

Getting started with organic matter basics



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Topics today

- **What does soil organic matter do**
- What is soil organic matter
- How can it be improved
- Over what timeframe can it be improved



Top soil health challenges

- Erosion
- Nitrogen management
- Soil compaction
- Poor crop emergence
- Poor water infiltration
- Poor pore structure (no tith)

All = poor soil organic matter



Number #1 recommendation...

To amend a sandy soil?

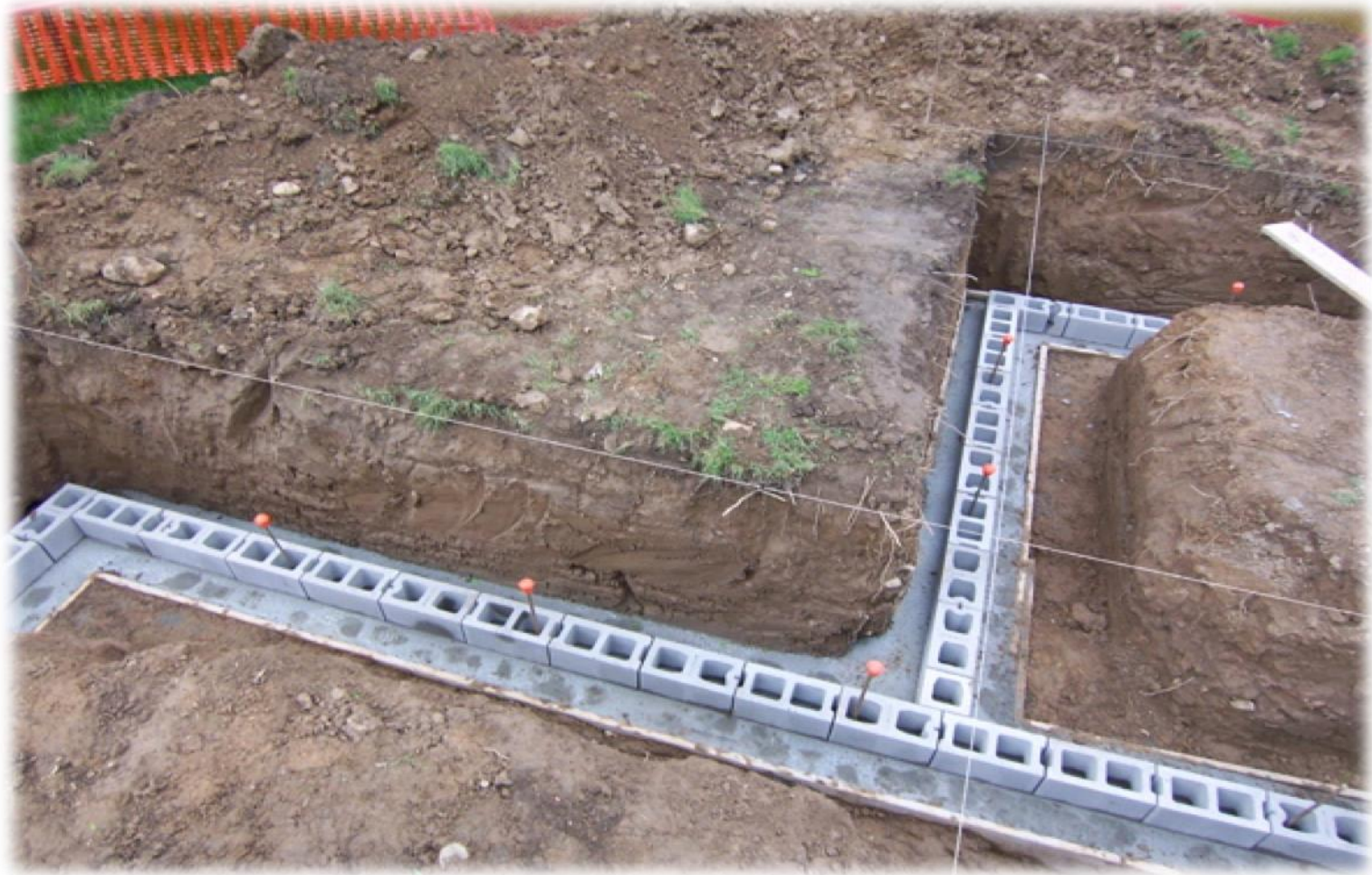


Number #1 recommendation...

