Welcome to the 2013 Grow Good Food Workshop!

K-STATE Research and Extension

Sedgwick County... working for you

Vegetable Gardening from the Ground UP

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K·STATE
Research and Extension

Preparing the Soil

Choosing a Garden Site

- Full Sun – at least 6 hours
- Wind protection?
- Good drainage!
- Water

Anchorage

Nutrients

Water

Oxygen

3 Major Soil Characteristics

Texture

Structure

Chemistry

What is Soil Texture?

The relative proportion of sand, silt, & clay

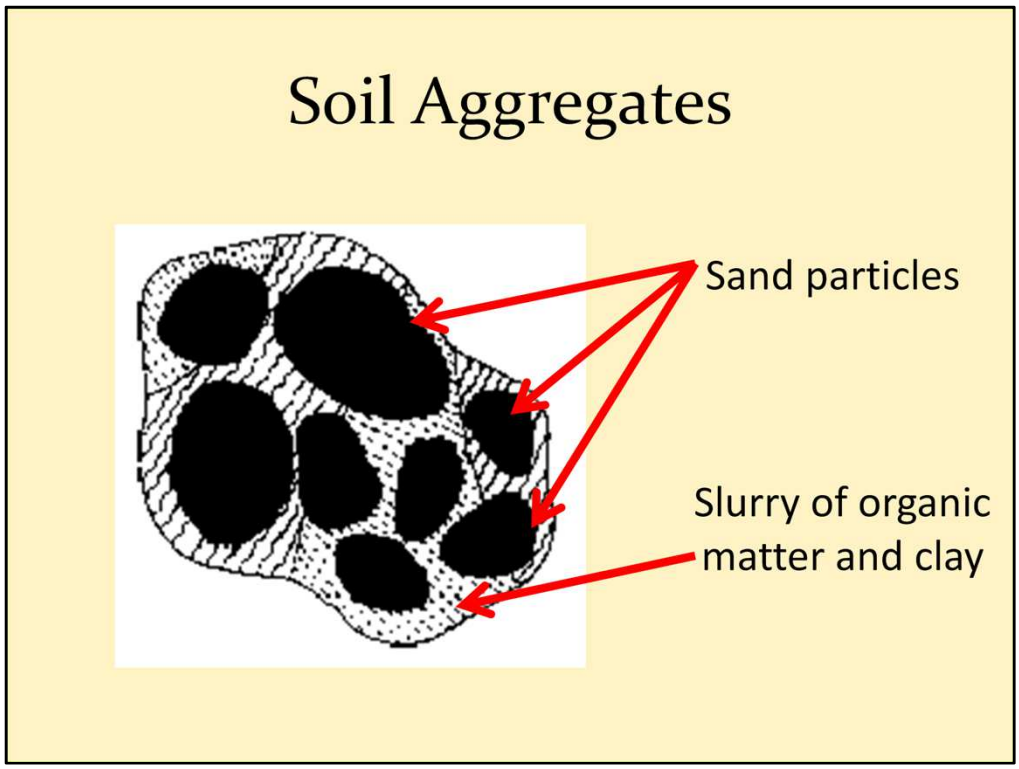
Soil Texture Triangle

Testing Our Soil Texture

Why Soil Texture Matters

- Water Movement
- Water Holding Capacity
- Soil Temperature
- Soil Aeration
- Soil Erosion
- Nutrient Holding Capacity

Soil Structure



Soil aggregates are particles of sand and silt held together by clay and organic matter.

Work the soil when it is too wet

Compact the soil with heavy equipment

Pulverize with excessive tillage

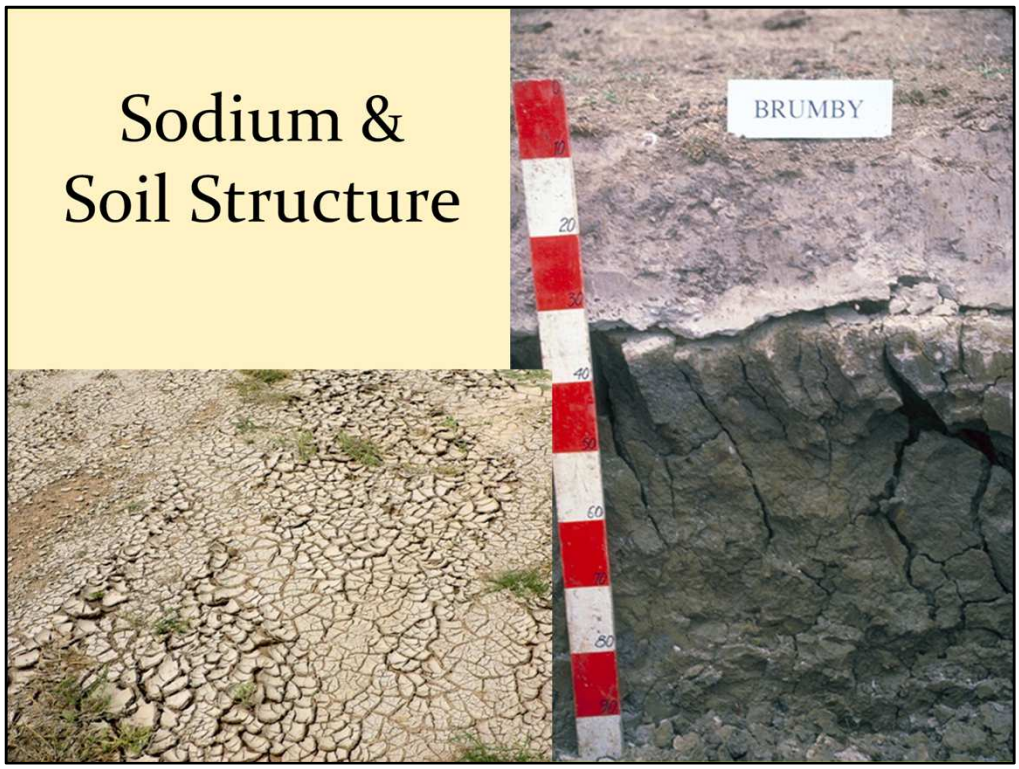
Ways to Rebuild Soil Structure

Lots of organic matter!

