Optimizing soil health using Kernza during organic transition period

MK Rakkar
G. Bergquist, C Sheaffer, J Jungers, J Gutknecht, J Grossman
University of Minnesota

Introduction: Organic transition period

Conventional farming system

Organic farming system

Transitioning period 3 years

Challenges: Organic transition period

Conventional farming system

Challenges:

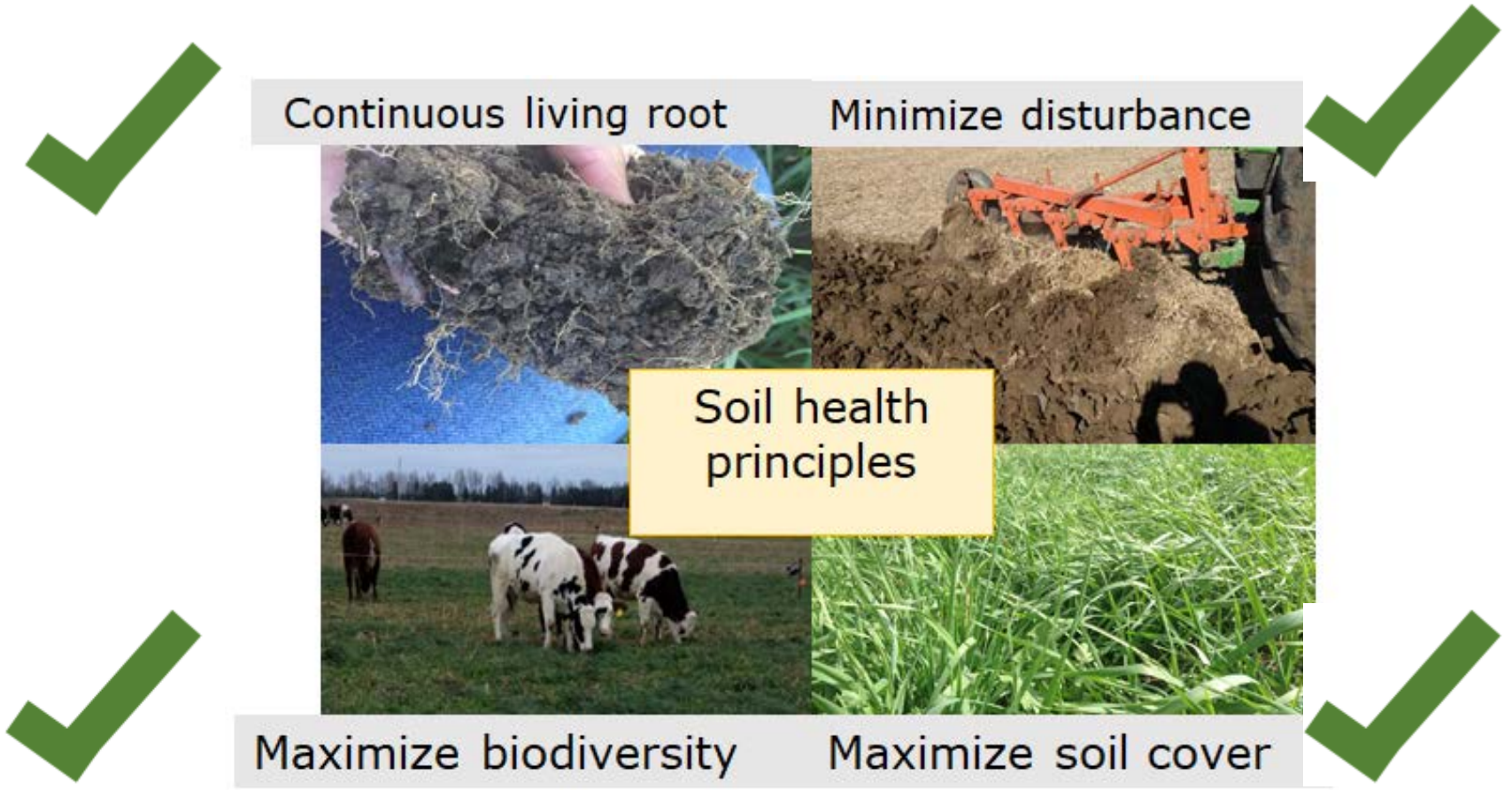
- Weed control: frequent cultivation
- Soil fertility
- Low crop yields
- Low profitability
- Adaptability to system
  - Farmer
  - Soil biota

