

DAFTAR PUSTAKA

- [1] The Economist Group, “Global Food Security Index (GFSI) 2022,” *The Economist Intelligence Unit*, pp. 1–42, 2022, [Online]. Available: <https://impact.economist.com/sustainability/project/food-security-index/#global-overview>
- [2] Fadila. M.A and N. A. Putri, “Analysis of Food Security Development in Indonesia : A Big Data and Data Mining Approach,” *Seminar Nasional Official Statistics*, no. 2022, pp. 1–10, 2023.
- [3] N. Jadhav, B. Rajnivas, V. Subapriya, S. Sivaramakrishnan, S. Premalatha, and P. Poongodi, “Enhancing Crop Growth Efficiency through IoT-enabled Smart Farming System,” *EAI Endorsed Transactions on Internet of Things*, vol. 10, pp. 1–5, 2024, doi: 10.4108/eetiot.4604.
- [4] M. Kocakulak and I. Butun, “An Overview of Wireless Sensor Networks Towards Internet of Things,” *2017 IEEE 7th Annual Computing and Communication Workshop and Conference, CCWC 2017*, no. January 2017, 2017, doi: 10.1109/CCWC.2017.7868374.
- [5] W. Sun, M. Choi, and S. Choi, “IEEE 802.11ah: A Long Range 802.11 WLAN at Sub 1 GHz,” *Journal of ICT Standardization*, pp. 83–108, Jul. 2013, doi: 10.13052/jicts2245-800X.125.
- [6] M. Centenaro, L. Vangelista, A. Zanella, and M. Zorzi, “Long-Range Communications in Unlicensed Bands: The Rising Stars in The IoT and Smart City Scenarios,” *IEEE Wirel Commun*, vol. 23, no. 5, pp. 60–67, 2016, doi: 10.1109/MWC.2016.7721743.
- [7] S. R. Auliany, T. Dw Lumbantoruan, and M. Rusdi, “Rancang Bangun Penyiram Tanaman Otomatis Menggunakan Timer Dengan Sensor YL-69 Berbasis Internet of Things (IoT),” pp. 483–490, 2023.
- [8] I. K. A. Enriko and F. N. Gustiyana, “Wi-Fi HaLow: Literature Review About Potential Use of Technology in Agriculture and Smart Cities in Indonesia,” *2024 International Conference on Green Energy, Computing and Sustainable Technology*,

- GECOST* 2024, no. March, pp. 277–281, 2024, doi: 10.1109/GECOST60902.2024.10474936.
- [9] F. N. Gustiyana, R. Munadi, N. Karna, and I. K. A. Enriko, “Technical Study for Recommendations IoT Standardization in Fire Alarm Control Panel Systems,” *Journal of Communications*, vol. 19, no. 7, pp. 331–339, 2024, doi: 10.12720/jcm.19.7.331-339.
 - [10] M. Y. Hariyawan, R. Salsabilla, and R. Sasmita Darwis, “Analisis Pengaruh Perubahan Jarak Node Harvester Terhadap Kinerja Wi-Fi,” *Jurnal Elektro dan Mesin Terapan*, vol. 8, no. 2, pp. 91–103, Nov. 2022, doi: 10.35143/elementer.v8i2.5488.
 - [11] P. R. Ashtikar, “Water Resource Management using Internet of Things (IoT): Literature Survey,” *Int J Res Appl Sci Eng Technol*, vol. 7, no. 9, pp. 80–83, Sep. 2019, doi: 10.22214/ijraset.2019.9012.
 - [12] N. Shirvanian, M. Shams, and A. M. Rahmani, “Internet of Things Data Management: A Systematic Literature Review, Vision, and Future Trends,” *International Journal of Communication Systems*, vol. 35, no. 14, Sep. 2022, doi: 10.1002/dac.5267.
 - [13] R. C. W. Pratama, F. T. Syifa, and N. A. Zen, “Pengujian Sistem dan Parameter QoS pada Perancangan Prototipe Pintu Air Irigasi Sawah Menggunakan Aplikasi Blynk,” *Journal of Telecommunication, Electronics, and Control Engineering (JTECE)*, vol. 5, no. 1, pp. 50–62, 2023, doi: 10.20895/jtece.v5i1.827.
 - [14] N. Shirvanian, M. Shams, and A. M. Rahmani, “Internet of Things Data Management: A Systematic Literature Review, Vision, and Future Trends,” *International Journal of Communication Systems*, vol. 35, no. 14, Sep. 2022, doi: 10.1002/dac.5267.
 - [15] W.-F. Alliance, “Wi-Fi Certified HaLow.” Accessed: Feb. 05, 2025. [Online]. Available: <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-halow>
 - [16] W.-F. Alliance, “Wi-Fi Certified HaLow.” Accessed: Feb. 05, 2025. [Online]. Available: <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-halow>
 - [17] D. Bankov, E. Khorov, A. Lyakhov, and E. Stepanova, “IEEE 802.11ba - Extremely Low Power Wi-Fi for Massive Internet of Things - Challenges, Open Issues, Performance Evaluation,” *2019 IEEE International Black Sea Conference on Communications and Networking, BlackSeaCom 2019*, 2019, doi: 10.1109/BlackSeaCom.2019.8812785.
 - [18] R. M. N. Ajinegoro, D. Perdana, and R. M. Negara, “Performance Analysis of Mobility Impact on IEEE 802.11ah Standard with Traffic Pattern Scheme,”