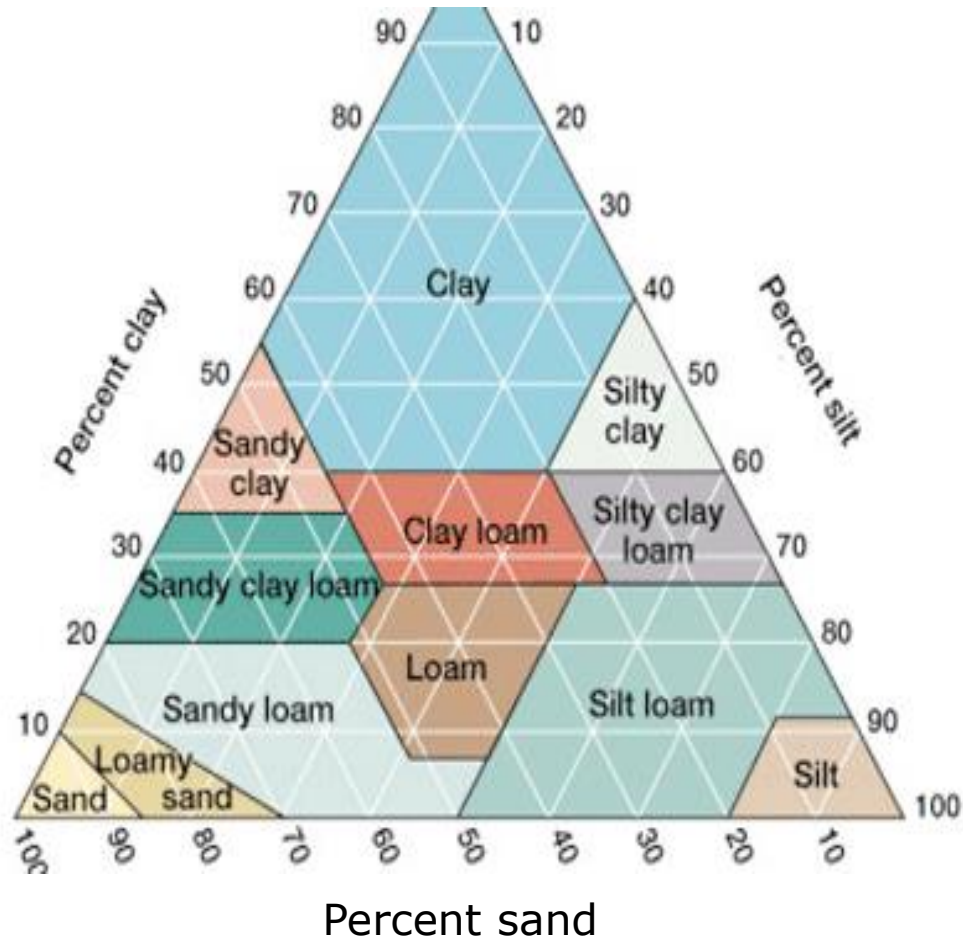
To amend a clay soil?



