Applying Principle Component Analysis to MODIS NDVI for Estimation of Paddy Rice Yield in Gyeonggi, South Korea

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Abstract: MODIS NDVI is generally used for the estimation of various kinds of crop yields including paddy rice, which is an important crop for Asians. There have been efforts to estimate paddy rice yield using MODIS NDVI in Korea, and MODIS NDVI and meteorological data were generally used as independent variables for the paddy rice yield model. However, it is ambiguous on how to choose a representative MODIS NDVI as an independent variable for estimation of paddy rice yield due to high correlations among annual MODIS NDVIs. This study proposed a method to produce representative values from MODIS NDVI by applying PCA technique and to develop the estimation model especially for paddy rice yield in Gyenggi which is one of the provinces in South Korea. To develop the model, stepwise regression was performed on 16-day composite MODIS NDVI products taken from July to September, meteorological observations from August to September, and statistical data of paddy rice yield from 2006 to 2012. Application of PCA on MODIS NDVI was evaluated in two ways: its acceptability as an independent variable for the model and the comparison between estimations and statistics in 2012. Applying PCA to MODIS NDVI resulted the estimation model simpler and more accurate than using MODIS NDVI of one DOY showed the strongest correlation with the paddy rice yield.

Keyword: Crop yield model, MODIS NDVI, Principle Component Analysis, Stepwise Regression