



# Western Lake Erie Basin Regenerative Agriculture Bus Tour

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## Regenerative Farming Practice FAQs:

Principles of Soil Health

Soil Health and Downstream Impacts

Soil Microbes

Cover Crops

No-till

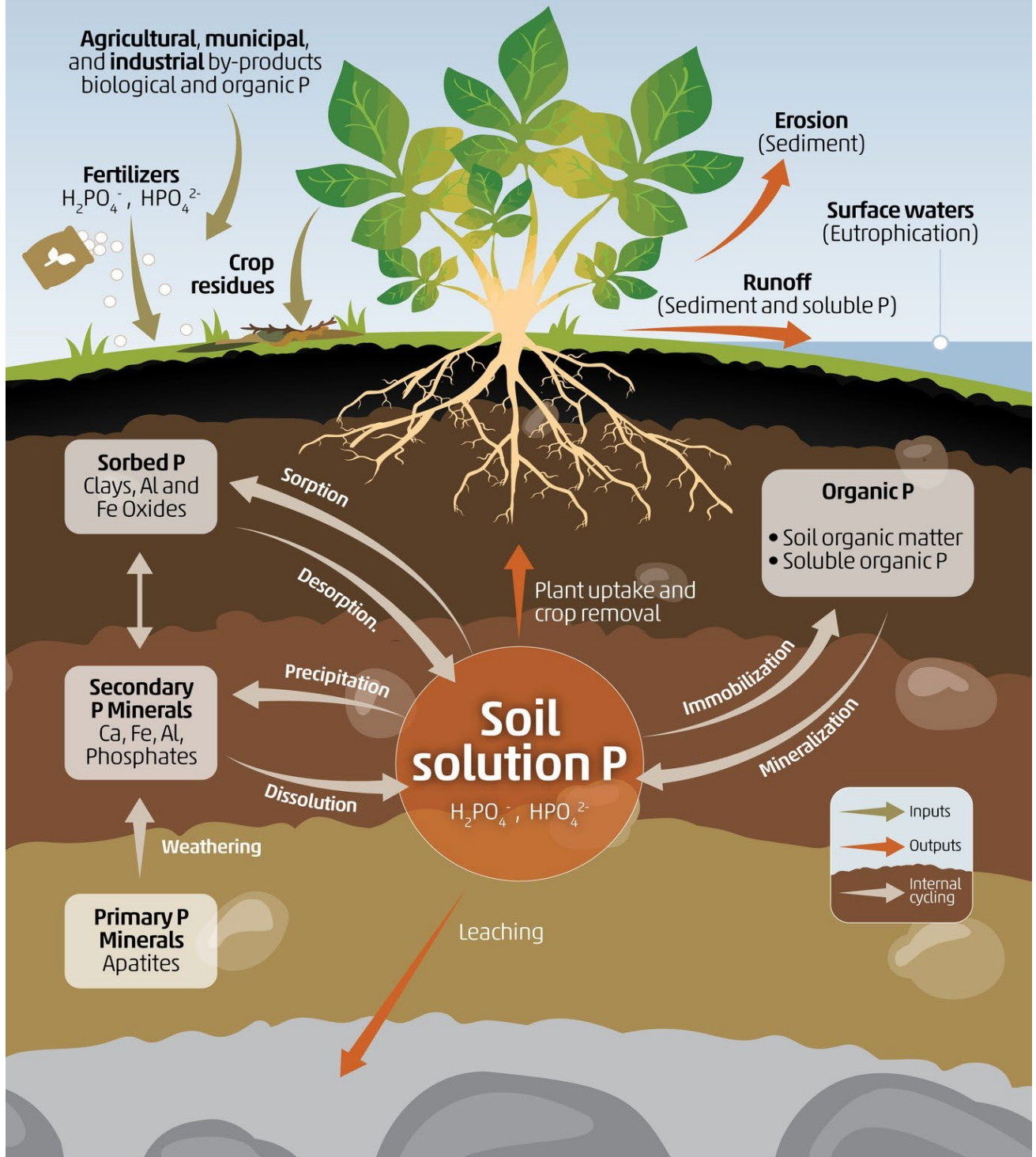
Grazing

Two-stage Ditch

Composting Manure

Barriers and Resources

# The P cycle in soils



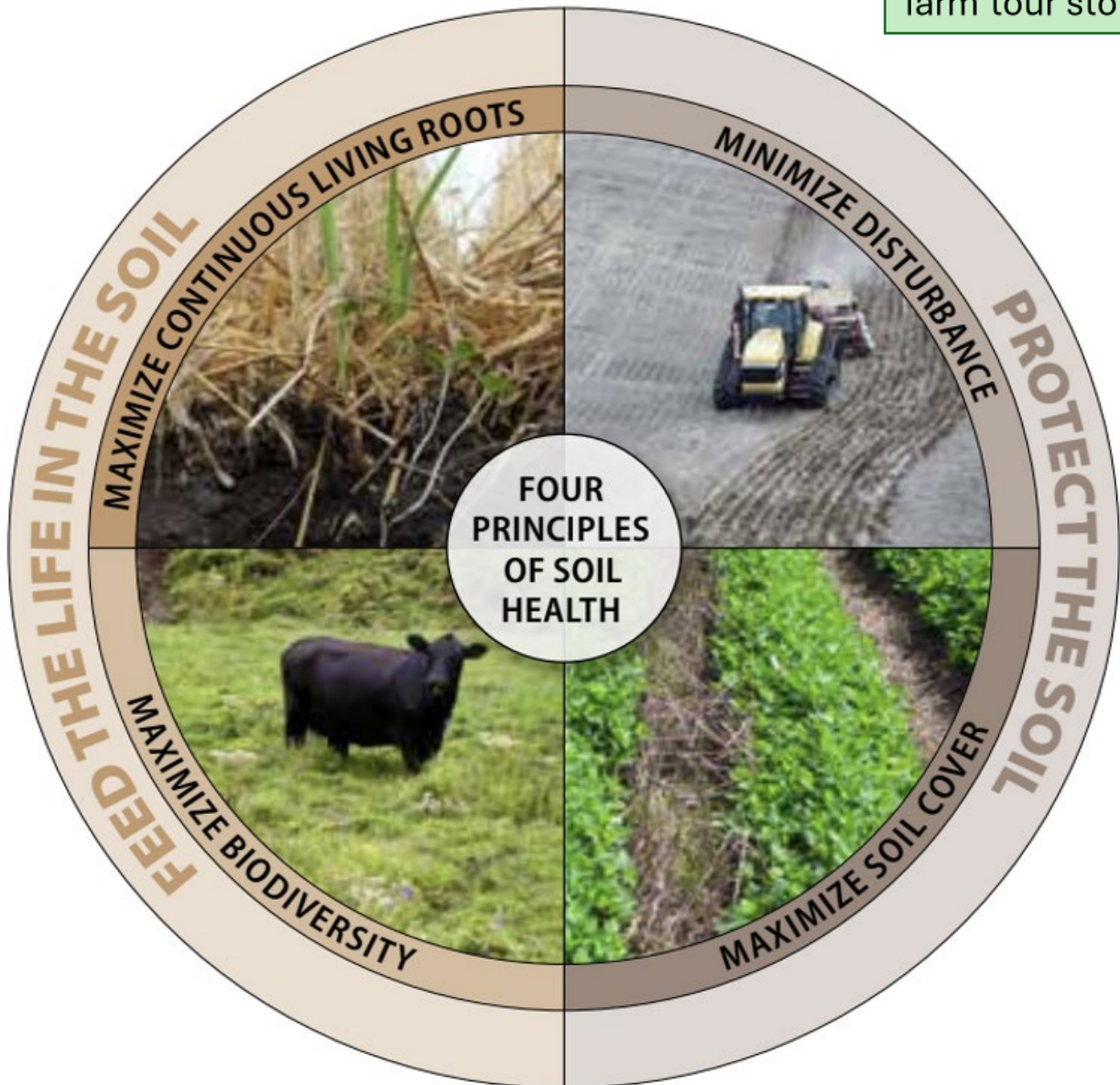
Food and Agriculture  
Organization of the  
United Nations



GLOBAL SOIL  
PARTNERSHIP

## Four Principles of Soil Health

See soil health highlighted at all farm tour stops



### Practices you will see today that support these principles:

- Cover crops
- Grazed cover crops
- Reduced tillage
- Rotational grazing
- Diversified crop rotations

## Soil Health and Downstream Impacts

Runoff from fields where plant nutrients have been applied can lead to impaired water quality. Phosphorus in runoff is a contributing factor to freshwater eutrophication, a process that promotes the growth of cyanobacteria and algae, and results in depleted oxygen levels and a buildup of toxins in those waters.

