δ13C Abundance and Distribution in Soil Fractions under Vetiver and Native Pastures

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Soil carbon fractions indicate the resilience or otherwise of carbon stored in soils and its relative rate of decomposition and cycling. Where a change of vegetation cover from C3 to C4 species takes place, δ13C abundance in SOC fractions and their distribution in soil profiles can be used to determine the quantity, rate and distribution of "new" carbon added to the soil system. In this work, we examined the isotopic signature (δ13C) of two soil fractions, their quantity, vertical distribution and turnover rates in the soil profile under the C4 vetiver grass compared with native (C3) grasses at a research site in Gunnedah in northwest NSW. Vetiver is a fast growing tropical grass used extensively in Africa and Asia for soil conservation works and it has been proposed that this grass has considerable potential for efficient storage of additional soil carbon. Undisturbed soil core samples were collected to 1m soil depth and subdivided in to seven soil depth increments. In each depth increment, two fractions were determined using physical and density fractionation to >50µm (POM) and <50µm (mineral associated). Samples were analysed using Sercon 20-22 continuous flow isotope ratio mass spectrometer (IRMS). The δ13C distribution in the soil profile was used to explore the nature and proportion of soil carbon contributed by Vetiver. Findings of the experiment are presented and significance of vetiver grass for carbon storage in the different soil fractions are discussed.