Soil organic matter = foundation

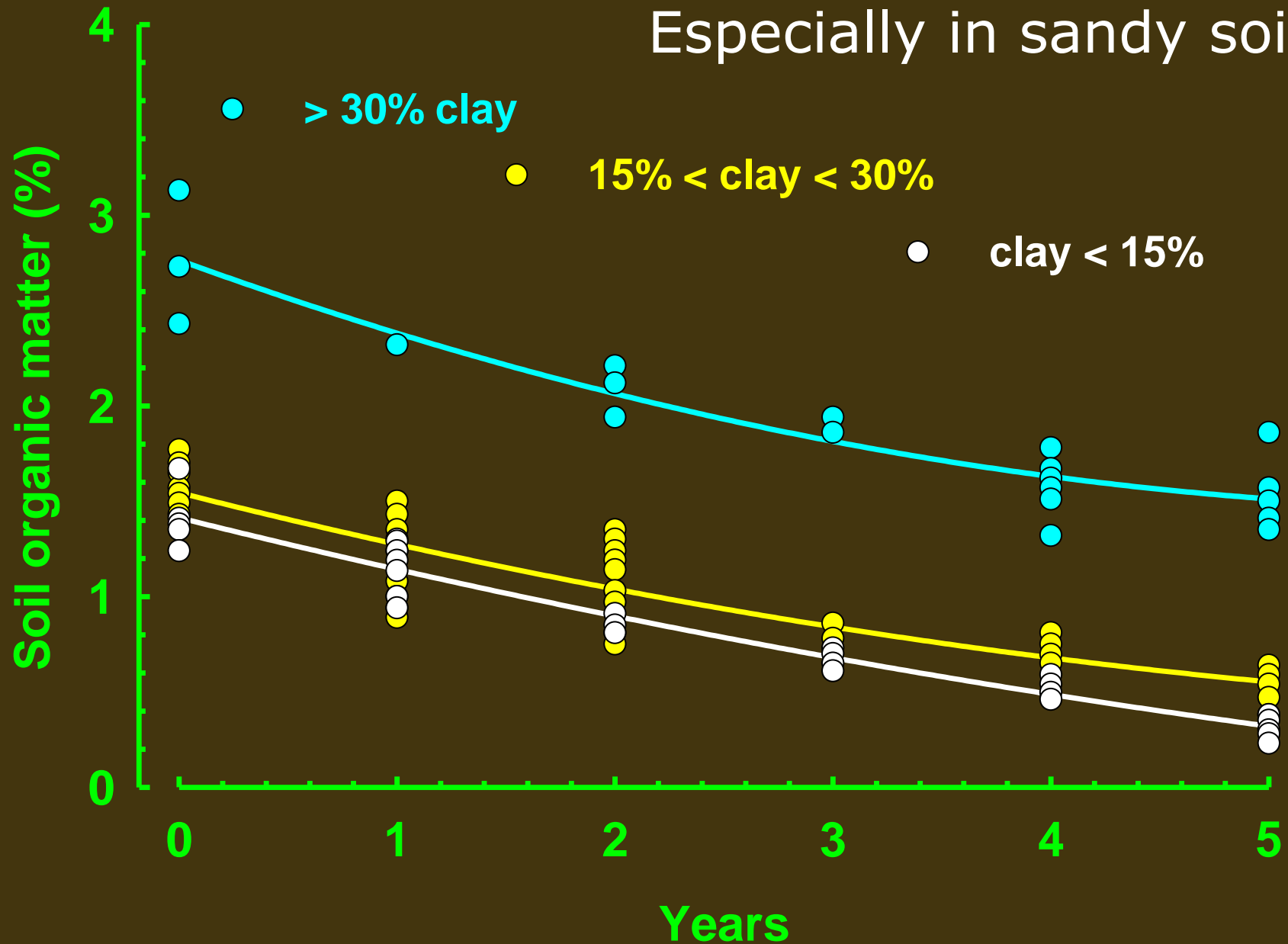


Determine texture of your soil



Tillage reduces organic matter

Especially in sandy soil!

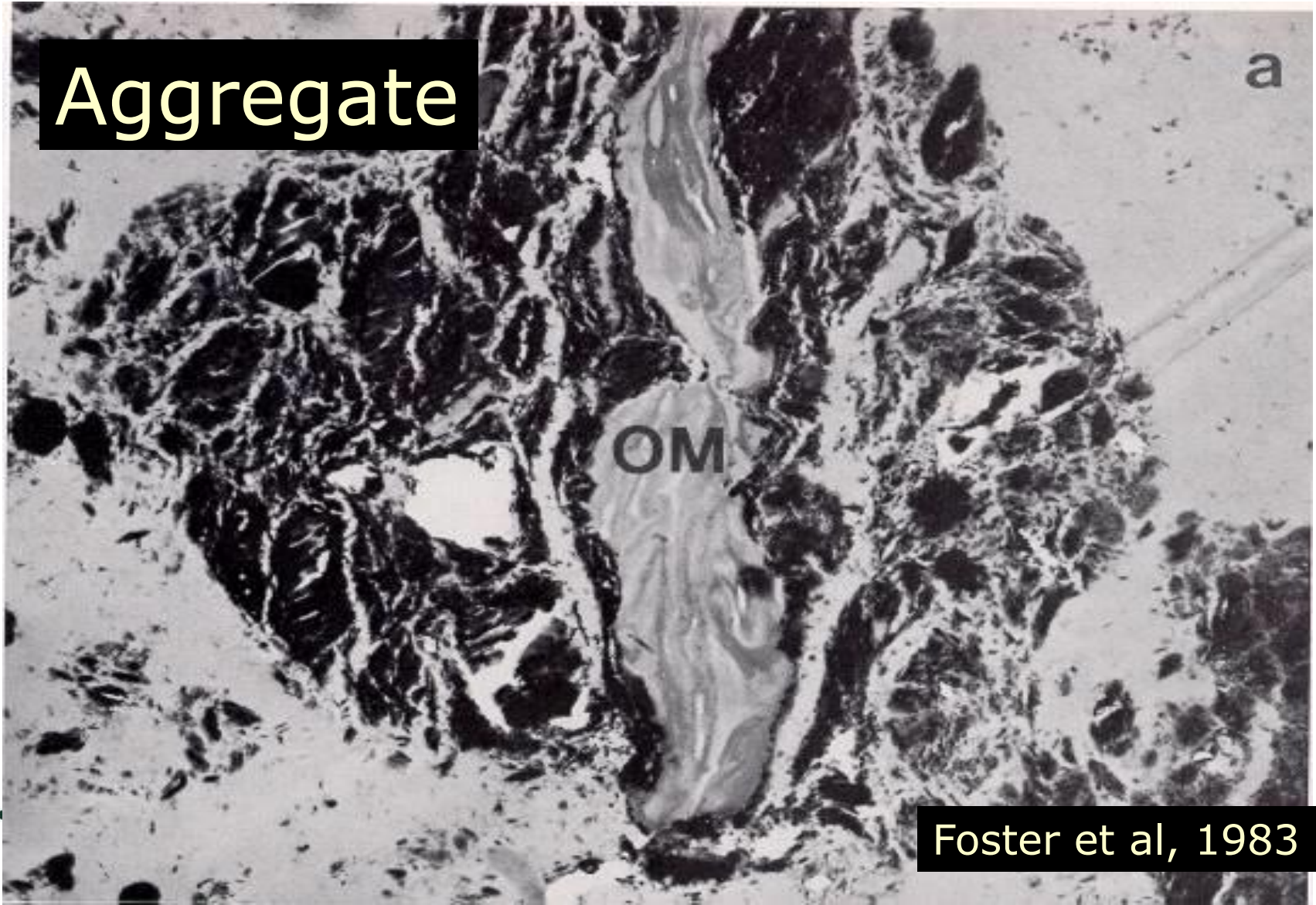




Aggregates protect
organic matter



Soil organic matter 'sandwich'



