



Deep Soil Carbon: The Insight into Global Carbon Estimation and Deforestation Impacts

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World carbon stocks have been dramatically changed by deforestation. The current estimation of carbon loss is based on allometric techniques assisted with satellite imagery and the assumption that, 20% of the total biomass carbon stock is below ground. However, the monitoring of soil carbon is limited to 0.3 m despite many soils being much deeper than this. For example, direct measurement of soil carbon demonstrated the occurrence of two to five times more carbon stored in deep soils of south Western Australia (SWA) compared to what would normally be reported, although the land had been deforested for 80 years. This raises important questions about the dynamics of this deeper carbon and whether it will contribute to global climate change. This paper reports the form and variation of carbon in soil at three adjacent areas at three different depths (0-1, 11-12 and 18-19 m). Techniques were developed to quantitatively and qualitatively determine small concentrations of carbon in deep soils. There were marked differences in carbon compounds with depth. Near the surface these were macromolecular organic compounds derived from lignin, polysaccharides, proteins, terpenes, whereas at depth they were low molecular weight compounds, 13-docosenamide, 13-docosenoate, xanthone, benzophenone. The deeper compounds are likely derived from the roots of the previous forest whereas the surface soils are affected by current land use. The in situ decomposition of deep roots was revealed by the pyridine compound. The variation of compounds and location of carbon in clay could imply the state of decomposition. The result demonstrated that carbon is contained in deep soils and should be considered in global carbon accounting, particularly given ongoing deforestation on deep soils.