

# **Unit D: Fruit and Vegetable Crop Production**

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## **Lesson 2: Planting and Maintaining a Vegetable Garden**

# Terms

- # All-American Selection (AAS)
- # Biological controls
- # Cell packs
- # Chemical control
- # Clean seed
- # Community pack
- # Complete fertilizer
- # Cool-season vegetables
- # Cultural control
- # Disease-free seeds
- # Disease-resistant varieties
- # Drilled
- # Fall garden
- # Flood irrigation
- # Fresh seed
- # Frost-free date
- # Frost-tolerant vegetables
- # Hill dropped
- # Hot caps
- # Hybrid seed

# Terms Cont.

- # Inorganic fertilizer
- # Integrated Pest Management (IPM)
- # Irrigation
- # Jiffy strips
- # Jiffy-7s
- # Mechanical control
- # Mulching
- # Organic fertilizer
- # Organic mulches
- # Quality transplants
- # Seed tapes
- # Sprinkler irrigation
- # Synthetic or inorganic mulches
- # Tender vegetables
- # Trickle irrigation
- # Very hardy vegetables
- # Viability
- # Warm-loving vegetables
- # Warm-season vegetables

# What Determines When to Plant Various Vegetables?

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- # Determine when to plant the vegetable garden.

# When to Plant

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- # Planting time depends upon the hardiness of the vegetables and the climate in your area.
- # Some vegetables can withstand frost, while others cannot.
- # If your area has frost, the **frost-free date** for your area is the average date of the last 0°C freeze in the spring or the first freeze in the fall.

# Vegetable Classification

- # **Very hardy vegetables** withstand freezing temperatures and hard frosts without injury so they can be planted 4-6 weeks before the average frost-free date.
  - Onions, cabbage, lettuce, and potatoes are in this group.
- # **Frost-tolerant (semi-hardy) vegetables** can withstand light frost, germinate in cool soils, and can be planted 2-3 weeks before the average frost-free date.
  - Beets, carrots, radishes, and cauliflower fall into this group.

# Vegetable Classification Cont.

- # **Tender vegetables** are injured or killed by a frost, do not germinate well in cold soil, and should be planted on or after the frost-free date.
  - Snap beans, maize, summer squash, and tomatoes are included in this category.
- # **Warm-loving vegetables** are intolerant of frost and cold, require warm soil and air temperatures to germinate, and should be planted beginning 1-2 weeks after the frost-free date.
  - Examples from this category are lima beans, cucumbers, peppers, and sweet potatoes.

# Vegetable Classification Cont.

- # Very hardy and frost-tolerant vegetables are known as “**cool-season vegetables**”.
- # Tender and warm-loving vegetables are known as “**warm-season vegetables**”.
- # A **fall garden** is a garden planted in late summer with harvesting in the fall before frost.
  - Fall gardens generally require watering and extra attention to weed, disease, and insect control because of the warm days of the late summer.



# What Factors Determine the Selection of a Particular Seed Packet or Plant Pack?

- # Understand the selection of seeds/transplants for the garden.

# Seed Selection

- # **Fresh seed** is seed that was grown and packaged for the current calendar year.
- # **Clean seed** indicates that the package purchased contains only the named seed (that is, true to name), not plant debris, insects, damaged seeds, or weed seeds.
- # **Viability** refers to the ability of the seed to germinate and produce a thrifty plant.
  - # Many seed companies package seeds in special moisture-proof foil packets to help maintain the viability of their seeds during storage.

# Seed Selection Cont.

- # **Disease-free seeds** are seeds that are not carrying seed-borne diseases.
  - Check seed packets to see that the seed was treated to kill any disease organisms that might be present.
- # **Disease-resistant varieties** are varieties with natural disease resistance bred into the seed development.
  - For example, a tomato seed packet with the letters VFNT indicates resistance to **V**erticillium wilt, **F**usarium wilt, **N**ematodes, and **T**omato ring spot virus.

# Seed Selection Cont.

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- # **Hybrid seed** is seed that was produced by crossing two parental lines.
  - Hybrids exhibit characteristics of both parents and are generally stronger, healthier, more uniform, more disease resistant, and higher yielding.