Foster et al, 1983



Brick = high bulk density,
low pore space



Sponge = low bulk density,
high pore space

Sponge = **stable** soil organic matter

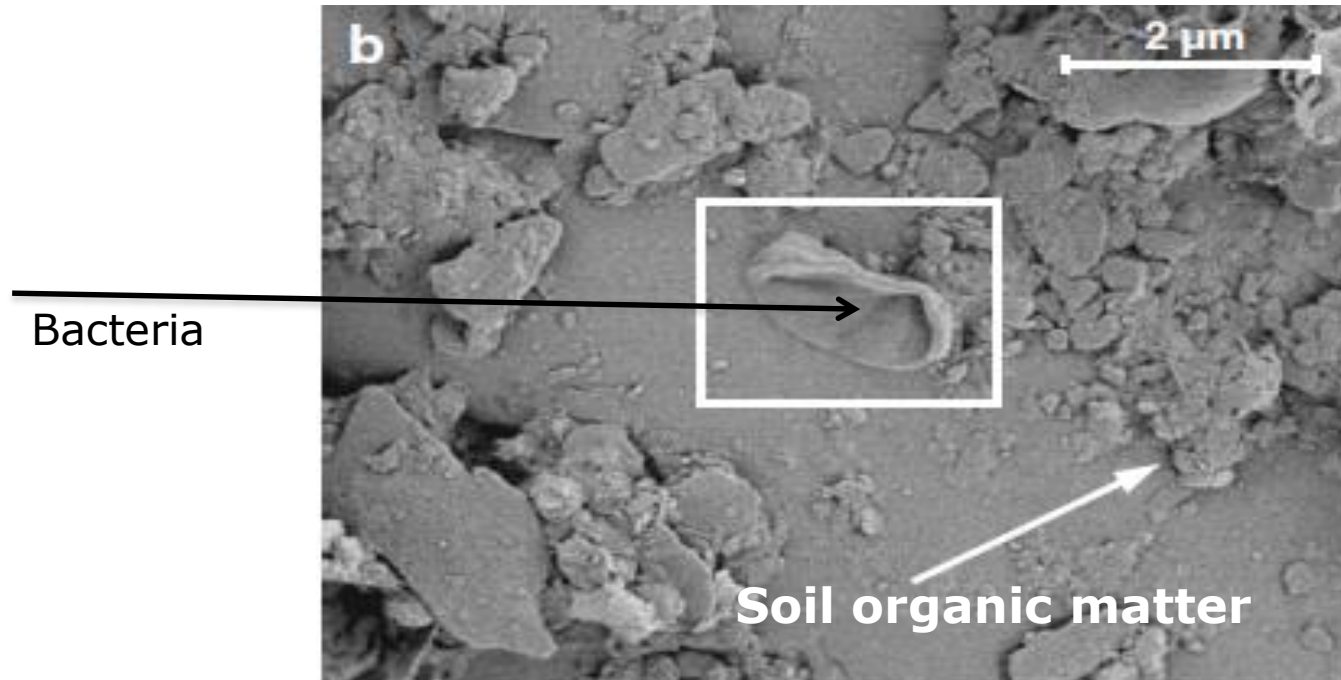


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Organic matter close up (scanning electron micrograph)