Make sure your pH & nutrient levels are good

Green manures/cover crops

Normal freeze/thaw cycles



Sodium (Na) destroys chemical bonds – results in soils that don't absorb water well and are very hard and compacted

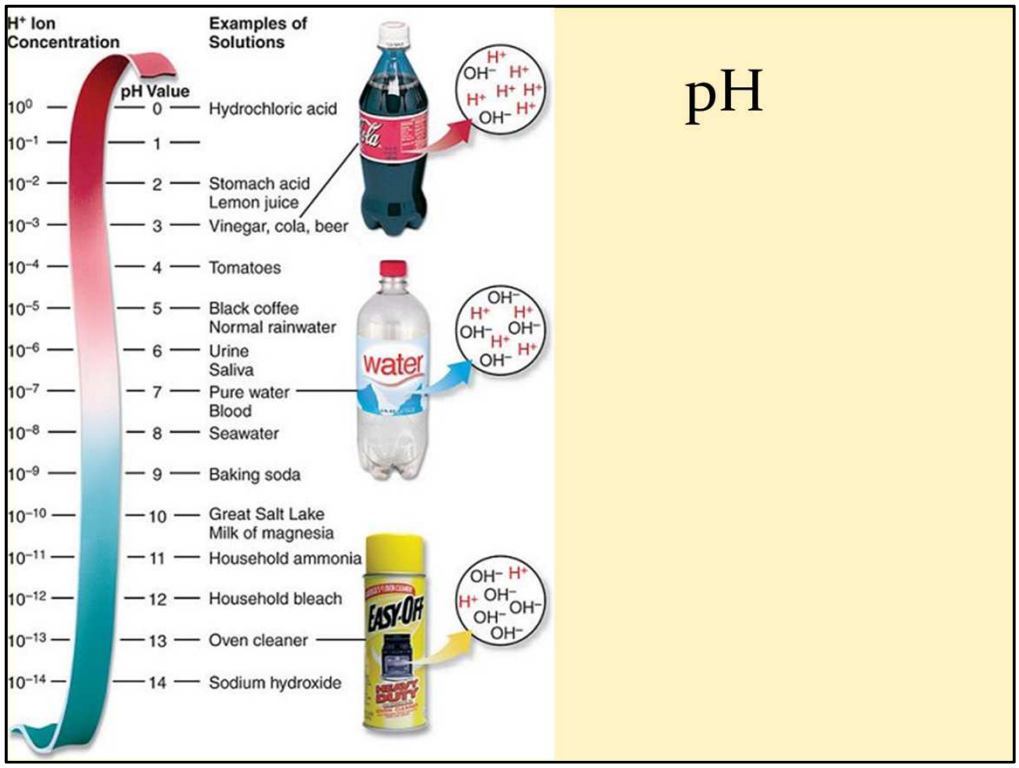
Salt water/ice melt or poor quality irrigation water

