Bringing carbon back into nutrient management

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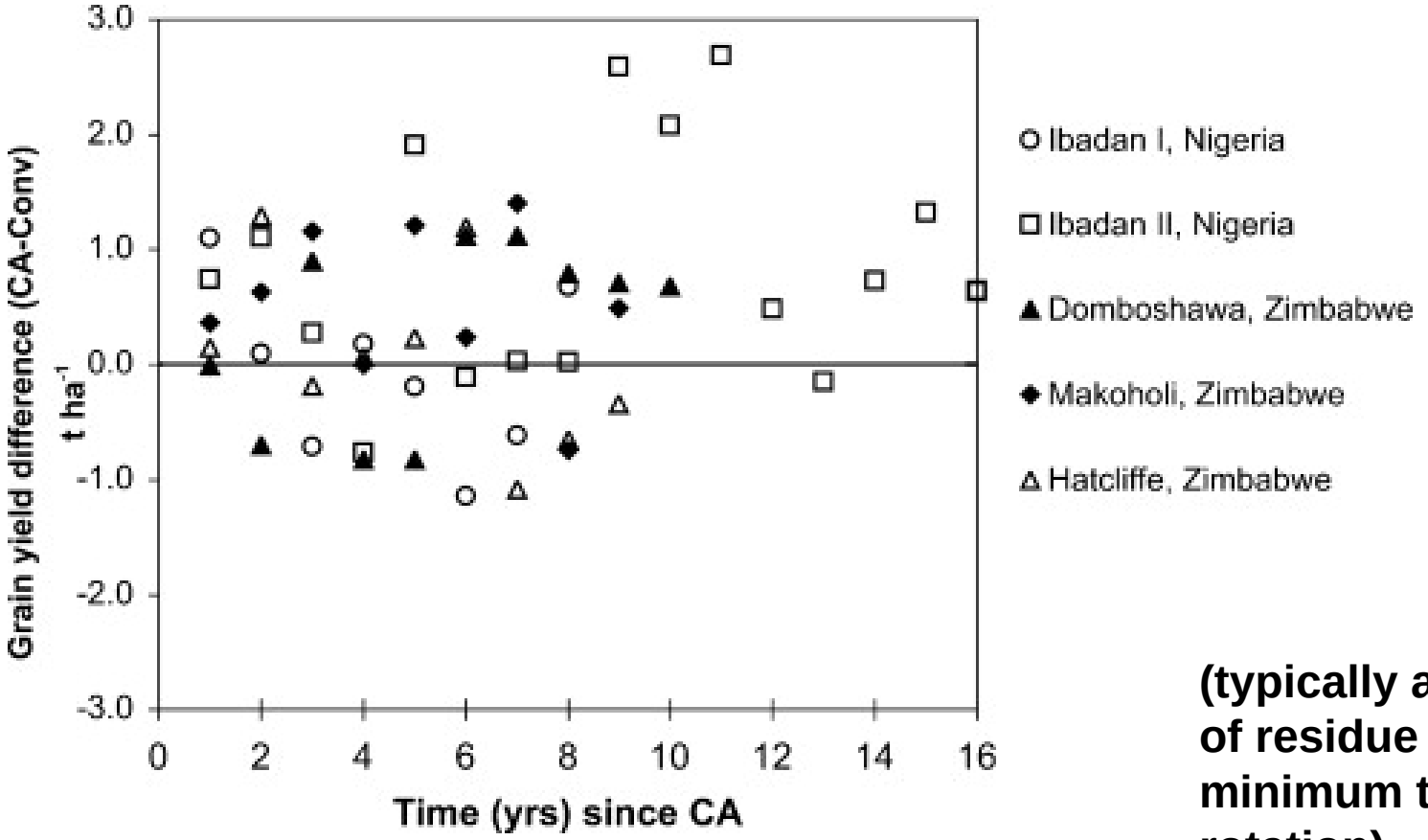
Soil Knowledge is Available to Develop Nutrient Recommendations

1. **Site–specific recommendations**

2. **Constraints may lie outside soil knowledge (fertilizer availability, costs etc.)**

