Lampiran 4 Kode Program Arduino IDE (Penyiraman.ino)

```
#include <WiFi.h>
#include <HTTPClient.h>
const char* ssid = "MCA";
const char* password = "Syndicate";    // your network password
String HOST_NAME = "http://smartgardentsukamoto.my.id"; //
change to your PC's IP address
String PATH_NAME   = "/";
String queryString, payload, drfid;
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
#include <Arduino.h>
#include <FlowSensor.h>
#include "DHT.h"
#include <ESP32Servo.h>
Servo myservo;
int servoPin = 23;
int buka = 180, tutup = 0;
#define DHTPIN 32
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);
#define type YFS201
#define pin 27
FlowSensor Sensor(type, pin);
unsigned long timebefore = 0;
unsigned long reset = 0;
void IRAM_ATTR count()
{Sensor.count();}
const int Tanah1 = 35;
const int Tanah2 = 39;
const int Hujan = 34;
const int pompa = 5;
int maxtanah1 = 60, maxtanah2 = 55;
int tanah1, tanah2, hujan, suhu, lembab;
String tanaman1 = "Basah", tanaman2 = "Basah", sthujan =
"Cerah";
int t1 = 0, t2 = 0;
int hit = 0;
String st = "stanby";
String Mode = "Automatic";
char buffer1[30]; // Buffer untuk fuzzy1 (maksimal 30 karakter
untuk memastikan cukup)
char buffer2[30]; // Buffer untuk fuzzy2 (maksimal 30 karakter
untuk memastikan cukup)
void setup() {
  Serial.begin(115200);
  lcd.begin();
  lcd.backlight();
  lcd.setCursor(0, 0);
  lcd.print("Hello.....");
  Sensor.begin(count);
  pinMode(Tanah1, INPUT);
  pinMode(Tanah2, INPUT);
  pinMode(Hujan, INPUT);
  pinMode(pompa, OUTPUT);
  digitalWrite(pompa, HIGH);
  dht.begin();
```

```
  myservo.attach(servoPin);
  myservo.write(90);
  wifi();}
//Turun
float FTSUKAMOTO(float nilai, float ambang_min, float
ambang_max) {
  float maxmin = ambang_max - ambang_min;
  float alpha = ambang_max - nilai;
  float defd = alpha / maxmin;
  return defd;}
//Basah Naik
float FTSUKAMOTO2(float nilai, float ambang_min, float
ambang_max) {
  float maxmin = ambang_max - ambang_min;
  float alpha = nilai - ambang_min;
  float defd = alpha / maxmin;
  return defd;}
void loop() {
  if (millis() - timebefore >= 1000)
  {Sensor.read();
    Serial.println("Flow rate (L/minute) : " +
String(Sensor.getFlowRate_m()));
    Serial.println("Volume (L) : " +
String(Sensor.getVolume()));
    timebefore = millis();}
  if (millis() - reset >= 60000)
  {Sensor.resetVolume();
    reset = millis();}
  if (runEvery(1000)) {
    analogReadResolution(10);
    tanah1 = analogRead(Tanah1);
    tanah2 = analogRead(Tanah2);
    hujan = analogRead(Hujan);
    lembab = dht.readHumidity();
    suhu = dht.readTemperature();
    float hujan_percent = (100.0 - ((float)hujan / 1023.0 *
100.0)) * 1.8;
    if (hujan_percent > 100.00) {
        hujan_percent = 100.00;}
    float tanah1_percent = (100.0 - ((float)tanah1 / 1023.0 *
100.0)) * 1.5;
    if (tanah1_percent > 59.99) {
        tanah1_percent = 59.99;}
    float tanah2_percent = (100.0 - ((float)tanah2 / 1023.0 *
100.0)) * 1.4;
    if (tanah2_percent > 54.99) {
        tanah2_percent = 54.99;}
    if (hujan_percent > 40.0) {
        sthujan = "Hujan";
    } else {
        sthujan = "Cerah";}
    //MISAL u Aglonema
    float AGLO = tanah1_percent;
    float hasil1 = FTSUKAMOTO(AGLO, 30, maxtanah1);
    //MISAL u Adenium
    float ADEN = tanah2_percent;
    float hasil2 = FTSUKAMOTO(ADEN, 20, maxtanah2);
    float fuzzy1 = hasil1;
    if (hasil1 > 45) {
```

```
      fuzzy1 = FTSUKAMOTO2(AGLO, 30, maxtanah1);}
    float fuzzy2 = hasil2;
    if (hasil2 > 37) {
       fuzzy2 = FTSUKAMOTO2(ADEN, 20, maxtanah2);}
  // Mengubah nilai fuzzy1 dan fuzzy2 menjadi string dengan