Organic matter categories

- **Living** 15%

Fresh plant and animal residues and microbes

- **Biomass (active)** 15%

Recent residues that are being decomposed

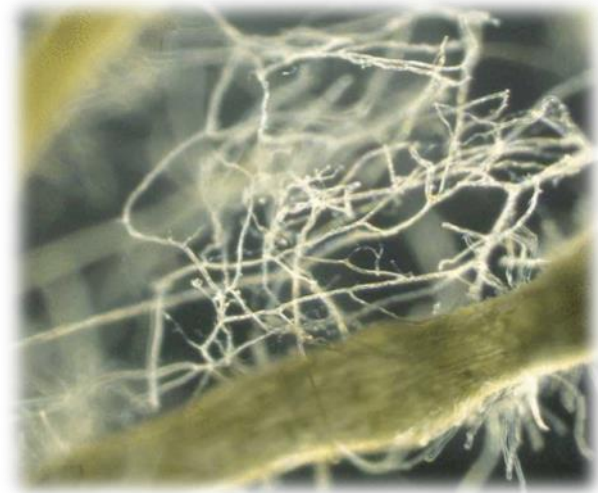
- **Stable (long-term)** 70%

Resistant to further decomposition, last for centuries

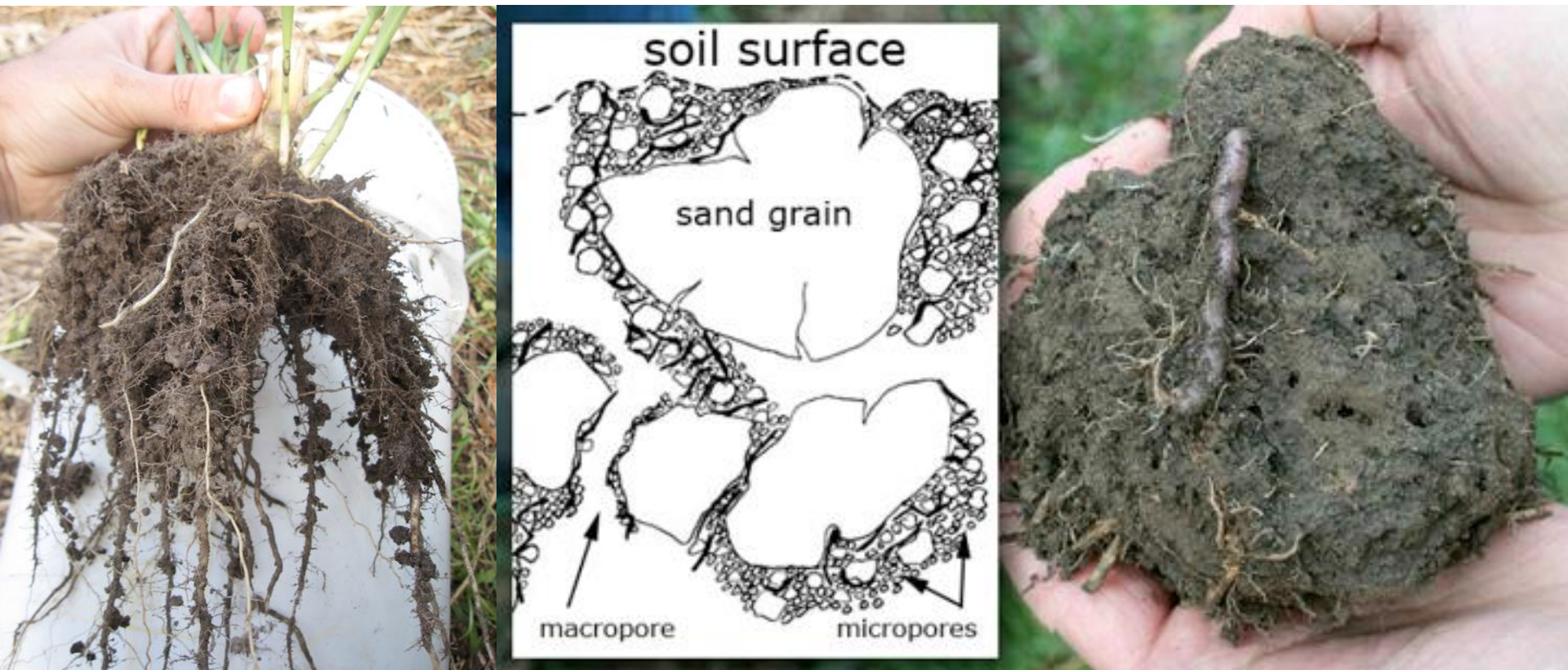


Roots and 'their' microbes!

- Root systems have been shown to be twice as important as residues to improve aggregates for STABLE soil organic matter.



