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## Horticulture Fact Sheets

Jerry L. Goodspeed  
*Utah State University Extension*

Larry A. Sagers  
*Utah State University Extension*

Duane Hatch  
*Utah State University Extension*

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# PREPARING GARDEN SOIL

HORTICULTURE FACT SHEET—FS - H1

By Duane Hatch, USU Extension Horticulturist



A good garden soil is deep, loose, fertile, well-drained, near neutral, and has a lot of decayed organic matter. The ideal is seldom available, so the good gardener may have to improve what is at hand! Vegetables and other plants will grow satisfactorily with a wide range of soil types from sand to clay if certain steps are followed for overcoming their basic short-comings.

Utah garden soils are almost all alkaline to some degree. On a scale with pH 7 being neutral, many vegetables will grow quite well from 6.0 to 8.4. Samples submitted to the USU Soil Testing Lab will determine the pH, salts concentration and level of nutrients. You will be sent a fertilizing guide. The cost is \$12 and sampling information is available from the USU Extension office in your county.

## HAULING SOIL

In most instances you are better off to work with the soils that you have. You know what their problems are. Hauled in soil may not be any better than that in your yard. It could be a source of noxious weeds that you don't have. If you need to cover a rock or coarse gravel bed or raise the level of a yard area, "fill" may be needed. It may or may not improve an area in which you wish to grow plants.

## TIMING

Many gardeners are impatient and damage the soil structure by rushing the season. Soils that gardeners call "gumbo" or "adobe" are usually a loam type that one tries to prepare too early.

*Test this way: take a handful of soil from a 3 inch depth. Squeeze it firmly in the hand. Drop it on a side-walk.*

*Unless the ball shatters, do not try to rototill.* You'll get hard clods and preparing a good seedbed will be difficult. As you use soil improving techniques discussed later, you can hasten the gardening time.

## MIXING

When the soil has dried sufficiently, spade or rototill to a depth of about 6-8 inches. Garden soil doesn't need to be "flour-fine." Leave marble-sized particles and crusting will not be as severe as with over prepared soil. You'll need to use a rake to pulverize clods. Level and compact the soil for a firm seedbed. The final soil surface should be as level as possible for uniform water penetration.

## SOIL IMPROVEMENT

Clay soils have the ability to hold moisture well (often too well) and usually contain more nutrients than light soils. They dry slowly in the spring so early planting of crops is not possible. Water penetration is slow so irrigation water often runs off instead of entering the root zone.

Sandy soils are easy to work but have low water holding capacities, so plants may suffer from moisture stress in hot weather. Nutrients may be lost as irrigation water moves downward through the soil.

These almost opposite drawbacks of both soil types can be corrected by the same technique—adding organic matter. Fine clay particles can be physically separated by coarse organic material. Nutrient and water holding qualities of sandy soils can be increased. As the organic matter breaks down, its components continue to have soil improving characteristics.

Begin by incorporating 2 to 3 inches of organic matter 6 to 8 inches deep. This application will not last forever and you should plan to add about 2 more inches each year. With heavy soils, you'll need two or three years to see much of an improvement. Summer mulching or compost addition will be helpful.

## SOURCES OF ORGANIC MATTER

You will need a lot to do the job so look for abundant, inexpensive materials. Leaves from deciduous trees may be gathered in the fall for composting and/or soil incorporation. **Needles** from conifer trees may also be used. **Bark, sawdust, shavings, and other wood products** are less likely to contain weed seeds than are manures. **Peatmoss** is an excellent material, high in organic matter and somewhat acidic. Cost is a major factor for the quantities needed. **Manure** may be available and is an excellent source of organic matter. If well handled, it may contain substantial nutrients when used in sufficient quantities. It may also be a source of viable weed seeds that survived the trip through the animal's digestive tract. **Straw**, depending on the kind, may also create weed problems. **Grass clippings, green manure crops and kitchen vegetable trimmings** may be used. These tissues are mostly water, their cells are not mature and don't contain the lignin and waxes which produce long term soil improvement. **Grass clippings** are an excellent material to mulch the garden soil surface to reduce weed problems and to conserve moisture. Don't apply a lot at once. A one-half inch layer will dry out quickly and not get slimy.

## ADDING NITROGEN

Large quantities of mature, woody type products such as sawdust, bark, leaves, straw, etc., will promote nitrogen deficiency in plants because of their high carbon content. Overcome this problem by adding a nitrogen fertilizer when incorporating them into the soil. Ammonium sulfate (21% nitrogen) is readily available and quite inexpensive. Use 1 pound (1 pint) per 100 square feet for each 1 inch of woody mulch mixed with the soil. You may substitute  $\frac{2}{3}$  pound of ammonium nitrate (34%) or  $\frac{1}{2}$  pound of urea (45%) for the one pound of ammonium sulfate.