Transitioning period
3 years

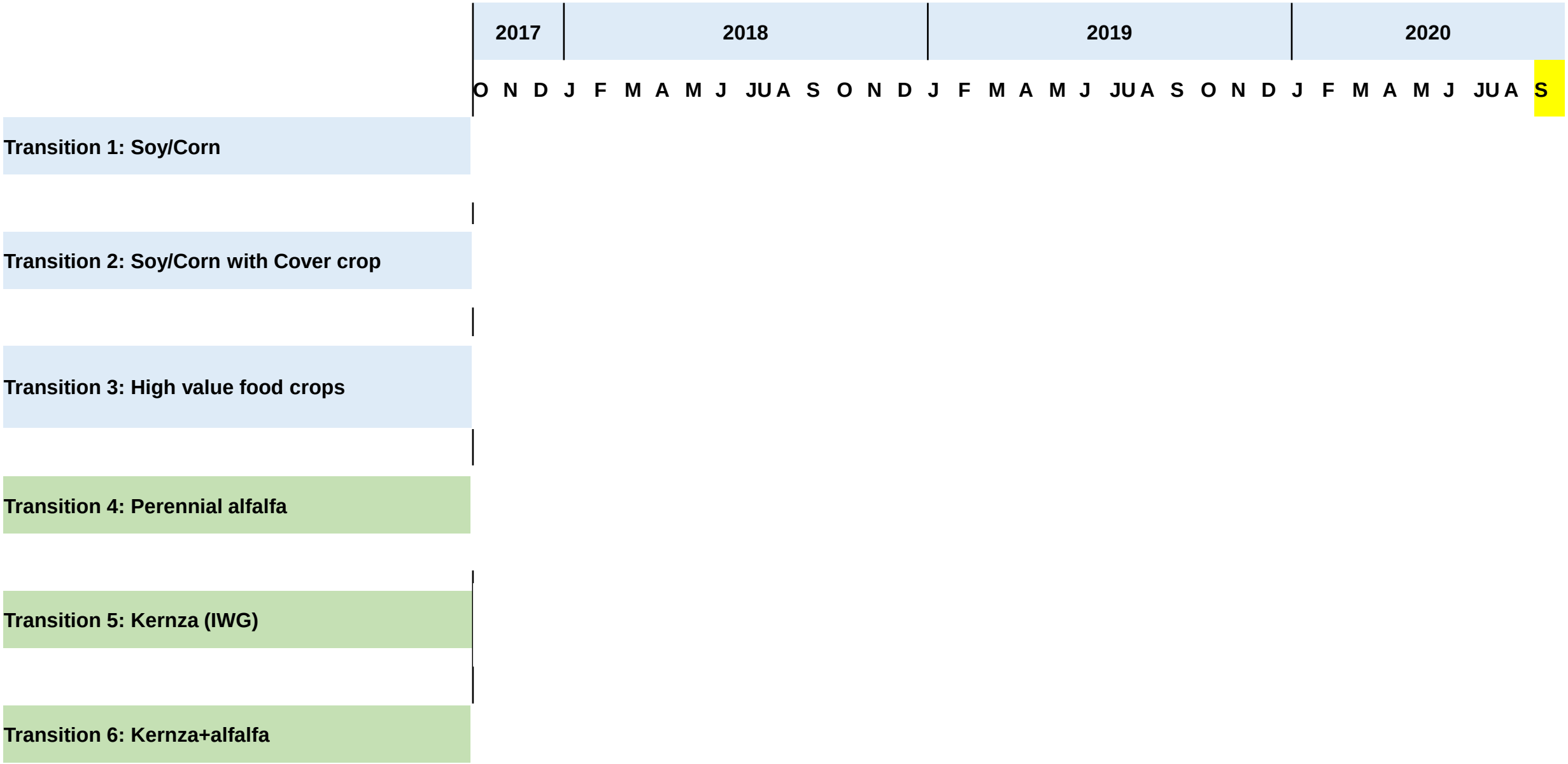
Organic farming system

Can Kernza optimise soil health?

