223/B

Soil and litter carbon contents in the cardamom plantations compared to the natural forests and grasslands of the Knuckles region, Sri Lanka

A L S Dharmaparakrama
Research Station, Department of Export Agriculture, Matale

In the Knuckles range (North latitude 7' 16" – 7' 36" and East longitude 79' 42" – 81' 52"), the undergrowth of about 3230 ha is being cleared for cardamom [*Elettaria cardamomum* (L.) Maton] plantations. Cardamom is an economically important spice crop, providing foreign exchange to the country. As a carbon sink, the natural forests play a dominant role while the cardamom forests sequester carbon in considerable amount but it has not been accounted so far. The study shows, how those land use types act as carbon sinks when compared to the grasslands in this region. The experiments were designed to observe the soil and litter carbon stores of the cardamom forests, grasslands and the natural forests in three agro-ecological zones, namely mid country wet zone (WM3b), mid country intermediate zone (IM1b) and up country intermediate zone (IU1) of the Knuckles region. Combinations of different land use types in the same geologic and climatic region were selected within one sampling area to compare those land use types from 44 locations. Litter samples were randomly collected from the different land use types while the soil samples were taken from four depth classes of 0 – 10 cm, 10 – 20 cm, 20 – 40 cm and 40 – 60 cm in each site. The air-dried fine soil samples and grounded litter samples were analyzed for carbon content using C/S-Element Analyzer LECO S/C 444. The carbon content was estimated by dry combustion of soil samples at 1400 ^{o}C in a pure O_2 atmosphere followed by infrared detection of evolved CO_2 (ÖNORM L 1080). The data were analyzed using SPSS version 12. The results show that the soil carbon content decreases with increasing soil depth. In the first depth class, the highest carbon content was found in IM1b & IU1 eco-zones in natural forest (> 46 mg g^{-1}), followed by the cardamom forests in IU1 (37 mg g^{-1}) eco-zone and grasslands have about 19 – 25 mg g^{-1} of carbon. In the WM3b ecological zone, the carbon content is lower than in the other two ecological zones irrespective of the land use type. The soil carbon in 60 cm depth, natural forests have the highest amounts (7489 – 8878 g m^{-2}.60 cm^{-1} depth) whereas cardamom forests and grasslands show 6882 – 8451 and 4351 – 5403 g m^{-2}.60 cm^{-1} depth respectively. The litter dry mass is lower in grasslands (5 – 10 t ha^{-1}) and cardamom forests (30 – 47 t ha^{-1}) than in natural forests (100 – 157 t ha^{-1}). Carbon contents of litter in all land use types are between 395 – 460 mg g^{-1}. Total soil and litter carbon stores are higher in natural forests (125 – 141 t ha^{-1}) when compared to the cardamom forests (90 – 98 t ha^{-1}) and grasslands (48 – 58 t ha^{-1}).

Keywords: Soil carbon, cardamom, natural forest, grassland, carbon sink

dharmaparakrama@yahoo.com Tel: 071-2805032