



Cornell Cooperative Extension Cornell Garden-Based Learning

10 Things You Need to Know for a Successful Vegetable Garden





Learning Objectives

We will...

- Examine methods to start vegetable seeds indoors and outdoors.
- Describe best management practices for watering, pest prevention and nutrient management for maintaining vegetable and herb crops.





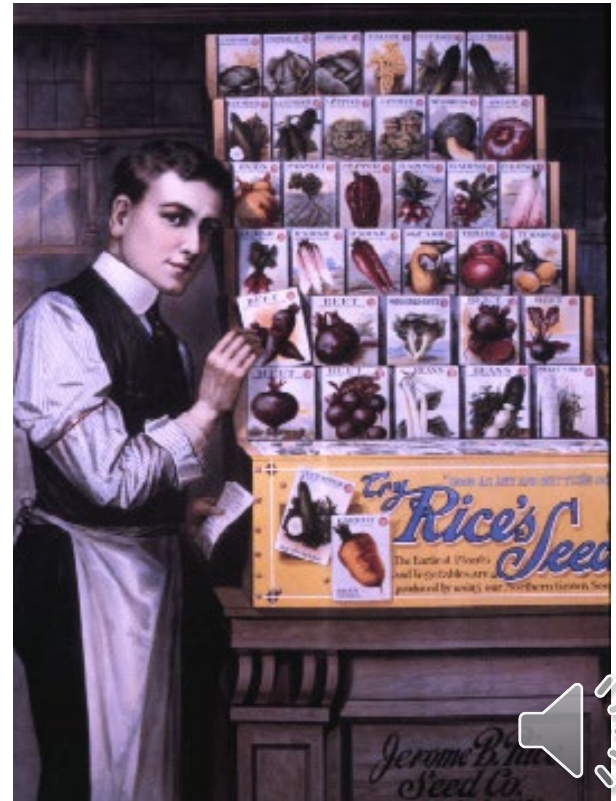
Why do gardens fail?

- Poor Planning
- Too shady
- Too big
- Too many weeds
- Too far from water
- Too closely spaced
- Too soon / Too late



The Basics

- Location
- Prepare Your Soil
- Make Watering Easy
- Everything has a Season
- Don't Waste Space
- Grow 'Up'
- Get a Plan on Paper
- Weeds are the Enemy
- Is it really a pest?
- Clean Up the Garden in Fall

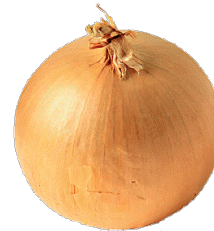


1. Location – Let there be light!

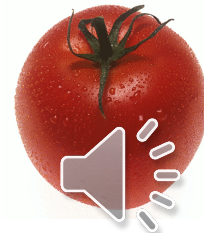
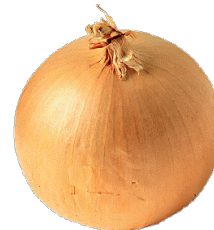
- 4 hours for leafy vegetables



- 4-6 hours for leafy and root vegetables



- 6-8 hours for leafy, root and fruiting vegetables



1. Location – Avoid Competition from Other Plants

- Root competition
- Black walnuts and walnut wilt





1. Location – Near a Water Source

- Make watering simple



2. Prepare Your Soil

- Lime (acid soil) or Sulfur (alkaline soil)
- Organic matter
- Fertilizer



2. Prepare Your Soil – Soil Testing

- Optimal pH of 6.2 - 6.8 (slightly acid)
- Nutrient levels
- Organic matter %
- Soil type



Agro-One Soil Analysis
with Cornell Nutrient Guidelines

Agro-One
230 Warner Road
Ithaca, NY 14850
Phone: (800) 344-2807
Fax: (607) 251-1300
www.dairyone.com

Cornell University
College of Agriculture
and Life Sciences
Dairy One

Lab Sample ID: 3000000
Field Location: AZALEA
Date Sampled: 09/27/2011
Date Tested: 10/03/2011
Statement ID: John Jones
Description:
County: Dutchess

No address

Element	lbs/acre*	Very Low	Below Optimum	Optimum	Above Optimum	High
Phosphorus (P)	9					
Potassium (K)	150					
Calcium (Ca)	8.33†					
Magnesium (Mg)	166					

Element	Value	Element	Value
Soil pH	7.4	Manganese (Mn), lbs/acre	74
Iron (Fe), lbs/acre	12	Zinc (Zn), lbs/acre	1 % OM
		Aluminum (Al), lbs/acre	30
			2.8

Sample Information Summary

Crop Code: ALG Soil Texture: Clayey
Type: Maintenance Soil Drainage: Poor

Soil Fertilizer Recommendations (1=current yr, 2=next yr, etc.)

