Measurement (pH) and temperature miccrocontroller Based AVR 128 and SMS Gateway"*.

3. Results And Discussion

3.1 Software Design

Software design in this NFT hydroponic automation system, aims to control and regulate every input and quadrant (I / O) so that the system works well. The system used in programming automation systems are hydroponic If Else. The entire setting is done with a software program arduino then convert to the AVR Burner Extreme software so it can be inserted commands to the microcontroller via USB ASP loader. Here is a flowchart for software design automation systems hydroponic NFT.
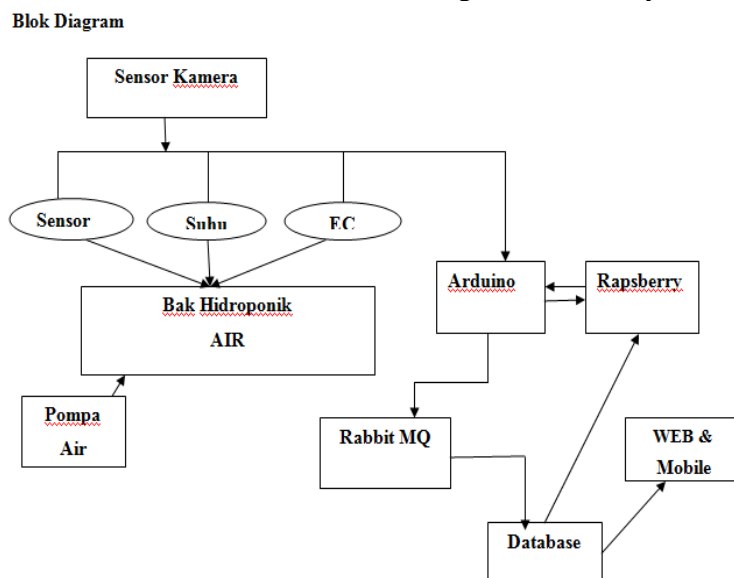
Figure 1. Block Diagram Design Hydroponics

Description workflow in software design Hydroponics system:

1. pH sensors send input of acidity in the water. Camera sends images of plants as an input;
2. Temperature sensors send input of the water temperature levels;
3. EC sensors send input of nutrients in the water
4. Arduino receive data is then processed and sent to the raspberry pi
5. Raspberry receive data is then sent to the Rabbit MQ;
6. Rabbit MQ queue process data that is then sent to Databsae
7. The database stores data sent from from Rabbit MQ
8. Opera- already stored in the database and then displayed on the Website and Mobile.
9. Raspberry requests a rule requirements existing plants in the database, if the data does not meet the raspberries will send commands to arduino
10. Arduino sends the action to the valve and the water pump.

3.2 Hydroponics System Architecture Design

Architecture design scheme of work flow hydroponics system can be seen in Figure 3.2 below.
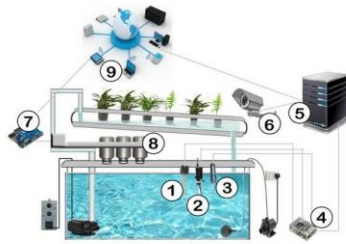
Figure 2 Architecture Design Hydroponics

From architecture design in Figure 3.2 above can be explained workflow hydroponics system like the one in figure 3.3 below
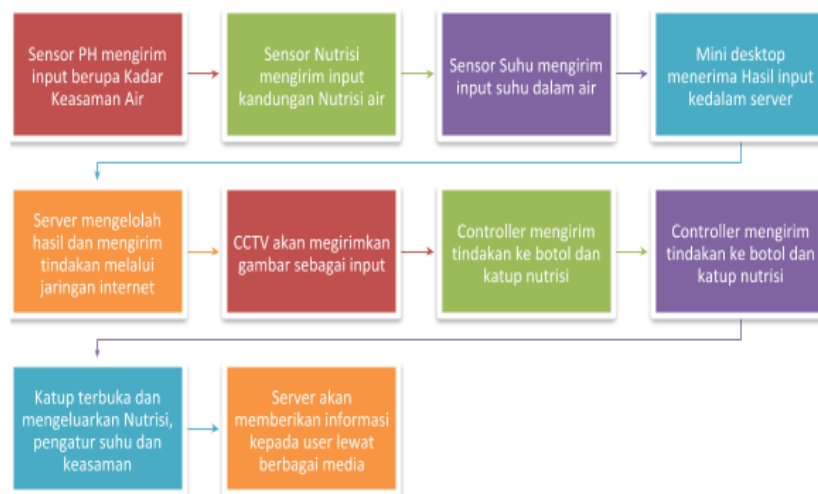

