Development of a Cloud Computing Based Traceability System with Coffee Leaf Disease Detection Using CNN Resnet50: A Case Study at Sekolah Kopi RAISA

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ABSTRACT

Indonesia plays an important role in the global coffee industry as a major producer and exporter. However, product quality and traceability at the farmer level still face significant challenges. This study, conducted as a case study at Sekolah Kopi RAISA in Sumber Wringin District, Bondowoso Regency, proposes an integrated solution in the form of a web-based traceability system and application using QR Code to record product origins in real time, combined with a CNN based leaf disease detection module using ResNet50. This study involved problem and requirements identification, coffee supply chain mapping, data identification and traceability system design, dataset collection and splitting, pre-processing, model implementation, training, and evaluation. The dataset for the model was obtained from a public source (Coffee Leaf Diseases, Kaggle) and processed using a preprocess_input pipeline, data augmentation, and balanced sampling of 260/60 per class for training, validation, and testing. The results show that the ResNet50 model (implemented in two stages: head training and fine-tuning) achieved excellent performance, with a test loss of 0.0252 and a test accuracy of 99.44% on 180 test samples (60 samples per class). The classification report indicates high per-class performance (perfect for phoma, while no disease and rust each show one minor misclassification), with only a single error observed in the confusion matrix. Practically, integrating this classification model into the traceability system enables early disease detection and traceable record-keeping, which is expected to help improve quality consistency and enhance the competitiveness of RAISA coffee within a broader supply chain.

Keyword : *Traceability System, Coffee Leaf Disease, Machine Learning, CNN, ResNet50*