

ASSISTING SMALLHOLDER FARMERS IN ADOPTING INTEGRATED
NEMATODE-SOIL HEALTH MANAGEMENT: III – CHANGES IN SOIL
PHYSIOCHEMISTRY

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CHANGES IN BIOPHYSIOCHEMISTRY

Expectations when applying soil amendments

- A) Improve soil health**
- B) Increase beneficial nematodes**
 - i) Use changes in nematode population structure and identify best-to-worst soil health conditions**

CHANGES IN CYST POPULATION DENSITY AND POTATO YIELD

Soil amendment treatments

0, 318, or 354 kg/ha of composted chicken manure

+/- 1.8 kg/ha *Purpureum* and *Bacillus*

Replicated 4 times

Two regions

Andisols around 2,900 m altitude (8 locations)

Mollisols at 3,200 to 3,353 m altitude (8 locations)

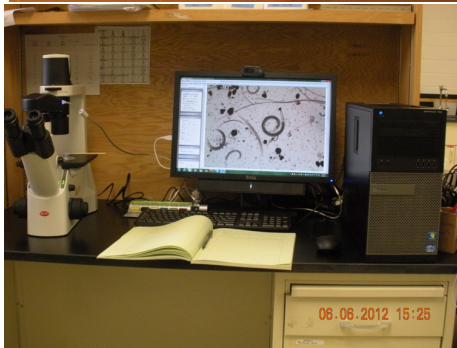
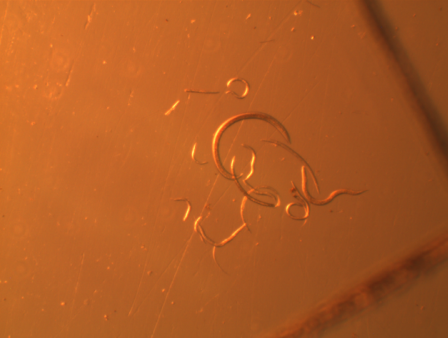
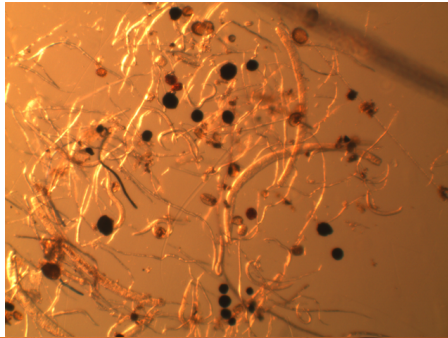
Data collection

Nematode community

Soil physiochemistry (pH, C, N, and etc.)

