

RESEARCH PAPER

## Temporal analysis of carbon sequestration pattern in evergreen vegetation using Support Vector Machine

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### ABSTRACT

Support Vector Machines (SVM) are very specific class of algorithms, characterized by usage of kernels, absence of local minima, sparseness of the solution and capacity control obtained by acting on the margin, or on number of support vectors, etc. In this study the gross primary production (GPP) of evergreen tropical vegetation calculated from remote sensing data are classified using SVM. In this study, analyzed multilayer satellite images from the vegetation (VGT) sensors on board the SPOT-4 satellite (01/2006 to 12/2009) were analysed for Cashew plantations areas of Tamilnadu, India. The temporal analysis of vegetation indices such as enhanced vegetation indices (EVI) and land surface water index (LSWI) were done and the GPP was calculated using the satellite based vegetation photosynthesis model (VPM). The enhanced vegetation index (EVI) identified subtle changes in the seasonal dynamics of leaf phenology in cashew plantation area, as supported by leaf moisture content and leaf area index. The land surface water index (LSWI) indicates that the plantation experienced water stress during the dry seasons. The VPM model which uses EVI, LSWI and site specific climate data for 2008-2009 predicted high GPP in the late wet season than in summer season. The GPP calculated from the remote sensing data are classified into three classes using SVM. The calculated GPP of different months in year showed that the monthly GPP ranged from 51-128 g C/m<sup>2</sup>. The SVM is trained to provide an output value of 0, 1 and 2 for carbon sequestration which ranged from 50-75, 76-100 and 101-125 g C/m<sup>2</sup>, respectively. The experimental results shows that the SVM classified the carbon sequestration with an accuracy of 98.1 per cent.

**Key Words :** Support vector machines, Cashew, Carbon sequestration, Pattern classification, EVI, LSWI, GPP

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Global climate change is a wide spread and growing concern that has led to agreement on emission of CO<sub>2</sub> among different countries. Responses to this concern have focused on reducing emission of green house gases, especially carbon-di-oxide, and measuring carbon absorbed by and stored in plants, soils and oceans. One of the options for reducing the rise of green house gas concentration in the atmosphere and thus possible climate change is to increase the amount of carbon removed by and stored in plants. Forests are large reservoirs of carbon as well as potential carbon sink and sources to the atmosphere. In tropical countries like India, forest carbon sinks are believed to offset a significant portion of carbon emission associated with fossil fuel combustion. But due to large scale industrialization and increased population, the forest area is slowly declining. Perennial fruit trees like cashew, mango and guava have similar potential like forest trees to sink atmospheric carbon. Cashew is an evergreen fruit tree; it occupies nearly 40,000 ha in Tamilnadu

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