DAFTAR PUSTAKA

[1] A. Mustafa, "Disain, tata letak, dan konstruksi tambak," *Media Akuakultur*, vol. 3, 2008.

[2] P. A. P. H. S. dan K. Windhani, "Analisis Daya Saing Ekspor Komoditas Udang Indonesia di Pasar Eropa Tahun 2008-2016," *Semin. Nas. dan Call Pap. Suistanable Compet. Advant.*, no. September, pp. 1–15, 2018.

[3] M. F. Fuady, M. N. Supardjo, and Haeruddin, "Pengaruh Pengelolaan Kualitas Air terhadap Tingkat Kelulushidupan dan Laju Pertumbuhan Udang Vaname (Litopenaeus vannamei) di PT. Indokor Bangun Desa, Yogyakarta," *Diponegoro J. Maquares Manag. Aquat. Resour.*, vol. 2, no. 4, pp. 155–162, 2013.

[4] G. G. Simatupang, S. Panduan, and P. Skala, "Buku Panduan Perikanan Skala Kecil Budidaya Udang Vannamei," 2014.

[5] D. Haliman, R. W. Dan Adijaya, *Udang Vaname*. Jakarta: Penebar Swaday, 2005.

[6] I. Yano, B. Tsukimura, J. N. Sweeney, and J. A. Wyban, "Induced Ovarian Maturation of Penaeus vannamei by Implantation of Lobster Ganglion," *J. World Aquac. Soc.*, vol. 19, no. 4, pp. 204–209, 1988.

[7] Widjanarko, *Tingkat Kesuburan Perairan*. Surabaya: Gramedia, 2005.

[8] M. M. Raswin, "Modul Pengelolaar Air Tambak," 2003.

[9] E. Plus, *Budidaya Udang Vaname (Litopenaeus Vannamei) :Teknologi ekstensif plus*. Palu: Dinas Kelautan dan Perikanan Daerah Provinsi Sulawesi Tengah, 2009.

[10] C. E. Boyd and F. Lichtkoppler, “Water Quality Management in pond fish culture Research and Development Series,” *Int. Cent. Aquac.*, vol. 22, no. 22, pp. 1–30, 1979.

[11] C. E. Boyd and V. K. Pillai, “Water quality management in Aquaculture,” *C. Spec. Publ.*, vol. 44, pp. 1–44, 1985.

[12] Ahmat, *Pengelolaan Peubah Mutu Air yang Penting dalam Tambak Udang*. Balai Penelitian Perikana Budidaya Pantai Maros, 1991.

[13] C. E. Boyd, *Water Quality In Warn Water Fish Ponas*. Albama: Departemens of Fisheries and Allied Aquacultur Auburn University., 1997.

[14] Supono, “Teknologi Produksi Udang,” Universitas Negeri Lampung, 2017.

[15] T. Klabat, P. Bangka, and M. Simanjuntak, “Oksigen Terlarut dan Apparent Oxygen Utilizationdi Perairan Teluk Klabat, Pulau Bangka,” *Ilmu Kelaut. - Indones. J. Mar. Sci.*, vol. 12, no. 2, pp. 59–66, 2012.

[16] S. Hutabarat, *Pengantar Oseanografi*, no. 101. Jakarta:UI-Press, 2006.

[17] I. R. Mardhiya, *Sistem Akuisisi Data Pengukuran Kadar Oksigen Terlarut Pada Air Tambak Udang Menggunakan Sensor Dissolve Oxygen (DO)*. 2017.

[18] S. Bahri, R. Setiawan, W. Hermawan, and M. Yunior, “Perkembangan Desain dan Kinerja Aerator Tipe Kincir,” *Inst. Pertan. Bogor*, vol. 2, no. 1, 2014.

[19] M. A. M. M. K. El-Bendary, “Developing security tools of WSN and WBAN networks applications,” *Lect. Notes Electr. Eng.*, vol. 316, no. March, pp. iii–iv, 2015.

[20] A. R. Agusta, J. Andjarwirawan, and R. Lim, “Implementasi Internet of Things Untuk Menjaga Kelembaban Udara Pada Budidaya Jamur,” *Univ. Kristen Petra*, vol. 7, no. 2, pp. 95–100, 2019.

[21] R. M. BARINGBING, “Sistem Monitoring Kualitas Air Menggunakan Sensor PH Dan Sensor Tds Berbasis Android,” Universitas Sumatera Utara, 2020.

[22] M. . A. Ellia, Nurazizah Ramdhani, S.T., M.T, Mohamad Rizal, S.T., “Rancang Bangun Termometer Digital Berbasis Sensor Ds18B20 Untuk Penyandang Tunanetra,” *Univ. Telkom*, vol. 4, no. 3, 2017.

[23] A. A. Pradana and D. Ramadhan, “Rancang Bangun Kursi Roda Berpenggeratk Motor Listrik Untuk Meningkatkan Ruang Gerak Pengguna,” Institut Teknologi Sepuluh Nopember, 2010.