presisi 21 digit total dan 16 digit di belakang koma
   dtostrf(fuzzy1, 21, 16, buffer1);
   dtostrf(fuzzy2, 21, 16, buffer2);
    if (Mode == "Automatic") {
  if (hasil1 >= 0.5 && hujan_percent <= 40.0) {
    tanaman1 = "Kering";
    t1 = 2;
  } else if (hasil1 >= 0.5 && hujan_percent > 40.0) {
    tanaman1 = "Kering&hujan_percent";
    sthujan = "Hujan";
    t1 = 0;
  } else if (hasil1 < 0.5) {
    tanaman1 = "Basah";}
  if (hasil2 >= 0.5 && hujan_percent <= 40.0) {
    tanaman2 = "Kering";
    t1 = 1;
  } else if (hasil2 >= 0.5 && hujan_percent > 40.0) {
    tanaman2 = "Kering&hujan_percent";
    sthujan = "Hujan";
    t1 = 0;
  } else if (hasil2 < 0.5) {
    tanaman2 = "Basah";}}
    if (t1 == 2 || t1 == 22) {
      hit++;
      myservo.write(180);
      st = "Aglonema";
    } else if (t1 == 1 || t1 == 11) {
      hit++;
      myservo.write(0);
      st = "Adenium";
    } else {
      hit = 0;
      myservo.write(90);
      st = "stanby";
      digitalWrite(pompa, HIGH);
      t1 = 0;}
  if (hit > 5) {
   digitalWrite(pompa, LOW);

  if (AGLO < 45 && t1 == 2) {
    tanaman1 = "Kering";  // Opsional: Update status tanaman
    t1 = 2;
  } else if (AGLO > 45) {
    t1 = 0; }
  if (ADEN < 37.50 && t1 == 1) {
    tanaman1 = "Kering";  // Opsional: Update status tanaman
    t1 = 1;
  } else if (ADEN > 37,50) {
    t1 = 0; }}
    kirim();
    if (payload == "Automatic") {
      Mode = "Automatic";
    } else if (payload == "Aglonema") {
      Mode = "Manual";
```

```
      t1 = 22;
    } else if (payload == "Adenium") {
      Mode = "Manual";
      t1 = 11;
    } else if (payload == "Off") {
      Mode = "Manual";
      digitalWrite(pompa, HIGH);
      t1 = 0;}
    lcd.setCursor(0, 0);
    lcd.print("T1:");
    lcd.print(tanah1_percent);
    lcd.print("% ");
    lcd.print("S:");
    lcd.print(suhu);
    lcd.print("C   ");
    lcd.setCursor(0, 1);
    lcd.print("T2:");
    lcd.print(tanah2_percent);
    lcd.print("% ");
    lcd.print(st);
    lcd.print("     ");
// Menampilkan hasil ke Serial Monitor
    Serial.print("Tanah 1 : ");
    Serial.print(AGLO);
    Serial.print("%  ");
    Serial.print(" Hasil Fuzzy Aglonema :");
    Serial.println(buffer1);
    Serial.print("Tanah 2 : ");
    Serial.print(ADEN);
    Serial.print("%  ");
    Serial.print(" Hasil Fuzzy Adenium   :");
    Serial.println(buffer2);
    Serial.print("Hujan    : ");
    Serial.print(hujan_percent);
    Serial.println("%");
    Serial.println("Suhu     : " + String(suhu));
    Serial.println("tanaman1: " + String(tanaman1));
    Serial.println("tanaman2: " + String(tanaman2));
    Serial.println("Cuaca: " + String(sthujan));
    Serial.println("hit: " + String(hit));
    Serial.println("st: " + String(st));
    Serial.println("t1: " + String(t1));
    Serial.println("Mode: " + String(Mode));}}
// Fungsi untuk URL encoding
String urlEncode(const char* msg) {
  const char *hex = "0123456789ABCDEF";
  String encodedMsg = "";
  while (*msg) {
    if (('a' <= *msg && *msg <= 'z') ||
        ('A' <= *msg && *msg <= 'Z') ||
        ('0' <= *msg && *msg <= '9')) {
      encodedMsg += *msg;
    } else {
      encodedMsg += '%';
      encodedMsg += hex[*msg >> 4];
      encodedMsg += hex[*msg & 15];}
    msg++; }
  return encodedMsg;}
// Variabel global untuk menyimpan status terakhir yang dikirim
```

```
String lastStatus = "";
String lastMode = "";
// Flag untuk mencegah panggilan ganda
bool dataKirimTertunda = false;
void kirim() {
  // Konversi nilai tanah1, tanah2, dan hujan ke format persen
dengan dua desimal
  String tanah1_percent = String((100.0 - ((float)tanah1 /
