**Background**

- Understanding processes that ameliorate cropping system productivity and sustainability is particularly important in intensively managed row crop systems.
- Cropping system productivity and sustainability are highly dependent on soil organic matter dynamics (Snapp et al., 2010).
- Soil organic carbon accrual and soil stabilization are among the key indicators of agro ecosystem productivity. However, these have rarely been determined in long term rotational crop diversity gradients in integrated nutrient management systems. This study conducted in LFL of the KBS LTER in 2013 aimed at addressing this research gap.

**Objectives**

The objectives of the study were to:

i) determine long term soil structure stability effects of crop bio-diversification in an integrated compost and integrated fertilizer management using water stable aggregates as indicators.

ii) quantify measures of labile C to determine long term responses of integrated nutrient management and temporal crop bio-diversification.

iii) examine relationship between labile C soil measures and structural stability in fine loamy mixed, semi active, mesic Typic Haplustalf soils of the long term trial.

**Research Questions**

**Question 1:** What are the long term effects of integrated nutrient management systems to soil structural stability?

**Question 2:** What effects does rotational crop diversity have on agro ecosystem function in integrated nutrient management systems?

**Hypotheses**

1. Integrated compost management will be associated with increased soil structural stability compared to integrated fertilizer management.

2. Increasing rotational biodiversity will enhance aggregate stability and soil C accrual reflected by various C measures in both systems.

**Methods**

We investigated the role of management and temporal crop bio-diversification through the manipulation of crop diversity in a 20 year study located at Kellogg Biological Station, southwest Michigan.

Treatments included:

1. Continuous monoculture of corn (C)
2. Corn-soy biculture (CS)
3. Corn-soy-wheat triculture (CSW)
4. Polyculture of corn-soy-wheat with two cover crops (CSWco)

We quantified Soil Organic Carbon (SOC), labile soil organic carbon (Permanganate Oxidizable Carbon – POXC) and water stable aggregates at 3 different depths (0-5, 5-20 and 20-25 cm).

**Experimental design**

Split plot, randomized complete block with 4 replications

Main plots within blocks were Integrated Fertilizer (IF) and Integrated Compost (IC)

**Results**

**Table 1. Influence of Management and Crop Diversity on Soil Characteristics in the LFL at KBS_LTER in 2013**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Management</th>
<th>Crop Diversity</th>
<th>SOC %</th>
<th>POXC mg kg⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous monoculture C</td>
<td>IF+FC</td>
<td>Corn (C)</td>
<td>0.26</td>
<td>37.5 ± 5.6</td>
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</tbody>
</table>

**Conclusion**

Results indicated that POXC and water stable aggregate size fractions responded to long-term treatment differences. Over the 20 year period, management had a greater influence with IC as the better system. The least diverse system (C) had reduced macro aggregate stability compared to rest of the treatments, in both management systems. Of all measures, SOC and POXC were moderate predictors of aggregate stability across the plow depth profile (0-25 cm).

**References**


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