### **Healthy Soils and Protecting Waters:**

Soil is the Earth's largest natural water filter; as water passes through soil, natural processes bind, break down, or remove contaminants. The water holding capacity of the soil can slow the water's infiltration and reduce the potential for flooding

### Services Healthy Soils Provide:

- Improved plant health
- Reduced inputs
- Carbon sequestration
- Reduced erosion
- Improved water and air quality
- Improved biodiversity
- Water infiltration and retention

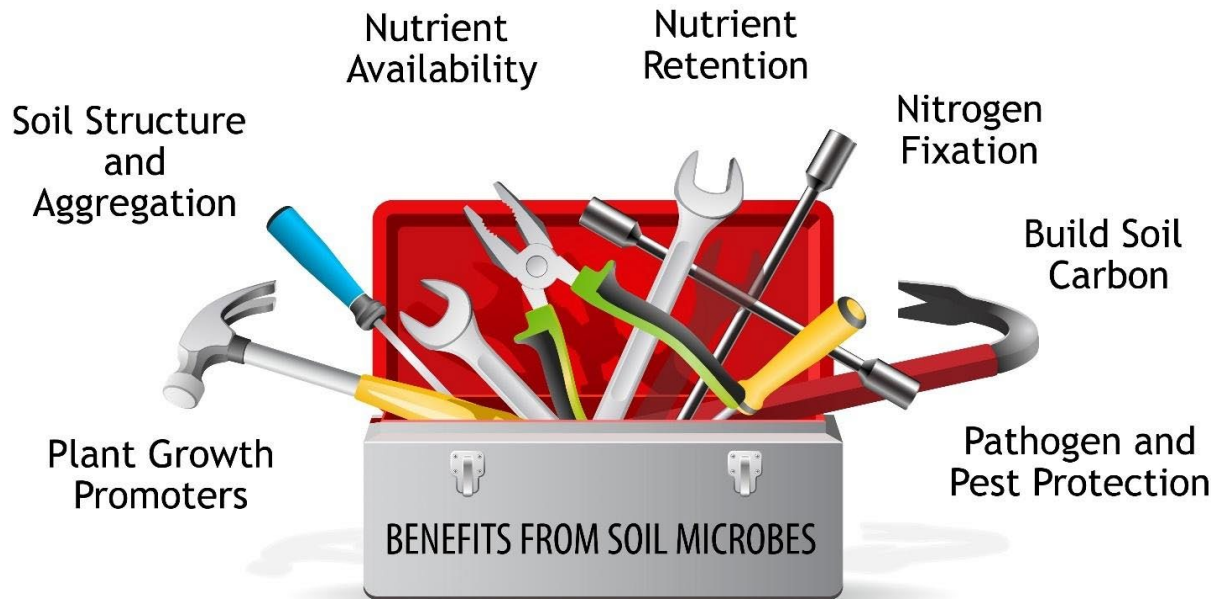


**Picture:** Farmer-led Watershed Conservation group members investigating soil quality on a farm in Lenawee County MI. (Farmer-Led Conservation Group, [waterqualityfarming.com](http://waterqualityfarming.com))