- International Journal of Communication Networks and Information Security (IJCNIS)*, vol. 10, no. 1, Apr. 2022, doi: 10.17762/ijcnis.v10i1.3212.
- [19] R. Store, “WiFi HaLow Extender, 802.11ah, Wi-Fi HaLow, Up to 16Mbps, 1500 Feet | Broader Coverage Than Ever WiFi Extenders Signal Booster for Home | Internet Booster Wi-Fi Repeater, 1 Transmitter + 1 Receiver.” Accessed: Mar. 24, 2025. [Online]. Available: <https://www.amazon.com/REUMAR-Extender-Extenders-1Transmitter-1Receiver/dp/B0C3R3XDN7>
- [20] L. Kane, V. Liu, M. McKague, and G. Walker, “An Experimental Field Comparison of Wi-Fi HaLow and LoRa for the Smart Grid,” *Sensors*, vol. 23, no. 17, pp. 1–27, 2023, doi: 10.3390/s23177409.
- [21] S. Santi, L. Tian, E. Khorov, and J. Famaey, “Accurate Energy Modeling and Characterization of IEEE 802.11ah RAW and TWT,” *Sensors*, vol. 19, no. 11, p. 2614, Jun. 2019, doi: 10.3390/s19112614.
- [22] F. Faydhe, M. S. Ibrahim, and K. Y. Kamal, “HaLow Wi-Fi Performance in Multiusers and Channels Environment with MATLAB Simulink,” *International Journal of Communication Networks and Information Security (IJCNIS)*, vol. 15, no. 1, pp. 01–11, May 2023, doi: 10.17762/ijcnis.v15i1.5487.
- [23] S. Sarkar, A. Jana, S. Maity, C. Maiti, and C. K. Bera, “IoT Based Performance Display System using ESP32: Design and Development,” *J Phys Conf Ser*, vol. 2576, no. 1, p. 012002, Sep. 2023, doi: 10.1088/1742-6596/2576/1/012002.
- [24] ElectronicWings, “Introduction to ESP32.” Accessed: Mar. 24, 2025. [Online]. Available: <https://www.electronicwings.com/esp32/introduction-to-esp32>
- [25] A. Imran, M. Yantahin, A. M. Mappalotteng, and M. Arham, “Development of Monitoring Tower Using Gyroscope Sensor Based on ESP32 Microcontroller,” *Journal of Applied Engineering and Technological Science (JAETS)*, vol. 4, no. 1, pp. 405–414, Dec. 2022, doi: 10.37385/jaets.v4i1.1327.
- [26] I. D. Tirta, A. Wisaksono, A. Ahfas, and J. Jamaaluddin, “Home Surveillance Monitoring with ESP32-Cam and SD Card For Data Storage,” *Journal of Computer Networks, Architecture and High Performance Computing*, vol. 6, no. 1, pp. 419–429, Jan. 2024, doi: 10.47709/cnahpc.v6i1.3498.
- [27] M. Pramanik *et al.*, “Evaluation of Capacitance-Based Soil Moisture Sensors in IoT Based Automatic Basin Irrigation System,” Jun. 16, 2023. doi: 10.21203/rs.3.rs-3043138/v1.

