

Abstract ID: 017

FIELD IMAGING CONSTRAINTS AND AI MODEL READINESS FOR EARLY DETECTION OF RICE LEAF FOLDER INFESTATION IN SRI LANKAN PADDY FIELDS

J. Janarththan^{a,b*}, G. Mikunthan^c, S. R. Liyanage^d, and S. Tharaga^{a*}

^aDepartment of Applied Computing, Faculty of Computing and Technology, University of Kelaniya,
Sri Lanka.

^bInformation Technology Center, Trincomalee Campus, Eastern University, Sri Lanka.

^cDepartment of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka.

^dDepartment of Software Engineering, Faculty of Computing and Technology, University of
Kelaniya, Sri Lanka.

*tharagas@kln.ac.lk, janarththananj@gmail.com

Abstract

Early detection of rice leaf folder (*Cnaphalocrocis medinalis*) is essential for mitigating yield losses in Sri Lankan paddy fields, where rice is a staple crop under constant threat from pest infestations. This study assesses the operational readiness of AI-based pest detection systems and the field imaging constraints that impact their deployment in real-world agricultural environments. Field data were collected in the Trincomalee district, capturing diverse imaging challenges such as leaf overlap, motion blur, glare from standing water, and limited camera access due to field conditions. A manually annotated dataset was constructed and used to train and evaluate various AI models. Seven categories of AI architectures, including deep CNNs, object detection networks, lightweight and hybrid models, were assessed for accuracy, efficiency, and deployability. Models such as DenseNet201 (93.87%), MobileNetV2 (89.20%), and YOLOv8 (88.90%) demonstrated high performance while meeting the requirements for field use in resource-limited settings. However, the study emphasizes that model accuracy alone is insufficient; interpretability, transparency, and trust are crucial for adoption by farmers and agricultural officers. The integration of explainable AI (XAI), domain adaptation using local datasets, and hardware compatibility were identified as key enablers for field deployment. This research underscores the significance of addressing real-world imaging limitations and developing localized, low-cost, and scalable AI tools for early pest detection. Future efforts will focus on expanding datasets across agro-ecological zones, improving drone and smartphone-based imaging, and co-developing mobile applications with stakeholders to promote practical, real-time decision-making in integrated pest management.

Keywords: Rice leaf folder, Pest detection, Artificial Intelligence (AI), Explainable AI, Field deployment.

Financial assistance from National Research Council of Sri Lanka (Grant No. NRC IDG 24-078) is acknowledged.