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Manure Application Effects on Soil Quality

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Manure and Soil Quality

- **Research indicates:**
 - Manure can improve biological and physical soil quality and supply nutrients to plants
 - Higher application rates lead to greater soil quality benefits
- **We will examine soil quality in the context of intensive vegetable cropping systems**

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Manure application rates

- Application rates vary widely, depending on nutrient value of manure.
- For intensive cropping systems, rates can range from 1 to 15 or more dry tons/acre.
- Acceptable application rates depend on:
 - Concentration and availability of manure nutrients
 - Salt concentration and potential for salt problems (see Manure Application to Legumes Webcast, section by C. Shapiro)

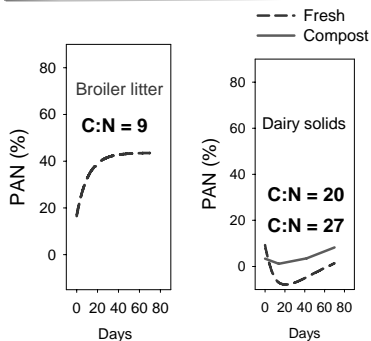
Review of Manure N Availability and Effect on Application Rates

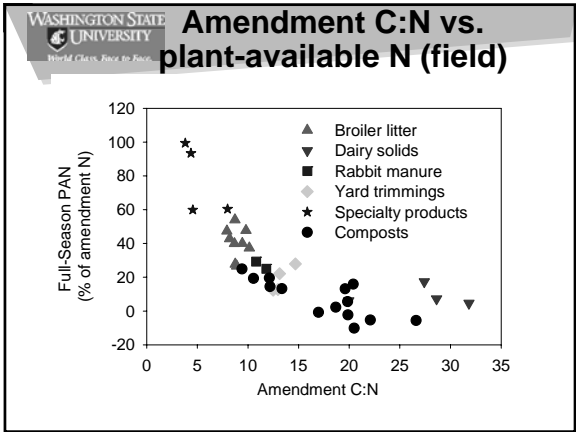
- Details in previous webcast: *Nitrogen Availability from Organic Sources by Dan Sullivan*
- Summary in next three slides

Manure decomposition in soil



Plant Available N





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Comparison of Effects of Broiler Litter and Mixed On-Farm Compost on Soil Quality

- Data collected from WSU Puyallup Organic Vegetable Crops Systems experiment.

Organic Systems Research – started 2003

Nutrient Management ↔ Weed Ecology and Management
 Soil Quality ↔ Economics of Crop Production
 Crop Yield and Quality ↔ Insect Predators and Pests

Soil Amendments

- Chicken (Broiler) litter: low C application (CKN) (1.8-2.7 dt/ac)
- Mixed on-farm compost: high C application (OFC) (13-17 dt/acre)



Cover Crops

- | | | |
|----------------------------|-----------------------------------|---------------------------------------|
| Relay planted Legume (RLY) | Post-Harvest Cereal & legume (PH) | Short-term Grass-legume Pasture (LEY) |
|----------------------------|-----------------------------------|---------------------------------------|



Measurements: Soil Quality

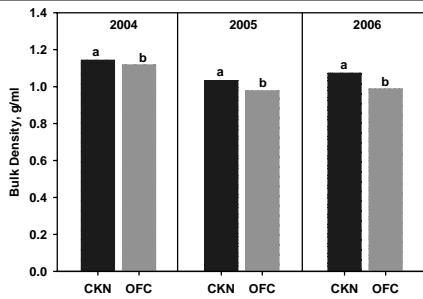
- Bulk Density
- Infiltration
- Particulate OM
- Enzyme activity
- Nematodes
- Compaction
- Collembola
- Aggregation of particles
- Nitrogen cycling
- Microbial community structure
- Water holding capacity



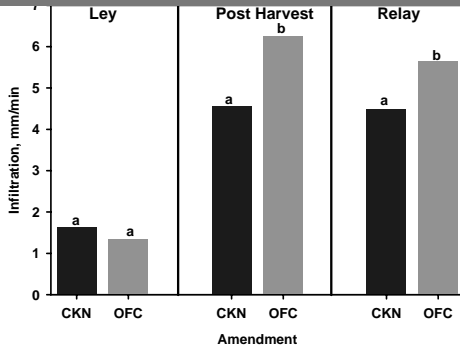
Soil pH, K, and OM 2006

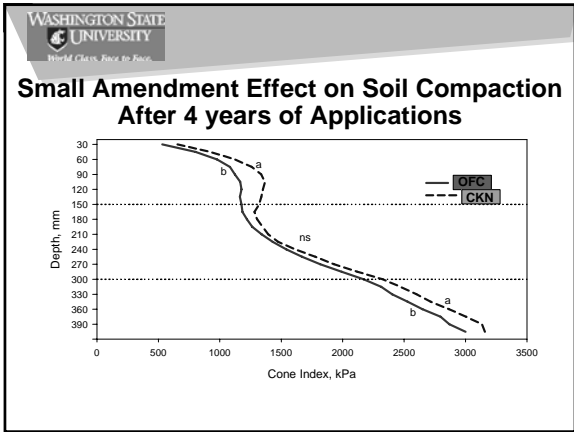
	pH	Exch. K mg/kg	OM g/kg
Ley	6.2 a	229 b	38
Fall	5.9 b	370 a	41
Relay	6.0 b	375 a	42
Low C	5.8 b	247 b	37 b
High C	6.3 a	402 a	44 a
CC x amd	***	***	**

