

# Changes in Soil Health throughout an Organic Potato Rotation

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# Soil Health

- Capacity of soil to function as a vital living system within ecosystem and land use boundaries (Doran et al. 1994)
- Central concept in sustainable agriculture
- Examines the soil holistically: interaction of physical, chemical and biological factors
- A diverse and abundant soil biota is considered integral to a healthy and productive soil



# Organic Potato Production

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- ❑ Organic systems prohibit the use of fertilizers
- ❑ Longer rotations and inclusion of legumes are suggested maintain and/or improve soil fertility
- ❑ Soils unable to recover from a disturbance (potato) will continue to degrade over time





# Objectives

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1. To determine the yearly changes in the health of the soil throughout an extended 5 year organic potato rotation using biological, physical and chemical indicators
2. To measure the morphological growth and reproduction response of *Folsomia candida*, a potential bioindicator

# Minimum Data Set

## Soil Health Indicators

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graph TD; A[Soil Health Indicators] --- B[Biological]; A --- C[Physical]; A --- D[Chemical]; B --- B1[Earthworm abundance]; B --- B2[Soil respiration]; B --- B3[Potentially Min N]; B --- B4[Microbial Biomass-C]; C --- C1[Light Fraction OM]; C --- C2[Bulk Density]; C --- C3[Soil Texture]; D --- D1[Soil pH]; D --- D2[C:N ratio];
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### Biological

Earthworm abundance  
Soil respiration  
Potentially Min N  
Microbial Biomass-C

### Physical

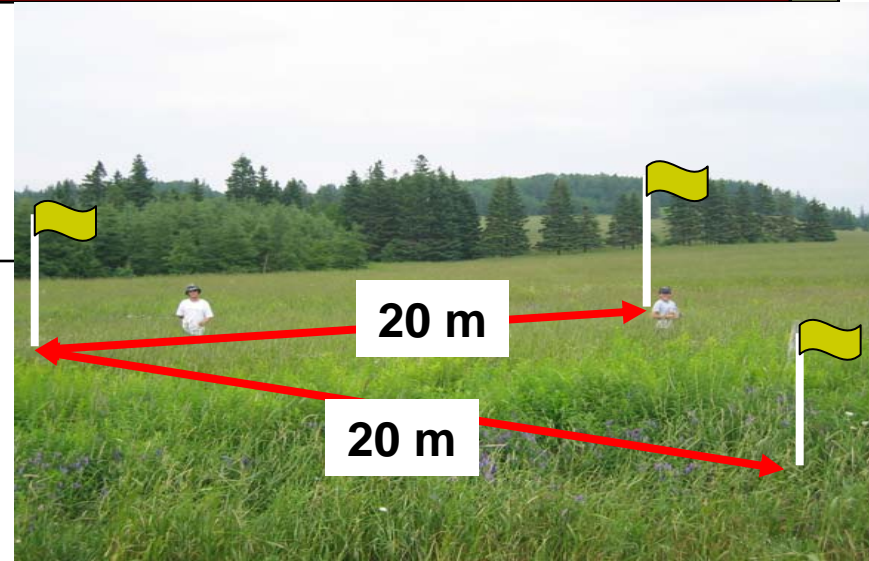
Light Fraction OM  
Bulk Density  
Soil Texture

### Chemical

Soil pH  
C:N ratio

# Methods

- RICB design
  - Four organic farms (PEI & NB)
  - 4 quadrants per field
  - Each phase of the 5yr rotation were composite sampled (n=24)
  
