



Soil Management Basics

New Farms for New Americans



Questions for Today:

- What is *organic agriculture*?
- What is *soil fertility*?
- What are *the goals* of a good soil management program?
- What are the *components* of a good soil management program?
- What is *the relationship* between *soil fertility*, *plant health* and the *resistance and resilience* of plants to pests and diseases?
- What are some of the agricultural practices that help farmers manage soil?



What is Organic Agriculture?

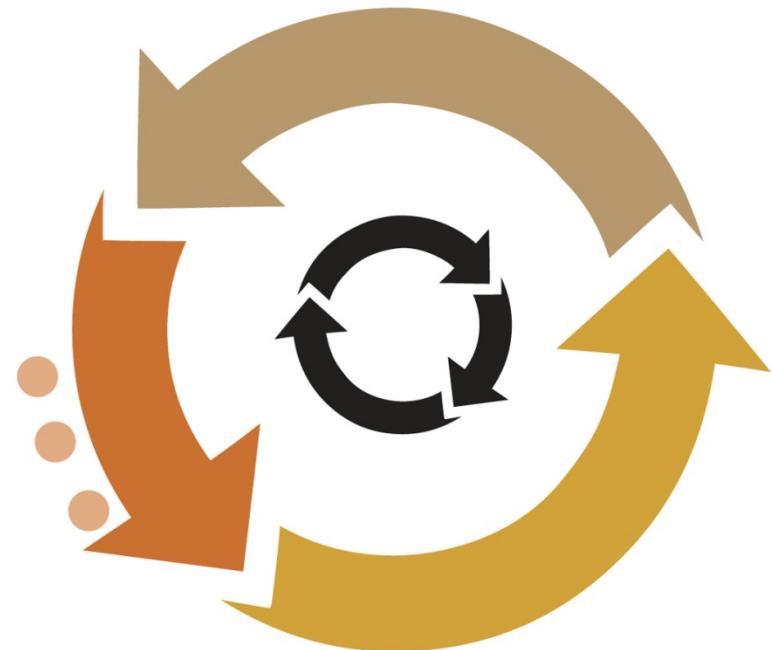
An ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain or enhance ecological harmony. The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people.



Organic agriculture in California –
Notice hedgerows

Organic Agriculture

- CYCLES OF RESOURCES
 - Healthy plants
 - Healthy soils
 - Healthy water
 - Healthy bugs and animals
 - Healthy human beings



Organic Agriculture



Organic Agriculture



Organic Agriculture



Conventional Agriculture

An industrialized agricultural system characterized by mechanization, monocultures, and the use of synthetic inputs such as chemical fertilizers and pesticides, with an emphasis on maximizing productivity and profitability. Industrialized agriculture has become “conventional” only within the last 60 or so years (since World War II).