Use gypsum & water to banish the sodium

Chemical Characteristics of Soil

pH

Nutrients

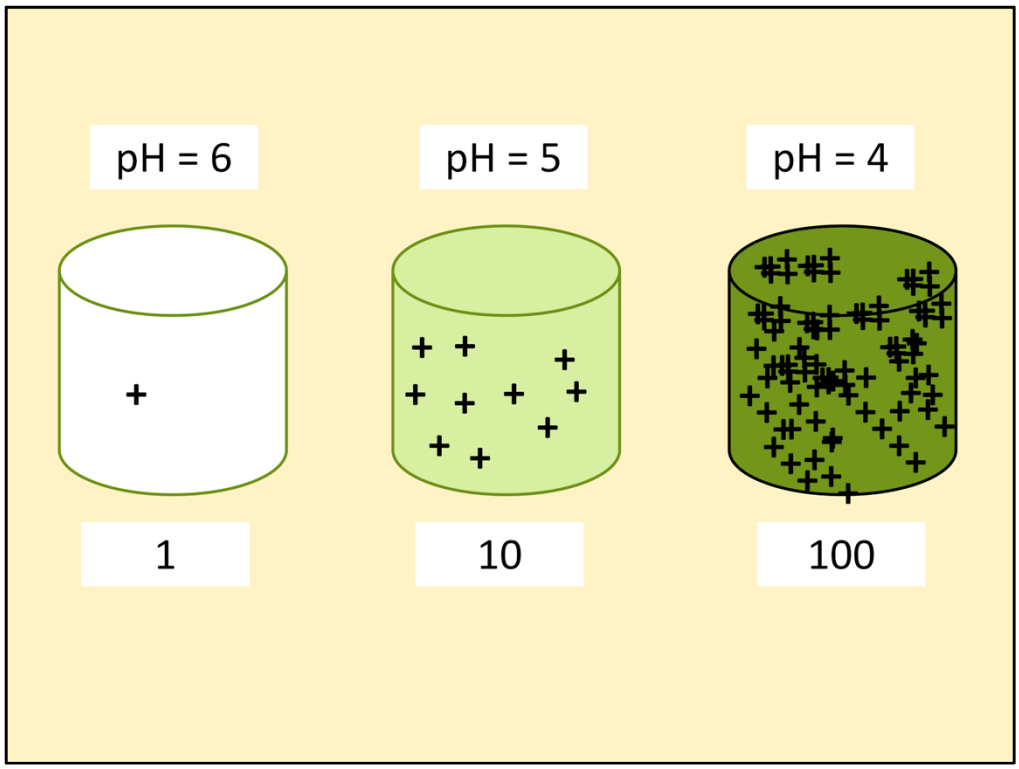


pH is a measure of Hydrogen ion concentration

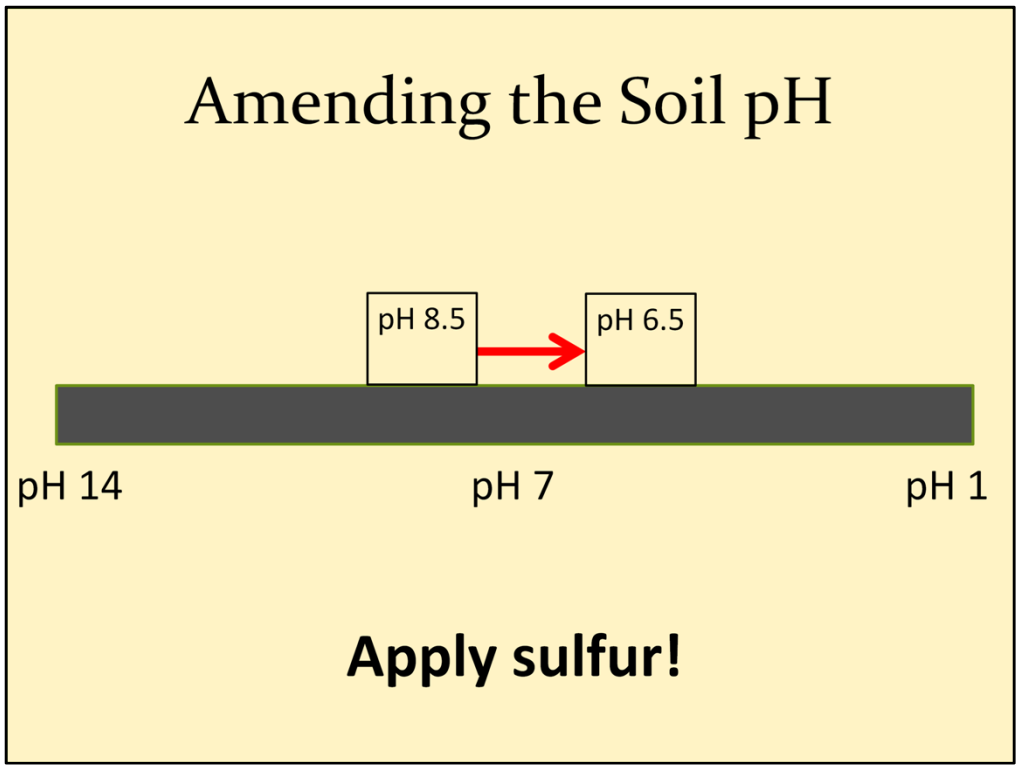
H^+ is what makes something acidic

The pH affects nutrient availablility

Ideal pH range is 6.0-7.0 for most plants



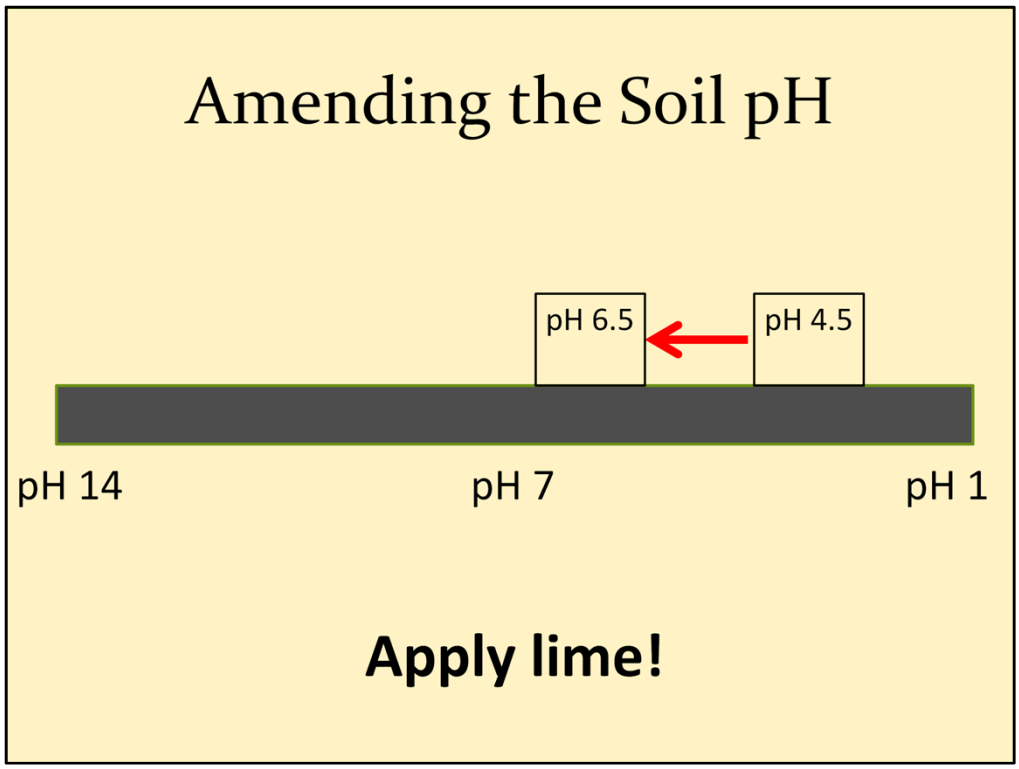
One unit change in pH is a 10 fold change in H^+ concentration



Use lime to raise the pH (make more alkaline)

Use sulfur to lower the pH (make more acidic)

Be careful! Have an accurate soil test first!



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Plant Nutrients

Macronutrients

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)
- Sulfur (S)

Micronutrients

- Boron (B)
- Chlorine (Cl)
- Copper (Cu)
- Iron (Fe)
- Manganese (Mn)
- Molybdenum (Mo)
- Nickel (Ni)
- Zinc (Zn)

Nutrients = Chemical Elements
Absorbed through roots
Absorbed in small amounts through leaves
Mobility of nutrients varies
Amount needed by plant varies