Extraction and enumerations

Extract and identify Mouth parts



Trophic group

Menus

Carnivores

→ **Animals**

Omnivores

→ **Animals/plants**

Herbovores

→ **Plants**

Bacteriovores

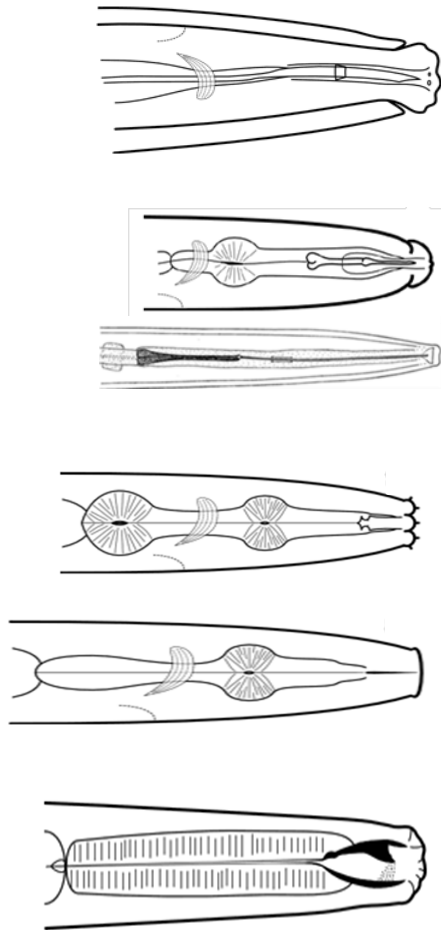
→ **Bacteria**

Fungivores

→ **Fungi**

Preditors

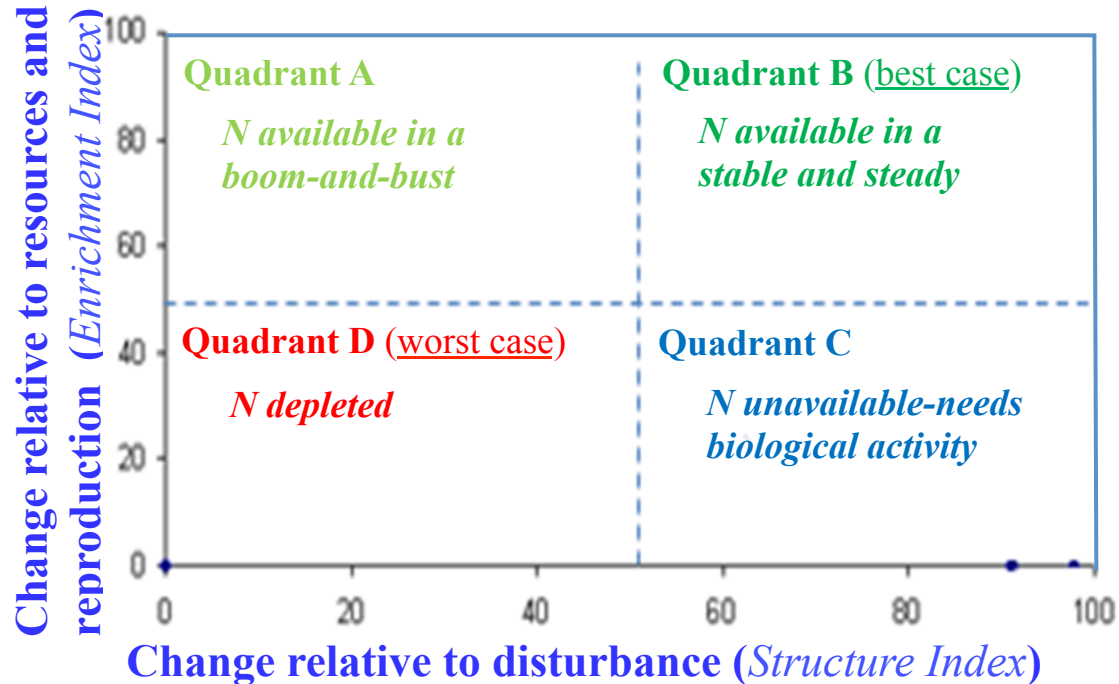
→ **Nematodes**



How do we use nematodes to study soil health?

