CARBON SEQUESTERING THROUGH THE PHOTOSYNTHESIS IN RUBBER PLANTATIONS; A COMPARISON BETWEEN GENOTYPES

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Being an industrial crop, rubber (*Hevea brasilensis*) is having a consistent demand and grown in smallholdings under different environmental conditions providing an economically viable (in terms of both latex and timber production) and socially acceptable system. Also in terms of the environmental benefits, rubber helps to mitigate climate change through the fixing of atmospheric carbon and reducing the carbon emission form nonrenewable resources. Therefore, the present study aimed to assess the genotypic differences in carbon fixing capability of field grown mature rubber cultivations with two specific objectives, 1) to quantify the potential carbon fixation of the mature rubber plantations through the CO_2 assimilation and 2) to establish the genotypic differences of rubber in fixing atmospheric carbon.

The experiment was conducted in the Dartonfield estate of the Rubber Research Institute at Agalawatte. Two promising genotypes i.e. RRIC 100 and RRIC 121 at maximum productivity (i.e. in mature stage; 12 years old) were selected for the study. The assessment of the carbon fixation capability of rubber tree was based on measurements on leaf level photosynthesis, leaf area distribution and light attenuation of the rubber canopy. CO_2 assimilation rates in rubber leaves under varying light levels were monitored with a portable infra red gas analyzer after dividing the canopy into three strata and then, the parameters of light response curve of photosynthesis were estimated using a quadratic function. Leaf area distribution was assessed by physical counting with point quadrats and the available light for the photosynthesis in different canopy levels was estimated using existing ecophysiological models and then, canopy photosynthetic rates were calculated.

In general, mature rubber was capable of sequestering 22 MT of carbon per hectare annually. Monthly values of carbon fixed differed according to the number of sunny and dull days. The highest rate of carbon sequestering was given in the month of March, whilst November has shown the lowest rate. The value estimated for the whole economic lifecycle of rubber was 660 MT/ha. The genotype, RRIC 121 was superior (160% greater) to RRIC 100

in fixing atmospheric carbon with annual rates of 31.8 and 12.2 $MTha^{-1}$, respectively. Differences in the capacity of photosynthetic apparatus and canopy architecture were identified as the reasons for the genotypic differences in carbon sequestering.