Nitrogen

Highly soluble

Leaches down out of root zone

Volatilizes

Exits soil as a gas into atmosphere

Vegetative growth

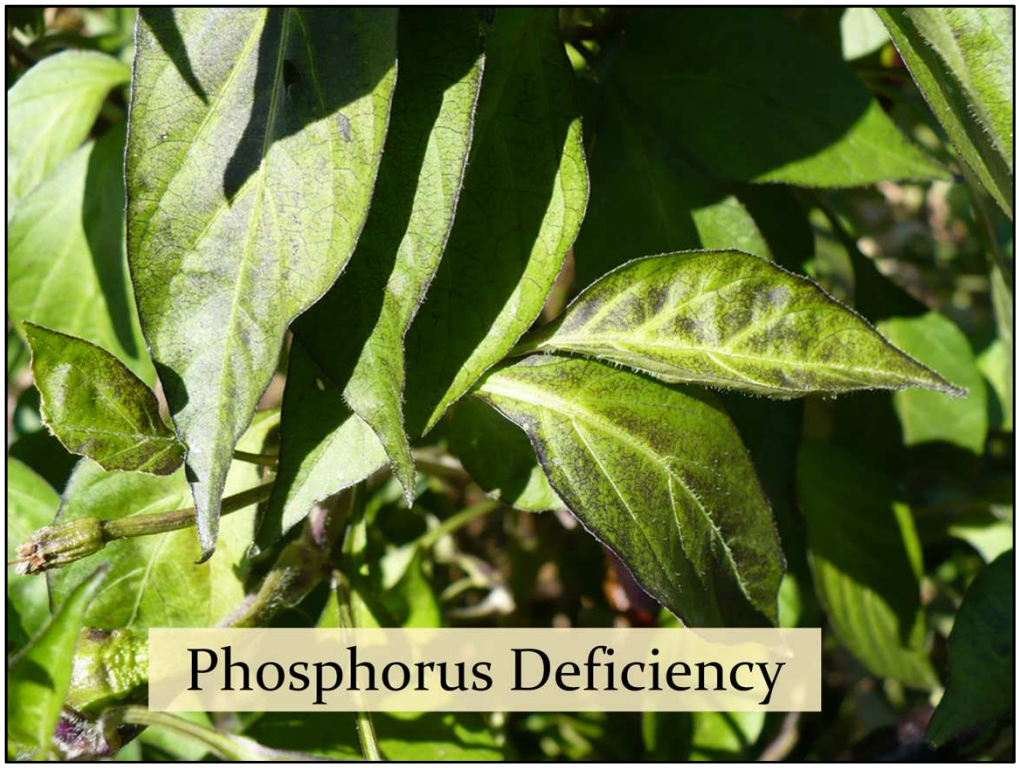

Nitrogen Deficiency

Relatively insoluble

Attaches strongly to soil particles

Primary function is energy transfer within plant

Root development


Phosphorus Deficiency

Can be leached by water

Important for stress management in plants

Plants will practice “luxury consumption”

Potassium Deficiency

How Do We **Improve**
Our Soil?

Incorporating Compost

Incorporating Other Organic Materials (i.e. – leaves)

Incorporating Manures

Letting Grass Clippings Drop

Using Mulch

Planting Cover Crops

Needs to be replaced continually

- Plants use it
- It oxidizes and breaks down
- Microbes and soil animals digest it

Low organic matter has MAJOR ramifications!

Adding/maintaining organic matter is the most important soil modification you can make!

Also known a “green manures”, cover crops are extremely important for soil health
- Organic matter
- Soil microbial health

Suppress Weeds

Add / Recover nitrogen
- Highly-leachable $N0_3$
- Legume cover crops fix N

Can be used as mulch
- No-till or strip-tillage

Can reduce excess nutrients (P)

Reduce soil erosion

Soil Testing

- Collect 8-10 small scoops of soil, 6" deep
  - Random scoops from the entire sample area
- Mix the samples together, then bag and label about 2 cups of soil.
- Bring to the Extension office. $18 for normal test.
  - N, P, K, pH, Organic Matter

Sources of Plant Nutrients

Synthetic / organic fertilizers

Soil amendments (Compost)

Crop residue / organic matter

Fertilizer Analysis

N	–	P	–	K
Nitrogen		Phosphorus		Potassium
10	–	10	–	10

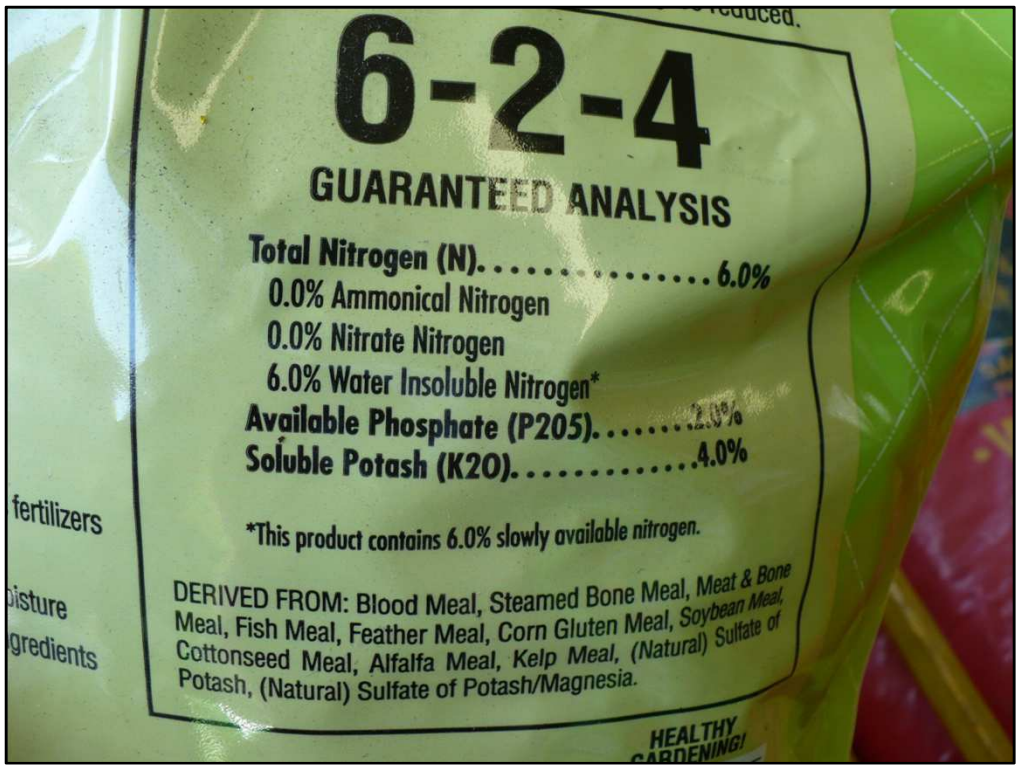

11-15-11
cellent All-Purpose

Derived solely from the remains or by-products of a once-living organism (not counting fossil fuels) OR rock