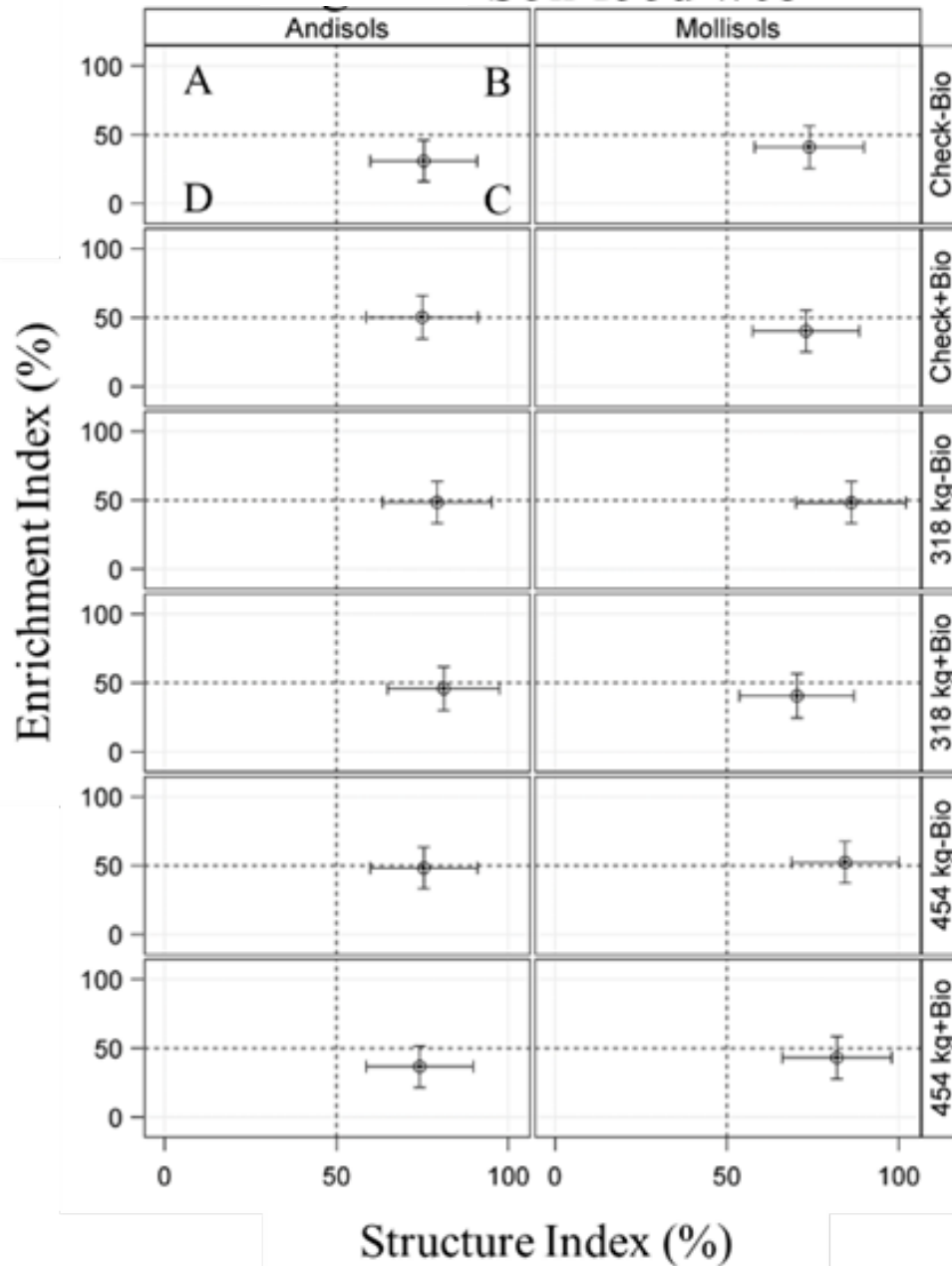
- 1) Extract and preserve
- 2) Identify trophic group (feeding behavior)
Bacteriovore, fungivore, herbivore, predator, omnivore
- 3) Identify colonizer-persister (**cp**, measure of life histories)
cp-1 (*boom-and-bust, r-selected and broad distribution*)
cp-5 (*k-selected and narrow ecological amplitude*)
- 4) Analyses to extract:
 - a) *Community indices*
Abundance, diversity and richness
 - b) *Ecological/Maturity indices (MI)*
MI (*measure of disturbance*)
MI25 (*measure of disturbance excluding cp-1*)
PPI (*measure of plant feeders*)
FI (*nutrient availability*)
 - c) *Soil food web structure and function*
Basal Index (BI, faunal profile)
Channel Index (CI, decomposition pathway)
Structure Index (SI, disturbance)
Enrichment Index (EI, opportunistic B and F)

Use the Soil food web (SFW) model as a tool to convert basic information into applied decision-making