# Transplants

- # Gardeners prefer to plant transplants instead of seed for tomatoes, cabbage, and peppers.
  - Transplants provide the gardener with the advantage of earlier harvest.
  - **Quality transplants** are healthy, stocky, medium-sized, disease-free, and insect-free plants.
  - Do not buy plants that are wilted, yellow, spindly, or have spots on the leaves.

# TYPICAL SEED PACKET INFORMATION

Lot No. 65321

Net Wt. 1/32 oz

**SUPER SEEDS**

**140 SUPER BOY VFNT  
F1 Hybrid Tomato**

Treated with \_\_\_\_\_

Packed for \_\_\_\_\_  
Tested \_\_\_\_\_  
Germination 88%

**Super Seeds Company, Inc.**

## Front

Weight of contents. The weight also may be given in grams. The number of seeds may be indicated.

Lot number. For identification by seller.

Trade or brand name.

Seed catalog number. Name of hybrid, resistance to verticillium and fusarium wilts, nematodes, and tobacco mosaic virus.

Description of seed treatment. Fungicide, insecticide, or hot-water treatments for protection from certain insects and diseases.

Season that seeds were packaged for sale.

Date of germination test.

Percent of seeds germinated under specific laboratory conditions.

Name and address of seller.

Packet produces about 40 plants \_\_\_\_\_

Germination procedure \_\_\_\_\_

When to plant \_\_\_\_\_

How to plant \_\_\_\_\_

Where to plant \_\_\_\_\_

Conditions of sale \_\_\_\_\_

## Back

General planting and growing instructions.

Warranty. Limits the liability of the seller to the purchase price of the seeds. The seller guarantees the seeds in this packet to be exactly as described, true to name, and free from insects and diseases.

# How Should Seeds and Plants Planted?



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- # Explain general planting procedures.

# Guidelines for Planting

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- # If the seedbed has been properly prepared, the soil when squeezed together in a handful will crumble easily when dropped.
- # Do not be tempted into the poor practice of planting too thick or too deep.
- # Refer to the seed packet for planting recommendations.
- # Check your garden plan to see the location you want the particular vegetable planted.



# Planting Seeds

- # Use small stakes with a string drawn tight to mark straight rows.
  - Drawing a garden hoe handle along the string line can make shallow furrows, suitable for small seed.
  - For deeper furrows, use a wheel hoe or the corner of the hoe blade.
  - Evenly spaced rows at recommended distances make cultivation easier, particularly if a rototiller or small tractor is used.



# Planting Seeds Cont.

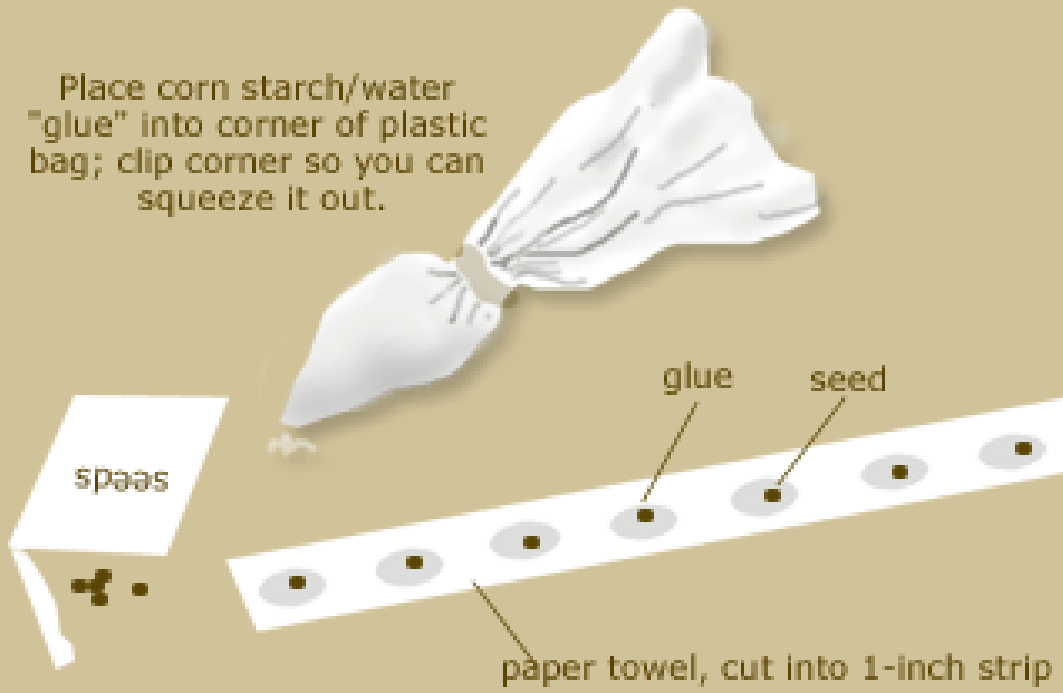
- # Place seeds at the depth and spacing recommended.
  - Home gardeners either plant by hand placement or with a one row garden planter available at local garden centers.
  - Take a few minutes to think before dropping the seeds.
  - One rule of thumb for the depth of seed placement is to plant a seed 2 to 4 times its smallest diameter.
  - **Drilled** seeds are planted one at a time while **hill dropped** seeds are planted in groups of usually 2-3 in a hill.

