Ecological Knowledge You Can Use to Create a Better Functioning Farm

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In Conclusion......

Support soil food web by maintaining or increasing *organic matter* in the soil

Keep chemical fertilizers and pesticides (chemical disturbance) to a minimum

Keep tillage (physical disturbance) to a minimum

Use compost, cover crops, green manures

Crop rotation!!—breaks pest cycles, adds biodiversity to the soils
Talking Points, or Why Should You Care?:

- The time’s they are a-changin’: Regulatory Landscape, Markets, Inputs, and Climate
- Soil Management (Nature as the Model)
- A bit about Pest Management
Regulation of pesticides and off-farm impacts....?

Regulation of fertilizers and off-farm impacts....?
The Organic Market: National trends.

Fuel, fertilizers and pesticides....
...All of which are derived from fossil fuels...

Will they increase or decrease in cost in the near future?
Climate change...

All models of climate change predict more extreme rain events...
Climate change...

...and more extreme drought events...
What to do?

Climate change

Regulation

Input Costs

Changing Markets
Soils: The Foundation of the Farm

Fungal Hyphae (make glomalin, a soil glue)

Bacteria (secrete polysaccharides that help glue soil together)

Micro aggregates

Plant roots
Step 1: Repair/prepare your soil

Soil organic matter (SOM) can hold 30 times its weight in water. One percent organic matter in the top three inches of soil can hold 1.4” of water...
The relationship between some crop species and VAM fungi

<table>
<thead>
<tr>
<th>High dependency</th>
<th>Low dependency</th>
<th>Non-hosts</th>
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<tbody>
<tr>
<td>Peas, Beans, and other legumes</td>
<td>Wheat and other cereals</td>
<td>Canola, Mustard and other brassicas</td>
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<tr>
<td>Flax</td>
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<td>Lupins</td>
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<td>Sunflowers</td>
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<tr>
<td>Maize or Corn and other warm season cereals</td>
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No-till/strip till techniques... leave the soil mostly undisturbed.
Mulches...

No-till/strip till techniques...
Mulches...

...using roller crimpers can be planted into with no-till drills.
Many studies have shown that spiders are important predators in agricultural ecosystems.

The Chinese have augmented spider populations in field crops as a pest management strategy for centuries.

Spiders are able to rapidly colonize an area through parachuting. Ballooning spiderlings are often the earliest predaceous colonizers of agricultural fields.

A study in Germany found that mulch increased spider densities in wheat fields, and thereby reduced cereal aphid populations by 25%

Organic farms generally have higher spider populations than conventional farms.
Presence of spiders changes insect herbivore behavior, decreasing damage to crops. Spider-caused abandonment of plants is known for cucumber beetles, Japanese beetles, lep larvae in apple orchards, cutworms, greenbugs, leaflys, leafhoppers and planthoppers.

Spiders often kill more insects than they can consume.

Spider diversity is important. Spider species differ in:
• hunting strategies,
• habitat preferences and prey preferences
• active periods.

Provide diversity of habitats—structural diversity in or adjacent to fields.
The Little Brown Bat

Small and efficient—adult weight: 10 grams, 4-5 inches long
Gophers......

Alternative controls...
An owl can consume 155 gophers per year, and it also eats rats and mice.

A pair of owls can have a clutch of 5 to 6 chicks.

One nest for every 10 acres is needed if the problem is severe, one nest every 20 acres if the pest pressure is average.
Barn Owl Nest Box

Graphic from:
http://birdsofprey.org/owlbloxes.htm
A word about funding and biodiversity....

• Natural Resource Conservation Service (NRCS) Programs:
  • Environmental Quality Incentive Program (EQIP) cost share
  • EQIP Organic Initiative
  • Conservation Stewardship Program (CSP)
  • Wildlife Habitat Incentive Program (WHIP)
Take home messages....

Maintain or increasing **organic matter** in the soil compost, cover crops, manures, and green manures

Keep disturbance of the soil and ecosystem to a minimum (avoid chemical and physical disturbance)

Crop rotation!!—breaks pest cycles, adds biodiversity to the soils

Understand the ecology of pests AND beneficials. Provide habitat for beneficials...
Working *with* nature….

…can help your bottom line