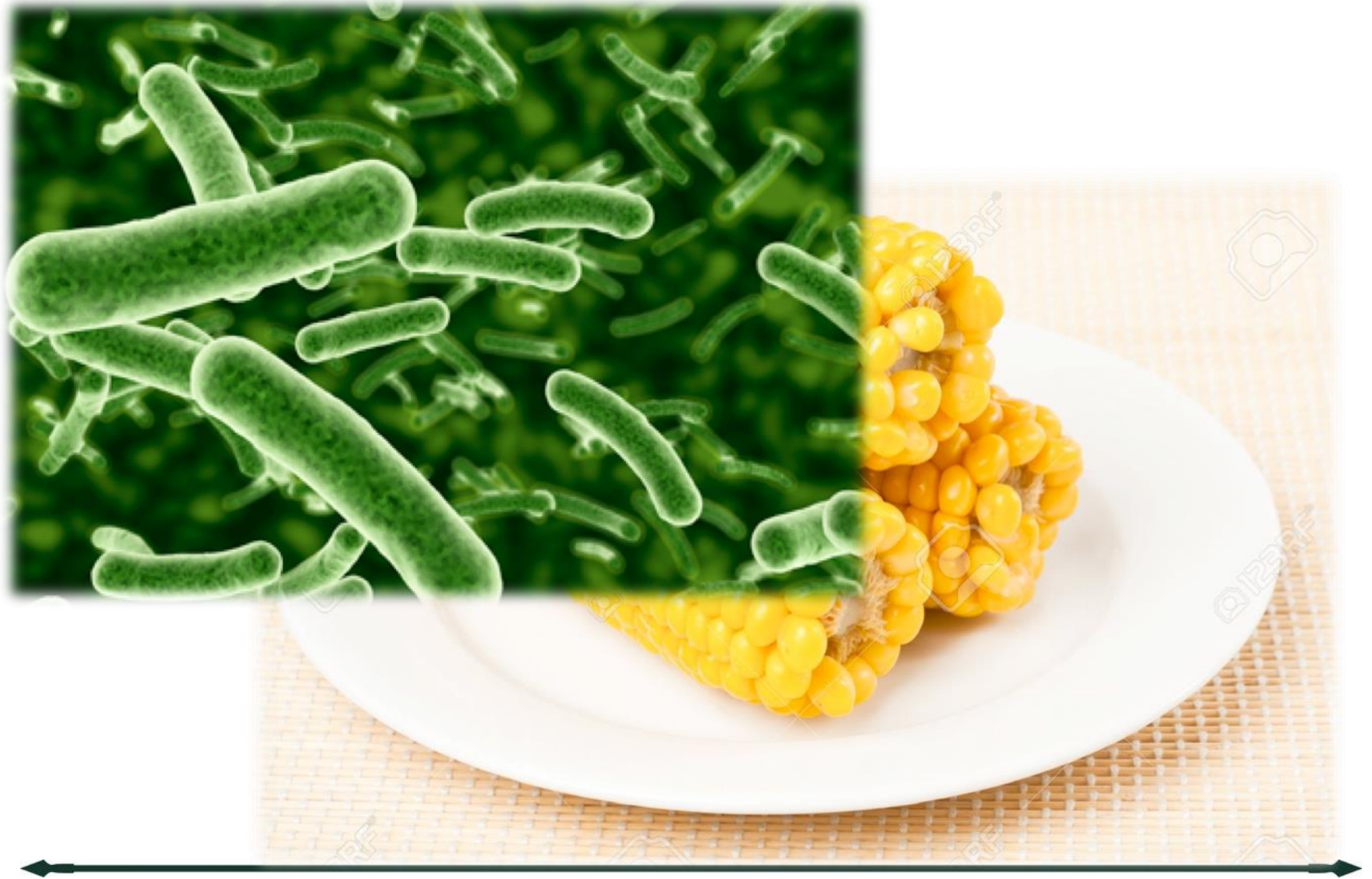
Aggregates build stable organic matter



Diversity for living and active biomass!

- Cover crop mixtures provide excellent source of roots shoots and leaves for diversity.
- Compost and manure are also good sources of diversity.



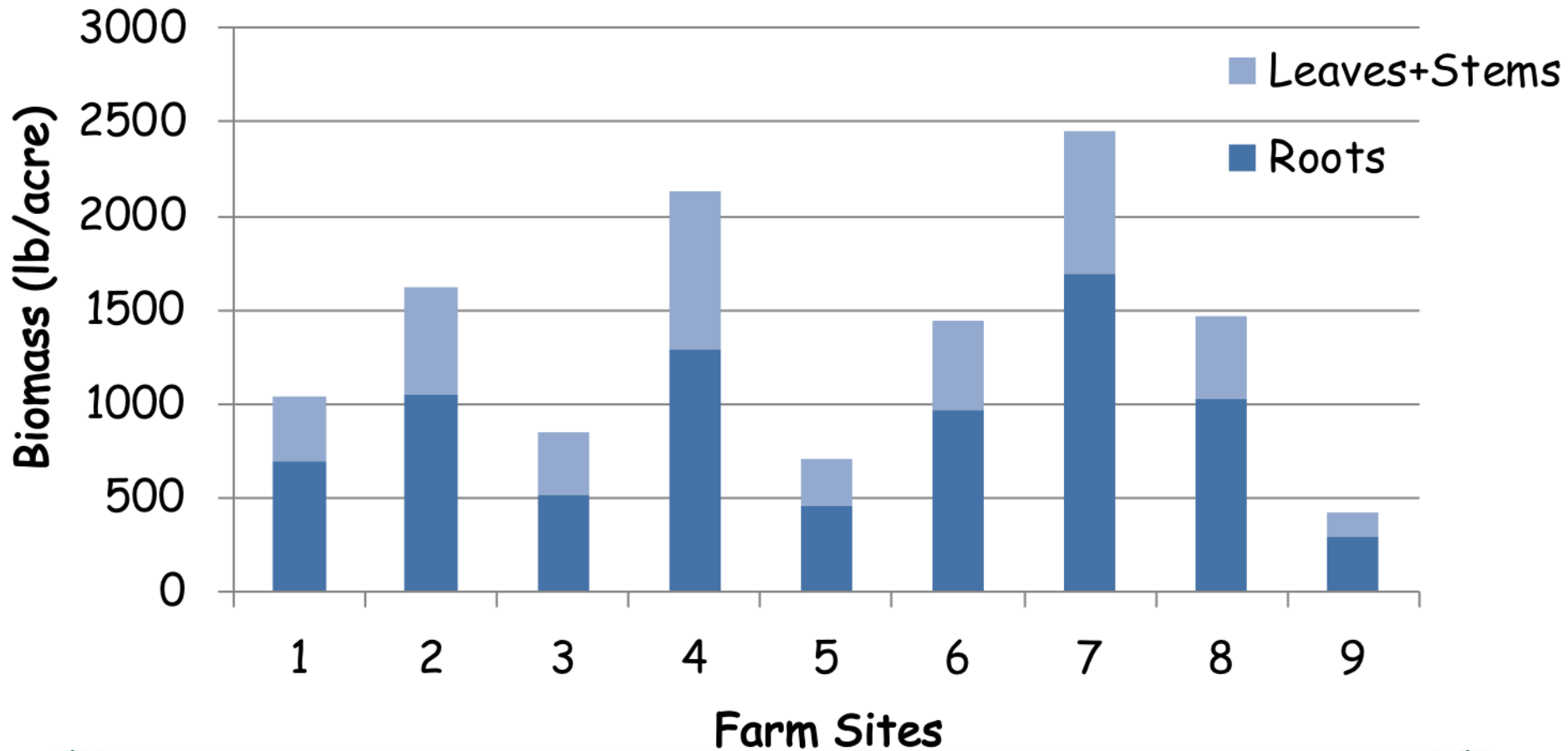




A grass plus a legume (rye + hairy vetch)



Rye + vetch cover crop growth over the winter



Organic matter categories

- **Living 15%**

Fresh plant and animal residues and microbes JUST ADDED

- **Biomass (active) 15%**

Recent residues that are being decomposed

- **Stable (long-term) 70%**

Resistant to further decomposition, last for centuries

**Leaves and stems,
Legumes, 'greens'**



**Roots, compost,
Grasses 'Browns'**



Quantity?