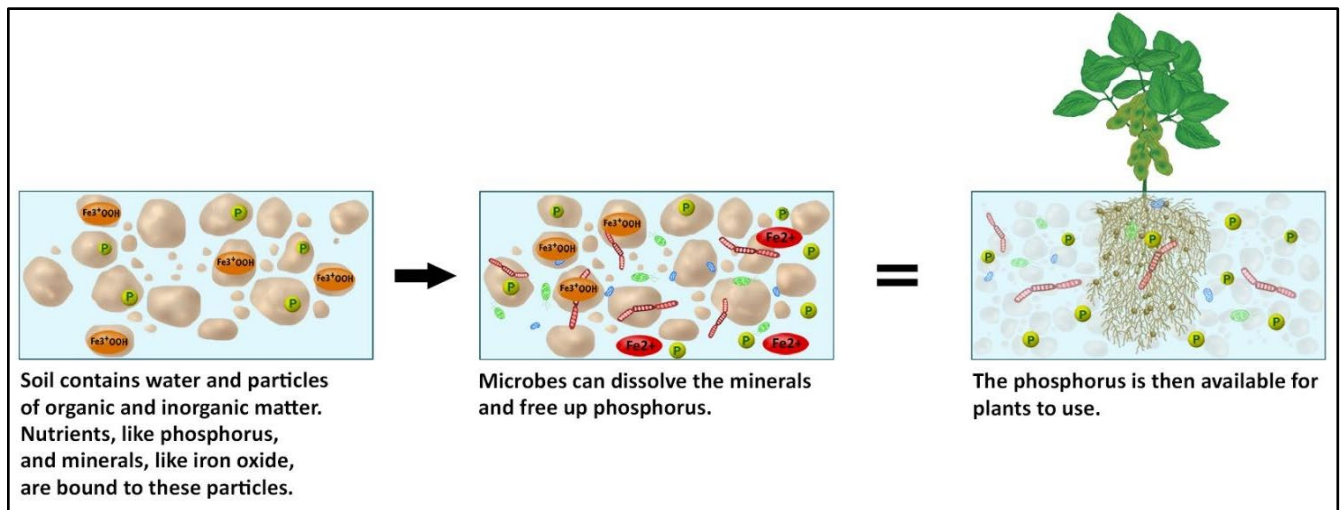
Read more about soil health here:



# Soil Microbes



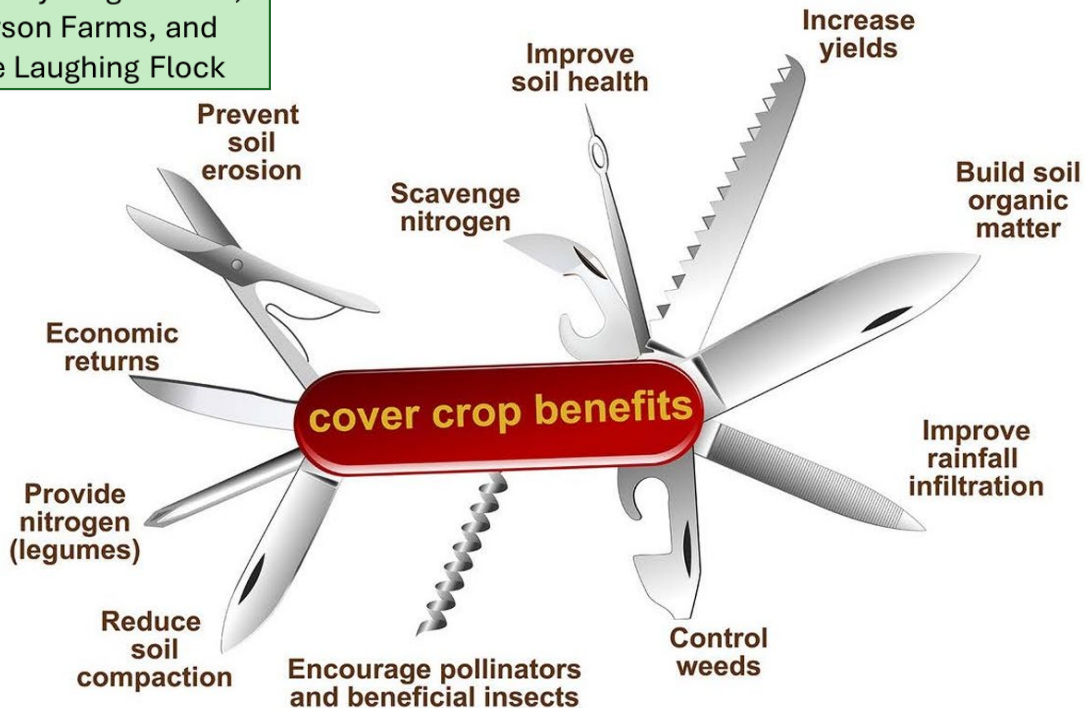
Soil Microbes are a key component of healthy soils, and like a toolbox, provide many important services.