# Spacing and Depth Cont.

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- Small seeds are the most difficult to plant.
- Small seeds can be carefully placed by dropping from between the fingers or mixed with dry soil or sand and scattered in the row.
- **Seed tapes** are water-soluble plastic tapes with the seeds attached at the correct spacing for planting. They work well but are very expensive. You can also make your own.

Place corn starch/water "glue" into corner of plastic bag; clip corner so you can squeeze it out.



# Planting Seeds Cont.

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- # Cover the seeds and firm the soil with your hands, feet, an upright hoe, or a rake.
  - Firming prevents rapid soil drying and the washing away of the seeds and the soil when rainfall comes.
  - It also assures good seed-soil contact improving germination.

# Transplants

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- # When planting transplants refer to the variety label with the pack for planting instructions such as spacing in the row and between rows.
- # The ideal time to put transplants in the ground is a cloudy or rainy day, early in the morning, or in the evening.

# Transplant Rules

- # Beginning a transplant.
  - Water the transplants well about an hour before transplanting.
  - Plants growing in a “**community pack**”, one with no divisions, need to be cut into blocks by slicing through the soil and roots so as much soil as possible can be lifted out with each plant.
  - If transplants are grown in individual containers, carefully remove plants keeping the soil mass together.
  - **Cell packs** are plastic packs with 2, 3, 4, 6, or 8 individual compartments.
  - Plants can generally be popped out with their entire root system in tact.



# Beginning a Transplant Cont.

- **Jiffy strips** are peat pot containers connected together.
- For plants growing in Jiffy strips or peat pots, remove the container from the soil/root mass prior to planting.
- These containers tend to dry out and keep roots from growing out in the surrounding soil.
- **Jiffy- 7s** are peat moss containers held together with plastic netting.
- Most gardeners do not remove the netting when planting.

# Transplant Rules Cont.

- # Dig a hole for each transplant and position it a little deeper than it grew in the container.
  - # Fill the hole with soil and firm around the roots.
  - # Leave a slight depression around the plant to serve as a catch basin for water.
- # Water the transplant with a starter fertilizer solution such as 10-52-17 (10% nitrogen, 52% phosphate, and 17% potash) at a rate of about 2 tablespoons per gallon of water.

# Transplant Rules Cont.

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- # Early transplants may need to be protected from wind and cold by covering with hot caps.
  - **Hot caps** are plastic coverings for plants that allow sunlight in but protect plants from the cold and wind.
  - A collar of paper, foil, or plastic around the stem 2.5 centimeters above and 2.5 centimeters below the soil line might be used where problems with insects such as cutworms are anticipated.