Soil health, also referred to as soil quality, is defined as the continued capacity of soil to **function** as a vital living ecosystem that sustains plants, animals, and humans (NRCS)

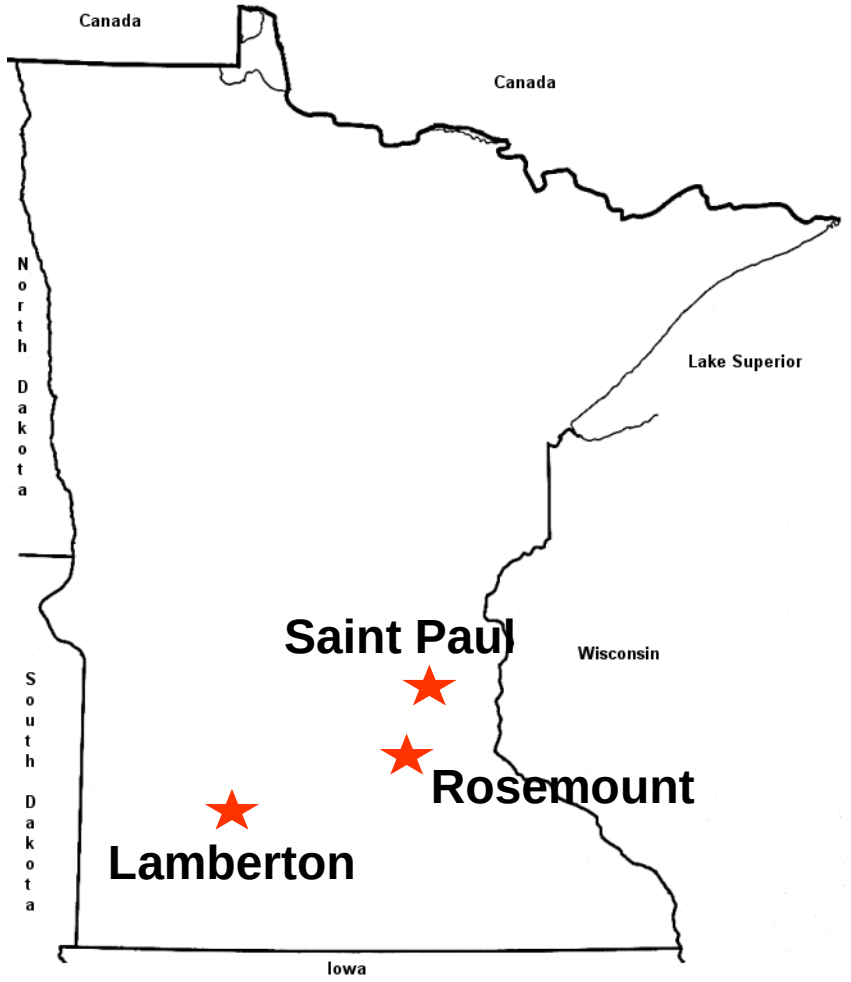


Experimental design

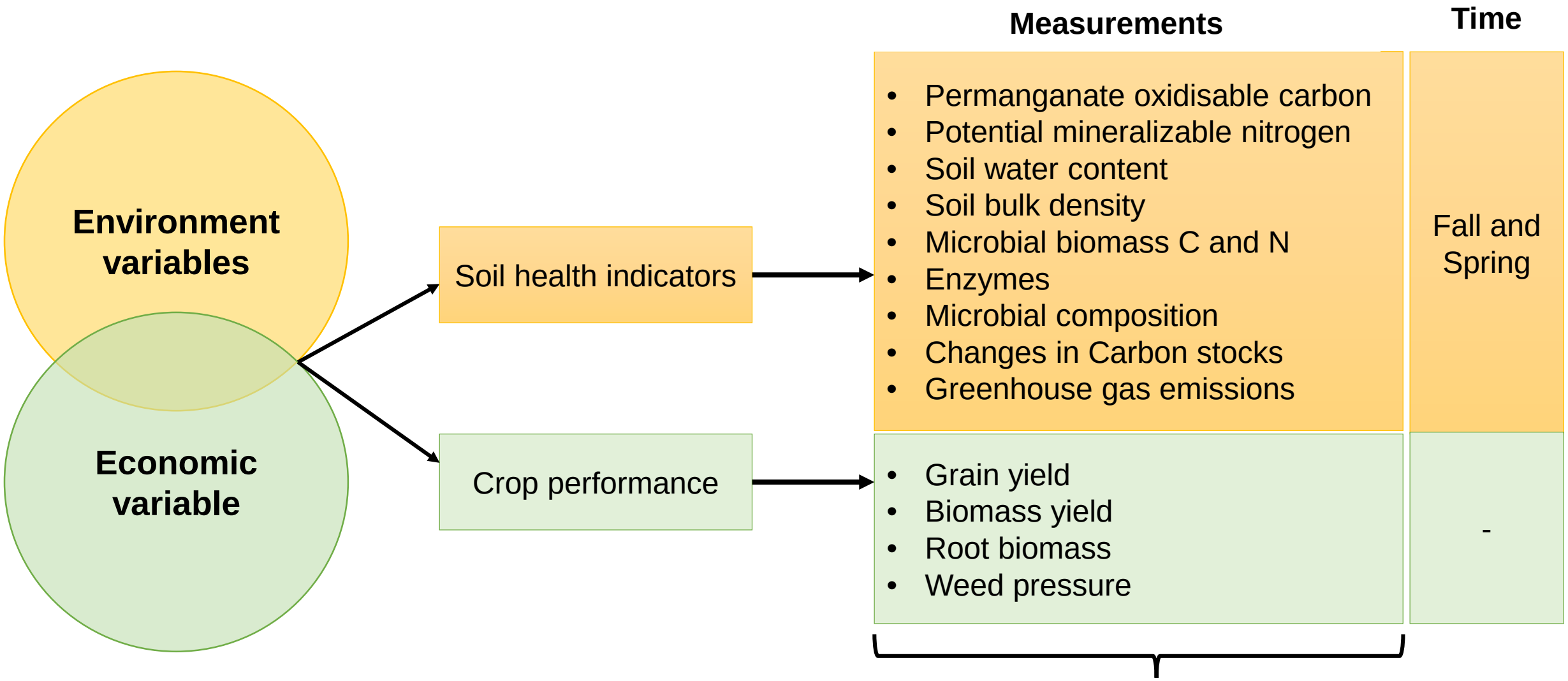


Experimental design

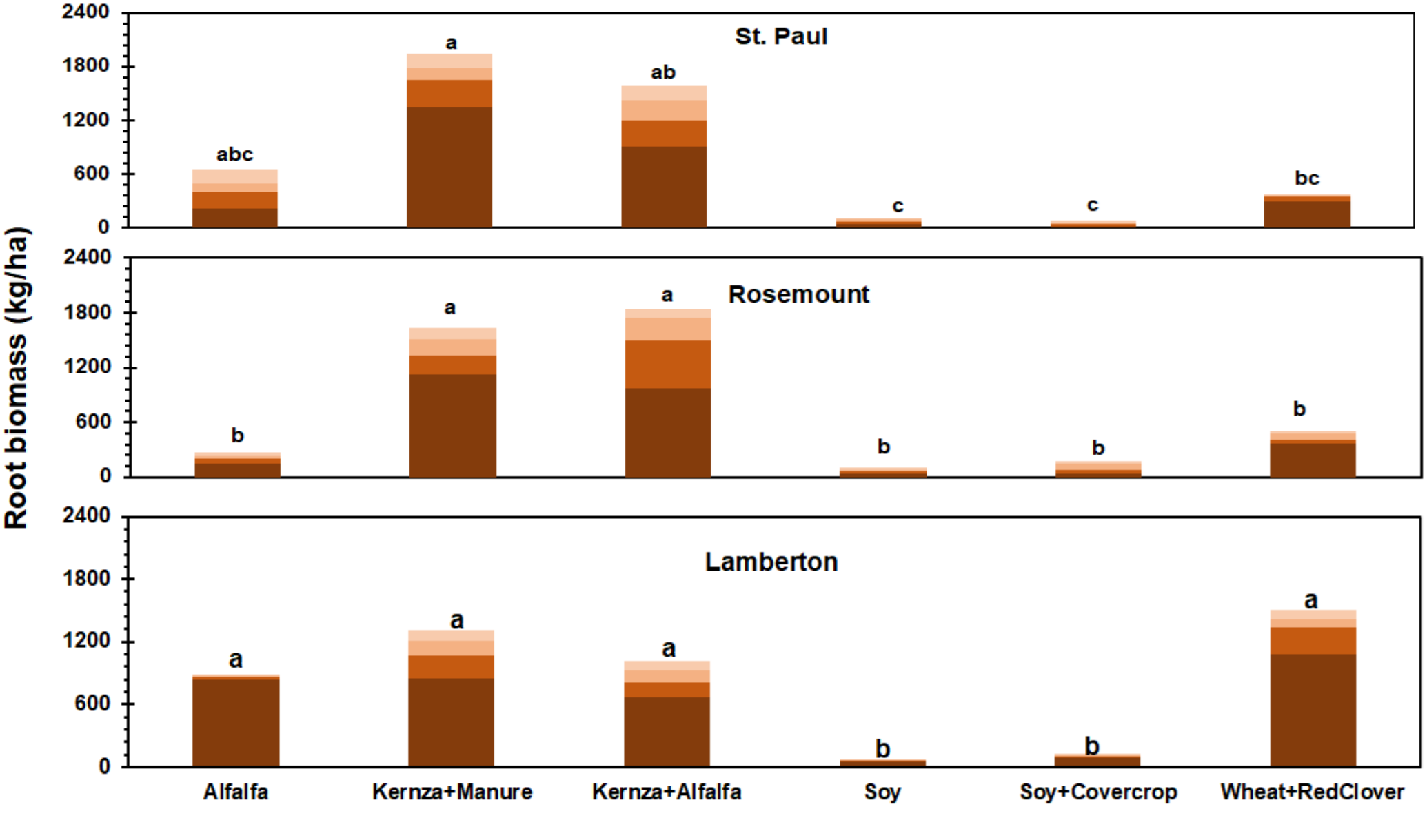
- **Treatments**: 6
  - Transition 1: Corn/soy
  - Transition 2: Corn/Soy with Cover crop
  - Transition 3: High value food crops
  - Transition 4: Perennial alfalfa
  - Transition 5: Kernza
  - Transition 6: Kernza+alfalfa
- **Replications:** 4
- **Experimental design**: Randomized complete block design
- **Locations:** 3