Illustrations by Carlyn Iverson, USDA – SARE

## Cover Crops

See cover crops at  
Les Seiler's Farm,  
Stoney Ridge Farms,  
Person Farms, and  
The Laughing Flock



Cover crops are like a Swiss Army Knife because of their dynamic utility on the farm. By planting and managing cover crops, farmers can see multiple benefits to their land, including:

- improved soil health,
- increased soil organic matter,
- reduced soil compaction,
- enhanced presence of pollinators and other beneficial insects,
- better nutrient cycling including the scavenging of residual nitrogen and the provision of additional nitrogen by legume crops such as clover, and
- economic returns by saving money spent on inputs and increasing crop yields.
- decreased soil erosion,
- improved rainfall infiltration,
- weed and pest management,

Read more about cover crops here:



## No-Till Management

See no-till practices at Les Seiler's Farm, Stoney Ridge Farms, Person Farms, and The Laughing Flock

Under no-till management, fertilizer and manures are typically broadcast on the soil surface and residues are not incorporated. These practices have a number of profound impacts to nutrient cycling and availability, described below.

# WHAT TO EXPECT IN THREE TO FIVE YEARS



### THRIVING SOIL LIFE

A few years without tillage will change soil biology. Mycorrhizal fungi will proliferate, creating strong micro-aggregates that lead to a loose, crumbly soil structure.

Earthworm populations will skyrocket to as many as 120,000/acre, creating pores up to five feet deep through which plant roots can grow to access water and nutrients.

In the absence of tillage, residue decomposition within the soil profile slows, enabling organic matter concentration to increase.

**It becomes a living soil.**



### BETTER NUTRIENT AVAILABILITY

Approximately 75% of nutrient cycling is biologically driven. Bacteria and mycorrhizal fungi break down residues and manure, releasing nutrients into the soil for plant uptake. Higher soil biological activity increases nutrient availability.

Increased organic matter and soil organic carbon concentration will improve soil cation exchange capacity (CEC). Higher CEC increases a soil's ability to hold and store nutrients and buffer against changes in pH.

Nutrient exchanges between organic matter, water, and soil are essential to soil fertility and need to be maintained for sustainable production purposes.



### LESS SOIL COMPACTION & GREATER INFILTRATION

The higher organic matter content and biological activity characteristic of no-till soils makes the soil more resistant to soil compaction.

Residue protects the soil surface from the impact of raindrops and reduces soil crusting, which in turn increases infiltration rates and gas exchange.

Over time, no-till soils develop a well drained, loose, crumbly structure through which rainfall easily percolates and the seedbed will become softer and more forgiving.

# NO-TILL SOILS ARE RESILIENT



## LESS EROSION

Residues on soil surface will protect soil from soil erosion. Under no-till management, erosion rates typically decline by more than 60%; fields accustomed to losing many tons of topsoil per year through erosion will experience minimal soil loss.

Every 1% increase in organic matter results in as much as 25,000 gallons of available water per acre

Source: Kansas State Extension Agronomy e-Upates, Number 357, July 6, 2012.



## IMPROVED DROUGHT RESISTANCE

### Reduced Evaporation

No-till management leaves plant residues on the soil surface, keeping soil cooler. Cooler soils experience less evaporative loss from sun and wind exposure. The lower soil temperature reduces evapotranspiration rates of cash crops during hot weather, thus further conserving soil moisture.

### MORE PLANT-AVAILABLE

**WATER:** The increase of organic matter in no-till soil is a two-fold benefit when it comes to water. First, the organic matter wicks more water down into the soil, providing for better rainfall capture and less loss to runoff. Secondly the organic matter holds more moisture in the soil increasing the water holding capacity.



## MORE PROFITS

Yield will typically rebound to the same levels achieved under conventional management a few years into the no-till transition.

At the same time, input costs under no-till management are typically lower. Less tillage means less fuel use. Lower soil disturbance reduces weed pressure and the need for herbicides. More microbial activity leads to more efficient nutrient uptake and lower nutrient inputs. All together, long-term no-till management systems are more profitable.

### EXPERT TIP NO-TILL FIELDS WIN YIELD CONTESTS

In national corn-growing competitions, no-till fields have consistently beat conventionally tilled fields in the non-irrigated crop category.