Figure 3. Explanation of Architectural Design Workflow

3.3 Process Sensor test

In this test checking the level of accuracy of data the read sensor with measuring instruments according to the sensor used. Tests were performed at this stage using EC meter, pH meter and thermometer to measure whether the value of the read sensor values are appropriate.

3.4 *Sensor Process Displays results via the Source Code*

Below is the coding process of retrieving the sensor values obtained are then displayed on the monitor.

```
#include <OneWire.h>
#define StartConvert 0
#define ReadTemperature 1
// #define SensorPin A2 // pH meter Analog output to Arduino Analog Input 0
unsigned long int avgValue; // Store the average value of the sensor feedback
float b;
int buf [10], temp;
char val;
const byte numReadings = 20; // the number of sample times
byte ECsensorPin = A1; // EC Meter analog outputs, analog on pin 1
byte DS18B20_Pin = 2; // DS18B20 signal, digital on pin 2
bytes in_serial, str;
unsigned int AnalogSampleInterval = 25 printInterval = 700, tempSampleInterval = 850; // analog
sample interval; serial print interval; temperaturesample interval
readings unsigned int[numReadings]; // The readings from the analog inputb
byte index = 0; // the index of the current reading
unsigned long AnalogValueTotal = 0; //the running total
```

```
unsigned intAnalogAverage = 0, averageVoltage = 0; // the average
unsigned long AnalogSampleTime, printTime, tempSampleTime;
float temperature, ECcurrent, phVal;
// Temperature chip i / o
OneWire ds (DS18B20_Pin); // digital on pin 2
void setup ()
{//initialize serial communication with computer:
pinMode (3, OUTPUT);
pinMode (4, OUTPUT);
pinMode (5, OUTPUT);
pinMode (6, OUTPUT);
pinMode (7, OUTPUT);
Serial.begin (115200);
// initialize all the readings to 0:
for (byte thisReading = 0; thisReading <numReadings; thisReading ++)
readings [thisReading] = 0;
TempProcess (StartConvert); // let the DS18B20 start the convert
AnalogSampleTime = millis ();
printTime = millis ();
tempSampleTime = millis ();
}
Void loop ()
{for(int i = 0; i <10; i ++)
{buf
[i] = analogRead (0);
delay (10);
}
For (int i = 0; i <9; i ++) // sort the analog from small to large
{for
(int j = i + 1; j <10; j ++)
{if
(buf [i]> buf [j ])
{temp
= buf [i];
buf [i] = buf [j];
buf [j] = temp;
}}
// return buf [i];
}
AvgValue = 0;
for (int i = 2; i <8; i ++) // take the average value of 6 center sample
avgValue + = buf [i];
float phValue = avgValue * (float) 5000/1024; // convert the analog into the millivolt
phValue = 3.5 * phValue; // convert the millivolt into pH value
in_serial = Serial.read ();
str = char (in_serial);
switch (str)
{case
'1': digitalWrite (3.1); // pumps
break;
case 'a': digitalWrite (3.0);
```

```
break;
case '2': digitalWrite (4.1); // ph Valve Bases
break;
case 'b': digitalWrite (4,0);
break;
case '3': digitalWrite (3.1); // acid ph valve
break;
case 'c': digitalWrite (5,0);
break;
case '4': digitalWrite (6.1); // ec valve A
break;
case 'd': digitalWrite (6.0);
break;
case '5': digitalWrite (4.1); // ec valve B
break;
case 'e': digitalWrite (4.0);
break;
}
If (millis () - AnalogSampleTime> = AnalogSampleInterval)
{AnalogSampleTime
= millis ();
// subtract the last reading:
AnalogValueTotal = AnalogValueTotal - readings [index];
// read from the sensor:
readings [index] = analogRead (ECsensorPin);
// add the reading to the total:
AnalogValueTotal = AnalogValueTotal + readings [index];
// advance to the next position in the array:
index = index + 1;
// if we're at the end of the array ...
if (index> = numReadings)
// ... wrap around to the beginning:
index = 0;
// Calculate the average:
AnalogAverage = AnalogValueTotal / numReadings;
}
/ *
Every once in a while, MCU read the temperature from DS18B20 and then let the DS18B20 start the
convert.
Attention: The interval between start the convert and read the temperature should be greater than 750
milliseconds, or the temperature is not accurate!
* /
If (millis () - tempSampleTime> = tempSampleInterval)
{tempSampleTime
= millis ();
temperature = TempProcess (ReadTemperature); // read the current temperature from DS18B20
TempProcess (StartConvert); // after the reading, start the convert for next reading
}
/ *
Every once in a while, print the information on the serial monitor.
* /
```