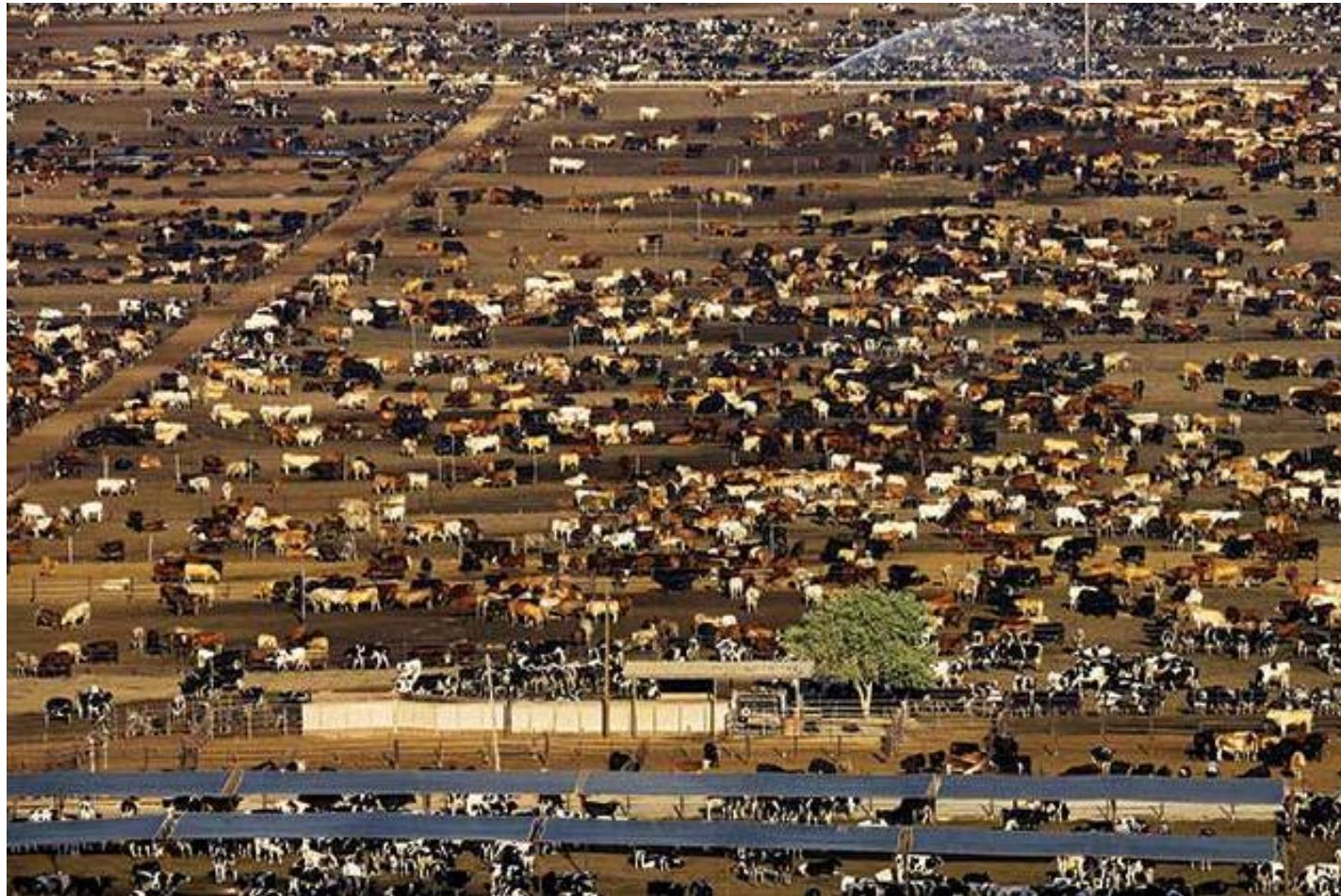
Conventional Agriculture



Conventional Agriculture



Conventional Agriculture



What is soil fertility?

The ability of soil to provide plant nutrients

- Nutrients: A source of nourishment
- What nutrients do plants need to grow?
 - Carbon, oxygen, hydrogen (obtained through carbon dioxide (air) and water)
 - Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, zinc, copper, boron, molybdenum and chlorine (obtained through the soil)

The table includes several annotations:
* Lanthanide series: A row of elements from La to Lu.
** Actinide series: A row of elements from Ac to Rn.
Elements are color-coded by group: Alkali metals (pink), Alkaline earth metals (light blue), Pnictogens (purple), Chalcogens (teal), Halogens (yellow-green), and Noble gases (light orange).
The table also includes a legend for element types: Metal (green), Nonmetal (orange), and Metalloid (grey).

What is soil fertility?