1023.0 * 100.0)) * 1.5, 2) + "%";
  String tanah2_percent = String((100.0 - ((float)tanah2 /
1023.0 * 100.0)) * 1.4, 2) + "%";
  String hujan_percent = String((100.0 - ((float)hujan / 1023.0
* 100.0)) * 1.8, 2) + "%";
  // Encode parameter
  String encodedTanah1 = urlEncode(tanah1_percent.c_str());
  String encodedTanah2 = urlEncode(tanah2_percent.c_str());
  String encodedHujan = urlEncode(hujan_percent.c_str());
  String encodedBuffer1 = urlEncode(buffer1);
  String encodedBuffer2 = urlEncode(buffer2);
  // Periksa jika status st atau mode berubah dibandingkan
dengan lastStatus dan lastMode
  if (st != lastStatus || Mode != lastMode) {
    if (!dataKirimTertunda) {
      // Flag untuk menunjukkan data sedang dikirim
      dataKirimTertunda = true;
      // Membuat queryString untuk dikirim ke server
      String queryString = "save.php?h1=" + encodedTanah1 +
"&h2=" + encodedTanah2 + "&hujan=" + encodedHujan
                          + "&t=" + String(suhu) + "&f=" +
String(Sensor.getFlowRate_m())
                          + "&output1=" + String(tanaman1) +
"&output2=" + String(tanaman2)
                          + "&fuzzy1=" + encodedBuffer1 +
"&fuzzy2=" + encodedBuffer2
                          + "&mode=" + String(Mode) + "&status="
+ st;
      Serial.println("kirim data");
      Serial.println(queryString);
      HTTPClient http;
      String serverPath = HOST_NAME + PATH_NAME + queryString;
      Serial.println(serverPath);
      http.begin(serverPath.c_str());

      int httpResponseCode = http.GET();
      if (httpResponseCode > 0) {
        Serial.print("HTTP Response code : ");
        Serial.println(httpResponseCode);
        payload = http.getString();
        payload.trim();
        Serial.println(payload);
      } else {
        Serial.print("Error code : ");
        Serial.println(httpResponseCode);}
      http.end();
      // Update lastStatus dan lastMode setelah data dikirim
      lastStatus = st;
      lastMode = Mode;}
    // Reset flag untuk pengiriman data berikutnya
    dataKirimTertunda = false;
```

```
  } else {
    Serial.println("Tidak ada perubahan status atau mode, tidak
mengirim data.");
  }}
void wifi()
{Serial.println("Connecting to AP ...");
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.println(".");}
  Serial.println("Connected to AP");
  Serial.print("Connected to WiFi network with IP Address: ");
  Serial.println(WiFi.localIP());}
boolean runEvery(unsigned long interval)
{static unsigned long previousMillis = 0;
  unsigned long currentMillis = millis();
  if (currentMillis - previousMillis >= interval)
  {previousMillis = currentMillis;
    return true;}
  return false;}
// Fungsi untuk menghitung derajat keanggotaan basah
float basah(float x) {
  if (x <= 0.5) {
    return 1;
  } else {
    return 0;}}
// Fungsi untuk menghitung derajat keanggotaan kering
float kering(float x) {
  if (x > 0.5) {
    return 1;
  } else {
    return 0;}}
// Fungsi untuk menghitung nilai Fuzzy Tsukamoto
float fuzzy_tsukamoto(float nilai, float ambang_min, float
ambang_max) {
  // Ambang batas
  // Menghitung derajat keanggotaan
  float derajat_basah = basah(nilai / ambang_min);
  float derajat_kering = kering(nilai / ambang_max);
  // Inferensi dan defuzzifikasi
  float z_basah = ambang_min * derajat_basah;
  float z_kering = ambang_max * derajat_kering;
  // Menghitung nilai defuzzifikasi
  float hasil;
  if ((derajat_basah + derajat_kering) == 0) {
    hasil = 0;
  } else {
    hasil = (z_basah + z_kering) / (derajat_basah +
derajat_kering);}
  return hasil;}
```

