Remote Sensing Modeling for Estimating Methane Gas Emission from Irrigated Paddy Fields in Thailand

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Abstract

The objectives of this paper are to estimate the methane emission form irrigated paddy field with the ground measurement of the spectral reflectance of rice plant using spectrometer. This study aims to develop mathematical models for methane gas emission estimation from irrigated paddy field. There are two mathematical models developed in this study. Firstly, ground measurement of methane emission rate was analyzed to develop methane emission rate model. Secondly, aboveground biomass of rice was collected and spectral reflectance of rice plant obtained from remote sensing technique for Normalized Difference Vegetation Index (NDVI) analysis. It was found that NDVI was well related to methane gas emission and aboveground biomass of rice, which can be used to estimate methane emission. It can be manipulated by using methane emission rate model coupling with methane emission remote sensing model and biomass remote sensing model based on data from spectrometer and ground measurement. The results showed that the average of methane emission after 110 days of planting from ground measurement were 1,850.46 $mg.m^{-2}d^{-1}$ and 1,799.59 $mg.m^{-2}d^{-1}$ from biomass remote sensing model (84.50 % accuracy ; R^2 = 90.82). The accumulated methane emission after 110 days planting from ground measurement was 5.05 $g.sq.m^{-2}$ and from remote sensing extraction was 4.52 $g.sq.m.^{-2}$ (88.74% accuracy; R^2 = 99.75). These models can be used to estimate methane emission from irrigated paddy field with verified accuracy.