RINGKASAN

Tanaman serai wangi (*Cymbopogon nardus L.*) termasuk dalam keluarga *Gramineae* yang dapat menghasilkan minyak atsiri. Tanaman serai wangi mampu tumbuh pada lahan subur maupun lahan marginal. Lahan marginal adalah lahan dengan kualitas tanah secara fisik, kimia, dan biologis yang rendah. Sistem irigasi yang tepat diperlukan untuk meningkatkan produktivitas dalam budidaya tanaman serai wangi terutama pada lahan marginal. Otomatisasi sistem irigasi tetes sangat berpotensi untuk dikembangkan dengan penggunaan sensor kelembaban tanah karena termasuk irigasi tekanan rendah yang paling efisien. Penelitian ini bertujuan untuk: 1) Mengembangkan sistem irigasi tetes otomatis berdasarkan kelembaban tanah untuk budidaya tanaman serai wangi. 2)Mendapatkan model kalibrasi untuk sensor kelembaban tanah. 3) Menguji performansi sistem irigasi tetes otomatis berbasis kelembaban tanah pada budidaya tanaman serai wangi. 4) Mengidentifikasi respon pertumbuhan tanaman serai wangi menggunakan sistem irigasi tetes otomatis.

Penelitian ini dilaksanakan secara eksperimental observatif di (1) lahan Laboratorium Lapang Agronomi, Fakultas Pertanian, Universitas Jenderal Soedirman yang terletak di Desa Kedungrandu, Kecamatan Patikraja, Kabupaten Banyumas dan (2) Laboratorium Teknik Pengelolaan dan Pengendalian Bio-Lingkungan, Fakultas Pertanian, Universitas Jenderal Soedirman. Penelitian dilaksanakan dari bulan Oktober 2022 – Maret 2023. Komponen yang digunakan pada penelitian ini adalah Arduino Mega, LCD, pompa air, sensor YL-69, RTC (*Real Time Clock*) DS 1307, *relay*, *SD Card Module,* laptop. RTC berfungsi untuk mengirimkan data waktu berupa tanggal dan jam ke mikrokontroler. *Relay* berfungsi untuk menyalakan dan mematikan pompa air otomatis sesuai perintah dari mikrokontroler berdasarkan 2 *setting point* yang ditentukan, *setting point* A yaitu batas bawah (bb) sebesar 22% dan batas atas (ba) 27% dan *setting point* B yaitu batas bawah (bb) sebesar 30% dan batas atas (ba) 35%. Data pemberian air akan tersimpan pada *SD Card Module.*

Hasil penelitian menunjukan bahwa rancang bangun sistem kontrol irigasi berdasarkan kelembaban tanah berhasil dibuat dan dapat berjalan dengan baik sesuai dengan diagram alir sistem yang telah dirancang. Kalibrasi yang dilakukan antara kadar air tanah dan resistansi sensor menghasilkan grafik dengan persamaan y = -20.448x + 74.755 dimana nilai R^2 = 0.9141. Rancangan sistem irigasi otomatis berbasis kelembaban tanah ini memiliki koefisisen keseragaman 94.10%. Berdasarkan perbandingan dan hasil *error* nyala pompa air berdasarkan kelembaban tanah dengan rumus APE (*Absolute Percentage Error*), maka diperoleh nilai MAPE (*Mean Absolute Percentage Error*) pada *setpoint* A sebesar 1.93% dan sebesar 1.64% pada *setpoint* B, nilai tersebut didapatkan dari data kelembaban tanah yang diambil pada 14–87 HST. Selain itu, dapat dilihat bahwa produktivitas tanaman serai wangi pada *setpoint* A memiliki hasil yang lebih optimal dibanding *setpoint* B dengan tinggi rata-rata 66.83 cm; jumlah batang rata-rata 24.33 batang; jumlah daun rata-rata 83.67 helai; dan diameter batang rata-rata 8.12 mm.

SUMMARY

The citronella plant (Cymbopogon nardus L.) belongs to the Gramineae family and can produce essential oil. Citronella plants are able to grow on fertile land and marginal land. Marginal land is land with low physical, chemical and biological soil quality. An appropriate irrigation system is needed to increase productivity in cultivating citronella plants, especially on marginal land. Drip irrigation system automation has great potential to be developed with the use of soil moisture sensors because it is the most efficient low pressure irrigation. Automatic drip irrigation can streamline the dose of water given to citronella plants, thereby optimizing plant growth. This research aims to: 1) Develop an automatic drip irrigation system based on soil moisture for cultivating citronella plants. 2) Obtain a calibration model for the soil moisture sensor. 3) Testing the performance of an automatic drip irrigation system based on soil moisture in cultivating citronella plants. 4) Identify the growth response of citronella plants using an automatic drip irrigation system.

This research was carried out experimentally in (1) the Agronomy Field Laboratory, Faculty of Agriculture, Jenderal Soedirman University which is located in Kedungrandu Village, Patikraja District, Banyumas Regency and (2) Bio-Environmental Management and Control Engineering Laboratory, Faculty of Agriculture, Jenderal Soedirman University. The research was carried out from October 2022 – March 2023. The components used in this research were Arduino Mega, LCD, water pump, YL-69 sensor, RTC (Real Time Clock) DS 1307, relay, SD Card Module, laptop. RTC functions to send time data in the form of date and time to the microcontroller. The relay functions to turn on and turn off the water pump automatically according to commands from the microcontroller based on 2 specified setting points, setting point A, namely the lower limit (bb) of 22% and upper limit (ba) of 27% and setting point B, namely the lower limit (bb) of 30% and the upper limit (ba) of 35%. Water supply data will be stored on the SD Card Module.

The research results show that the design of an irrigation control system based on soil moisture was successfully created and can run well in accordance with the system flow diagram that has been designed. The calibration carried out between soil water content and sensor resistance produces a graph with the equation y = -20.448x + 74.755 where the R2 value = 0.9141. This soil moisture-based automatic irrigation system design has a uniformity coefficient of 94.10%. Based on the comparison and results of the water pump ignition error based on soil moisture using the APE (Absolute Percentage Error) formula, the MAPE (Mean Absolute Percentage Error) value at setpoint A was 1.93% and 1.64% at setpoint B, this value was obtained from soil moisture data taken at 14 HST–87 HST. Apart from that, it can be seen that the productivity of citronella plants at setpoint A has more optimal results than setpoint B with an average height of 66.83 cm; average number of stems 24.33 stems; average number of leaves 83.67 pieces; and the average stem diameter is 8.12 mm.