Mineral Deficiency



Healthy

Lacking nitrogen and magnesium

Mineral Deficiency



Low magnesium

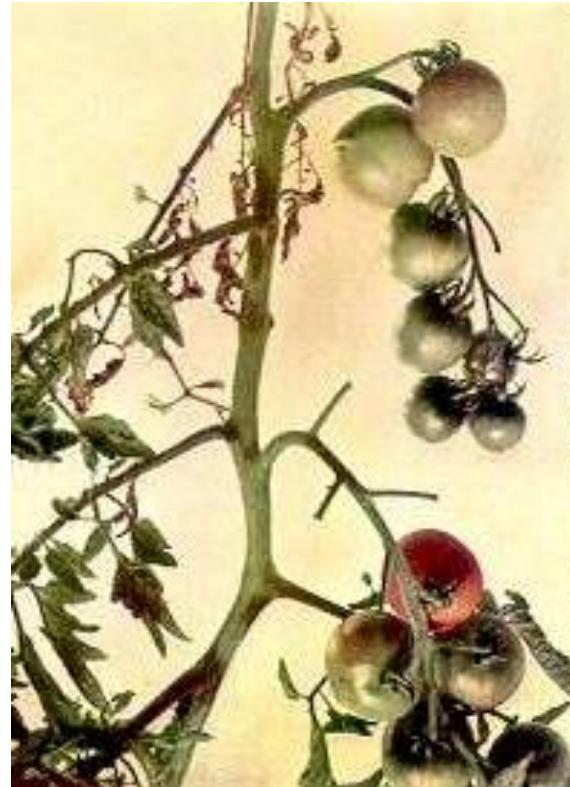


Low potassium



Low manganese

Mineral Toxicity



Too much manganese

What is Soil Fertility?

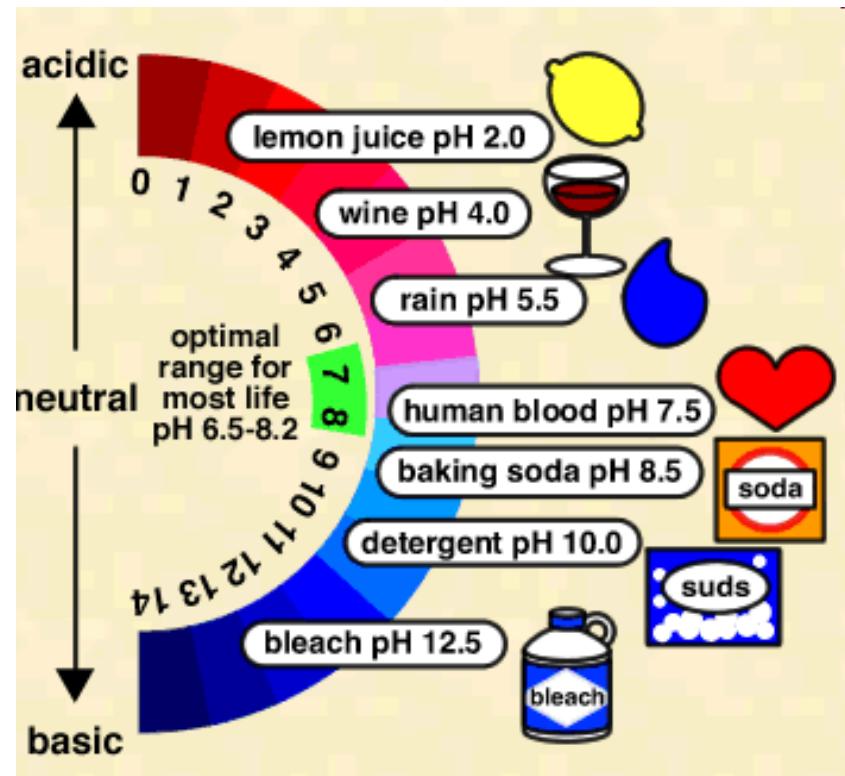
The ability of soil to provide plant nutrients