Year	Crop	lbs / 100 sqft		P2O5 Range	K2O
		Lime	N Range		
1	Woody Plants (pH 4.5 to 5.9)	0.0	0.1 - 0.1	0.2	0.1

Comments - improve yield and plant quality as well as protect the environment with proper fertilization.

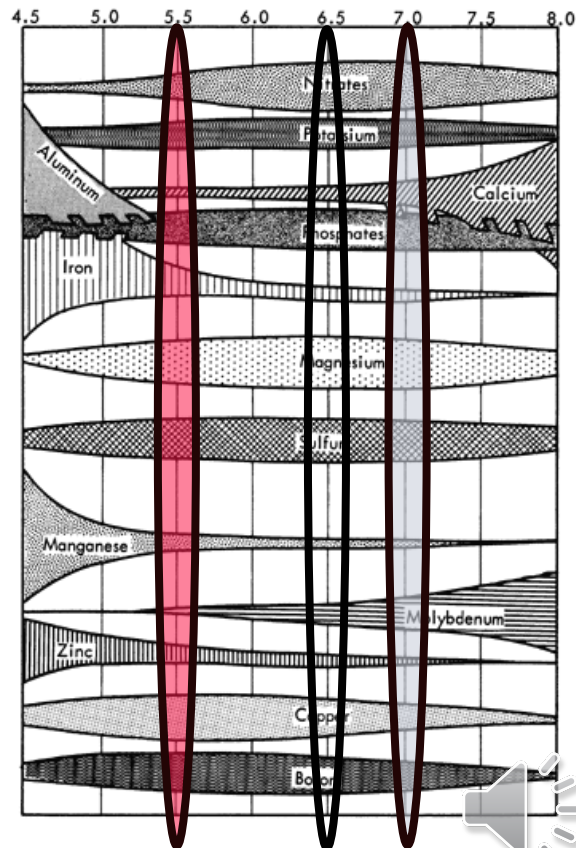
* Modified Morgan analysis results reported in pounds per acre.
For assistance interpreting your report, contact your local Cooperative Extension office at 845-677-6223 or <http://lscs.cornell.edu/Pages/Default.aspx> for a complete list of Cornell Cooperative Extension offices.
Nutrient recommendations provided by Cornell University.
These are general comments. Always consult with your crop adviser for recommendations specific to your farm.

- If an analysis result is not referred to specifically in the recommendations or comments then levels are considered normal.
- Side-dress nutrients over estimated root zone during the first or second growing season, broadcast thereafter.
- N may be reduced 20 lbs/acre (1.0 lbs/1000 sq ft) for slow growing corn and increased 10 lbs/acre (1/4 lbs/1000 sq ft) for fast growing deciduous.
- Side-dress, if possible, so as to limit to established root zones.
- The pH is high enough that lime induced chlorosis or micronutrient deficiency may be noted.

Page 1 of 1 Visit www.gardening.cornell.edu for more information. Go to www.dairyone.com/AgroOne to order more sample kits.

Soil pH

- Alkaline Soil - pH >7
 - Phosphorus, Boron, Copper, Iron, Manganese, and Zinc are less available
- Acid Soil - pH <5.5
 - Calcium, Magnesium, Molybdenum less available



2. Prepare Your Soil - Tilling



Rototiller



Broadfork/U-Bar digger



U-Bar crew



A shovel and spading fork work well, too!