Quantity?
Quality - Diversify!
(Greens + browns,
crop residues and cover
crop mixtures)



Mixtures of residues – Apply manure or compost (browns) to living plants (greens)



Topics today

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Which would you prefer?



Erosion – soil loss due to weather

Keep soil covered with plants

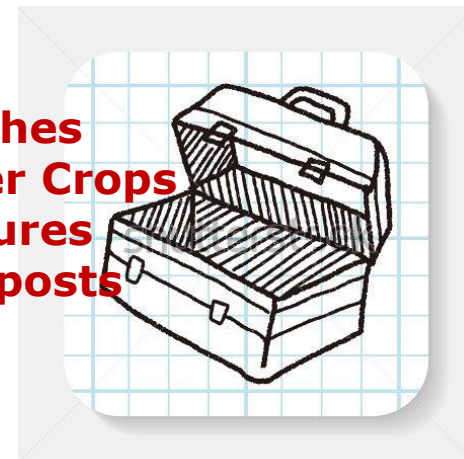
- Cover crops
- Straw or leaves around plants
- Perennial plants
- Cloth/plastic mulch



Tools to improve the soil

- **Mulches**
 - Plastic
 - Straw
- **Cover crops**
 - Legumes -clovers
 - Grasses
 - Mustards
- **Nutrient inputs**
 - Manure
 - Compost

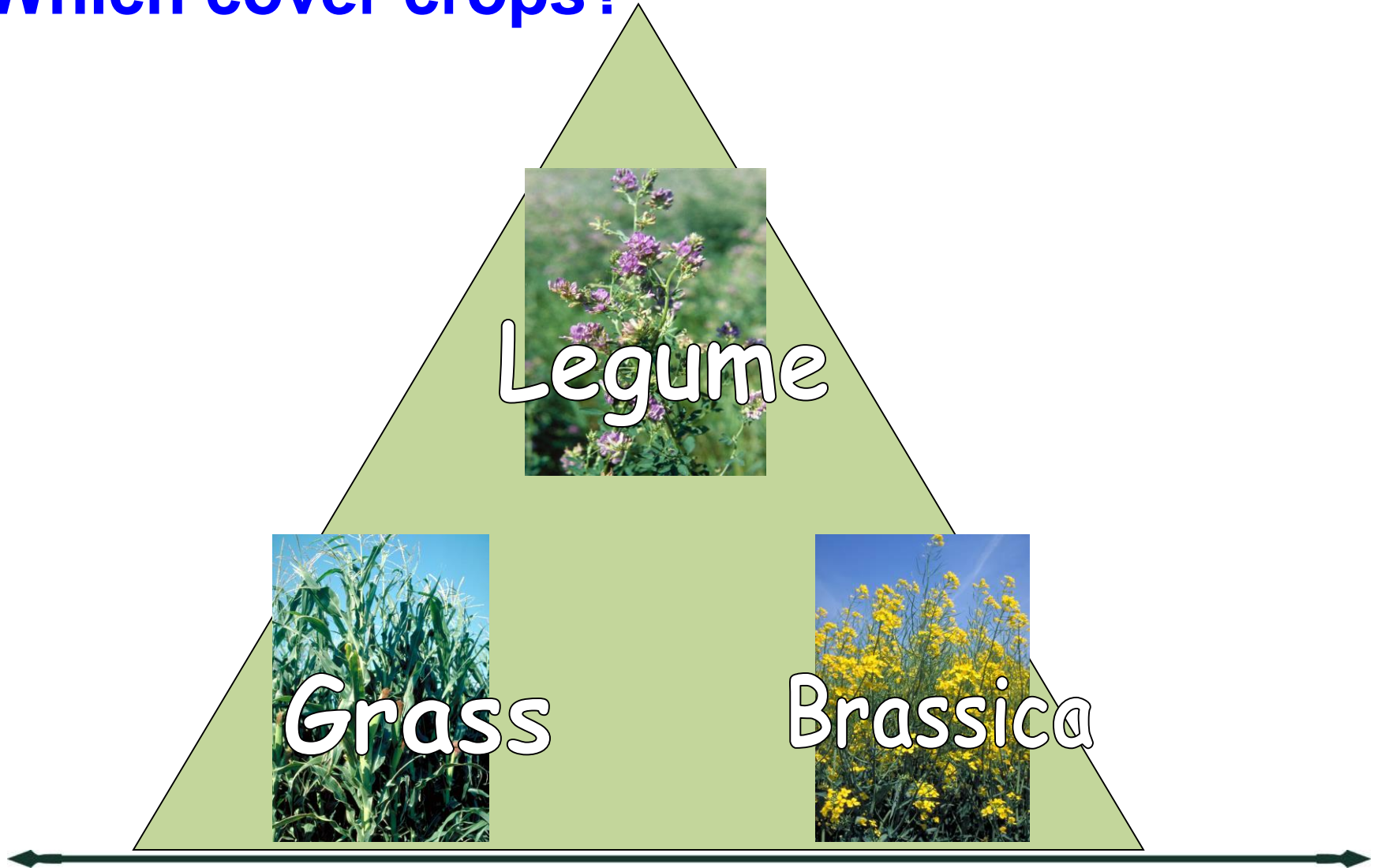
Mulches
Cover Crops
Manures
Composts



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Which cover crops?