[24] B. Tri, W. Utomo, and D. S. Saputra, “Simulasi Sistem Pendeteksi Polusi Ruangan Menggunakan Sensor Asap Dengan Pemberitahuan Melalui SMS (Short Message Service) Dan Alarm Berbasis Arduino,” vol. 10, no. 1, pp. 56–68, 2016.

LAMPIRAN

1.Lampiran Program Arduino IDE

```
#include <ESP8266Wi-fi.h>
#define BLYNK_PRINT Serial
#include <BlynkSimpleEsp8266.h>
#include <DallasTemperature.h>
#include <OneWire.h>
#include <SimpleTimer.h>
#include <SoftwareSerial.h>
#include <elapsedMillis.h>
elapsedMillis counter1;

SoftwareSerial mySerial (D2, D3); //RX,TX
#define ONE_WIRE_BUS D8  //D3 pin of nodemcu
#define ESP8266_BAUD 115200
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature DS18B20(&oneWire);

#define SensorPin A0          //pH meter Analog output to
Arduino Analog Input 0
#define Offset 0.20          //deviation compensate
#define LED 13
#define samplingInterval 20
#define printInterval 800
#define ArrayLenth  40    //times of collection
//SUHU
float suhuDS18B20 ;
//pH
int pHArray[ArrayLenth];   //Store the average value of the
sensor feedback
int pHArrayIndex=0;
//motor
int pwm1 = D4;
int dir1 = D11;
int pwm2 = D5;
int dir2 = D12;
int k;

float pH =0;
float pH_lama =1;
float abc ;
```

```
unsigned int interval = 10000;

//wemos-wi-fi
char auth[] = "lw_u14atQmjmebYlqYNwgJ_fct45sRDH";
char ssid[] = "susahsinyal";
char pass[] = "12345678";
SimpleTimer timer;

void setup()
{
  DS18B20.begin();
  Serial.begin(9600);
  mySerial.begin(9600);
  mySerial.println("AT+CMGF=1");
  mySerial.println("SIM800L started at 9600");
  delay(1000);
  mySerial.println("Setup Complete! SIM800L is Ready!");
  mySerial.println("AT+CNMI=2,2,0,0,0");
  //SIM800L.println("AT+CNMI=2,2,0,0,0");
  Wi-fi.begin(ssid, pass);
  Blynk.config(auth);
   delay(10);
   pH_lama = 1.0;
   abc =1.0;
   k = 0;
}


BLYNK_READ(V2){
 DS18B20.setResolution(9);  // Sebelum melakukan pengukuran, atur resolusinya
  //sensor.setResolution(10);
  //sensor.setResolution(11);
  //sensor.setResolution(12);
 DS18B20.requestTemperatures();  // Perintah konversi suhu
  suhuDS18B20 = DS18B20.getTempCByIndex(0);  //Membaca data suhu dari sensor #0 dan mengkonversikannya ke nilai Celsius
  //suhuDS18B20 = (suhuDS18B20*9/5) + 32;
  //suhuDS18B20 = suhuDS18B20 = 273.15;
  Blynk.virtualWrite(V2, suhuDS18B20);
  Serial.print(" suhu : ");
  Serial.print(suhuDS18B20,2);
```

```
  Serial.println(" C ");//Presisi 1 digit
  //Serial.println(suhuDS18B20, 2);  //Presisi 2 digit
  //Serial.println(suhuDS18B20, 3);  //Presisi 3 digit
  //Serial.println(suhuDS18B20, 4);  //Presisi 4 digit
  Blynk.notify("Nilai suhu:");
  delay(1000);    //delay 1 detik (1000 miliseconds)
}

BLYNK_READ(V1){

  static unsigned long samplingTime = millis();
  static unsigned long printTime = millis();
  static float pHValue,voltage;
  if(millis()-samplingTime > samplingInterval)
  {
     pHArray[pHArrayIndex++]=analogRead(SensorPin);
     if(pHArrayIndex==ArrayLenth)pHArrayIndex=0;
     voltage = avergearray(pHArray, ArrayLenth)*3.3/1024;
     pHValue = 3.5*voltage+Offset;
     samplingTime=millis();
  }
  if(millis() - printTime > printInterval)   //Every 800
milliseconds, print a numerical, convert the state of the LED
indicator
  {
    Serial.print("Voltage:");
    Serial.print(voltage,2);
    Serial.print("    pH value: ");
    Serial.println(pHValue,2);
//  digitalWrite(LED,digitalRead(LED)^1);
    printTime=millis();
    Blynk.virtualWrite(V1, pHValue);
    Blynk.notify("Nilai pH:");
  delay(1000);    //delay 1 detik (1000 miliseconds)

  }
}
double avergearray(int* arr, int number){
  int i;
  int max,min;
  double avg;
  long amount=0;
  if(number<=0){
```

```
  Serial.println("Error number for the array to avraging!/n");
  return 0;
 }
 if(number<5){   //less than 5, calculated directly statistics
  for(i=0;i<number;i++){
   amount+=arr[i];
  }