2. Prepare Your Soil – Organic Matter

- 1-2 inch layer of compost, aged manure, cover crop
- Turn into soil in fall or early spring

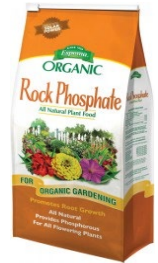


2. Prepare Your Soil – Organic Matter 2



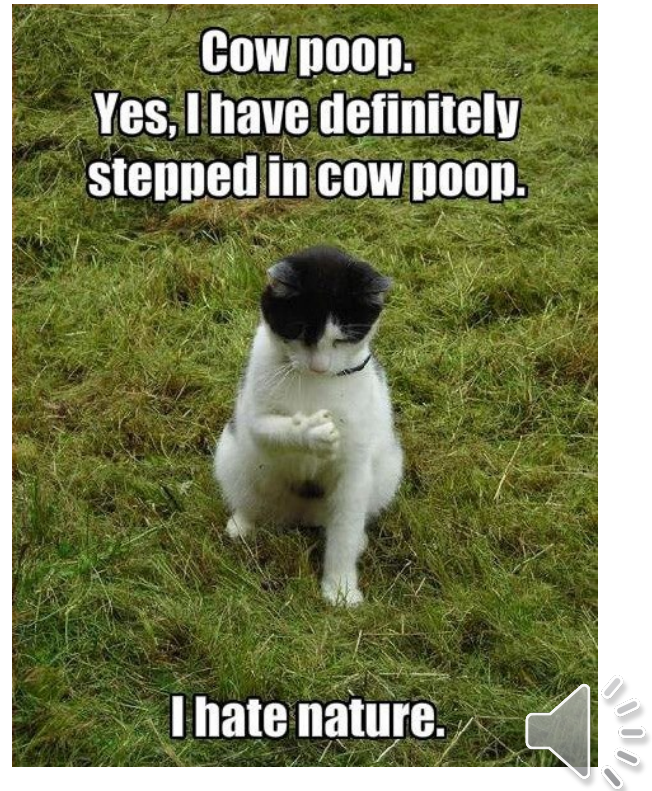
2. Prepare Your Soil – Fertilizer

- Organic Fertilizer
- Manure, compost, fish emulsion, bone meal, rock phosphate, greensand, etc.
- Synthetic Fertilizer
- Miracle Grow, Urea, Super phosphate, potash



2. Prepare Your Soil – Manure Concerns

- Bacterial contamination of manure with E. coli O157, Listeria, Salmonella
- Allow 120 days between application of fresh manure and harvest
- Use composted manure if less than 120 days
- Don't use manure "teas"
- Use mulches to prevent splashing from soil





2. Prepare Your Soil – Fertilizer 2

- When to apply?
 - Apply 1/2 to $\frac{3}{4}$ of total annual fertilizer when soil is prepared
 - Give transplants “starter” solution
 - Sidedress in season with compost or soluble fertilizer like fish emulsion or seaweed extract





3. Make Watering Easy

- 0.5"-1.5" per week, depends on season and mulch
- Avoid shallow watering except to germinate recently planted seeds
- No need to wet leaves
- For overhead watering, the best time to water is the early morning.
- For trickle watering (drip, soaker hose), water anytime.



3. Make Watering Easy 2

- 1.5" of water on square foot = 1 gallon
- Example: 100 square feet x 1.0 = 100 gallons
- Water is best applied in two to three applications per week. If using mulch, reduce amounts by 1/3.



Watering





Watering 2



3. Make Watering Easy –Measuring Irrigation

- For overhead irrigation it's easy....





Irrigation



4. Everything has a Season

- Know the temperature requirements of vegetables you want to grow!



4. Everything has a Season – Cool Season Crops

Tolerate cool, wet soils and frost
(4-6 weeks before last frost)

- Peas
- Spinach, Chard

Tolerate cooler soils and light
frost (2-4 weeks before last frost)

- All of the above and..
- Lettuce
- Cole crops (cabbage, broccoli, kale, etc.)
- “Root” crops (potatoes, carrots, beets, onions, turnips, radish)
- Parsley



4. Everything has a Season – Warm Season Crops

Plant after danger of frost and soil has warmed

- Tomato, pepper, eggplant
- Vine crops (cucumbers, squash, pumpkins, etc.)
- Snap beans
- Basil, cilantro
- Sweet potatoes
- Sweet corn*

*Sweet corn may be planted before last frost as growing point lies beneath soil surface until 4-6 leaf stage





4. Everything has a Season – Warm Season Crops 2

Crops for mid-summer planting for fall harvest
July 5 through September 1

- Broccoli
- Turnip
- Kale
- Beets
- Lettuce
- Swiss Chard
- Spinach

* Frost and cool fall temperatures actually improve the flavor of carrots, beets, parsnips, Brussels sprouts, and kale.



