

V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The conclusions that can be drawn from this thesis are:

- 1) The severity of bacterial leaf blight (*Xanthomonas* sp.) in rice plants can be identified using drone image analysis based on the VARI vegetation index combined with a transfer learning-based CNN model and the Focal Loss loss function. The developed model can classify five severity levels of the disease with sufficient accuracy, achieving a validation accuracy of 82.25% and a loss value of 0.0493 without overfitting, demonstrating significant potential in supporting the automatic spatial identification of plant diseases.
- 2) The VARI-based drone image and CNN method was compared with conventional monitoring in detecting disease severity, yielding disease severity levels of 16% (conventional monitoring) and 20.3% (drone monitoring) on Plot A, and 49% (conventional monitoring) and 56% (drone monitoring) on Plot B. with comparison accuracy showing 78.8% on Plot A and 87.5% on Plot B. This demonstrates that the drone-based VARI and CNN imaging method can cover a wide area and produce more accurate and standardized classifications, making it a potential solution in technology-based plant disease monitoring systems.

5.2. Recommendations

Recommendations for further research include increasing the amount and diversity of training data to improve the model's ability to generalize across varying degrees of symptom severity and to produce a more consistent and less fragmented classification map. At the implementation stage, this system can be further developed into a web-based or mobile application to support automatic, fast, and efficient monitoring of land conditions in the field.