- Regulates water
- Filters pollutants
- Holds nutrients
- Has proper pH

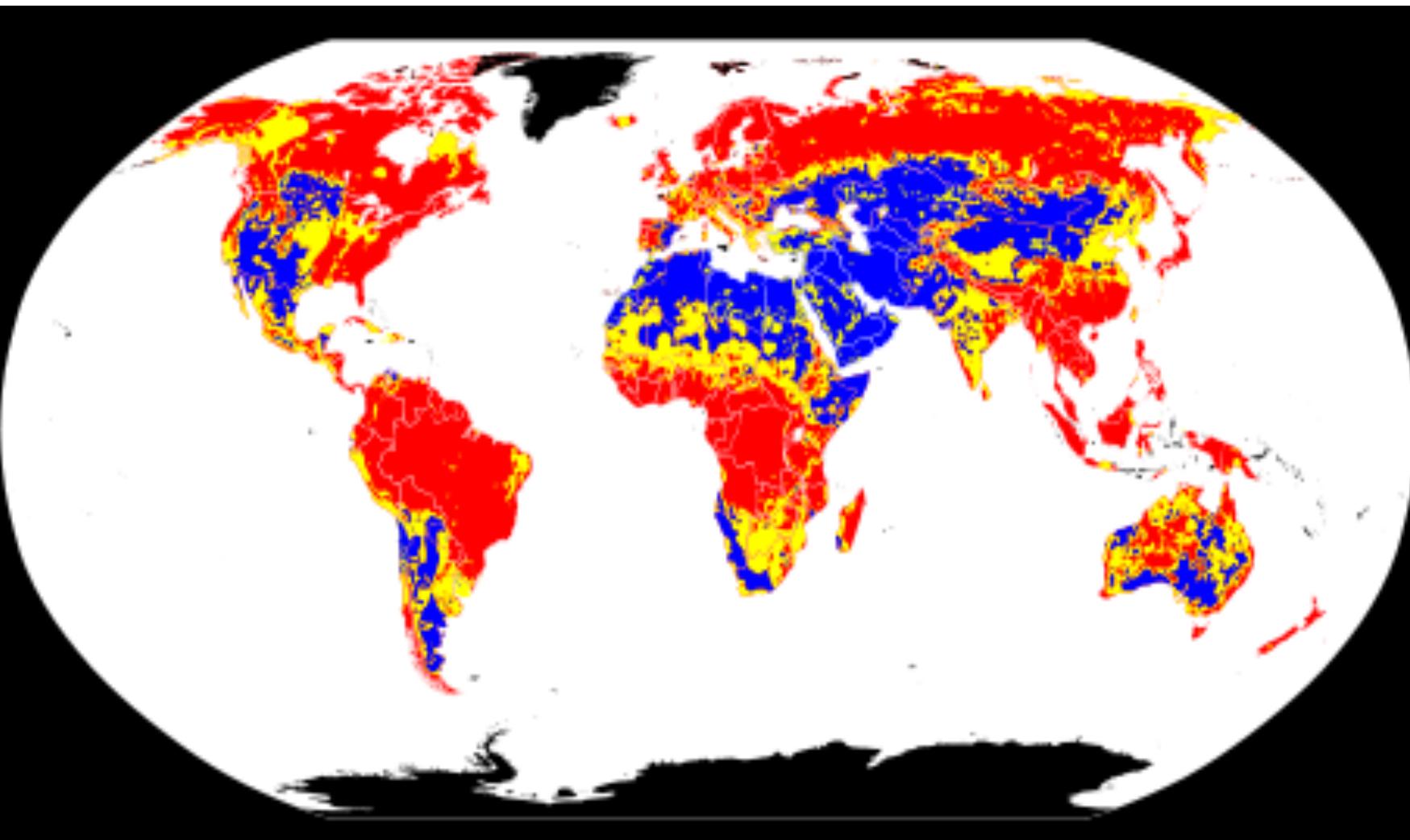


What is pH?

- Soil pH is a measure of soil acidity or soil alkalinity.
- The majority of food crops prefer a neutral or slightly acidic soil (pH 7).
- Some plants prefer more acidic (e.g., potatoes, strawberries) or alkaline (e.g., cabbages) conditions.



Worldwide Soil Acidity Map



Red = acidic soil Yellow = neutral Blue = alkaline Black = No data

New Farms for New Americans

Field pH

6.8

What are the goals of a good soil management program?

1. High crop productivity and quality

- Good yields
- Make money
- Farms stay in business



What are the goals of a good soil management program?