Learn more about no-till here:

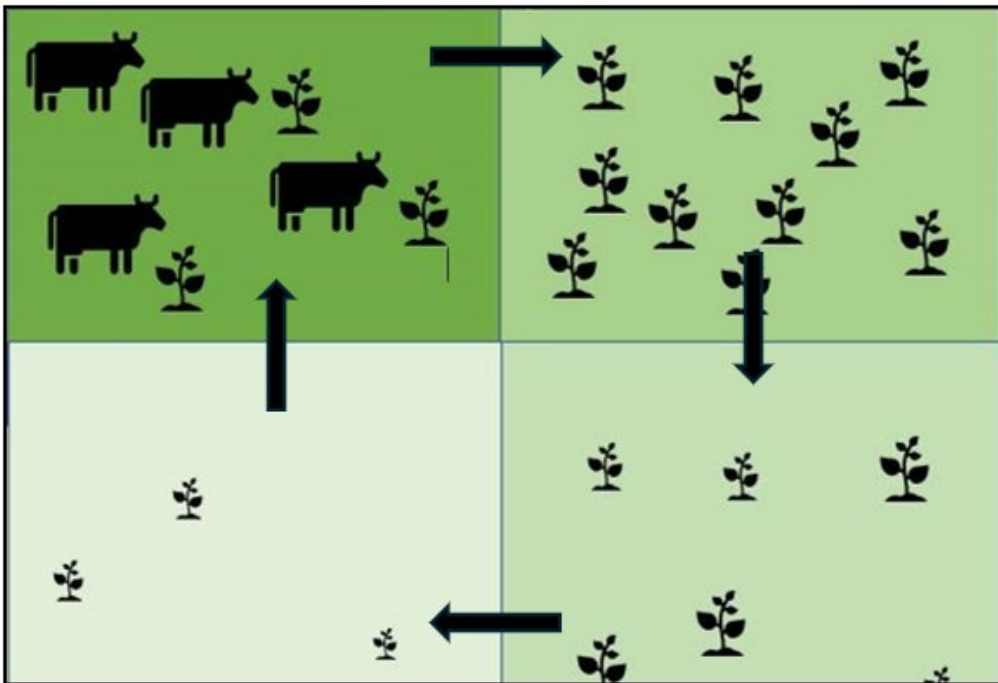




## Rotational Grazing

See rotational grazing at  
The Laughing Flock and  
Person Farms

- Livestock are regularly moved to new paddocks
- Grazed paddocks are rested for a period, allowing regrowth
- Prevents overgrazing and allows growth of deeper root systems, increasing plant nutrients, reducing erosion and water pollution
- Improves soil health, carbon sequestration capacity, and herd health



### Considerations:

- Requires more fencing and labor (though virtual fencing is an effective alternative to traditional fencing)
- Requires water and shade to be accessible in each paddock
- May result in soil compaction and degraded water quality if livestock are not moved regularly

Read more about rotational grazing here:



## Cover Crop Grazing

- Works best following wheat harvest, oat harvest, or an idled field
- Plantings from late July to mid-August work best
- Cover crop mixes of brassicas, small grains, legumes, and cool season grasses work best



See cover crop grazing at Stoney Ridge Farms, The Laughing Flock, and Person Farms

### Fall Season Livestock Carrying Capacity for Annual Cover Crop Mixes

Dry Matter Tons/Acre		Cow Days of Grazing/Acre
1.5	average stand	74
2.25	good stand	110
3.0	great stand	147

Read more about cover crop grazing here:



# Forest Grazing

See forest grazing  
at Person Farms

*Forest Grazing* is based on the ecological principles that drive a natural system to move toward or maintain a desired ecological site.

Typical management practices may include (but are not limited to):

- grazing deferments based on selected forage and browse availability
- prescribed fire
- forest improvement that drives the forest ecologically toward a desired outcome
- herbivory that doesn't detract from the desired natural regeneration or ecological site needs
- biological or chemical brush management
- livestock grazing intensity based on key forage plant preferences for the grazing season.