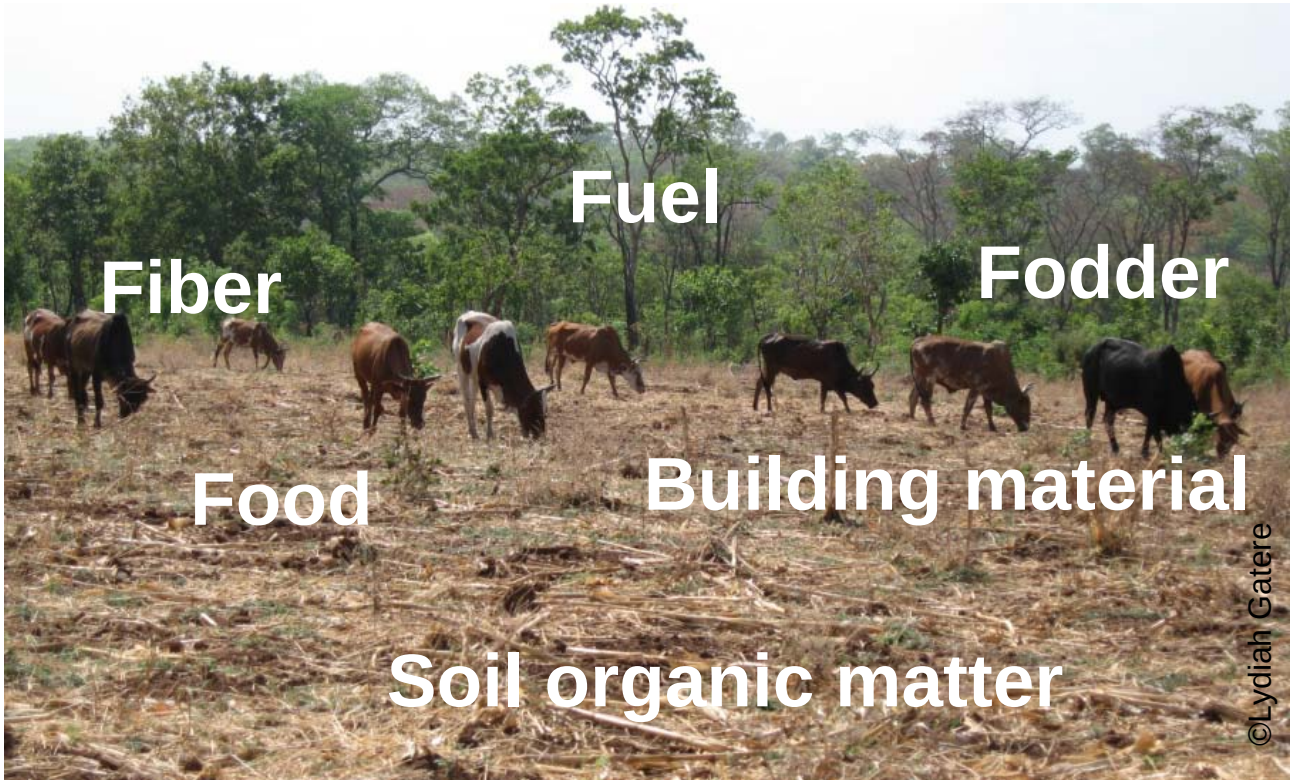
Conservation Agriculture



(typically a combination of residue retention, minimum tillage, crop rotation)