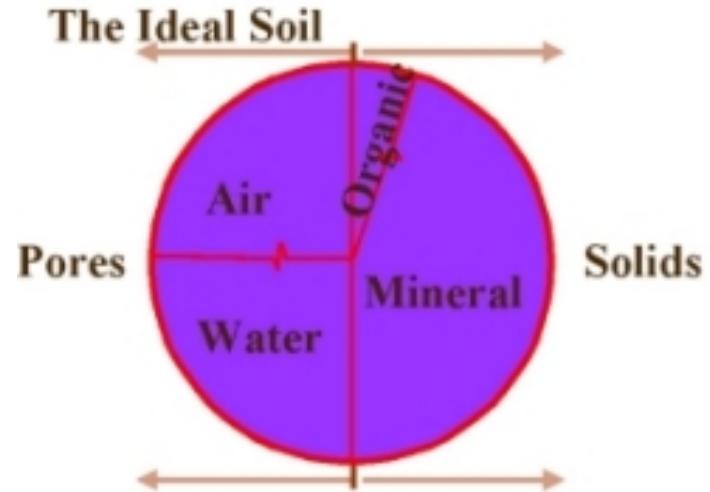
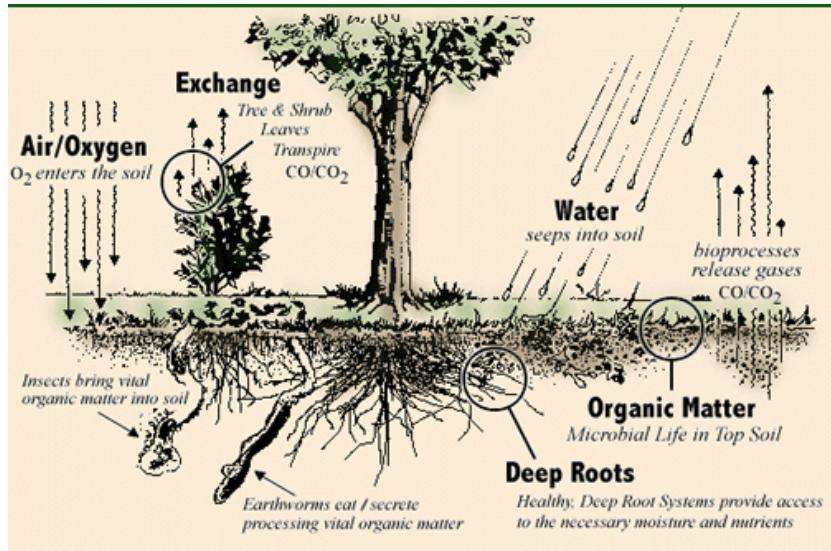
2. High environmental quality and limited human risks

- No chemicals that are bad for animals or people
- Prevent run off and soil erosion
- Recycle nutrients through the system



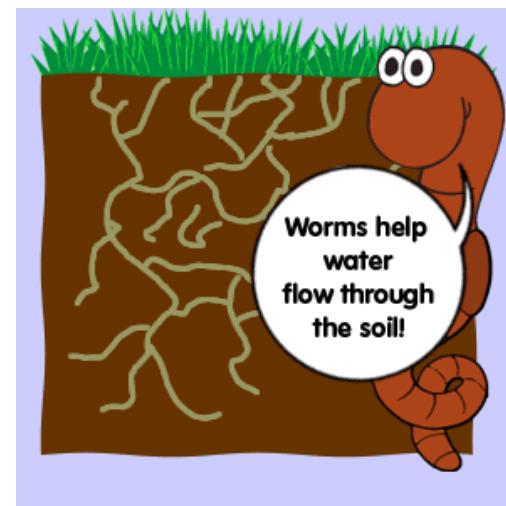
What are the components of good soil management?