Usually slow-release

Often very low analysis

Often expensive


6-2-4
GUARANTEED ANALYSIS
Total Nitrogen (N)..... 6.0%
0.0% Ammonical Nitrogen
0.0% Nitrate Nitrogen
6.0% Water Insoluble Nitrogen*
Available Phosphate (P205)..... 2.0%
Soluble Potash (K2O)..... 4.0%
*This product contains 6.0% slowly available nitrogen.
DERIVED FROM: Blood Meal, Steamed Bone Meal, Meat & Bone Meal, Fish Meal, Feather Meal, Corn Gluten Meal, Soybean Meal, Cottonseed Meal, Alfalfa Meal, Kelp Meal, (Natural) Sulfate of Potash, (Natural) Sulfate of Potash/Magnesia.
fertilizers
isture
gredients

Lawn – fall, summer?
Annual flowers & vegetables – before planting, as needed
Containers – regularly
Trees – with lawn or maybe in the fall
Fruit – early spring before growth begins

Application Methods

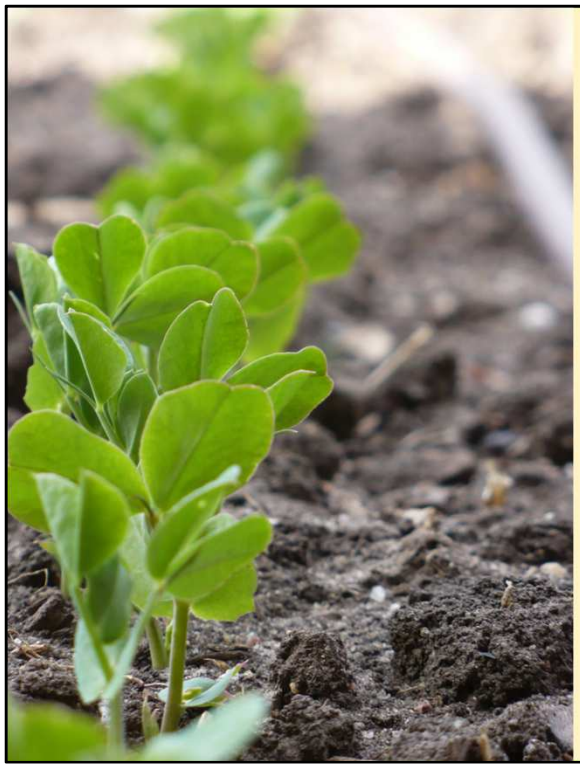
- Broadcast
- Banding/Side-Dressing/Top Dresing
- Foliar Feeding
- Starter Solutions
- Fertigation

Tips for Success with Clay Soils

- Avoid working the soil when wet
- Incorporate organic matter regularly
- NEVER add sand

Tips for Success with Clay Soils

- Double dig??
- Water slowly, deeply, and infrequently
- Loosen soil to prevent crust



Our Goal:

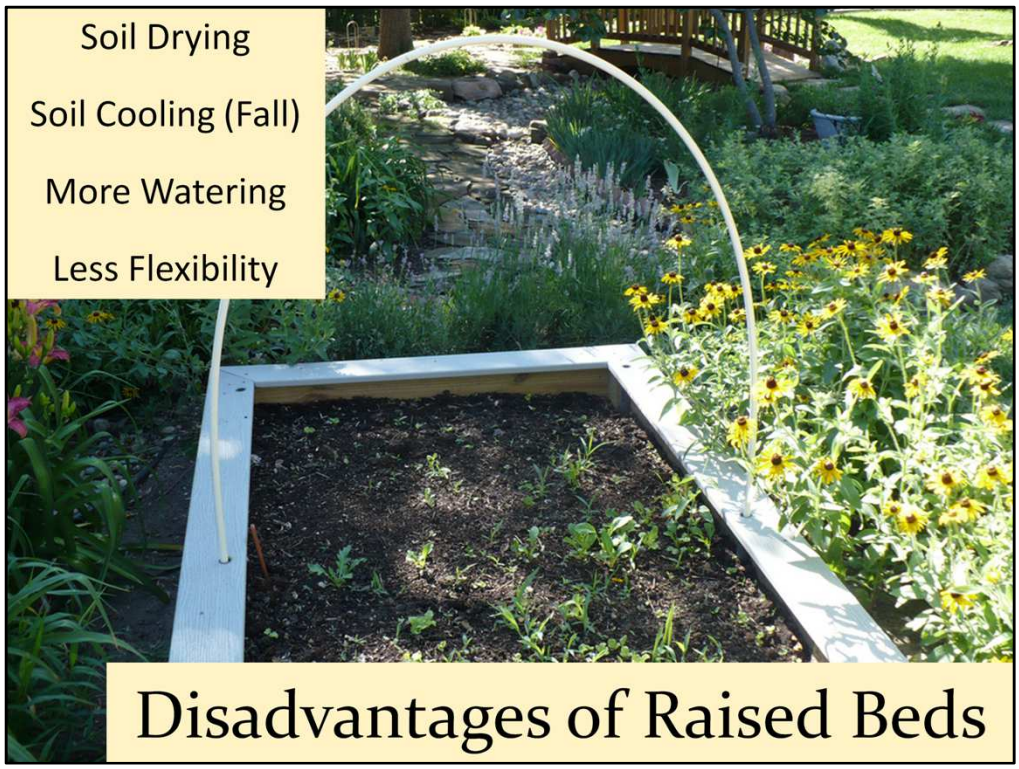
Maintain or Improve Soil Quality

Raised Bed Gardening

Drainage
Soil Improvement
Accessibility

Soil Warming
Space Saving
Season Extension

Drainage
Soil warming
Soil improvement
Space saving


Soil Drying
Soil Cooling (Fall)
More Watering
Less Flexibility
Disadvantages of Raised Beds