Read more about forest grazing here:



## Management Inputs

- Forest stand improvement
- Grazing deferments
- Prescribed fire
- Natural regeneration
- Brush management
- Grazing ecology based on preference values

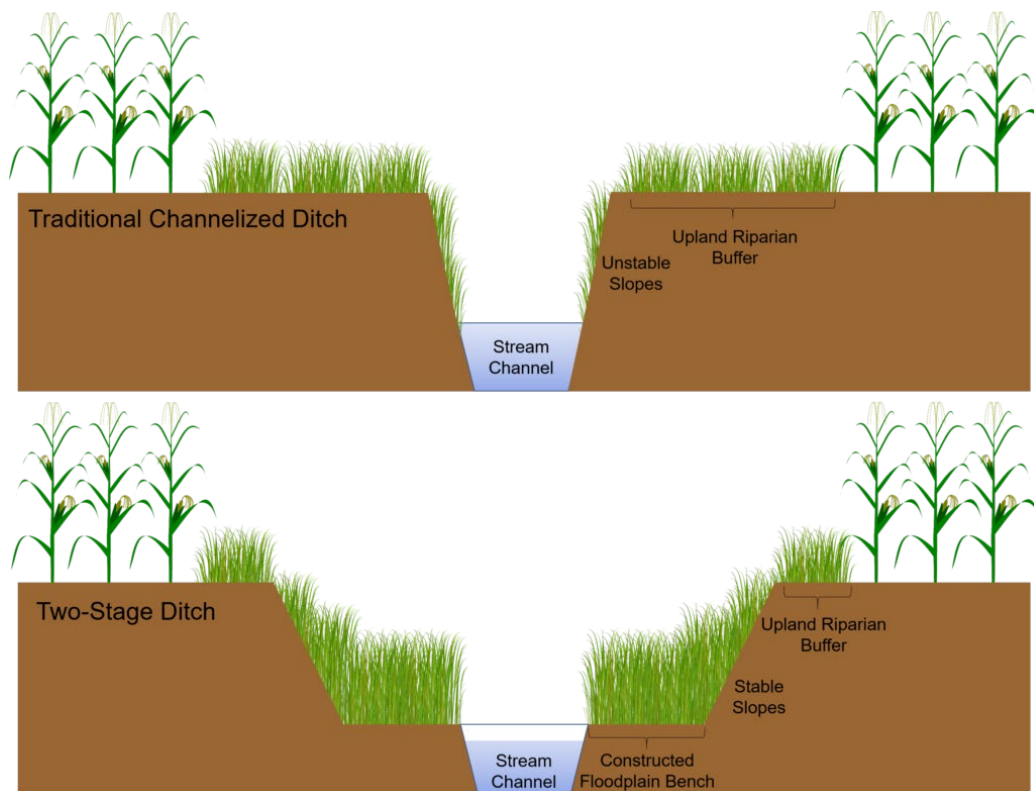
## Forest Grazing

## Results

- Cooler environment for livestock
- Some wind and weather protection
- More diverse understory vegetation
- Reduced probability of catastrophic wildfires
- May receive preferential tax treatment in greenbelt areas
- "Open Stand" of timber in grazed forest settings can be more scenic

## Open Channel/Two-Stage Ditch

Two-stage ditches create a vegetated bench that becomes flooded during higher flows, slowing water where sediment might settle.



See two-stage ditches at Les Seiler's Farm

Image from Indiana Illinois SeaGrant

### **Benefits:**

- It reduces wetness in fields with subsurface drainage, where outlets are frequently under water.
- It makes the banks more stable and reduces the maintenance cost.
- It reduces downstream exports of nutrients and sediment.
- It improves plant-soil-water interactions in ditches, increasing nutrient cycling.