If (millis () - printTime> = printInterval)
{printTime
= millis ();
averageVoltage = AnalogAverage * (float) 5000/1024;
Serial.print ("28.00"); // current temperature
delay (5);
//Serial.print ("6:00");
Serial.print ("");
Serial.print (phValue, 2);
delay (5);
//Serial.print("^C EC: ");
float TempCoefficient = 1.0 + 0.0185 * (temperature-23.0); // temperature compensation formula:
fFinalResult (25 ^ C) = fFinalResult (current) / (1.0 + 0.0185 * (FTP-23.0));
float CoefficientVolatge = (float) averageVoltage / TempCoefficient;
if (CoefficientVolatge <10) Serial.println ("1.7"); // 25 ^ C 1413us / cm <-> about 216mv if the voltage (compensate) <150, that is <1ms / cm, out of the range
else if (CoefficientVolatge> 3300) Serial.println ("Out of range ! "); //> 20ms / cm, out of the range
else
{if
(CoefficientVolatge <= 448) ECcurrent = 6.84 * CoefficientVolatge-64.32; // 1ms / cm <EC <= 3ms / cm
else if (CoefficientVolatge <= 1457) ECcurrent = 6.98 * CoefficientVolatge-127; // 3ms / cm <EC <= 10ms / cm
else ECcurrent = 3.3 * CoefficientVolatge + 2278; // 10ms / cm <EC <20ms / cm
ECcurrent / = 1000; // convert us / cm to ms / cm
Serial.print ("");
Serial.println (ECcurrent); // two decimal
//Serial.println("ms/cm ");
  delay (500);

3.4 Results of Testing Sensor

Based on test results using a temperature sensor, EC sensor and pH sensor obtained the following results. Figure 3.4 below describes the output obtained from the process being undertaken by arduino, including displaying the temperature values, nutrition / ec and pH.
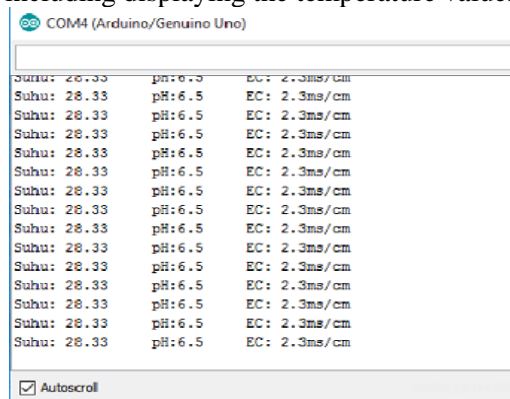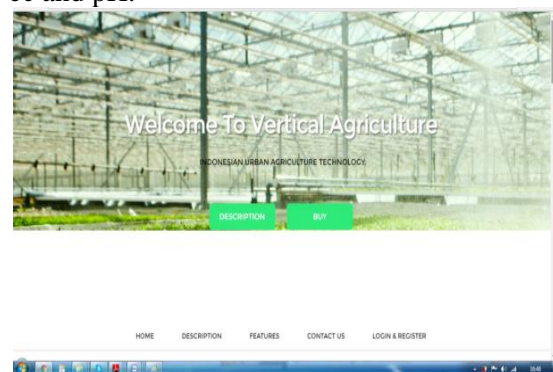

Figure 4. Sensor Test Results

Figure 5 Display Welcome Page

3.5 Page Views Website

Existing page on the website hidroponik.ubl.ac.id will be described below:

3.5.1 Page Views Welcome

welcome page is the page that will appear first when typing url hydroponics.ubl.ac.id. On this page there ae menu, *home description, features, contact us, login and* register. Welcome views can be seen in Figure 3.5 below.