1. The physical soil is healthy.
2. Soil nutrients and pH are balanced.
3. Pests and diseases are controlled.



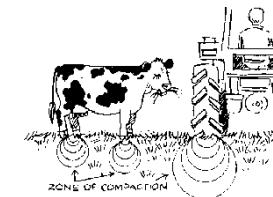
1. The Physical Soil

- You can build soil organic matter through compost and cover crops, which provides:
 - Nitrogen and other nutrients
 - Water and air filtration
 - Habitat for worms and bacteria that break down organic matter



1. The Physical Soil

- You can keep soils healthy by properly timed and scaled tillage
 - Helps organic matter break down
 - Reduces soil compaction
 - Exposes more soil for bacteria to break down
 - Increases good drainage



1. The Physical Soil

- Irrigate the right amount
 - Maintain moisture at 50% - 100% of field capacity by monitoring the soil and using water retention techniques like mulching
- Engage in crop rotation, soil amending and fertilizing as needed



2. Soil nutrients and pH

- Maintain good levels of nutrients
 - Test soil regularly and add compost or specific nutrients as recommended by soil experts
 - If plants are sick, get them tested
 - Don't leave fields bare and avoid overwatering



2. Soil nutrients and pH

- Maintain pH of between 6.0 and 7.0
 - pH can be changed by adding lime or sulfur
- Keep salt levels low



3. Pests and Diseases

- Maintain good nutrient levels and pH – this can help plants stay healthy and strong
- Give plants enough space – enough air and soil for roots to grow and leaves to breathe
- Avoid soil compaction and erosion for good soil moisture



3. Pests and Diseases

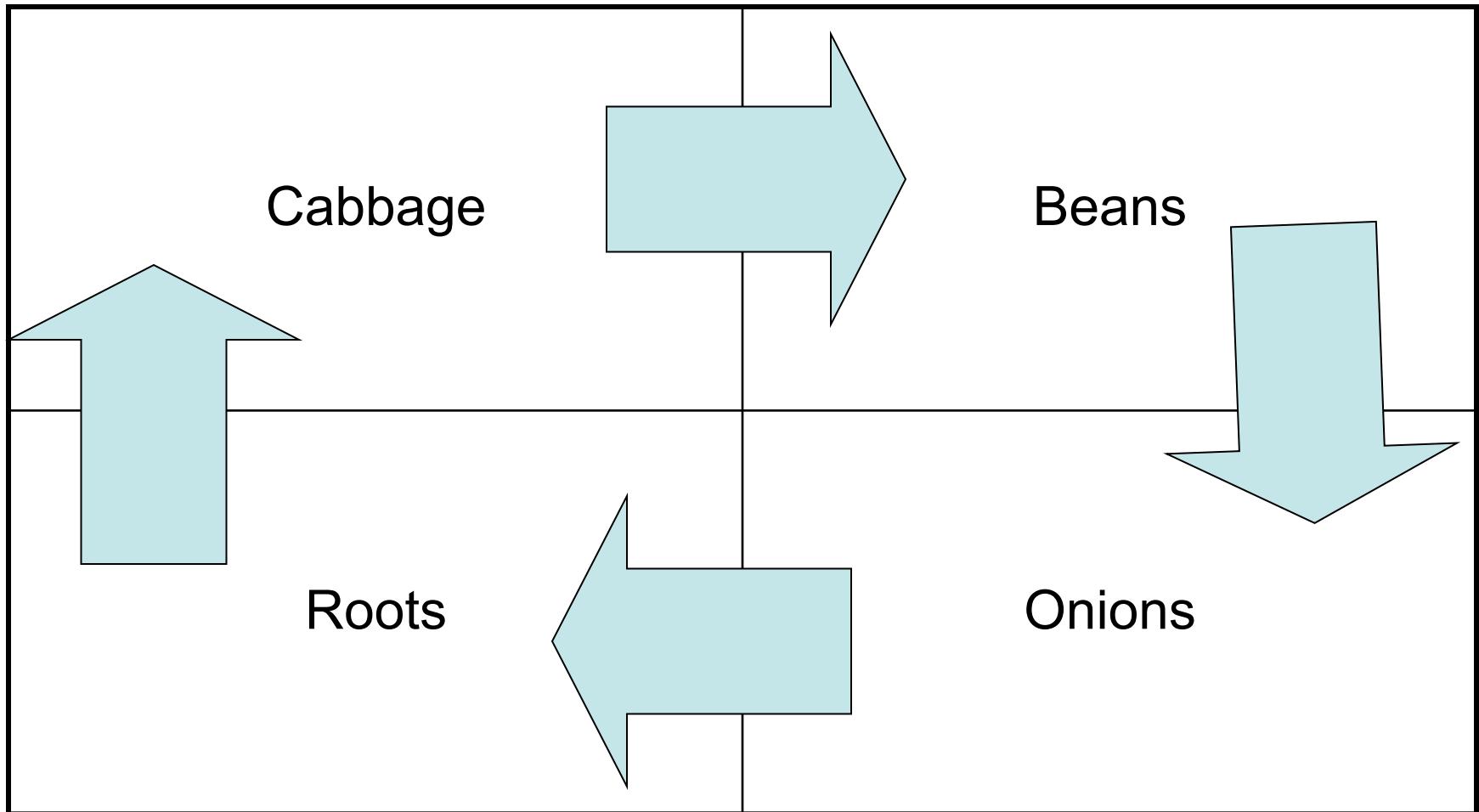
- Rotate crops into different locations to confuse pests and kill diseases
- Plant polycultures - Diversity will reduce pests and disease
- Kill bad bugs when you see them and report disease and use organic controls when necessary; encourage good bugs