Material and Methods



Root biomass (Belowground biomass)



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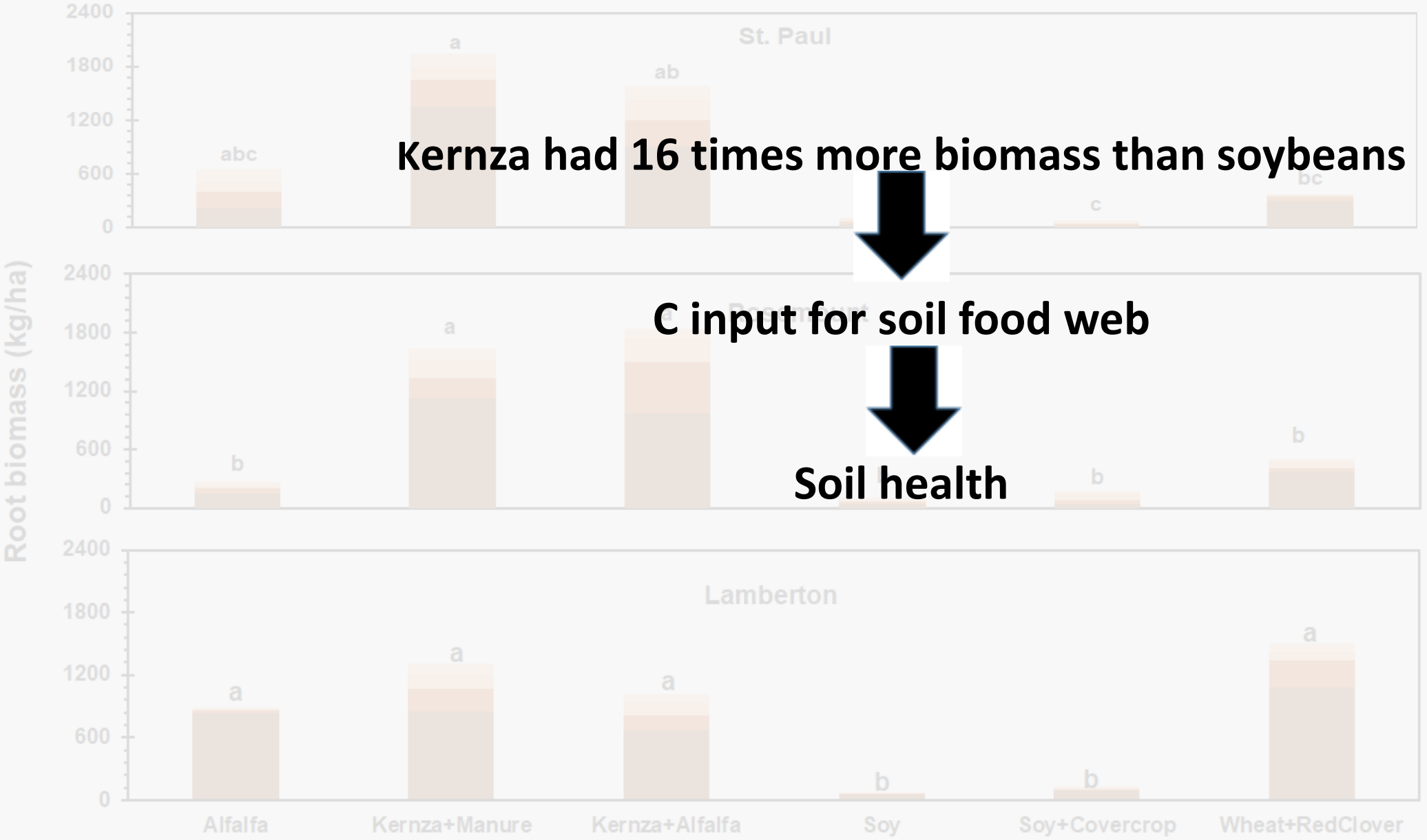
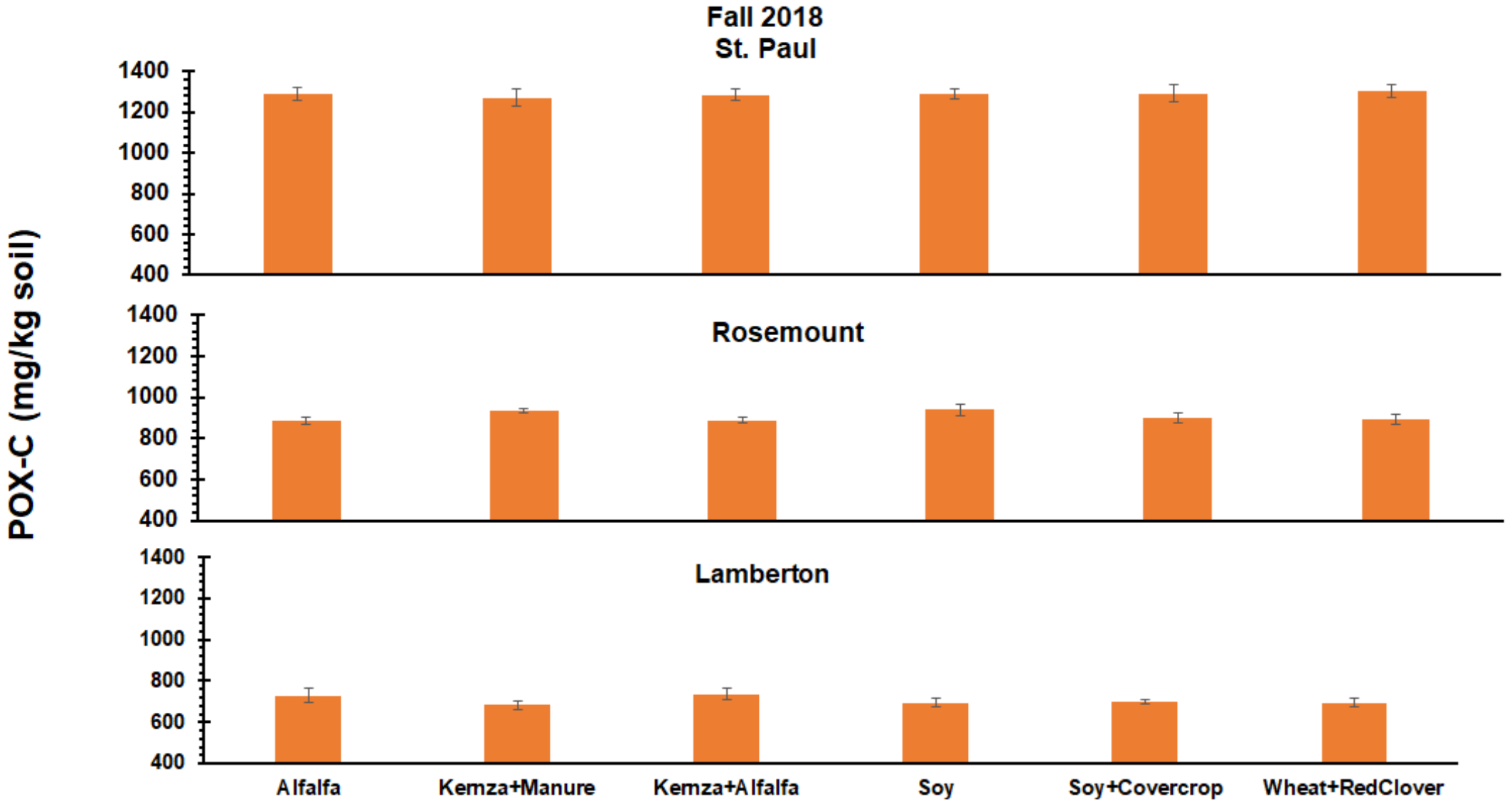


