

Rice yield estimation using free satellite images

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Abstract

Rice yield forecasting before harvest time is very important for assessment of seasonal production for strategic planning purposes. This is very significant work for a country like Sri Lanka because Sri Lankans major food source is rice. This study was focused to estimate rice yield in Kurunegala district which gives higher contribution for the total rice production in the country.

In this study, a new method has been suggested to identify cultivated paddy fields through a temporal analysis of NDVI time series. 8-day composite images (250m spatial resolution) from Moderate Resolution Imaging Spectroradiometer (MODIS) sensor onboard the NASA EOS Terra satellite were used from 2007 to 2014. Accuracy assessment results show that the suggested method has ability to identify cultivated paddy lands with 74% average accuracy. The other part of this study was focused to build up rice yield prediction models based on NDVI and EVI2 vegetation indices. Linear and exponential relationships between rice yield and related vegetation indices (NDVI and EVI2) were identified in this study. An accuracy assessment of rice yield estimations were performed by comparing estimated rice yield with national statistical data. According to the accuracy assessment results, it was clearly observed that both linear and exponential models produce approximately similar estimations. NDVI and EVI2 based models give more reliable estimations about 96 days after beginning time of the season. However, EVI2 based model (derived at 96 days) give more reliable estimations than NDVI based model with 92% average accuracy. Therefore accurate yield estimation can be provided before one month to harvest time using EVI2 based model. So, this procedure can successfully be applied to forecast rice yield in Kurunegala district.

Keywords: Rice yield, Vegetation indices, MODIS