# PLANT PACK CONTAINERS



**Community Pack**



**Cell Packs**



**jiffy®-7 peat pellets**



**jiffy®-strips**



**Flats**

...holder for plant packs

# How Can Temperature, Moisture, and Nutrient Levels be Altered?

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- # Explain how to control plant growth factors.

# Controlling Growth Factors

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- # Plant growth will be the best when temperature, moisture, and nutrient levels are as close to the ideal as possible.
- # We cannot control nature but through management practices we can alter these factors.

# Controlling Growth Factors Cont.

- # **Mulching** is covering the soil around vegetable plants with natural or synthetic materials to moderate temperature, prevent weed growth, conserve moisture, improve plant growth, and keep vegetables clean.
  - Light colored mulch such as straw may retard early season growth by keeping the soil cool but help late in the season by preventing damage from high temperatures.
  - Dark colored mulch such as black plastic may be helpful early in the season to warm soil and speed up plant growth.

# Mulching Cont.

- # **Organic mulches** are materials from plants or animals such as straw, leaves, grass clippings, ground corncobs, compost, wood chips, and animal manure.
  - When organic mulch decomposes it adds nutrients to the soil and improves soil structure.
- # **Synthetic or inorganic mulches** are man-made materials such as black plastic film, clear plastic film, paper-plastic combinations, foil, and foil-paper combinations.
  - The main disadvantage of the synthetic mulches is the need to remove them when the season ends.



# Controlling Growth Factors Cont.

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- # Water is necessary to produce good vegetable crops.
  - Water vegetables once a week during dry periods (usually when less than 2.5 centimeters of rain falls during a week).
  - Watering early enough in the day so that moisture on the plants dries before sunset helps to keep down many diseases.
  - When watering, it is best to soak the soil to a depth of 15 centimeters once a week rather than sprinkle lightly every day.
  - About 2.5 centimeters of water a week, including rainfall is desirable for most vegetables.

# Watering Cont.

- # **Irrigation** is the application of water to the soil by flood, sprinkle, or trickle means to supplement natural rainfall.
  - **Flood irrigation** is filling trenches between rows with water and is seldom used in home gardens.
  - **Sprinkler irrigation** is the application of water in a spray over the top of the plants.
    - The techniques vary from a handheld sprinkler can or a garden hose with an oscillating sprinkler to very elaborate timer controlled systems.
    - Water on the leaves from this technique can result in foliar diseases.
    - The overhead application also results in considerable evaporation.



Flood Irrigation



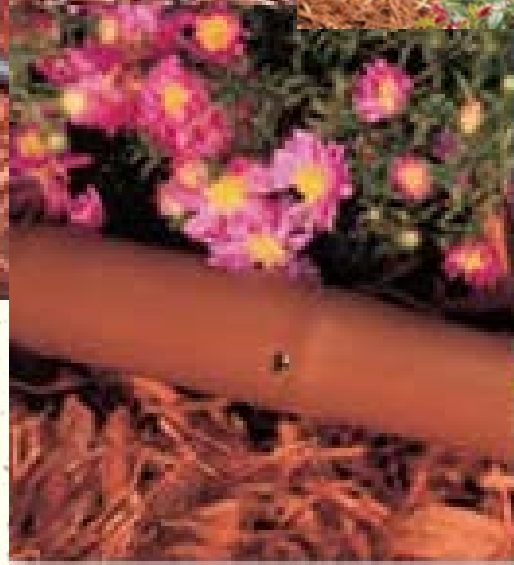
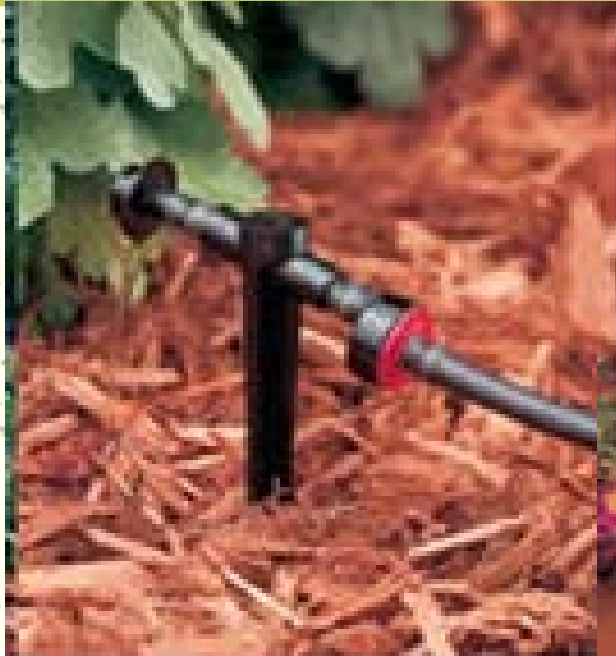
Sprinkler Irrigation

