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Monitoring ecosystem of North Tripura using remote sensing techniques

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ABSTRACT

Land use / land cover being a critical component of ecosystem controls the interactions with the biosphere to provide the needful services to the mankind. Hence management of land use/ land cover is vital to sustain life support system. This dynamic attribute of earth could be monitored with modern tool such as remote sensing by virtue of its tremendous capabilities and compatibility with advanced computer system with multi-temporal data. IRS P6 and IRS LISS III data pertaining to 2005 and 2009 were used to study the land use/ land cover condition and overall biomass changes of North Tripura district, Tripura over a time-scale as shifting cultivation is a crucial factor in the north eastern region that governs the stability of ecosystem of the district. Supervised classification of digital image reveals that forest coverage of north Tripura district has been reduced from 50.2% to 40.8% whereas the extent of permanent agriculture land has been increased from 18.3% to 22.9% during2005 to 2009. The current jhum area has been reduced by 1% where abandoned jhum land is found almost static during the period. However, the declining trend of overall biomass from higher categories to lower categories as revealed from NDVI analysis portrays a clear picture of degradation of ecosystem. Such periodical monitoring using remote sensing and GIS will serve as a decision support system to manage the ecosystem effectively for better services to mankind.

Key words: Ecosystem, Land Use/ Land Cover, Jhum cultivation, Remote Sensing, NDVI

INTRODUCTION

Land use/land cover changes play an important role in the environmental processes and also act as a sensitive indicator for environmental and global changes (Van Wijngaarden 1991). Thus monitoring land use/land cover at certain periodicity may be a vital tool to monitor the ecosystem.

Traditional method to monitor the vegetation is by field investigation. It is low efficiency and high labor demanding, especially for large scale area, and impossible to conduct continuously investigation and that too for inaccessible area (Li et al. 2010).

Remote Sensing (RS) is nowadays, an advanced powerful monitoring tool for its convenience and high efficiency. Thereby, it has been widely employed to monitor the vegetation changes (Townshend et al. 1986; Al-Bakri et al 2003; Kotoky et al. 2012; Das et al. 2013; Rawat et al. 2013). Satellite remote sensing by virtue of tremendous capability in terms of synoptic view, multi-spectral sensing, multi-temporal data acquisition, real time data acquisition and computer compatibility serve as a potent tool to study the land resources of inaccessible terrain, mountains, hills and remote villages in the country from laboratory using image analysis system.

Vegetation coverage, leaf area index and vegetation index are the main indices of vegetation information. However vegetation coverage and leaf area index are often obtained based on vegetation index. Vegetation index is a simple numerical indicator, which can be derived directly from remote sensing image. NDVI is one of the most important and commonly used vegetation indexes, defined as follows:

$$NDVI = \frac{(NIR - RED)}{(NIR + RED)}$$

where RED is the reflectance in the red band and NIR is the reflectance in the near-infrared band.

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