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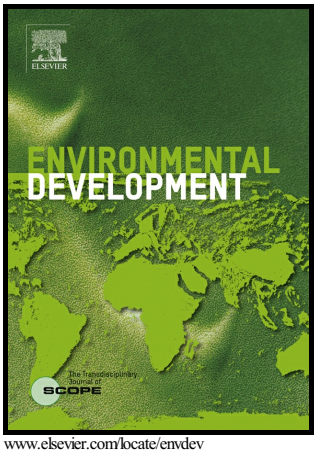

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ENERGY USAGE AND GREENHOUSE GAS EMISSIONS ASSOCIATED WITH TEA AND RUBBER MANUFACTURING PROCESSES IN SRI LANKA

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ABSTRACT

The objective of this study was to analyze the energy usage and greenhouse gas (GHG) emissions associated with energy usage in Sri Lankan tea and rubber industry sectors. The scope of the study covered GHG inventory analysis of carbon dioxide, methane and nitrous oxide starting from tea and rubber plantations to processing of bulk tea and value added rubber products respectively. The functional units of tea and rubber products were 'one ton of made tea' and 'one ton of dry rubber content (DRC)' respectively. Total GHG emission ranged from 514.27 ± 68.66 (high-grown) to 603.10 ± 191.58 (Uva) kg CO_2e ton^{-1} of made tea and the emissions were not statistically significant ($p > 0.05$; ANOVA and Tukey's multiple comparison tests) among four tea growing regions, namely, high-grown, mid-grown, low-grown and Uva. The electricity consumption contributed 63 percent of the GHG emissions and the balance came from fossil fuel (23 percent) and biomass (14 percent) usage. GHG emission associated with rubber plantations was 155.6 ± 47.4 kg CO_2e per ton of DRC. GHG emissions in raw rubber processing factories of crepe and ribbed smoked sheet (RSS), centrifuged latex and technically specified rubber (TSR) were 168.6 ± 44.1, 125.1 ± 24.8 and 375.60 kg CO_2e per ton of DRC respectively. GHG emissions associated with latex based and dry rubber based industries were 1,472.1 ± 1,011.8 and 1,801.23 ± 360.26 kg CO_2e per ton of DRC respectively. The main source of GHG emission was the use of grid electricity. GHG emissions associated with electricity usage in rubber plantations, crepe and RSS, centrifuged latex, TSR, latex based and dry rubber based industries were 15, 80, 42, 53, 75 and 52 percent respectively and the balances were from diesel, biomass, and fuel oil usage. Fuel switching in dry rubber based product manufacturing sector has contributed to about 80 percent reduction of GHG emissions.

Keywords: Tea, Rubber, Energy, Greenhouse Gas, Sri Lanka