Kernza had 16 times more biomass than soybeans

C input for soil food web

Soil health

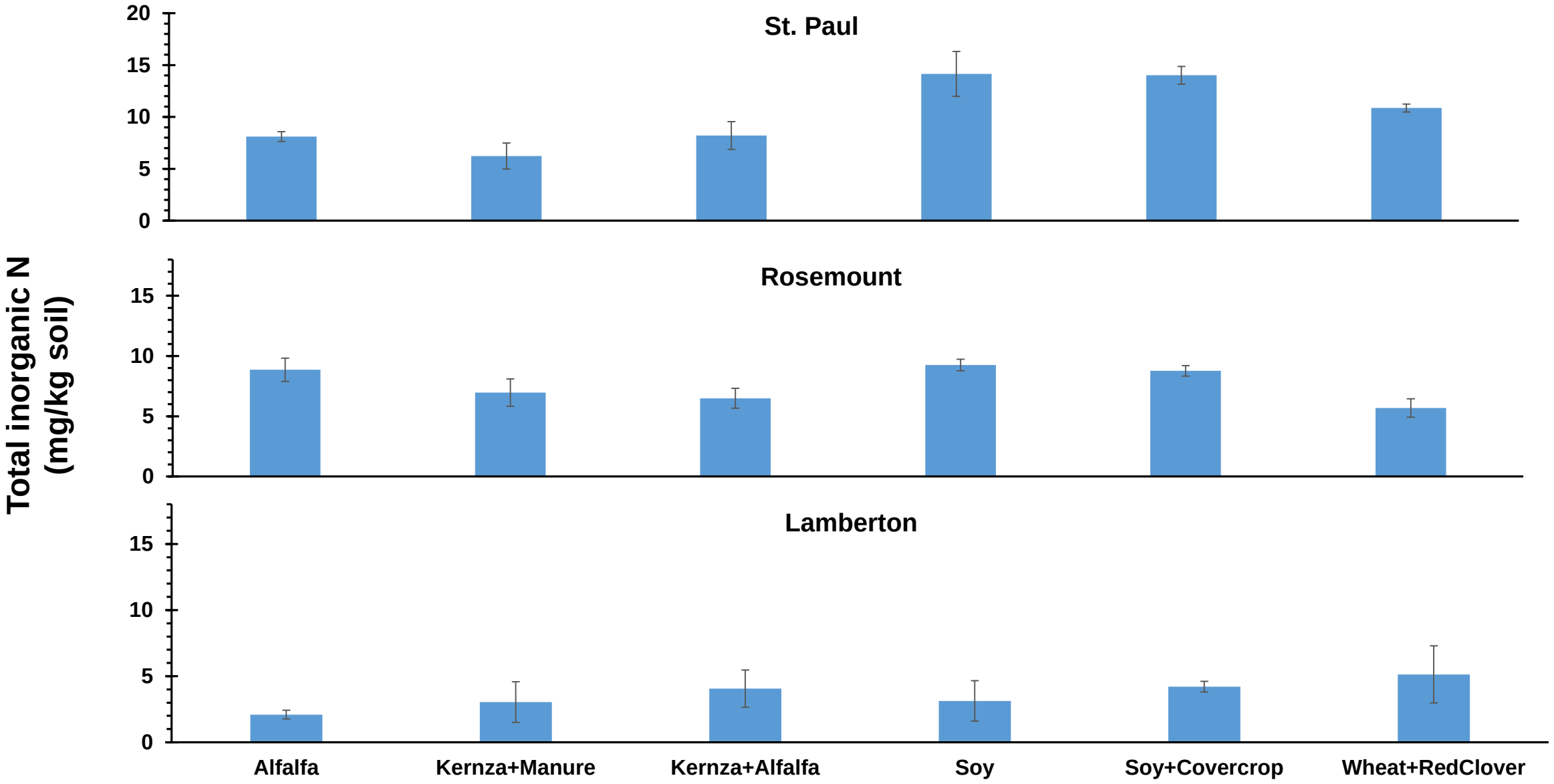
Labile carbon (Fall)