A lady bug is a
good bug.



Crop Rotation

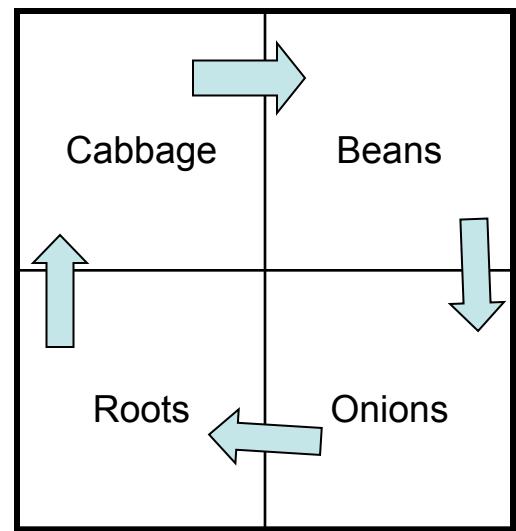
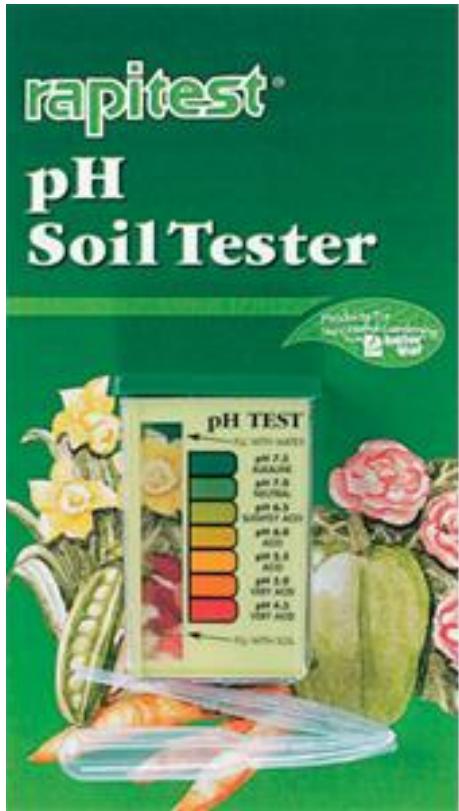


What is the relationship
between soil fertility, plant
health and the resistance and
resilience of plants to pests and
diseases?

Healthy Soil = Healthy and Resilient Plants!



What are some of the agricultural practices that help farmers manage soil fertility?



Great Resources

The Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms by Thomas Wallace:

<http://www.hbci.com/~wenonah/min-def/>

University of Vermont Plant and Soil Diagnostic Clinic:

Ann Hazelrigg – 656-0493