Garden Beds

No more than 4 or 5 feet wide
Length is variable – use common sense
Height – at least 6” high, up to 3’

Wood – treated and non-treated
Recycled plastic lumber/decking products
Railroad ties (untreated or plastic)
Stone
Concrete Block/pavers
Landscape timbers
Corrugated metal sheeting/roofing
Bamboo

Planning Your Garden

Planting Season

Cool Season Vegetables

Warm Season Vegetables

Prefer cooler, moderate temperatures

Tolerate frosts and cold weather

Can be over-wintered with protection

Grow best in spring and fall

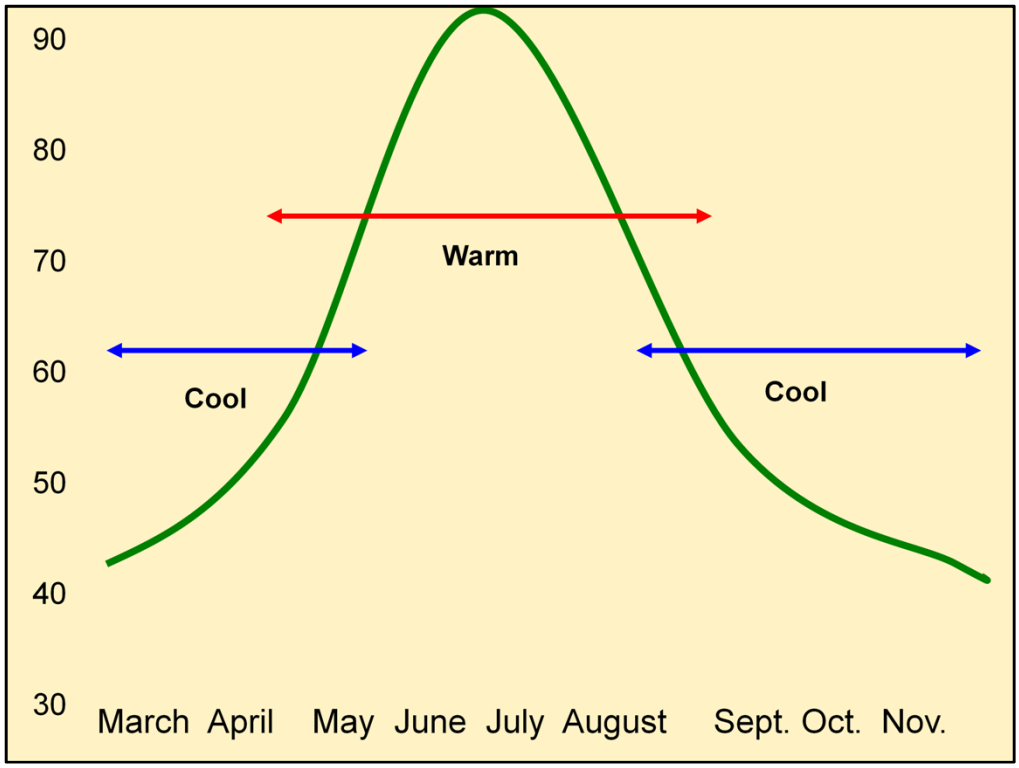
May bolt, lose quality, or die in the heat

<u>Warm Season:</u>
Need warm temperatures to grow

Will grow best during the heat of summer

Usually do not tolerate frosts or freezes

Usually cannot be over-wintered


90
80
70
60
50
40
30
Warm
Cool
Cool
March
April
May
June
July
August
Sept.
Oct.
Nov.

Cool Season

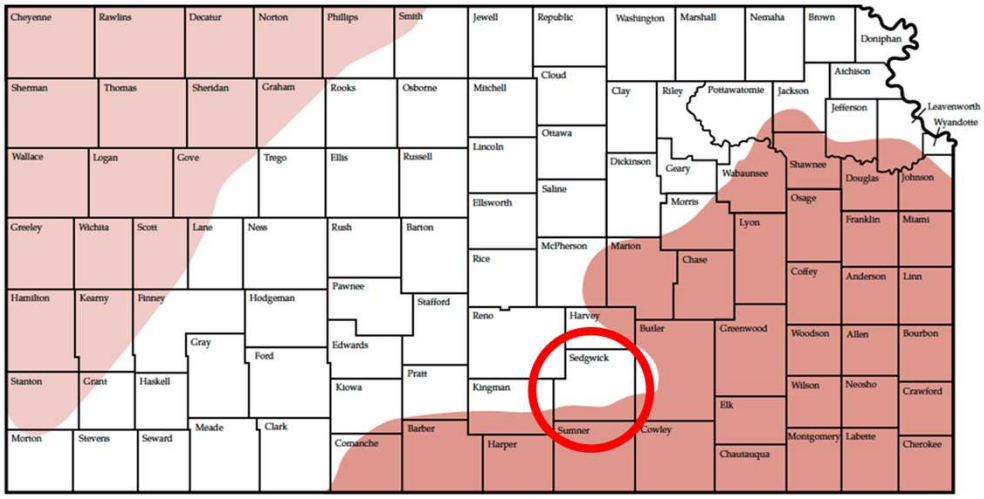
- Lettuce
- Radishes
- Spinach
- Potatoes
- Onions
- Peas
- Carrots
- Asparagus
- Rhubarb

Warm Season

- Tomatoes
- Cucumbers
- Beans
- Peppers
- Melons
- Sweet potatoes
- Pumpkins
- Squash
- Eggplant

Beware of Frost!