# Watering Cont.

## # Irrigation Cont.

- ***Trickle irrigation*** uses a tube or hose, usually at a low pressure directly to the row.
  - Systems range from canvas soaker hoses to plastic tubes of various construction types that pass water through their walls at a very slow rate.
  - These systems may lay on the surface or be placed below the soil surface.
  - These systems are very efficient but may also be expensive.

# Trickle Irrigation



# Controlling Growth Factors Cont.

- # Fertilizers are often necessary to provide for maximum growth of vegetables.
  - # **Organic fertilizers** are materials derived from living organisms (manure, fish meal, bonemeal, cottonseed meal, compost, etc.).
    - # They tend to be bulky, slow acting, and more expensive.
  - # **Inorganic fertilizers** are chemical compounds not produced from living organisms.
    - # Typical inorganic fertilizers include ammonium nitrate, superphosphate, and muriate of potash.

# Fertilizers Cont.

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- # Plants absorb nutrients without regard for their origin; the chemical form that is taken up by the plant is the same whether derived from organic or inorganic sources.
- # The real value of a fertilizer can be thought of in terms of the cost per pound of the nutrients it contains and the improved plant development it stimulates.

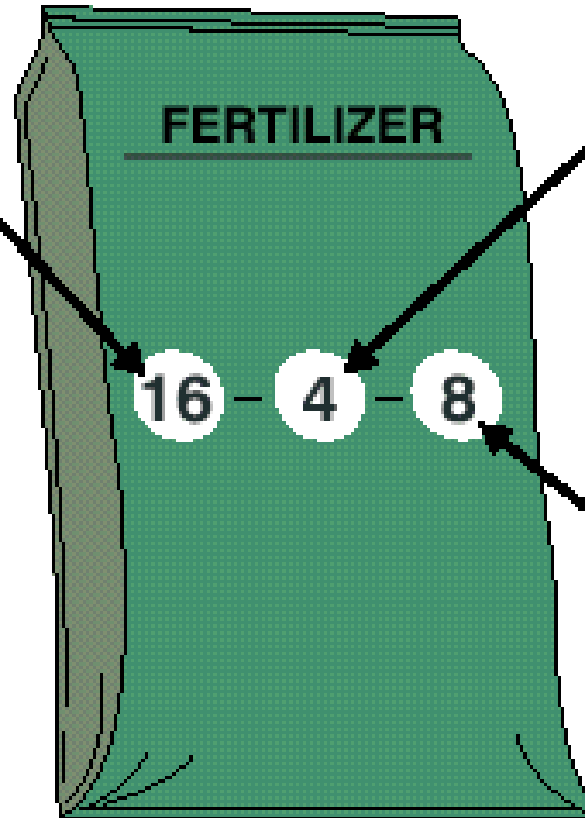
# Fertilizers Cont.

- # **Complete fertilizers** are fertilizers that provide the three major essential nutrients- nitrogen(as N), phosphorus (as P<sub>2</sub> O<sub>5</sub> ), and potassium (as K<sub>2</sub> O).
  - An example of a complete fertilizer would be 10-52-17 or 9-23-30. 18-46-0 would be an example of an in-complete fertilizer.
- # Fertilizer may be applied prior to planting (pre-plant fertilizer), at planting as a starter fertilizer, on the growing plant as a foliar spray, or between the rows of growing plants (side-dressing fertilizer).