- Included adjacent reference fields at each farm
  
- Earthworms were collected in August by hand-sorting



# Collembola Analysis

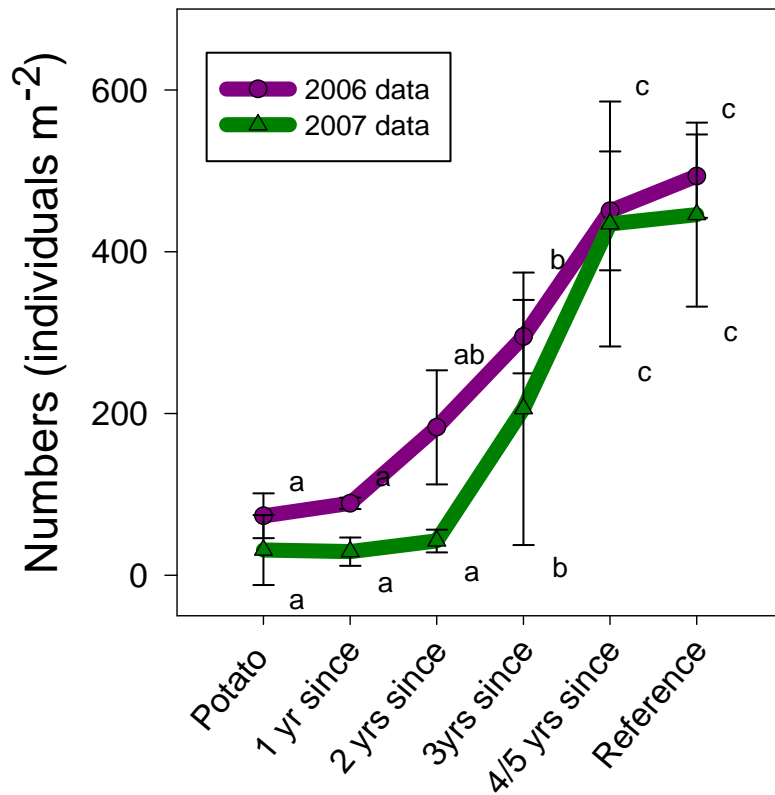
- Growth and reproduction of *Folsomia candida* are being assessed in five substrates :
  - Long term pasture fields
  - Deciduous forest soil
  - Composted manure
  - Sand
  - Sand with yeast