- A 50-50 chance of frost: April 17th
  - 50% April 17
  - 40% April 20
  - 30% April 23
  - 20% April 27
  - 10% May 2



	Zone I	Zone II	Zone III
Average Frost-Free Days	160	175	188
Average First Frost (Fall)	October 5-9	October 11-14	October 17-21
Average Last Frost (Spring)	April 29-May 1	April 17-19	April 13-15

Planting Time

- Soil Temperature is MOST important
  - Cool Season - 45º F
  - Warm Season - 55º F
  - Very Warm Season - 60º F
  - Measure at 2-3" soil depth in late morning

Short Season Vegetables

- Radishes
- Some lettuces
- Salad mixes
- Spinach

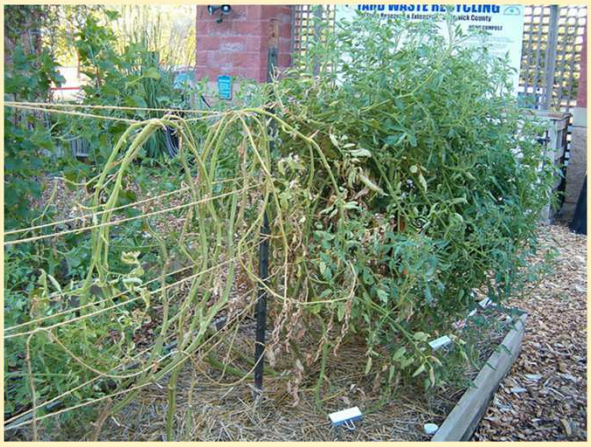
Half Season Vegetables

- Potatoes
- Onions
- Beets
- Carrots
- Peas
- Beans
- Lettuces
- Broccoli

Vegetables That Can Start Late

- Okra
- Sweet Potatoes
- Vine Crops
- Eggplant
- Peppers
- Even Tomatoes!

"When It's Time to Move On…



- Dying or Diseased
- Low Productivity
- Hot Summer Temps
- Cool Fall Temps

Making the Most of Your Space

- Small Spaces
  - Plant most productive things
  - Plant most expensive things
- Medium Spaces
  - Plant productive things
  - Plant things you love
- Large Space
  - Plant anything, but prioritize