# FERTILIZER COMPOSITION

**16% nitrogen (N)**–  
If it is a 100 pound bag, it contains 16 pounds of nitrogen.



**4% phosphoric acid (as P<sub>2</sub>O<sub>5</sub>)**– If it is a 100 pound bag, it contains 4 pounds of

**8% potash (as K<sub>2</sub>O)**–  
If it is a 100 pound bag, it contains 8 pounds of potash.

*(Courtesy, Interstate Publishers, Inc.)*

# How can Weeds, Diseases, and Insects be Prevented or Controlled?

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- # Discuss how to control weeds and plant pests.

# Weeds and Pests

- # Pests may be described as unwanted plants, animals, or microorganisms.
  - # Pests include weeds that compete for nutrients, sunlight, and moisture; insects that feed on plants; diseases of plants caused by fungi, bacteria, and viruses; nematodes, snails, slugs, rodents, and birds.
- # Preventive measures are best.
- # Careful observation or scouting of the growing plants is necessary to identify and control problems.

# IPM

- # **Integrated Pest Management (IPM)** is using a combination of cultural, mechanical, biological, and chemical methods to control pests.
- # ***Cultural controls*** are management practices including crop rotation, planting disease-resistant varieties, disposing of crop residues, and changing planting and harvesting times.
  - Trapping and hand removal would be another example of a cultural control.

# IPM Cont.

- # **Mechanical controls** include plowing, mowing, and rototilling.
- # **Biological controls** are the use of parasites, predators, or disease pathogens to regulate pest populations.
  - # Praying mantis and lady beetles are examples of biological controls used in a garden.
  - # *Bacillus thuringiensis* is a disease-causing bacteria that can be applied to the garden to kill leaf feeding larvae.
- # **Chemical control** is the use of a chemical to kill a pest.
  - # Cide means kill, so an pesticide is a chemical that kills pests.

# IPM Cont.

- # Weed control in a home garden is generally a combination of hand hoeing, pulling weeds by hand, rototilling, and mulching.
  - Herbicides are sometimes used for large gardens.
- # Insects and disease tend to pose problems in the garden in mid to late summer.

# IPM Cont.

- # Mice, rabbits, and squirrels can cause damage to plants.
  - # Fencing around the garden and the use of repellents (mothballs or moth flakes) work well.
  - # Trapping is another alternative.
- # Birds can become pests in the garden.
  - # The homemade scarecrow is generally ineffective but stakes and flags work well.
  - # Place stakes and strips of cloth or aluminum pie plates every 4.5 to 6.0 meters in all parts of the garden.

# When and How Should Vegetables be Harvested?

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- # Determine when and how to harvest vegetables.



# Harvest

- # If vegetables are harvested at the wrong time, their quality will be poor or unacceptable, and all your hard work will have been wasted.
- # In many cases, the gardener needs to know when to harvest, since merely looking at produce won't necessarily indicate if it is ready.
- # Proper vegetable harvest times will assure the best flavor, maximum tenderness, and crisp texture.
- # The quality of vegetables does not improve after picking, so it is important to harvest at the proper maturity for the best quality.

# Maturity

- # Many variables influence vegetable maturity.
- # Water stress, improper soil fertility, damage by insects and diseases, and planting out of season can cause vegetables to mature unpredictably.
- # However, the “days to maturity” listings on seed packets, in gardening books, and in seed catalogs are helpful indicators for calculating approximate dates for harvesting.
- # Record all planting dates to aid in predicting dates of harvest.

# Harvest Cont.

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- # If available, check garden books for information about harvesting specific vegetables.
  - Recommendations such as harvest color, leave stems on or pull off, pick firm or soft, and so on are answered for each vegetable.

# Review/Summary

- # What determines when to plant various vegetables?
- # What factors determine the selection of a particular seed packet or plant pack?
- # How should seeds and plants be planted?
- # How can temperature, moisture, and nutrient levels be altered?
- # How can weeds, diseases, and insects be prevented or controlled?
- # When and how should vegetables be harvested?