SOIL CARBON SEQUESTRATION POTENTIAL UNDER PERENNIAL PASTURES IN THE MID NORTH COAST OF NEW SOUTH WALES

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Contrary to the wheatbelt soils (Dalal and Chan 2001; Chan et al. 2003), even less information is available on the soil organic carbon (SOC) status under perennial pastures in the high rainfall areas along the Mid North Coast of New South Wales. A soil carbon assessment project was undertaken (i) to compare SOC stocks for paired vegetation types of introduced subtropical, grass dominant, perennial pastures with adjacent native hardwood forests and (ii) to assess SOC stocks under a range of perennial pasture types within a 100 km radius of Taree, New South Wales.

The Mid North Coast region of New South Wales , latitude 30deg S to 32 deg S has a median annual rainfall range of 900mm to 1600mm, a subtropical climate, with summer /autumn dominant rainfall and a regular spring drought. Eucalypt forests and open woodlands covered between 85% and 90% of the region before white settlement in the late1820's. Greater than 85% of the region is gently undulating to steep and covered in shallow, infertile, texture contrast soils derived from sedimentary rocks. Initially, only alluvial soils were cropped but with the introduction of dairying in the 1890's some cultivation of lower, gentle slopes occurred for winter fodder cropping. The dairying area declined after 1970, being replaced by beef cattle and declining fertiliser inputs due to declining terms of trade.
Currently, the vast majority of cleared, perennial pasture country would have been disturbed less than twice in the last 40 years. This area is dominated by low quality, naturalised and medium quality, introduced subtropical perennial grasses with low management inputs, especially fertiliser.

Composites of ten cores were taken from a 20m x 20m site by sampling five cores from two diagonally opposite 10m x 10m plots 0-10cm and 10-20cm deep. These soil samples were dried at 40^{o}C, ground to <2mm and analysed for total organic carbon, total nitrogen, pH and Bray phosphorus. Bulk density of soil at 0-100 mm and 100-200 mm were also determined.

Results

There was no significant difference ($P<0.05$) in SOC stock to 20 cm between paired sites of perennial pastures and native forest, with mean SOC storage being 72.9 t/ha and 76.5 t/ha respectively (Table 1).

Table1. Summary of Soil OC stock (0-20 cm) under native timber and different pastures on Mid North Coast of NSW

Vegetation Type	**SOC t/ha**	**SOC t/ha**
	Mean	**Range**
Native Timber	76.5	37.4 to 133.7
Summer Perennial Pasture (fertilised and unfertilised, paired sites only)	72.9	54.5 to 96.4
Naturalised Perennial Pasture (unfertilised)	60.8	60.4 to 61.1
Perennial Native Grass Pasture	47.3	44.2 to50.4
Improved Perennial Temperate Grass Table	164.3	NA

NA, not available as only one sample

The large variation in SOC amongst different pastures highlight the importance of improvement in soil fertility and management practices for introduced subtropical grasses to develop a competitive, productive ground cover and sequester more SOC. Trends in SOC data for different pasture sites suggest that agricultural land in this region can increase productivity and sequester more carbon. This can be achieved by environmentally based financial incentives, e.g. if landholders were compensated for SOC accumulation under perennial pastures by having the option of participating in carbon trading schemes.

This pilot study provides a baseline for a more comprehensive study where environment, pasture species, soil type, soil fertility, and other management issues were considered.

Results of this pilot survey indicated that on the mid-north coast of NSW, introduced perennial pastures can potentially sequester similar amount of soil carbon as native timber. Furthermore results highlighted the importance of management practices on SOC sequestration potential of pastures

References

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