Cover crops for every season

- Plants that are grown for the sake of the soil

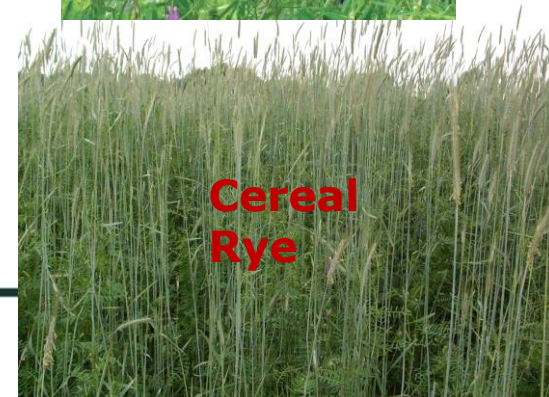
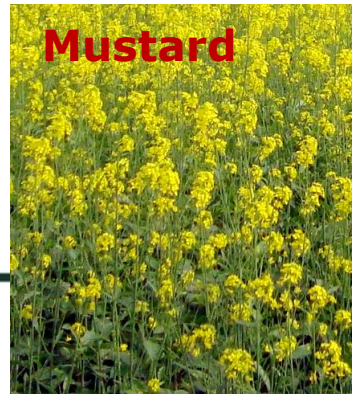
Summer



Fall



Winter



Legumes (N₂ fixers)



Crimson clover-a fast annual



Red Clover- a good tap root to loosen soil

Frost seeds into wheat



Alfalfa- can also harvest it for hay



Hairy vetch- is easily established, frost tolerant



Brassicas (mustards)

Oilseed Radish
(biopores)

Oriental Mustard
(healthy soil)



Grasses



Oats – winter kills



Cereal Rye – Very winter hardy



Sudangrass: summer soil builder



Winter cover options and soil nitrogen fertility

Cover Crop	Soil Nitrogen Improvement
Hairy Vetch + Rye	102 lb/acre
Crimson Clover	67 lb/acre
Oilseed Radish	39 lb/acre
Rye	28 lb/acre
Winter weeds	~ 20 lb/acre



Not all manures are the same

Percentage of nutrients

Type	N (Nitrogen)	P (Phosphorous)	K (Potassium)
Poultry Manure	3-5	1-3	1-3
Feedlot Manure	2-3	1-1.5	1-2
Dairy Manure	1-2	0.5-1.5	1-2
Urban Yard Waste	1-1.5	0.2-0.5	0.5-1.5
Crop Residue	1.5-2.5	0.2-0.5	1-2



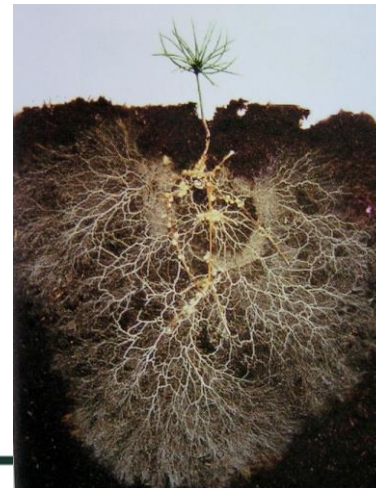
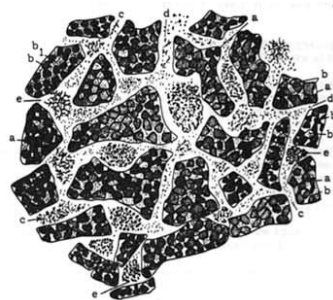
Making your own compost?

- Add 3 part browns + 1 part green = good

Carbon	Nitrogen
<ul style="list-style-type: none"> Leaves Straw Mulch Dry vegetation 	<ul style="list-style-type: none"> Manure Green legume vegetation Fish residue Vegetable residue
<p>3 to 1 Carbon to Nitrogen</p>	



Compost is much more than NPK!



Soil Health Plan Guide

Extension Bulletin E-3144 • New • January 2011



By
Vicki Morrone and Sieglinde S. Snapp

- Healthy root development can occur.
- Plant susceptibility to diseases and insect pests is reduced.



How long to improve soil organic matter?

- **Living**

Fresh plant and animal residues and microbes

- **Biomass (active)**

Recent residues that are being decomposed

- **Stable (long-term)**

Resistant to further decomposition, last for centuries

Days to months

Months to years

Years to decades



Summary: How to improve soil health

1. Input more carbon

- organic material

Use more than one type of soil amendment

- ◆ Grow cover crops!
- ◆ Add manure or compost

2. Decrease loss

- **slow decomposition**

- ◆ Manage tillage (judicious)
- ◆ Grow crops with tissues slow to degrade: **Diversify**



How will you improve your soil organic matter?



Additional Questions?

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