Lampiran 5 Kode Program Website Penyiraman Otomatis

a. Coding Halaman Login

```php
<?php
if (isset($_POST["Login"])) {
  $usr = $_POST["user"];
  $pas = $_POST["pass"];
  $sql1 = "select * from `$tbpengguna` where `username`='$usr'
and `password`='$pas' and `status`='Aktif'";
  if (getJum($conn, $sql1) > 0) {
    $d = getField($conn, $sql1);
    $kode = $d["id_pengguna"];
    $nama = $d["nama_pengguna"];
     $level = $d["level"];
    $_SESSION["cid"] = $kode;
    $_SESSION["cnama"] = $nama;
    $_SESSION["cstatus"] = $level;
saveLog($conn,"Login $level $nama($kode) Berhasil","Sukses
Login");
  echo"<script>Message1('$header','index.php?mnu=home',' Yth
Akun \'$nama\'... Sudah terverifikasi dengan
benar.Terimakasih...');</script>";
  } else {
      saveLog($conn,"Login Akun $usr Gagal","Gagal Login");
    session_destroy();
   echo"<script>Message2('$header','index.php?mnu=login','Akun
\'$usr\'... Dan Password \'$pas\' Salah...');</script>"; }}
?>
```

b. Coding Halaman Home

```html
<body>
<div class="container">
    <h1>Home <?php echo $header; ?></h1>
    <div class="table-container">
        <table id="examplec" class="display">
            <thead>
                <tr>
                    <th class="center-text small-text">No</th>
                    <th class="center-text small-
text">Waktu</th>
                    <th class="center-text small-text">Jam</th>
                    <th class="center-text small-text"><label
title='<?php echo $sens1; ?>'><?php echo $sens1_;
?></label></th>
                    <th class="center-text small-text"><label
title='<?php echo $sens2; ?>'><?php echo $sens2_;
?></label></th>
```

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```php
                    <th class="center-text small-text"><label
title='Hasil <?php echo $fuzzy1; ?>'><?php echo $fuzzy1_;
?></label></th>
                    <th class="center-text small-text"><label
title='Hasil <?php echo $fuzzy2; ?>'><?php echo $fuzzy2_;
?></label></th>
                </tr>
            </thead>
            <tbody>
                <?php
                $sql = "select * from `$tbmonitoring` order by
`tanggal`, `jam` desc limit 0, 100";
                $jum = getJum($conn, $sql);
                $no = 1;
                if ($jum > 0) {
                    $arr = getData($conn, $sql);
                    foreach ($arr as $d) {
                        $idm = $d["idm"];
                        $jam = $d["jam"];
                        $tanggal = $d["tanggal"];
                        $sensor1 = $d["sensor1"];
                        $sensor2 = $d["sensor2"];
                        $fuzzy1 = $d["fuzzy1"];
                        $fuzzy2 = $d["fuzzy2"];
                        $color = $no % 2 == 0 ? "#eeeeee" :
"#fff";
        echo "<tr bgcolor='$color'>
 <td class='center-text small-text'>$no</td>
 <td class='center-text small-text'>$tanggal</td>
 <td class='center-text small-text'>$jam</td>
 <td class='center-text small-text'>$sensor1</td>
 <td class='center-text small-text'>$sensor2</td>
 <td class='center-text small-text'>$fuzzy1</td>
 <td class='center-text small-text'>$fuzzy2</td>
 </tr>";
                        $no++;
                    }
                } else {
```

```
                        echo "<tr><td colspan='7' class='center-
text'><blink>Maaf, Data Log belum
tersedia...</blink></td></tr>";}
                ?>
</tbody>
</table>
    </div>
    <p>Note : Jika Hasil Perhitungan Fuzzy </p>
    <p>> 0.5 = Tanaman Kering = Butuh Penyiraman</p>
    <p>< 0.5 = Tanaman Basah = Tidak Butuh Penyiraman</p>
```

c. Coding Halaman Control