4. Everything has a Season - Starting Transplant Guidelines

- Don't start too early!
- 14-16 hours of light
- 40 watt fluorescent bulbs, within 2" of plants
- 70°-75° to germinate
- 65°-70° to grow
- Sterilized soil or peat lite mix
- Fertilize lightly when **first true leaves**
- **Harden-off** before planting



4. Everything has a Season - Starting Transplant Guidelines 2

<u>Crop</u>	<u>Weeks needed</u>
• Cole crops	4-6 weeks
• Eggplant	6-8 weeks
• Lettuce	3-5 weeks
• Onions	8-10 weeks
• Peppers	6-8 weeks
• Tomatoes	5-7 weeks
• Vine crops	2-3 weeks



4. Everything has a Season - Starting Transplant Guidelines (Video)

- How to avoid stretching:
 - Plant inside at the right time
 - Grow plants close to light (within 2" of overhead lighting) - don't let them stretch
 - Have a fan blow the plants for an hour per day
 - “Brush” plants once per day (10 times) so stems bend



4. Everything has a Season – Transplanting

- **Transplant Shock** – a check in growth that occurs when plants move from greenhouse conditions to field. Shock may last a couple of days to a few weeks.



4. Everything has a Season – Transplanting

Preventing Transplant Shock

- Take plants outside a few hours each day to acclimate
- While growing indoors, withhold water and allow plants to slightly wilt between watering
- Reduce temperature indoors
- Water well when planting outdoors
- If possible, plant on a cloudy day or later in the day
- Provide some shade to plants for a few days



5. Don't Waste Space – Succession Planting



Succession Planting



5. Don't Waste Space – Don't Overcrowd



DON'T OVERCROWD

Vegetable Garden Spacing

{What You Need to Know!}





5. Don't Waste Space – Don't Overplant

Vegetable	Expected Production from 10 Feet of Row	Vegetable	Expected Production from 10 Feet of Row
Asparagus	5-8 lbs	Onions (green)	12 bunches
Beans, bush	8 lbs	Onions (bulb)	30-40 bulbs
Beans, pole	16 lbs	Parsnips	10-15 pounds
Beets	12 lbs	Peas	10 lbs
Broccoli	12 lbs	Peppers	30 lbs
Brussels sprouts	10 lbs	Potatoes, white	20-30 lbs
Cabbage	15 lbs	Potatoes, sweet	15 -20 lbs
Carrots	8 lbs	Pumpkin	2-4 fruit
Cauliflower	12 lbs	Radish	10 bunches
Celery	20 plants	Rutabaga	20 lbs
Chard, Swiss	30 lbs	Spinach	5 lbs
Corn, sweet	15 ears	Squash (summer)	20-25 fruit
Cucumbers (trellis)	80 fruit	Squash (winter)	20 lbs
Eggplant	10-15 fruit	Tomato (staked)	50-70 lbs
Lettuce, leaf	20 plants	Turnip	15-20 lbs
Garlic	20 bulbs	Watermelon	6-10 melons
Muskmelon/ Cantaloupe	10 melons		

*Plant what you can use AND what you can give away.





5. Don't Waste Space – Don't Overplant 2

In 2' x 2' (4 ft²) section you could have:

- 25 - 50 tomatoes
- 16 leaf, romaine or Boston lettuces
- 5-10 cucumbers or zucchini