  avg = amount/number;
  return avg;
 }else{
  if(arr[0]<arr[1]){
   min = arr[0];max=arr[1];
  }
  else{
   min=arr[1];max=arr[0];
  }
  for(i=2;i<number;i++){
   if(arr[i]<min){
    amount+=min;        //arr<min
    min=arr[i];
   }else {
    if(arr[i]>max){
     amount+=max;    //arr>max
     max=arr[i];
    }else{
     amount+=arr[i]; //min<=arr<=max
    }
   }//if
  }//for
  avg = (double)amount/(number-2);
 }//if
 return avg;
}
void loop(){
//Sensor suhu
DS18B20.setResolution(9);  // Sebelum melakukan pengukuran,
atur resolusinya
  //sensor.setResolution(10);
  //sensor.setResolution(11);
  //sensor.setResolution(12);
 DS18B20.requestTemperatures();  // Perintah konversi suhu
```

```
  suhuDS18B20 = DS18B20.getTempCByIndex(0);  //Membaca
data suhu dari sensor #0 dan mengkonversikannya ke nilai
Celsius
  //suhuDS18B20 = (suhuDS18B20*9/5) + 32;
  //suhuDS18B20 = suhuDS18B20 = 273.15;

//sensor pH
  static unsigned long samplingTime = millis();
  static unsigned long printTime = millis();
  static float pHValue,voltage;
  if(millis()-samplingTime > samplingInterval)
  {
     pHArray[pHArrayIndex++]=analogRead(SensorPin);
     if(pHArrayIndex==ArrayLenth)pHArrayIndex=0;
     voltage = avergearray(pHArray, ArrayLenth)*3.3/1024;
     pHValue = 3.5*voltage+Offset;
     samplingTime=millis();
  }
  if(millis() - printTime > printInterval)   //Every 800
milliseconds, print a numerical, convert the state of the LED
indicator
  {
    Serial.print("Voltage:");
    Serial.print(voltage,2);
    Serial.print("    pH value: ");
    Serial.println(pHValue,2);
    Serial.println ("abc");
    Serial.print(abc);
    Serial.println("pH_lama:  ");
    Serial.print(pH_lama);
    Serial.println("k: ");
    Serial.print(k);


//  digitalWrite(LED,digitalRead(LED)^1);
    printTime=millis();


  }

  if(counter1 > interval){
       Blynk.connect();
       counter1 = 0;
```

```
  }

if( pHValue <= 7.10 && (k == 1 || k == 0) ){
     Serial.println("sms bawah");
     Serial.println("sms bawah");
     Serial.println("sms bawah");
     Serial.println("sms bawah");
     Serial.println("sms bawah");
     Serial.println("sms bawah");
     digitalWrite(dir1, HIGH);
     analogWrite(pwm1, 1023);
     digitalWrite(dir2, HIGH);
     analogWrite(pwm2, 820);
     delay(10);
     mySerial.println("AT+CMGF=1");
     delay(1000);
     mySerial.println("AT+CMGS=\"081250103730\"\r");
     mySerial.println("Aerator menyala karena pH dibawah ");
     mySerial.println(pHValue,2);
     mySerial.print(" suhu : ");
     mySerial.println(suhuDS18B20,2);
     mySerial.println(" C ");
     delay(1000);
     mySerial.println((char)26);
     delay(1000);
     k = 2;
    }

   if(pHValue >= 7.30 && (k == 2 || k == 0)){
     Serial.println("sms atas");
     Serial.println("sms atas");
     Serial.println("sms atas");
     Serial.println("sms atas");
     Serial.println("sms atas");
     Serial.println("sms atas");// ini yang if keduanya uni
     digitalWrite(dir1, LOW);
     analogWrite(pwm1, 0);
     digitalWrite(dir2, LOW);
     analogWrite(pwm2, 0);
     delay(10);
     mySerial.println("AT+CMGF=1");
     delay(1000);
     mySerial.println("AT+CMGS=\"081250103730\"\r");
```

```
    mySerial.println("Aerator mati karena pH diatas ");
    mySerial.println(pHValue,2);
    mySerial.print(" suhu : ");
    mySerial.println(suhuDS18B20,2);
    mySerial.print(" C ");
    delay(1000);
    mySerial.println((char)26);
    delay(1000);
    k = 1;
   }


   Blynk.run();
}
```

2. Lampiran pengujian pertama aerator otomatis

No.	Tampilan	Hasil	Keterangan
1	Tampilan Pengukuran sensor pH SKU SEN0161		Hasil pengukuran ditampilkan dalam bentuk angka desimal yaitu 7,71
2	Tampilan Pengukuran sensor suhu DS18B20		Hasil pengukuran ditampilkan dalam bentuk angka desimal yaitu 28^0C

Berikut dokumntasi pada saat pengambilan data dilakukan