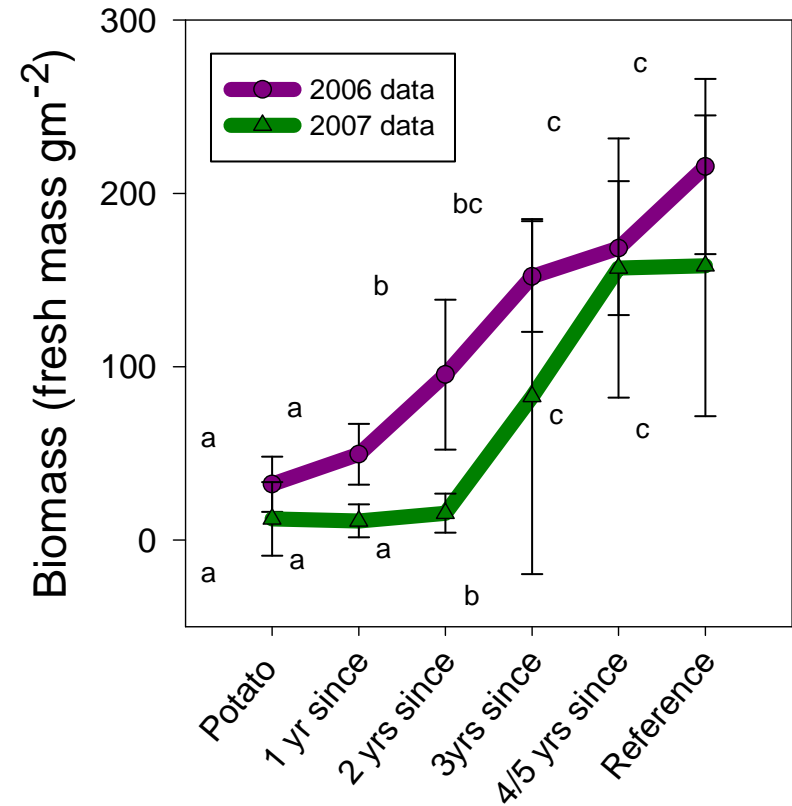
# RESULTS

# Earthworm: numbers & biomass

## Numbers

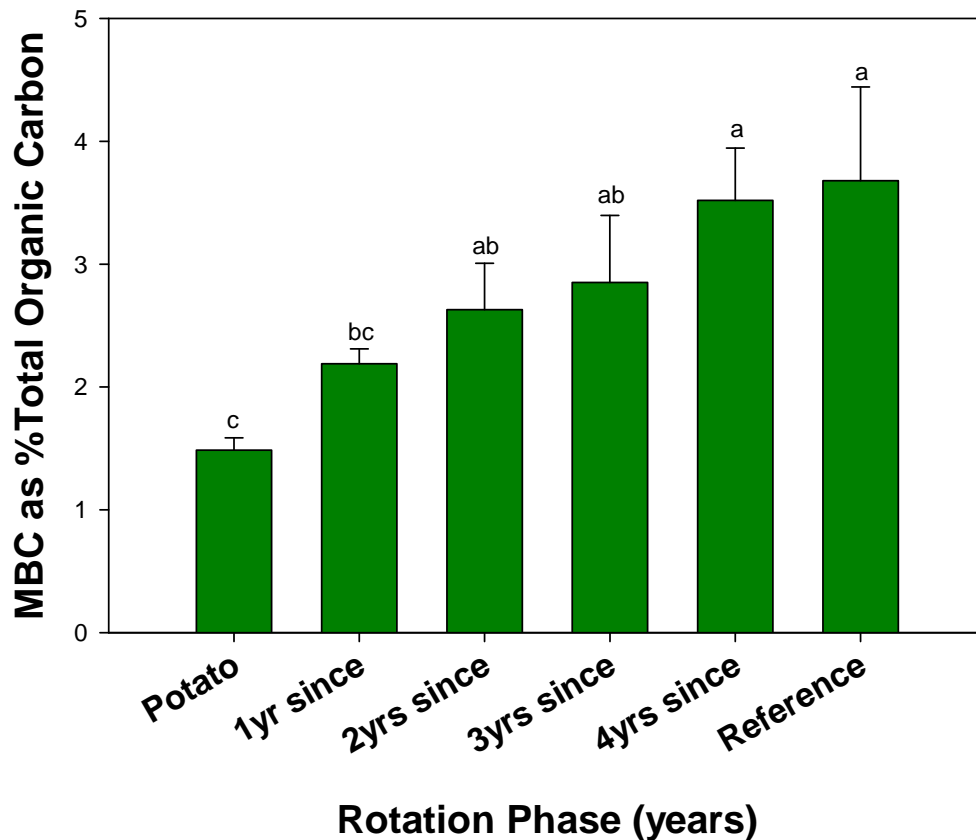


## Biomass



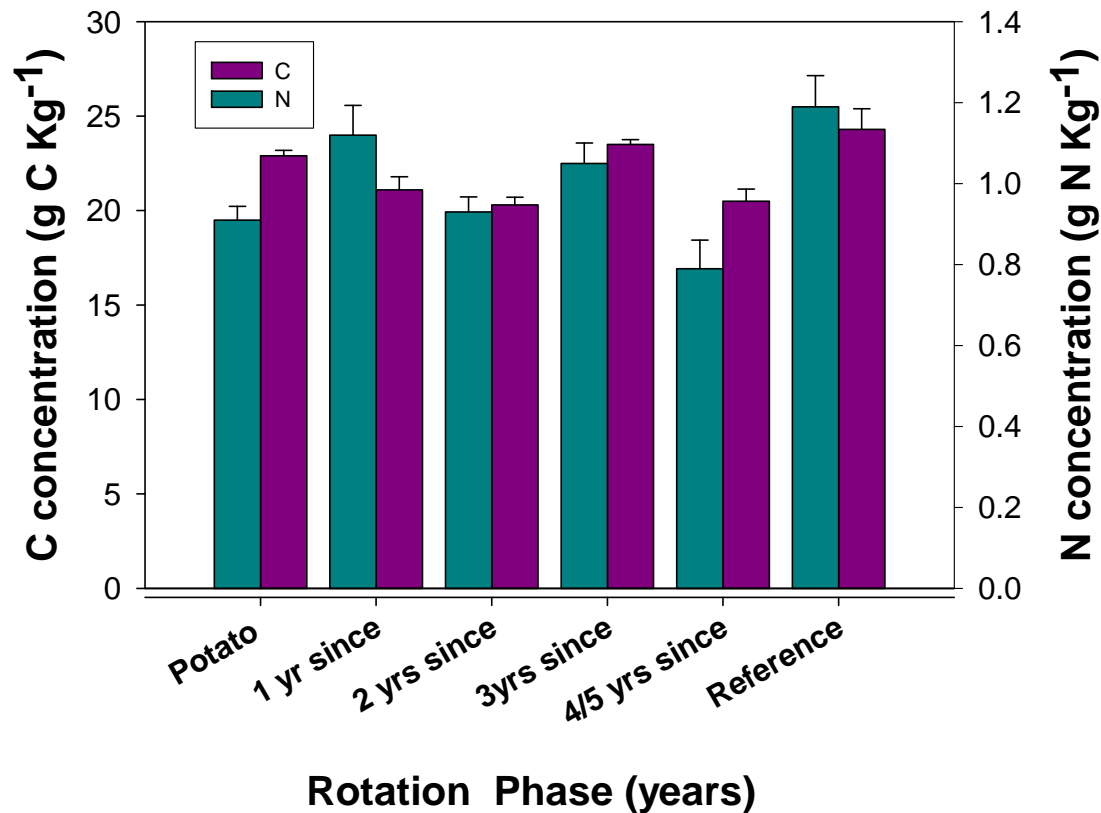
Phase of the Rotation (years)