Read more about two-stage ditches here:



# Composting Manure

See composting at Rebel Farm

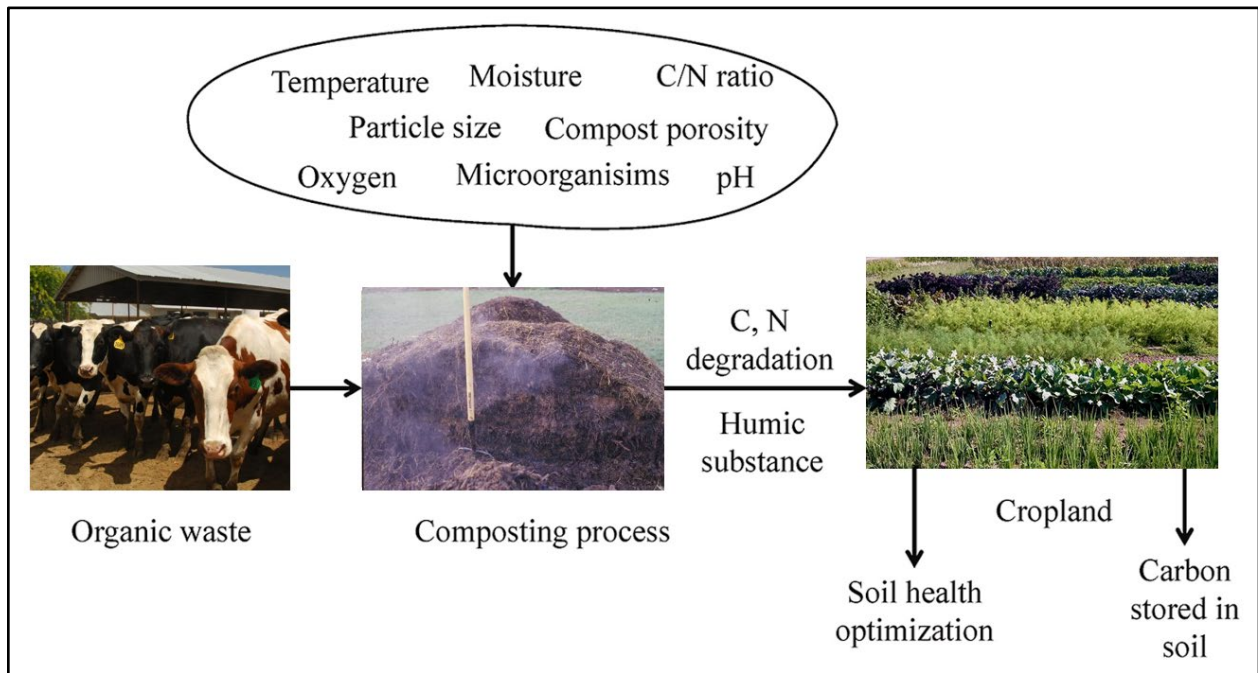


Image adapted from Ho, Thi Thien Kim, et al. "Compost to improve sustainable soil cultivation and crop productivity." 2022.

## **Benefits of Composting Manure:**

- Reduces odor and fly problems
- Reduces the volume of manure
- Finished compost is dry and fairly light, so it is easier to transport and spread
- It can be sold or used on other farms
- Fertilizer nutrients in compost are released more slowly than from raw manure

## **Things to Know About Composting Manure**

- Manure mixed with bedding material (straw, sawdust, etc.) is best suited for composting
- Initial carbon to nitrogen (C:N) ratio of the compost material should be 25:1 and 40:1 (Roughly 2 scoops of C (i.e., sawdust, straw) to 1 scoop of N (manure)).
- Finished compost should be tested for fertilizer value before applying to farm fields to avoid applying too much.

Read more about composting here:



## Common Barriers to Regenerative Agriculture

- limited awareness of benefits of BMPs
- cost-share program complexity
- limited social networks supporting regenerative agriculture
- limited collaboration between agencies and private sector
- financial constraints and implementation costs
- access to specialized equipment
- rented land
- continued access to information and technical assistance

## Resources to Address Barriers

### Farmer Networks:

- River Raisin Farmer-Led Watershed Conservation Group
- Farmer Advocates for Conservation (The Nature Conservancy)

**Picture:** Local farmers and agency staff share information at a Farmer-Led Conservation Group meeting in Lenawee County. (Farmer-Led Conservation Group, [waterqualityfarming.com](http://waterqualityfarming.com))



### Educational opportunities:

- Center for Excellence field days, educational field days hosted by agricultural extension offices, conservation districts, and other local groups
- On-farm research collaboration with MSU, U-M
- Local Conservation District and MAEAP technicians

### Funding Support:

[Access a list of potential funding opportunities here.](#) This spreadsheet is an open, active document, so please add additional resources you are aware of.