Giller et al., 2009, *Field Crops Res.* 114, 23-34

Multiple Uses of Biomass



1. Generate synergy between biomass uses
2. Adopt a watershed view of resource management

Example: Integration of Household Energy and Soil Improvement through Biochar

Biochar Stoves

Example: Integration of Household Energy and Soil Improvement through Biochar

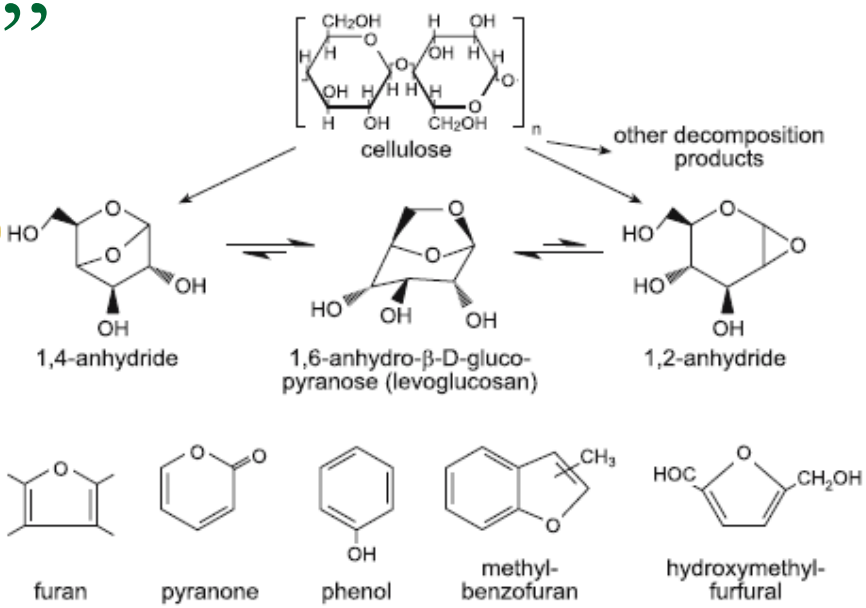
25,000 families

10,000 families
in the next 3 years

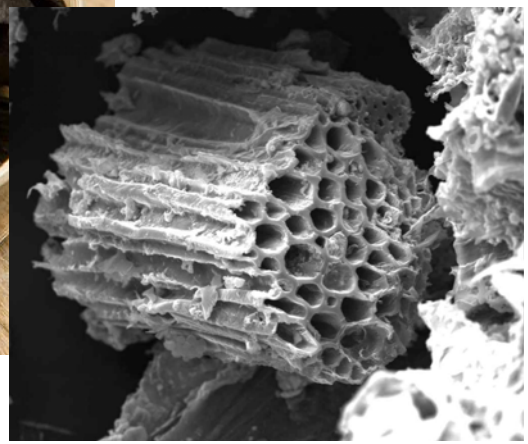
1,000 families

Biochar "Transformation"

Complete chemical changes
during heating in absence of air (pyrolysis)

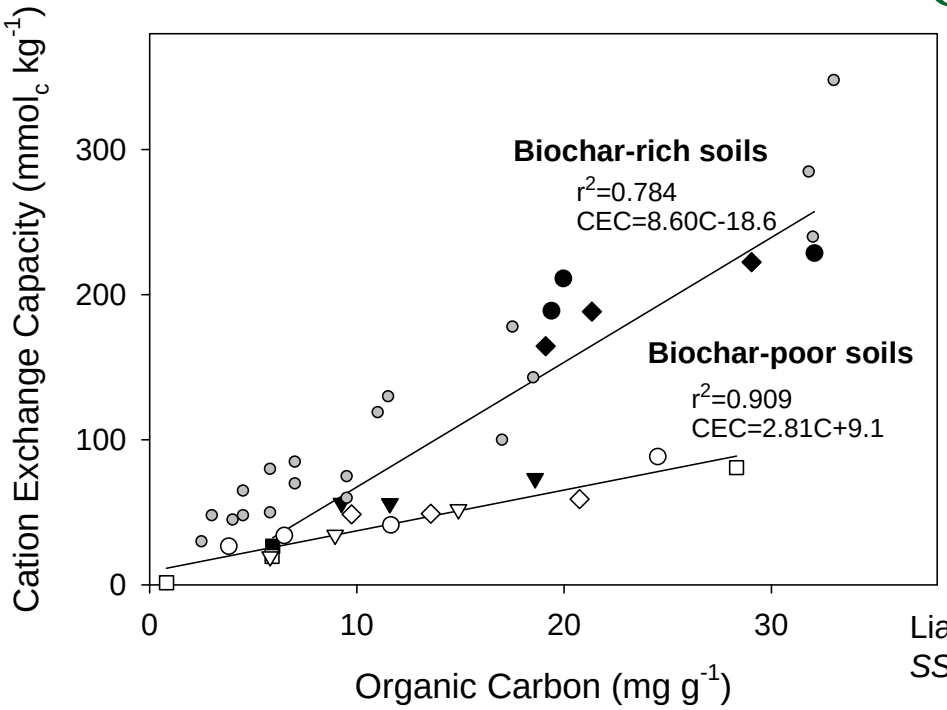


Knicker, 2007, *Biogeochem* 85, 91-118



Biochar Approaches to Nutrient Management

1. Nutrient retention

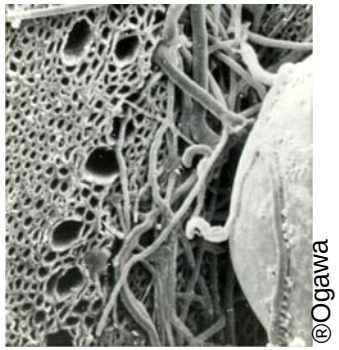


Liang et al., 2006,
SSSAJ 70: 1719-1730

2. Acidity management (alternative to lime)

3. Inoculant carrier

4. Lasts about 2 orders of magnitude longer in soil



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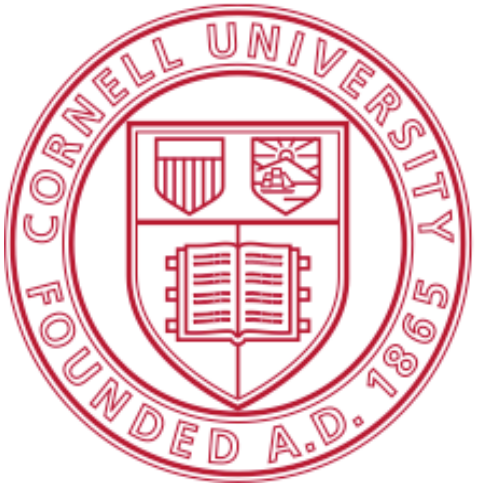
Soil Management Does Not Come in a Box

…but

COMACO



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