

CHAPTER V

CONCLUSION AND SUGGESTIONS

5.1 Conclusion

Based on the results of the system design, implementation, and testing that have been carried out, including the stages of system architecture development, LoRa-based data transmission integration, and overall system performance evaluation, several conclusions can be drawn as follows:

1. The Internet of Things (IoT)-based rainfall prediction system supported by LoRa communication was successfully designed and implemented in an end-to-end manner, starting from sensor data acquisition, long-range data transmission, to cloud-based data storage and visualization. The testing results show that LoRa communication operated consistently with signal quality that supports environmental monitoring requirements, and the data flow from the devices to the server functioned properly under the testing conditions.
2. The implementation of the Extreme Gradient Boosting (XGBoost) algorithm on weather data demonstrates that the model is capable of capturing patterns related to rainfall intensity and achieving reasonably good classification performance. However, the model still shows limitations in recognizing rainfall classes with low occurrence frequencies, which are influenced by imbalanced data distribution and the complexity of meteorological data characteristics.
3. The system mechanism for processing weather data to generate prediction outputs operated according to the proposed design, including the stages of data acquisition, transmission, storage, and result presentation through a cloud-based system. The integration between these components enables the system to support online environmental monitoring as a source of information for agricultural activities.

5.2 Suggestions

Based on the evaluation results and limitations identified during the study, several directions for future development can be proposed as follows:

1. Future development may focus on improving the quality of the prediction model through the enrichment of meteorological features, such as the addition of air pressure variables, solar radiation, and temporal features (rainfall lag). The inclusion of these features is expected to help the model capture data patterns that are more representative of atmospheric conditions.
2. In addition, the reliability of the data transmission system should be improved, for example through the implementation of connectivity disruption handling mechanisms or transmission process optimization, so that data continuity in the monitoring process can be better maintained.