3.5.2 Login and Register Page View

menu After click login and register on the previous page, it will show the login page and registers. To move to the next page, the user requires an account *(username and* password). After registering an account, users have a *username and password* that will be used to login. Register page views can be seen in Figure 3.6 and display the login page can be seen in Figure 3.7 below.
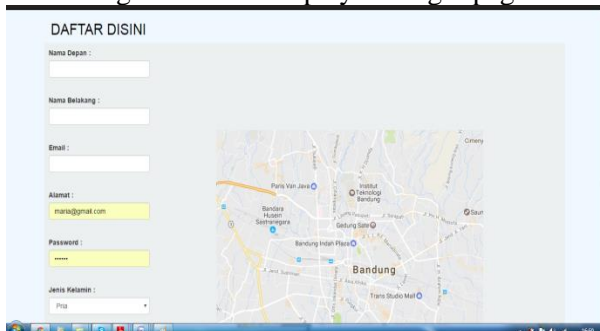
Figure 6 Page Views Register
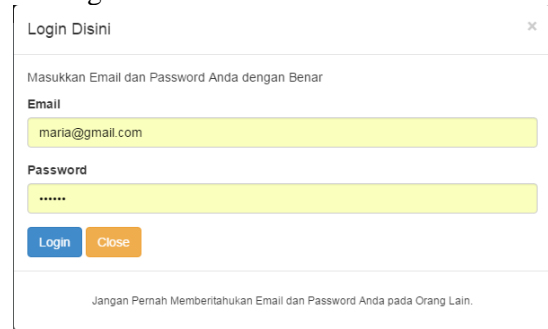
Figure 7 Display Login Page

3.5.3 User Home Page Views

Display form hidroponik.ubl.ac.id website user accounts

Figure 9 Plants Registration Page Views
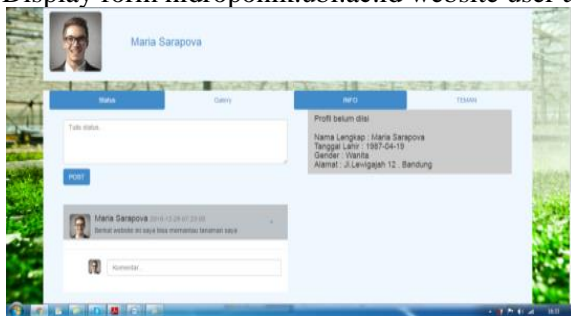
Figure 8 Page Views Home User

Form where users send postings regarding information hydroponic plants owned by the user.

3.3.3 Registration Page Views Plants

Once logged in, users can register plants will be planted on the registration page of the plant. Users can find out if the plants suitable for planting in hydroponics or not. Plant registration page can be seen in Figure 3.9 below.

3.3.4 Page Views Member Location

Once logged in users can see the location of the smart members on the member page hydroponic location. 5:10 can be seen in the image below.
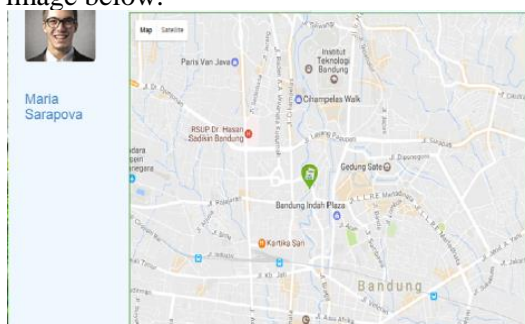

Figure 10 Page Views Member Location

4. Conclusion And Suggestions

4.1 Conclusion

Based on the analysis and discussion carried out can be summarized as follows:

a. Expected using *Code Igniter Framework* hydroponic website will be more efficient and not heavy when loaded.
b. Websites that there is now yet structured.
c. Automation system built is expected to help the process of controlling the hydroponic plants becomes easier.

4.2 Advice

a. From a conclusion and there is some discussion in the previous chapter it can be recommended need for *Framework* on the creation of websites.
b. The authors recognize that scientific writing is still a lot of shortcomings, and therefore does not rule out the possibility for candidates of other researchers to develop it.

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