- [28] E. A. A. D. Nagahage, I. S. P. Nagahage, and T. Fujino, "Calibration and Validation of a Low-Cost Capacitive Moisture Sensor to Integrate the Automated Soil Moisture Monitoring System," *Agriculture*, vol. 9, no. 7, p. 141, Jul. 2019, doi: 10.3390/agriculture9070141.
- [29] N. A. Nwogwu *et al.*, "Development of a Solar-Powered Integrated Wireless Soil Moisture Meter," *AgroEnvironmental Sustainability*, vol. 1, no. 1, pp. 12–21, Jun. 2023, doi: 10.59983/s2023010103.
- [30] A. M. Okasha, H. G. Ibrahim, A. H. Elmetwalli, K. M. Khedher, Z. M. Yaseen, and S. Elsayed, "Designing Low-Cost Capacitive-Based Soil Moisture Sensor and Smart Monitoring Unit Operated by Solar Cells for Greenhouse Irrigation Management," *Sensors*, vol. 21, no. 16, p. 5387, Aug. 2021, doi: 10.3390/s21165387.
- [31] H. Kurdi and V. Thayananthan, "A Multi-Tier MQTT Architecture with Multiple Brokers Based on Fog Computing for Securing Industrial IoT," *Applied Sciences*, vol. 12, no. 14, p. 7173, Jul. 2022, doi: 10.3390/app12147173.
- [32] TMSSoftware, "TMS MQTT 2.0 Released Bringing MQTT v5 Protocol Support to Delphi Users." Accessed: Mar. 25, 2025. [Online]. Available: <https://www.tmssoftware.com/site/blog.asp?post=1085>
- [33] H. Li-Wen, K. Yang, L. Fu, and M. Chen, "Dynamic Encryption Method for MQTT Communication," *J Phys Conf Ser*, vol. 2717, no. 1, 2024, doi: 10.1088/1742-6596/2717/1/012011.
- [34] F. Azzedin and T. Alhazmi, "Secure Data Distribution Architecture in IoT Using MQTT," *Applied Sciences*, vol. 13, no. 4, p. 2515, Feb. 2023, doi: 10.3390/app13042515.
- [35] Y. Shin and S. Jeon, "MQTree: Secure OTA Protocol Using MQTT and MerkleTree," *Sensors*, vol. 24, no. 5, p. 1447, Feb. 2024, doi: 10.3390/s24051447.
- [36] F. Azzedin and T. Alhazmi, "Secure Data Distribution Architecture in IoT Using MQTT," *Applied Sciences*, vol. 13, no. 4, p. 2515, Feb. 2023, doi: 10.3390/app13042515.
- [37] E. Team, "Quick Start of EMQX MQTT Cloud Service," 2025. Accessed: Mar. 25, 2025. [Online]. Available: <https://www.emqx.com/en/blog/quick-start-of-emqx-mqtt-cloud-service>
- [38] K. Kamoun, F. Hmissi, S. Ouni, and S. Ouni, "Improvement of MQTT Semantic to Minimize Data Flow in IoT Platforms Based on Distributed Brokers," *Transactions*

- on *Emerging Telecommunications Technologies*, vol. 35, no. 2, Feb. 2024, doi: 10.1002/ett.4945.
- [39] N. K. Ribas and M. A. Spohn, “A New Approach to a Self-Organizing Federation of MQTT Brokers,” *Journal of Computer Science*, vol. 18, no. 7, pp. 687–694, Jul. 2022, doi: 10.3844/jcssp.2022.687.694.
 - [40] O. Foundation, “Low-Code Programming for Event-Driven Applications.” Accessed: Mar. 25, 2025. [Online]. Available: <https://nodered.org/>
 - [41] S. U. Uddin, M. J. A. Baig, and M. T. Iqbal, “Design and Implementation of an Open-Source SCADA System for a Community Solar-Powered Reverse Osmosis System,” *Sensors*, vol. 22, no. 24, p. 9631, Dec. 2022, doi: 10.3390/s22249631.
 - [42] Q. Li, B. Cao, X. Wang, J. J. Wu, and Y. K. Wang, “Systematic Water-Saving Management for Strawberry in Basic Greenhouses Based on the Internet of Things,” *Appl Eng Agric*, vol. 37, no. 1, pp. 205–217, 2021, doi: 10.13031/aea.14095.
 - [43] Z. F. I. da M. Pavilhão Industrial C, “SF Smart Agriculture.” Accessed: Mar. 24, 2025. [Online]. Available: <https://sfs-pro.com/en/solutions/smart-agriculture/>
 - [44] V. Alomia-Hinojosa *et al.*, “Exploring Farmer Perceptions of Agricultural Innovations for Maize-Legume Intensification in The Mid-Hills Region of Nepal,” *Int J Agric Sustain*, vol. 16, no. 1, pp. 74–93, Jan. 2018, doi: 10.1080/14735903.2018.1423723.
 - [45] T. Mazhar *et al.*, “Quality of Service (QoS) Performance Analysis in a Traffic Engineering Model for Next-Generation Wireless Sensor Networks,” *Symmetry (Basel)*, vol. 15, no. 2, 2023, doi: 10.3390/sym15020513.
 - [46] R. Artikel, “Analisis Jaringan Serat Optik Menggunakan Metode Quality of Service,” vol. 1, pp. 69–77, 2022.
 - [47] I. S. N. Nisa, Rahmat Miyarno Saputro, Tegar Fatwa Nugroho, and Alfirna Rizqi Lahitani, “Analisis Quality of Service (QoS) Menggunakan Standar Parameter Tiphon pada Jaringan Internet Berbasis Wi-Fi Kampus 1 Unjaya,” *Teknomatika: Jurnal Informatika dan Komputer*, vol. 17, no. 1, pp. 1–9, 2024, doi: 10.30989/teknomatika.v17i1.1307.
 - [48] S. Dan and J. Digital, “G.1010 (11/2001),” vol. 1010, 2001.
 - [49] R. Eka Budiani, J. Dedy Irawan, and D. Rudhistiar, “Sistem Monitoring dan Penyiraman Otomatis pada Tanaman Cabai Berbasis Internet of Things (IoT),” *JATI*

(*Jurnal Mahasiswa Teknik Informatika*), vol. 8, no. 2, pp. 1331–1338, 2024, doi:
10.36040/jati.v8i2.9149.