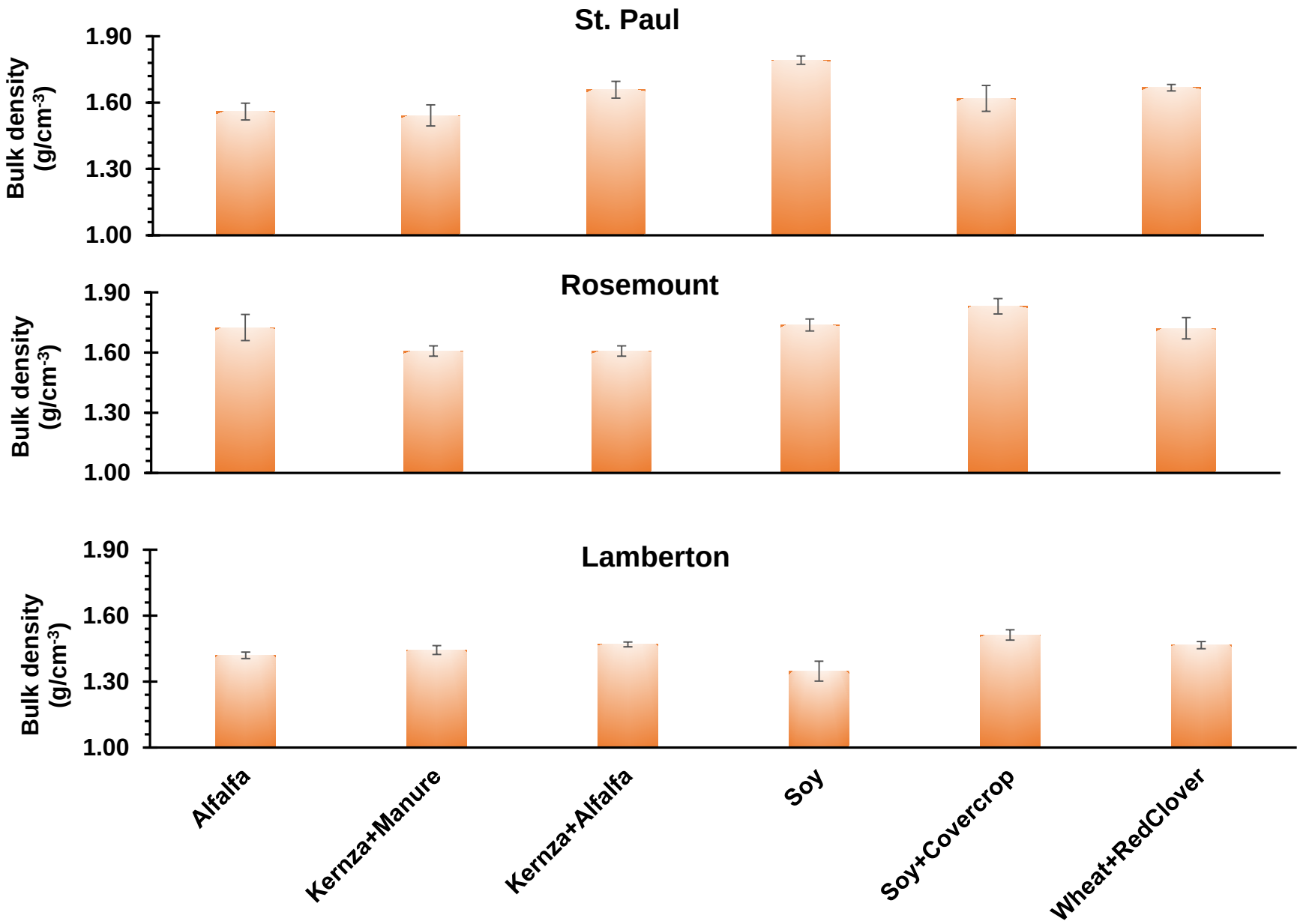
Carbon accural

- **Labile carbon similar in all treatments**
- **It takes about 2 to 4 years to observe changes in POX-C** *(Quincke et al., 2007; Melero et al., 2009b; DuPont et al., 2010; Lewis et al., 2011; Lopez-Garrido et al., 2011; Culman et al., 2012*)

Nitrogen (Fall)



Soil bulk density (0 to 15 cm_Fall)



- **Treatments did not affect soil bulk density**
- **Hypothesis: Different management practices, root biomass and C input will affect bulk density over years.**

After three years of different crop rotations….

- **Soil structural quality**

After three years of different crop rotations……

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After three years of different crop rotations……

- Soil structural quality

After three years of different crop rotations….

- Soil structural quality
- Soil infiltration test
- Changes in total C and nutrients
- Effect on corn and soybean yields

Summary

- **Kernza had 16 times more root biomass than soybeans**

- **Treatments had no to minimal effect on soil physical and chemical properties in the first year**

Questions ?

Feedback !!