Modeling yield and backscatter using satellite derived biophysical variables of rice crop based on Artificial Neural Networks

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ABSTRACT

In this study, ‘observed rice yield (ton acre⁻¹)’ and ‘remotely sensed backscatter’ are modeled using artificial neural network (ANN) and multiple linear regression (MLR) methods for East and West Godavari districts of Andhra Pradesh in India. The biophysical variables viz. backscatter (bs), normalized difference vegetation index (NDVI), Chlorophyll (chfl), fraction of absorbed photosynthetically active radiation (FAPAR), leaf area index (LAI), canopy water content (CWC), and fraction of vegetation cover (F \text{cover}) were derived from Scatterometer Satellite-1 (SCATSAT-1), Moderate Imaging Spectrometer (MODIS) and Sentinel-2 satellite data. Inputs selected are bs, NDVI, chfl, FAPAR, LAI, CWC, and F \text{cover} for rice yield model, whereas NDVI, chfl, FAPAR, LAI, CWC, and F \text{cover} are inputs for backscatter models. The performance of ANN and MLR models was evaluated using three indices such as root mean squared error (RMSE), mean absolute error (MAE), and coefficient of determination (R²). The results concluded that the ANN models achieved R² of 0.908 and 0.884 which are 42.73% and 28.85% higher than that of the MLR method for rice yield and backscatter, respectively.

Keywords: Rice yield, backscatter, artificial neural network, model, MLR