RINGKASAN

Perkembangan teknologi *Internet of Things* (IoT) memberikan kemudahan dalam bidang pertanian, khususnya pada sistem monitoring dan pengendalian penyiraman tanaman secara otomatis. Sistem menggunakan sensor kelembapan tanah tipe *Capacitive Soil Moisture* yang dipasang pada media tanam *cocopeat* dalam *polybag*. Data kelembapan tanah diproses oleh mikrokontroler ESP32 untuk mengendalikan pompa air secara otomatis berdasarkan nilai ambang kelembapan (<40%). Perancangan sistem berbasis ESP32 dan Blynk mendukung fungsi monitoring serta pengendalian jarak jauh melalui jaringan Wi-Fi. Metode irigasi *drip non-recovery* dipilih karena lebih efisiensi dalam penggunaan air, yaitu dengan mengalirkan air langsung ke zona perakaran tanpa mengembalikan larutan nutrisi ke penampungan. Penerapan sistem penyiraman otomatis berbasis IoT terbukti efektif meningkatkan efisiensi penggunaan air, mempermudah pengelolaan irigasi, serta mendukung pertumbuhan optimal tanaman cabai rawit dengan peningkatan tinggi batang dan lebar daun yang konsisten selama masa tanam.

Hasil kalibrasi menunjukkan tingkat presisi yang baik pada ketiga sensor dengan margin *error* yang rendah. Sensor 2 menunjukkan performa paling akurat dengan nilai *error* hanya 0,17%, sementara Sensor 3 sebesar 0,34% dan Sensor 1 sebesar 0,50%. Nilai tersebut menunjukkan bahwa sistem dapat mempertahankan kelembapan tanah secara konsisten hingga akhir pengamatan pada 100 Hari Setelah Tanam (HST) dengan ambang batas kelembapan minimum 40%. Hasil pengamatan menunjukkan perlakuan *drip sprinkler* menghasilkan pertumbuhan vegetatif terbaik, dengan tinggi tanaman 103-106 cm dan lebar daun 7,7-7,9 cm, perlakuan *drip head* menunjukkan pertumbuhan yang baik, dengan tinggi tanaman 102-104 cm dan lebar daun 7,5-7,8 cm dan perlakuan tanpa *drip* pertumbuhan yang baik, dengan tinggi tanaman 100-102 cm dan lebar daun 7,5-7,7 cm.

Kata Kunci : Cabai Rawit, *Capacitive Soil Moisture, Drip,* dan *Internet of Things* (IoT)

SUMMARY

The development of The development of Internet of Things (IoT) technology has provided significant advantages in agriculture, particularly in the monitoring and automatic control of plant irrigation systems. The system utilizes Capacitive Soil Moisture sensors installed in cocopeat growing media within polybags. Soil moisture data are processed by an ESP32 microcontroller to automatically control a water pump based on a predefined moisture threshold (<40%). The ESP32- and Blynk-based system supports real-time monitoring and remote control functions through a Wi-Fi network. A non-recovery drip irrigation method was selected due to its higher water-use efficiency, as water is delivered directly to the root zone without returning the nutrient solution to the reservoir. The implementation of the IoT-based automatic irrigation system proved effective in improving water-use efficiency, simplifying irrigation management, and supporting optimal growth of cayenne pepper plants, as indicated by consistent increases in plant height and leaf width throughout the cultivation period.

The calibration results demonstrated good precision for all three sensors, as indicated by their low error margins. Sensor 2 exhibited the highest accuracy with an error value of only 0.17%, followed by Sensor 3 with an error of 0.34% and Sensor 1 with an error of 0.50%. These results indicate that the system was capable of maintaining soil moisture consistently throughout the observation period up to 100 Days After Planting (DAP), with a minimum soil moisture threshold of 40%. The observations also revealed that the drip sprinkler treatment produced the best vegetative growth performance, achieving plant heights ranging from 103 to 106 cm and leaf widths between 7.7 and 7.9 cm. The drip head treatment showed favorable growth, with plant heights of 102–104 cm and leaf widths of 7.5–7.8 cm. Meanwhile, the treatment without a drip emitter also supported satisfactory growth, resulting in plant heights of 100–102 cm and leaf widths of 7.5–7.7 cm.

***Keywords** : Bird's eye chili, Capacitive Soil Moisture, Drip, and Internet of Things (Io*