# MBC quotient

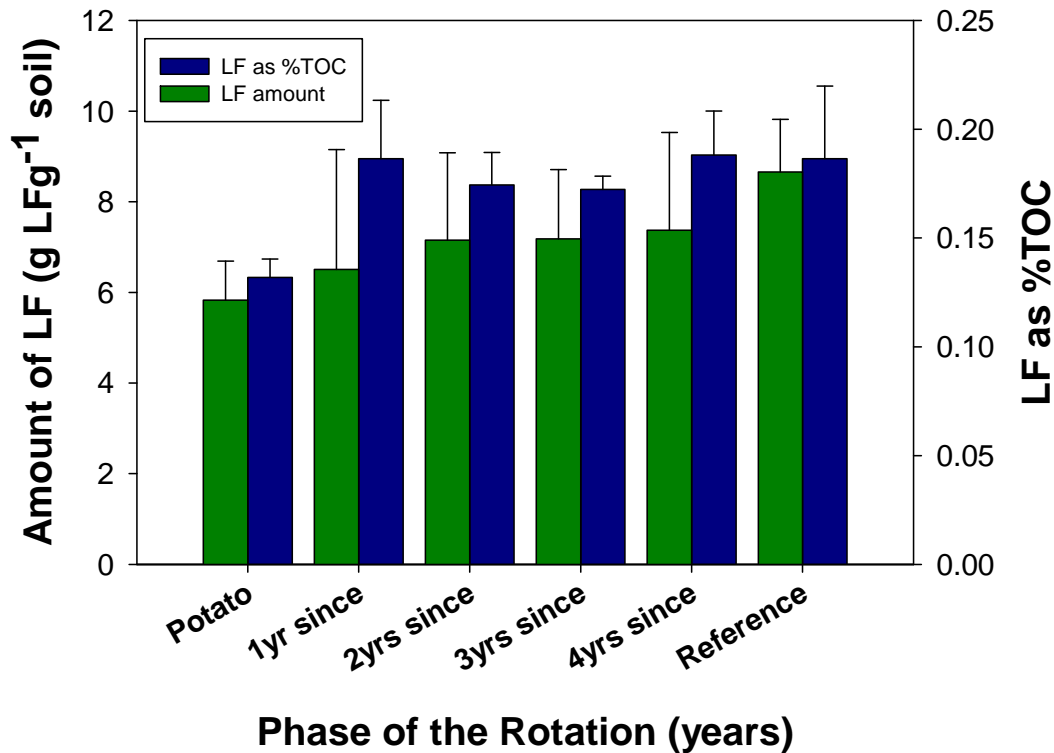


- Microbial biomass-C as a % of TOC was lowest in the potato year
- MBC/TOC increased to levels found under pasture (3.7% TOC) after two or more years

