

ABSTRACT

Adaptive Neuro Fuzzy-Inference System (ANFIS) Method Based on Adaptive HB-GWO Clustering

by

Chika Nurhaqikah

24010124410002

Brown Planthopper (BPH) attacks represent one of the greatest threats to rice crop productivity, influenced by climatic conditions such as the Number of Rainy Days (HH) and Minimum Humidity (RHmin). This study develops a BPH attack prediction model based on the Adaptive Neuro-Fuzzy Inference System (ANFIS) with a clustering approach using the Adaptive HB-GWO algorithm. The Adaptive HB-GWO algorithm combines the global exploration capability of the Butterfly Optimization Algorithm (BOA) in the first phase with the local exploitation of the Grey Wolf Optimizer (GWO) in the second phase to produce optimal clustering. The dataset consists of 288 monthly environmental condition records from the City of Semarang, divided into 70% training and 30% testing data. The results of the clustering process are used to initialize the premise parameters of the ANFIS model. The Adaptive HB-GWO clustering demonstrates balanced convergence between exploration and exploitation. The Adaptive HB-GWO clustering method is proven to yield better parameter optimization solutions, thereby improving the overall prediction accuracy of the ANFIS model. The accuracy values produced by ANFIS-HB-GWO are an RMSE of 0,0019 and an MAE of 0,0010 , indicating that the model is capable of predicting the intensity of BPH attacks with a high level of accuracy.

Keywords: *Adaptive HB-GWO, ANFIS, Clustering, Pest Risk Prediction, Brown Planthopper*