Modified from Ferris, Bongers and Geode (2001). *Applied Soil Ecology*, 18:13-29

-Soil food web

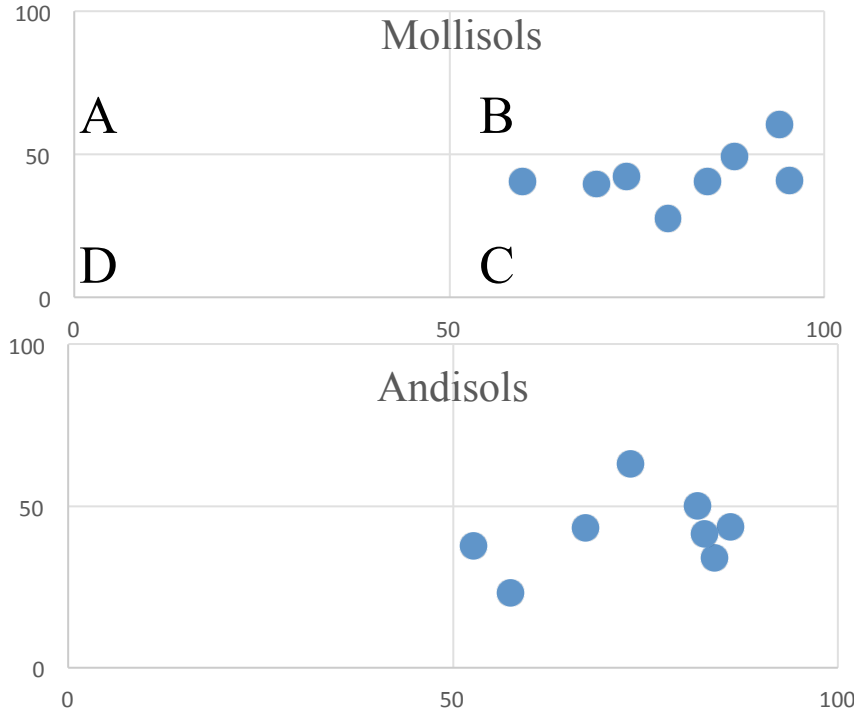


Main messages

- No ideal agroecosystems
 - Empty Quadrant B
- Data in Quadrant C
 - Need biological activity

Biophysiochemical pulses.

Change relative to resources and reproduction (*Enrichment Index*)

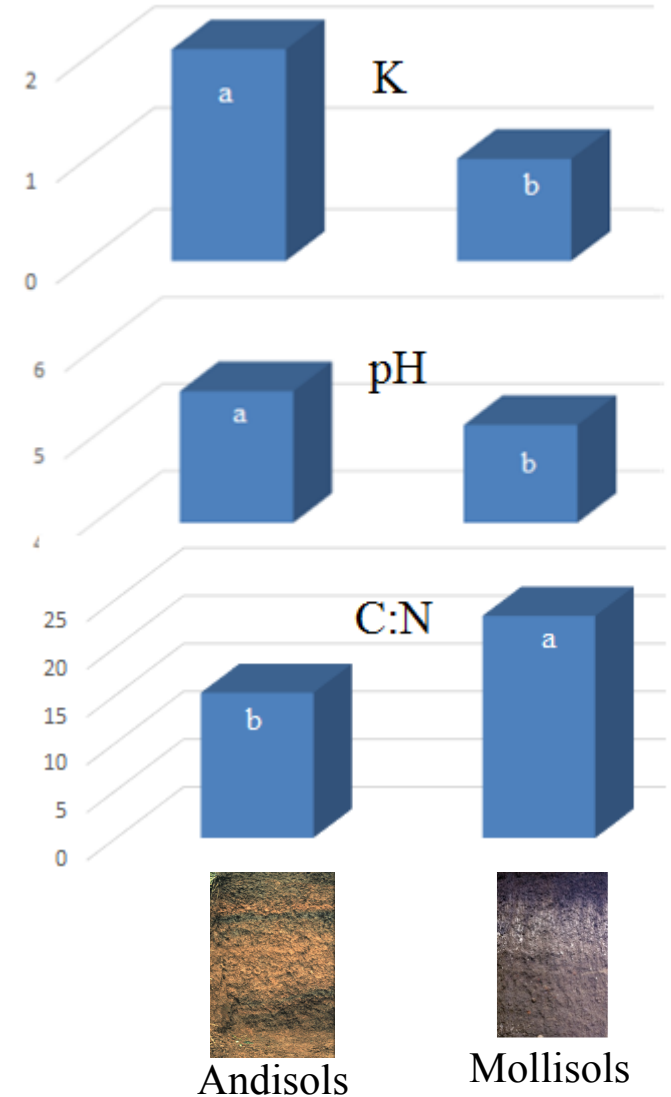


Change relative to disturbance (*Structure Index*)

Main messages

- No ideal agroecosystems
 - Empty Quadrant B
- Data in Quadrant C
 - Need biological activity
- Unbalanced physiochemistry
- Road to Quadrant B => Next

Soil physiochemistry



Thanks