Computers and Electronics in Agriculture
Volume 193, February 2022, 106723

Development of young *sago* palm environmental monitoring system with wireless sensor networks

Author links open overlay panel

Ee PingKho[a] Sing Ngie DavidChua[a] Soh FongLim[b] Lee ChungLau[c] Mohd Tirmidzi NgapdulGani[d]

Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, Malaysia [a]

Department of Chemical Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, Malaysia [b]

College of Engineering, Universiti Teknologi MARA, Cawangan Sarawak, Malaysia [c]

Upstream Technology Division, CRAUN Research Sdn. Bhd., Malaysia [d]

Received 17 September 2021, Revised 12 January 2022, Accepted 15 January 2022, Available online 22 January 2022, Version of Record 22 January 2022.

Show less

Add to Mendeley Share Cite

https://doi.org/10.1016/j.compag.2022.106723

Highlights

- Real-time monitoring of the environmental parameters (temperature, relative humidity, and light intensity) of young sago palms in mist chambers.
- Establishment of a web-based monitoring system with wireless sensor networks using Zigbee protocol and GPRS gateway.
- Reliability and performance of the system is discussed in terms of packet loss rate and mobile data consumption.
- Effect of functional system with respect to the environmental factors monitored is analysed.

Abstract

Environmental monitoring plays a significant role in the agriculture field as it manages the critical factors required for sustainable growth of plants, and thus enhancing the quality and productivity of the crops. In this paper, the development of a wireless sensor network (WSN) monitoring system for young *sago* palms in mist chambers is presented. The effect of the functional system with respect to the environmental factors monitored is also discussed. The system was set up to monitor three environmental factors i.e., temperature, relative humidity, and light intensity. Instantaneous readings of the monitored parameters were made possible through a wireless network and a web portal connection. The system recorded the environmental reading at every 15-min interval and transmitted the data from node to base using the Zigbee network. The data was then stored in an online cloud platform through the general radio packet service (GPRS) gateway. Linear actuators were also installed to control the mist chamber doors opening for natural ventilation and

they were automatically triggered by the threshold temperature. Besides, a smart alert system was added to the system prompting for actions via short messaging services (SMS) when triggered. The developed system achieved a reliable data transmission with a low packet loss rate (PLR) of 2.3%. The use of the GPRS gateway also enabled the system to operate at a lower cost as the mobile data consumption was low (10 MB per month). In conclusion, a WSN system for mist chambers in a *sago* palm greenhouse was successfully developed to real-time monitor the plant growing environment through data acquisition, data transmission and data visualisation. The developed WSN system had laid a foundation for smart farming. For future applications, the system could be further modified and developed for precision agriculture.

- **Previous** article in issue **Next** article in issue

Keywords

Wireless sensor network ; Environmental monitoring ; *Sago* palm ; Zigbee ; GPRS

View full text

© 2022 Elsevier B.V. All rights reserved.

- About ScienceDirect Remote access Shopping cart Advertise Contact and support Terms and conditions Privacy policy

We use cookies to help provide and enhance our service and tailor content and ads. By continuing you agree to the **use of cookies**.
Copyright © 2022 Elsevier B.V. or its licensors or contributors. ScienceDirect ® is a registered trademark of Elsevier B.V.