# Results: Carbon and Nitrogen

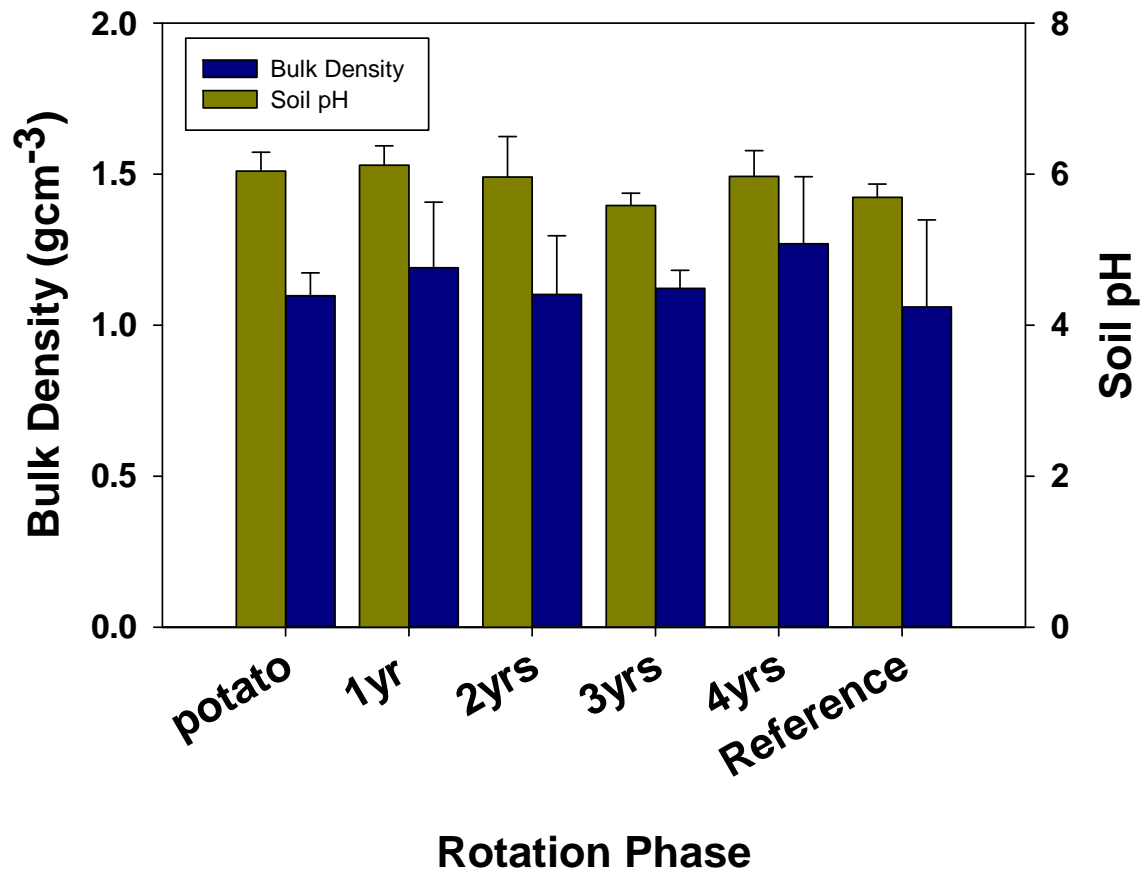


# Results: Light Fraction OM



- Amount of LF indicates an increasing trend
- No significant difference when looking at it as a %TOC

# Results: Bulk Density & pH



# Conclusions

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- Earthworm abundance and microbial biomass-C increased as the rotation period increased.
- Biological indicators were found to be more sensitive to changes in soil health
  - chemical and physical indicators were not as sensitive over the short time scale
  - act as an early warning system

# Thanks to:

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- ❑ OACC
- ❑ All the farmers participation



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# Questions

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