# Towards Sustainable Agriculture: Deep Learning Based Cocoa Disease Detection

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Cocoa production contributes 10% to Ghana’s GDP, but diseases like Anthracnose and Cocoa Swollen Shoot Virus Disease (CSSVD) caused $1.2 billion in losses in 2023. Traditional detection methods, including manual inspection and hyperspectral imaging, are either slow or costly. This study applies deep learning-based object detection to classify cocoa pod health from leaf images, improving efficiency and reducing losses. A dataset of over 3,000 annotated images was used, covering Anthracnose, CSSVD, and Healthy classes. A YOLO12x model from Ultralytics was fine-tuned while maintaining its architecture and weights, optimizing mAP50. Data augmentation techniques were applied to improve model generalization. The model achieved a mAP50 score of 78.4%, effectively detecting diseased cocoa pods. However, healthy pods were sometimes misclassified as background. To improve the detection accuracy of our model, we applied a post-processing procedure leveraging the weighted box fusion (WBF) technique. Detailed findings, benefits, barriers, and future directions to utilizing deep learning in aiding the diagnosis of cocoa diseases in Ghana are discussed in this study.

**Awards Won:**