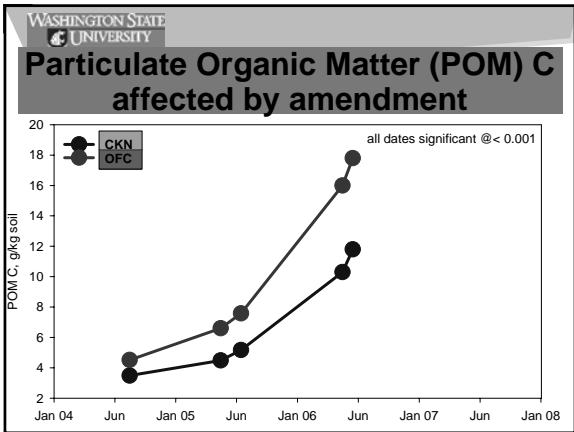
Bulk density affected by amendment

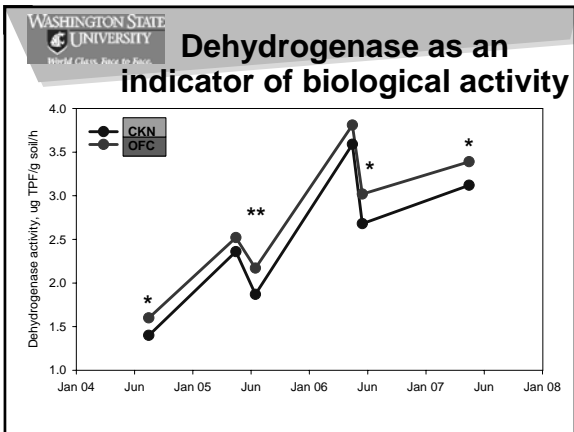


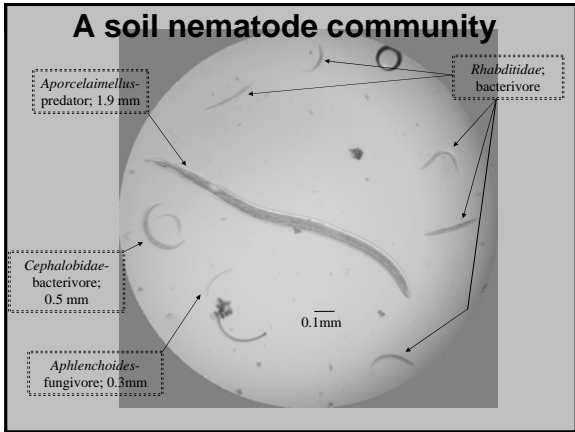
Infiltration affected by amendment and rotation

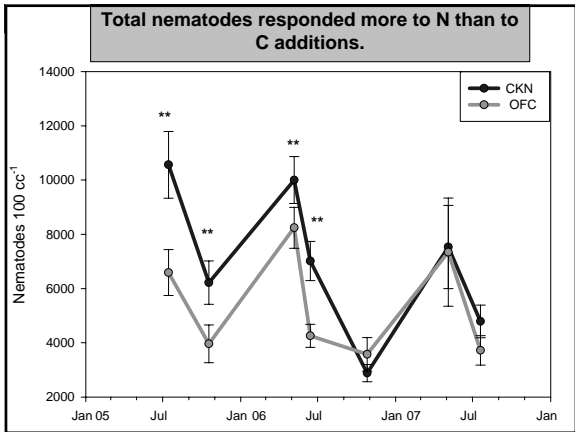


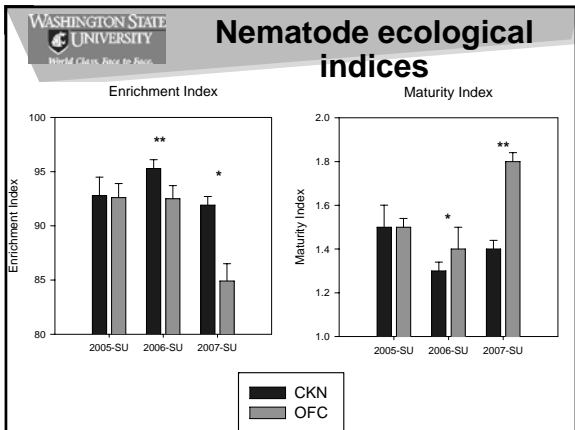












Summary

- Amendment had significant effects on bulk density, infiltration, dehydrogenase, nematodes, and organic C
- Nematodes more numerous following broiler litter (low C), but more diverse following compost (high C)
- Cover crop has had rotational effects; other effects are still evolving.
