Organic Farming and Its Effects on Carbon Content

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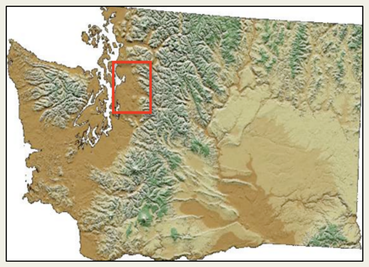
Introduction

In the past, research has shown that conventional farming practices typically lower soil carbon content. However, the effect of many organic farming practices on soil carbon storage is uncertain. Will organic farming practices increase soil carbon or at least retain soil carbon? This study assessed common organic farming practices and their effects on soil carbon content. Three organic farms working with alluvial floodplain soils were studied that varied in management practices and duration of organic farming. This study aimed to quantify carbon content in organically farmed systems and determine the effectiveness of different organic farming practices relative to unfarmed control soils.



Map 1: Map of Washington State showing study area.

Map 2: Areal view of three farms used in this study.

Methods

Summer 2009 sample locations were based on soil series and management practices. Plots were selected at random within a limited field space. Within each field four plots were randomly chosen. Plots were no closer than 20m and no further than 50m from each other. Areas that had not been farmed or treated served as control plots. A total of twenty-eight (28) profiles were sampled across the three farms to a depth of 50cm. At each profile two samples were collected from 0-10 cm, 10-30 cm, and 30-50 cm; one sample for bulk density, and the second for chemical analysis. Loss on ignition (L.O.I.) was used to quantify the amount of organic matter. Samples were oven dried at 105° C, then placed in a muffle furnace at 550° C. A subset of samples were also analyzed using a CHN analyzer to determine N concentration and to correct LOI values (values were high due to the fine texture of the soils).

Table 1. Farming practices and years organically farmed at replicated sites

Farm and Soil Order	Treatment	Years Farmed
Jubilee: Inceptisol	Limed	Eleven
Jubilee: Mollisol	Limed	Eleven
Growing Things: Inceptisol	Poultry Manure	Four
Full Circle: Inceptisol	Limed	Thirteen

Results

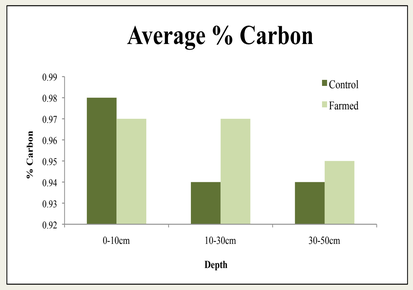


Figure 1. Average % carbon of farmed and control soils by depth. Concentrations of carbon decreased by depth and were higher in farmed soils except for the surface soil.

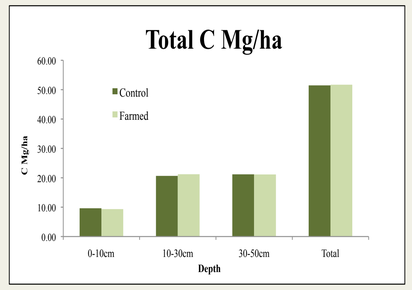


Figure 2. Total C Mg/ha content of farmed and control soils by depth. Content indicated that there were no differences in C Mg/ha between farmed and control soils.

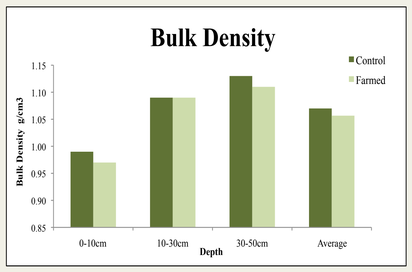


Figure 3. Bulk Density comparison between farmed and control soils by depth. Values indicate higher levels of compaction within control soils.

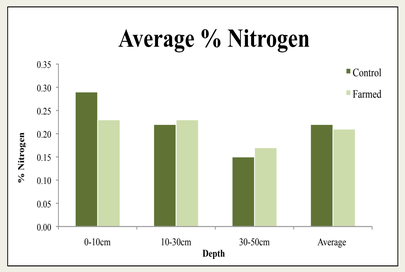


Figure 4. Average % Nitrogen comparison between farmed and control soils by depth. Concentrations of nitrogen decreased by depth and were higher in farmed soils except for the surface soil.

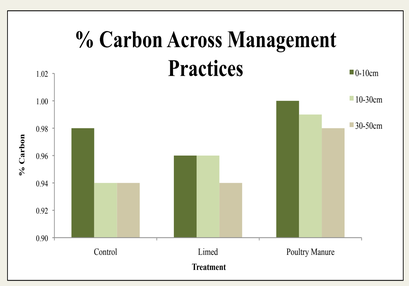


Figure 5. Effect of management practice on average % carbon by depth. Concentrations were higher in soils with additions of poultry manure.

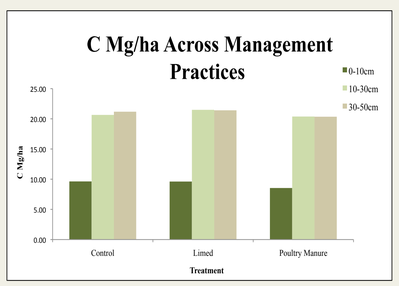


Figure 6. Effect of management practice on C Mg/ha by depth. Carbon content indicate no differences across management type.

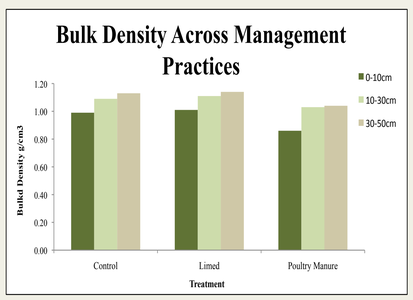


Figure 7. Effect of management practice on bulk density by depth. Values indicate that farmed soils are less compacted than control soils.

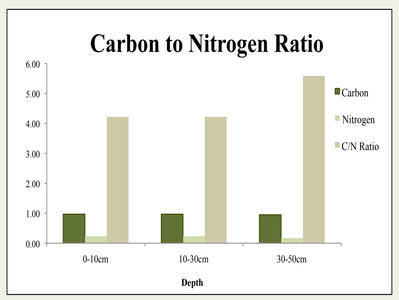


Figure 8. Carbon to Nitrogen ratio by depth. Values indicate that carbon concentrations are higher than nitrogen concentrations amongst soils.

Figure 9: Puget Silt Loam Profile

Figure 10: Puget Silt Loam control profile under grasslands

Figure 11: Lettuce crops at Full Circle Farm

Conclusion

- Total C content suggest that overall organic farming practices retain carbon within the soil.
- Bulk Density results indicate that compaction affects soil carbon content.
- In general higher carbon concentrations are evident in soils With poultry manure additions.
- Statistically significant changes in C storage are difficult to detect in short periods of time.
- A longer study with more varied management practices and soil types should be executed to determine if there is a change in carbon storage over time.