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Revisiting IPCC Tier 1 coefficients for soil organic and biomass carbon storage in agroforestry systems

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Agroforestry systems (AFS) have the capacity to sequester large quantities of carbon (C) in both soil and biomass. However, these systems have not yet been fully considered in the approach to C accounting developed by the Intergovernmental Panel on Climate Change (IPCC). Our literature review identified a total of 122 scientific, peer-reviewed articles associated with biomass C storage and with soil organic carbon (SOC), containing of total of 542 observations (324 and 218, respectively). Based on a synthesis of the reported observations, we are presenting a set of Tier 1 coefficients for biomass C storage for each of the 8 main AFS identified, including alley cropping, fallows, hedgerows, multistrata, parklands, shaded perennial-crop, silvoarable and silvopastoral systems, disaggregated by climate and region. Using the same agroforestry classification, we are presenting a set of stock change factors (FLU) and SOC accumulation/loss rates for three main land use changes: cropland to AFS; forest to AFS; and grassland to AFS. Globally, the mean SOC stock change factors (± confidence intervals) were estimated to be 1.25 ± 0.04, 0.89 ± 0.07, and 1.19 ± 0.10, for the three main land use changes, respectively. However, these average coefficients hide huge disparities across and within different climates, regions, and types of agroforestry systems, highlighting the necessity to adopt the more disaggregated coefficients provided herein.
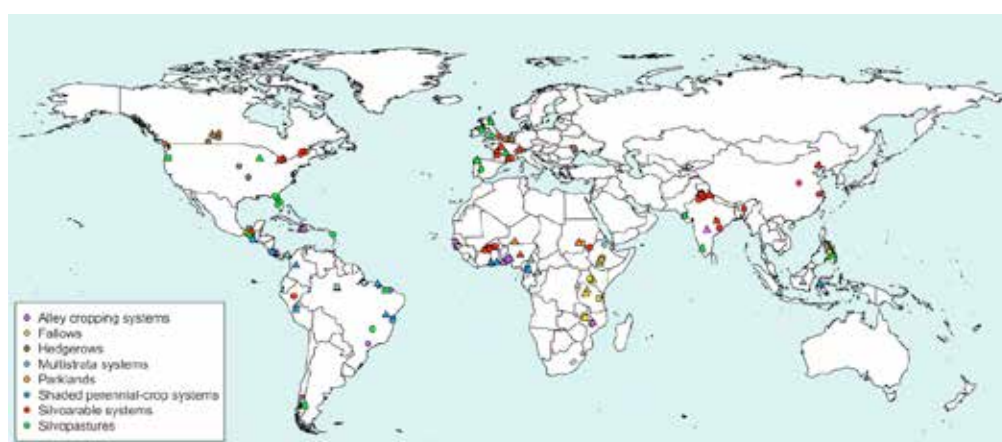
Figure: Sites of published studies on SOC (circles) and biomass (triangles) storage in various agroforestry systems. A few studies reported both SOC and biomass (squares).

Keywords: Carbone sequestration, emission factor, climate change mitigation, land use change.

References:

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