```
<h3>Menu Kendali SmartGarden</h3>
     <div>
<form action="" method="post" enctype="multipart/form-data">
<table class="table">
<tr>
<th width="70"><label for="idc">Pengguna</label>
<th width="9">:
<th colspan="2"><b><?php echo
$_SESSION["cnama"]."/".$_SESSION["cid"]; ?></b>
</tr>
<tr>
<td><label for="perintah">Perintah</label>
<td>:
<td colspan="2">
<input type="radio" name="perintah" id="perintah"
checked="checked" value="Automatic" <?php if ($perintah ==
"Automatic") {
echo "checked";
} ?> />     Automatic<br>
<input type="radio" name="perintah" id="perintah"
value="Aglonema" <?php if ($perintah == "Aglonema") {
echo "checked";
} ?> />     ON Aglonema <br>
<input type="radio" name="perintah" id="perintah"
value="Adenium" <?php if ($perintah == "Adenium") {
echo "checked";
```

```
} ?> />     ON Adenium <br>
<input type="radio" name="perintah" id="perintah" value="Off"
<?php if ($perintah == "Off") {
echo "checked";
} ?> />     OFF Servo/Pompa
```

d. Coding Halaman Monitoring

```
<div style="overflow-x:auto;">
        <table id="examplec" class="display"
style="width:100%">
        <thead>
        <tr>
<th width="3%"><small>No</small></th>
<th width="15%"><small>Waktu</small></th>
<th width="5%"><small>Jam</small></th>
<th width="5%"><small>MODE</small></th>
<th width="5%"><small><label title='<?php echo $sens1;?>'><?php
echo $sens1_;?></label></small></label></th>
<th width="5%"><small><label title='<?php echo $sens2;?>'><?php
echo $sens2_;?></small></label></th>
<th width="5%"><small><label title='<?php echo $sens3;?>'><?php
echo $sens3_;?></small></label></th>
<th width="5%"><small><label title='<?php echo $sens4;?>'><?php
echo $sens4_;?></small></label></th>
<th width="5%"><small><label title='<?php echo $sens5;?>'><?php
echo $sens5_;?></small></label></th>
<th width width="5%"><small><label title='Tanaman <?php echo
$out1;?>'><?php echo $out1;?></small></label></th>
<th width="5%"><small><label title='Tanaman <?php echo
$out2;?>'><?php echo $out2;?></small></label></th>
<th width="5%"><small><label title='Status
Sensor'>Status</label></small></label></th>
<th width="15%"><small><label
title='Catatan'>Keterangan</small></label></th>
<th width="5%"><small><label title='Hapus
Data'>Hapus</small></label></th>
        </tr>
        </thead>
```

e. Coding Halaman Aktifitas

```
<h3>Data Aktifitas <?php echo $header; ?></h3>
<thead>
        <tr>
        <th width="3%"><small>No</small></td>
        <th width="15%"><small>Tanggal</small></td>
        <th width="10%"><small>Jam</small></td>
        <th width="45%"><small><label
title='Aktifitas'>Aktifitas</label></small></label></td>
        <th width="25%"><small><label
title='Catatan'>Catatan</label></small></label></td>
        <th width="12%"><small><label title='Hapus
Data'>Hapus</small></label></td>
        </tr>
        </thead>
```

f. Coding Halaman Grafik

```
<h2>Monitoring Data <?php echo $sens1;?> </h2>
 </div>

 <script type="text/javascript">
      google.charts.load('current', {'packages':['line']});
      google.charts.setOnLoadCallback(drawChart);

    function drawChart() {

      var data = new google.visualization.DataTable();
      data.addColumn('string', 'Jam');
      data.addColumn('number', ' <?php echo $sens1;?>');
      data.addRows([<?php echo $graph1;?>]);

      var options = {
        chart: {
          title: 'Smart Garden Tsukamoto',
          subtitle: 'Grafik Monitoring Data  <?php echo
$sens1;?>'
        },
        width: 1300,
        height: 200,
        axes: {
          x: {
            0: {side: 'top'}}}};
      var chart = new
google.charts.Line(document.getElementById('line_top_x'));
      chart.draw(data,
google.charts.Line.convertOptions(options));}
 </script>
</head>
```

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