Use Vertical Space

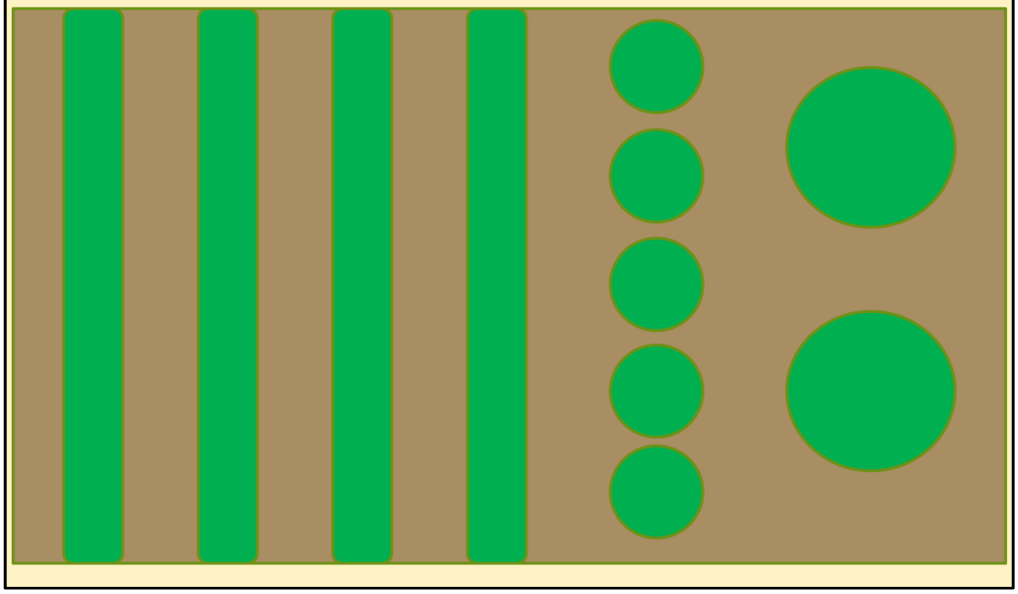
A Few Thoughts About Layout

- Group early crops together
- Think about tools and labor

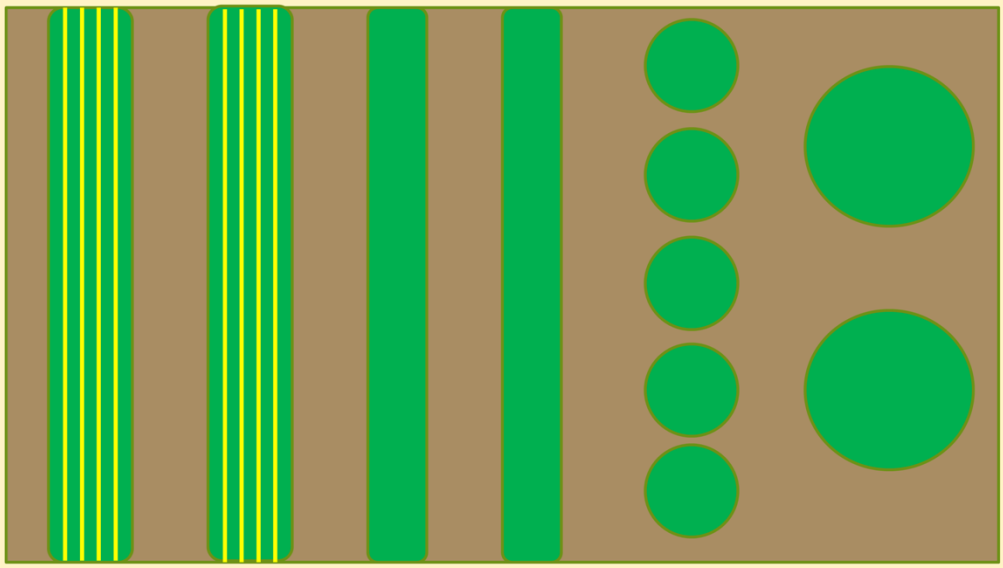
Types of Layouts

- Rows
- Wide Row – Bed System
- Raised Bed Grid

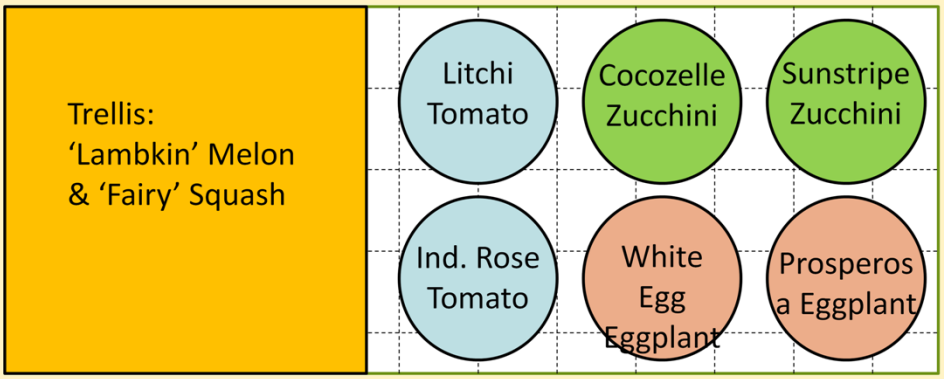
Rows



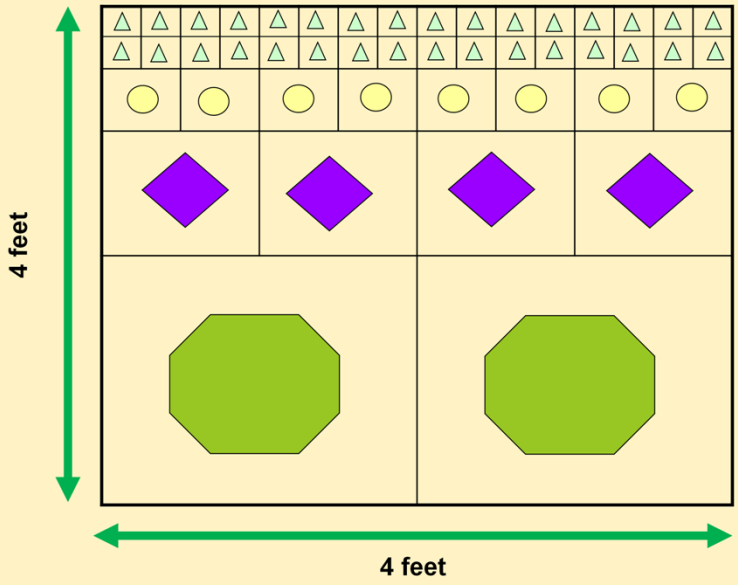
Wide Row/Bed System



Raised Bed Grid System

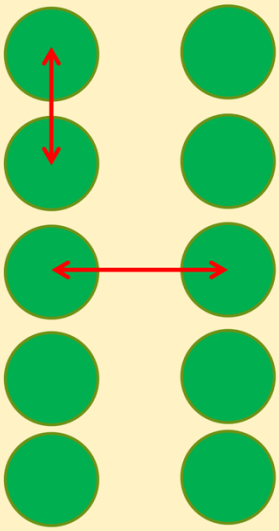


Raised Bed Grid System



How Do We Determine Spacings?

- Vegetable Garden Planting Guide
  - In Row Spacings
  - Between Row Spacings



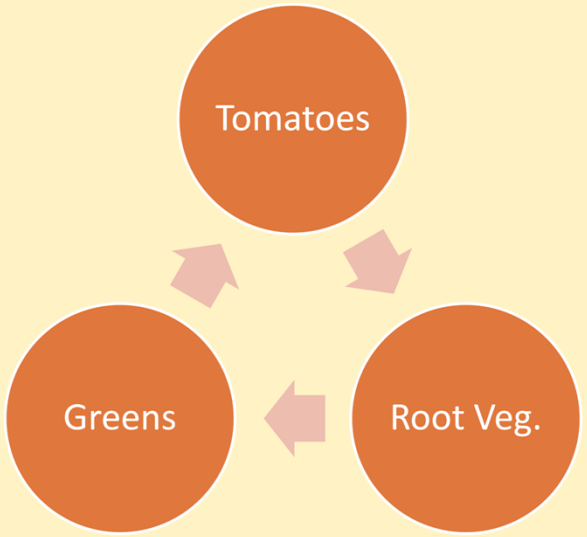
Crop Rotation

- Maintains healthy soil
- Breaks insect and disease cycles
- Plant vegetables from different "families"

Rotate by Plant Families

- Vine crops
- Tomato Family
- Leafy Greens
- Root Vegetables
- Beans & Peas
- Brassicas
- Other Misc.

Simple Crop Rotation



What if You Can't Rotate?

- Choose Disease Resistant Varieties
- Watch for Disease Problems
- Watch for Nutrient Deficiencies

Getting Growing

Direct Seeding

Typically Direct Seeded:

- Beans & Peas
- Beets, Carrots, Radishes, & Turnips
- Lettuces, Spinach, other leafy greens
- Squash, Pumpkin, Melons, other vines?

Direct Seeding

- Watch planting depth and spacings
- Clearly mark rows
- Know your seedlings!

Thinning Seeds

- When seedlings 1-2 weeks old
- Leads to healthier plants
- Not thinning can inhibit some crops

Selecting Transplants

- Dark green leaves
- Stocky plants (not tall and gangly)
- Not flowering or setting fruit

Transplanting

- Minimize plant stress!
- Use starter fertilizer
  - Water-soluble
  - After watered
- Protect the new transplants
  - Can use floating row cover

Highly recommended
Many materials: straw, leaves, grass, wood chips, compost, landscape fabric, plastic mulch

Conserves water
Cools or warms soil
Maintains more even soil moisture

Weeding

- Timing is important!
- Good tools are important!
- Herbicides?

Drip irrigation – easy, most efficient, can be problematic due to improved drainage, layout of system.
Sprinkler irrigation – easy, can get plants wet, less efficient
Handwatering – time consuming, hard to get enough water on

Need approx. 1” per week – varies with weather conditions and plant sizes

Questions?

- For More Information:
  - **http://thedemogarden.org**
  - Master Gardener Hotline
    - 660-0100
    - M-F, 9-12 and 1-4
    - Response Center
  - rmcmahon@ksu.edu