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ECOSYSTEM FLUX MEASUREMENTS IN RUBBER PLANTATIONS

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Perennial trees like natural rubber plants sequester large quantities of atmospheric CO_2 into biomass and therefore, mitigate the increase in greenhouse gas (GHG) emission. In the present study measurements of CO_2 and water vapour flux of a natural rubber ecosystem were attempted for one continuous year. An eddy covariance (EC) flux measurement system was installed on an 18 meter tower inside a rubber plantation (4-5 years old) at the Central Experimental Station of the Rubber Research Institute of India (RRII) which is situated in the traditional rubber growing region of Kerala. The daily net ecosystem exchange (NEE) of CO_2 by the rubber ecosystem was in the range of 1-25 g/m^2/day during the study period. Most of the days recorded a net CO_2 sequestration. However, a few days recorded a net CO_2 efflux (R_{eco}) from the plantation to atmosphere. The mean annual NEE of the 4-5 years old rubber plantation was 11 g CO_2/m^2/day which works out to 33.5 tons CO_2/ha/year indicating that rubber plantation is a potential sink for atmospheric CO_2. The amount of carbon sequestered by the plantation as calculated from the EC data was compared with carbon sequestration of the trees calculated from biomass inventory method. The annual mean evapotranspiration was 3.5 mm/day as calculated from the EC data indicating the high efficiency of sequestering carbon per unit amount of water consumed.

Keywords: Atmospheric flux, Biomass, Carbon sequestration, Eddy Covariance, NEE.

INTRODUCTION

CO_2 is the most important anthropogenic greenhouse gas (GHG) causing global warming (Solomon *et. al.*, 2007). Agricultural and forest ecosystems act as major sinks for atmospheric CO_2 as these ecosystems can sequester large quantities of CO_2. The term ????????????•?•??•?????????•?????•???????• forest lands or other systems that absorb and store CO_2 from atmosphere. Carbon sequestration is the removal and storage of atmospheric CO_2 by photosynthesizing organisms including terrestrial and aquatic vegetation, algae *etc*. in plant or algal biomass and soils (Kumar *et al.*, 2009). Sequestration of CO_2 by terrestrial plants helps prevent global warming (Suruchi and Singh, 2002). Marine algae are also a potent sink for atmospheric CO_2 (Takahashi *et al.*, 2002); however, terrestrial vegetation is obviously more amenable to human intervention than marine algae are.

Roughly between 45 and 55% of plant biomass is carbon (Malhi *et al.*, 2001). Some of this stored carbon in plants is transferred into soils when vegetation, litter and roots decay. In fact, there is more carbon stored in below ground biomass and soils than above

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