OR

- 1 ear of corn
- 1/3 of a pumpkin

*Don't forget bush or dwarf varieties



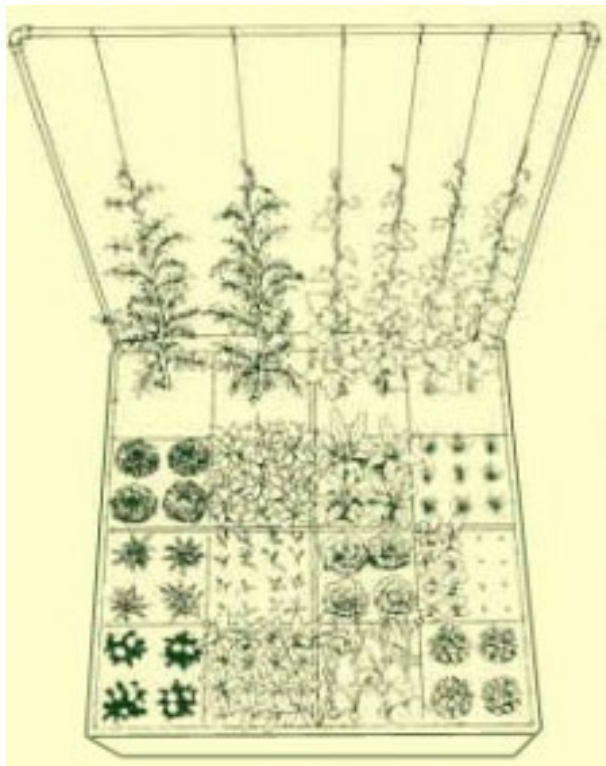
5. Don't Waste Space – Choose the Right Variety

How to choose varieties?

- Go to the Cornell Gardening website <http://vegvariety.cce.cornell.edu> and view “Vegetable Varieties for Gardeners”.
- You can even make your own recommendation!



6. Grow 'Up'





Grow 'Up'



Grow 'Up' 2





Grow 'Up' 3



7. Get a Plan on Paper - Make a Plan for the Entire Season

Spring

P E A S	O N I O N S	C A R R O T	L E T T U C E	S P I N A C H	B R O C C O L I
4/1 to 7/10	4/20 to 9/15	4/15 to 9/20	4/10 to 7/5	4/10 to 6/25	4/15 to 7/20

Fall

B R O C C O L I	C O V E R C R O P	G A R L I C	S Q U A S H	B E A N S	S P I N A C H
8/1	9/20	10/10	7/10	7/10	8/1

7. Get a Plan on Paper – Crop Rotation

Rotate your crops - don't plant similar crops in the same bed year after year. Plant from a different vegetable family.

- Crucifers - Cabbage, broccoli, cauliflower, radish, turnip
- Nightshade – Tomato, pepper, potato, eggplant
- Sunflower - Lettuce, endive, artichoke, salsify
- Umbel - Celery, carrot, parsnip, coriander, parsley
- Cucurbit - Cucumbers, melons, squash, pumpkin, gourd
- Legume – Bean, pea
- Onion - Onion, leek, chives, garlic
- Goosefoot – Beet, chard, spinach
- Mint - Sage, rosemary, thyme, basil, peppermint
- Lily - Asparagus
- Grass – Sweet corn



8. Weeds are your enemy!

Weed, weed, weed!



Common Weeds With Many Seeds



<- Lambsquarters

150,000
seeds/plant
50% viable in 12
years



<- Pigweed

120,000
seeds/plant
50% viable in 3
years

Fall Panicum ->

500,000
seeds/plant
>40 years viable



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8. Weeds are your enemy! Controlling Weeds - Mulches



9. Is it really a pest? What's wrong with my plant?



UC Statewide IPM Project
© 2009 Regents, University of California



Squash Vine Borer Larva



9. Is it really a pest? Correct Identification

Mexican Bean Beetle



Multi-colored Asian Lady
Bird Beetle



Which one is the pest of snap beans?



9. Is it really a pest? Correct Identification 2

Tomato Late Blight



Fruit Cracks – uneven watering



Which is caused by a disease?





9. Is it really a pest? Plan Ahead to Minimize Disease

Three things will help reduce disease on your plants

- Plant resistant varieties when possible
- Keep the leaves dry
- Remove sick plants (or leaves on plants) ASAP



10. Clean Up in the Fall

Pull weeds, compost, turn under.



Learning Objectives

Today we...

- Examined methods to start vegetable seeds indoors and outdoors.
- Described best management practices for watering, pest prevention and nutrient management for maintaining vegetable and herb crops.



Learn More

Contact: Cornell Garden Based Learning

<http://gardening.cals.cornell.edu/>

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