Manures vary in their quality. If mixed with large amounts of bedding materials, there may not be enough nitrogen to decompose it and feed the crop. Use one-half the nitrogen rate suggested above. Use this one-half rate when a green

manure crop is turned under also. If the manure is quite fresh and/or well protected from leaching by rains and other weather elements it may not need added nitrogen. For more details, refer to the "Mulches and Compost" fact sheet.

## TOUGH CLAY SOILS

Although it may be expensive and difficult to apply, a two inch layer of sand, **in addition** to the organic matter, will help your ability to garden in soils with a high clay content. If sand is used without the organic matter, low grade concrete may be formed with the fine clay particles acting as cement!

## SOIL AMENDMENTS

Soil preparation information from more humid areas may suggest time to neutralize acid soils. **Lime is not needed** in Utah soils because nearly all have an alkaline reaction.

**Dolomite** is another form of lime. **Gypsum** is neutral in its reaction and will not acidify alkaline soils. It may be promoted as an "alkali fighter." That reference is to the high sodium soils or "black alkali" areas where crops grow poorly, if at all. It is not needed on the general range of garden soils in Utah. Don't expect gypsum to alter the soil structure and improve its workability. Use organic matter to do that.

## CHANGING A LAWN TO A GARDEN

It is best not to mix the sod into the soil. A thatch layer can make it difficult to establish a good seed bed. In addition, grass clumps may sprout and be a serious weed problem.

Sod strippers can be rented that will make grass removal easier and minimize soil losses. A sharpened shovel will cut the sod, but is a great deal of work if the area is large. Skim the sod just below the crown and don't remove an excessive amount of soil.

By saving the stripped sod, you have a good source of compost to add to the garden later. Stack the sod, soil side up with a sprinkling of ammonium sulfate between layers. Cover the whole pile with black plastic to kill the sod and promote decomposition.

Once the lawn has been removed, follow the soil preparation steps listed earlier.





# GROW MORE FOOD IN A SMALL AREA

## HORTICULTURE FACT SHEET—FS - H3

By Duane Hatch, USU Extension Horticulturist



We all need to use resources wisely. Some are in short supply and almost all are expensive. Has the lack of a large garden area been your excuse for not supplying fresh nutritious vegetables and fruits to your family? By adopting the techniques suggested here, studying a little more about principles we don't have room to explain fully—then getting at it, you'll be surprised at the potential your yard has for food production.

### GARDEN LOCATION

Don't be locked into the traditional "garden behind the house and fence" syndrome. You may not want a whole front lawn replaced by a corn or potato patch, but a few folks have done it! Food crops may be planted in parking strips, corners of lots, along fences, surrounding patios and in other spots your active mind can imagine. As little as 100 square feet (10' x 10' or 20' x 5') can be used to grow a lot of good eating.

Many food plants are attractive enough to plant as ornamentals alone or combined with flowers and other border plants. Choose from rhubarb, chard, leaf lettuce in a range of colors, small tomato plants, eggplant, herbs such as opal, basil, parsley, or sage, strawberries and other plants with attractive foliage such as carrots, flowering kale, etc.

The watering and fertilizing schedule of a lawn isn't conducive to best performance of fruit trees. Why not put them by the walls or fences at the edge of the lot? With size and shape manipulation (espalier) they'll remain small for easy pruning spraying and picking. Apples and pears require the most intensive spray program for pest control, with other suited fruit kinds not as critical.

### SOIL MODIFICATION

Most soils will benefit from the mixing of 2 to 3 inches of organic matter to a 6 inch depth. This will help loosen heavy

clay soils and add nutrient and water holding capacity to sandy soils. Use abundant, inexpensive materials such as leaves, sawdust, wood shavings, old hay or straw. Some of these products may contain weed seeds. To avoid nitrogen deficiency and pale plants, add 1 pound (1 pt.) of ammonium sulfate for each 1 inch of material per 100 square feet. If enough composted material or manure is available, reduce the ammonium sulfate rate by half. Peat moss, perlite or vermiculite can provide the loosening effect but will be more expensive. To maintain this improved tilth and structure, add organic material each year.

### FERTILIZE ADEQUATELY

Well grown plants will yield more and will be less subject to disease and insect attack. It's important to provide nutrients so plants get a good start early in the season. Choose one of these methods: 1) Broadcast—scatter about 1 1/2 lbs. of a fertilizer such as 16-16-8, per 100 sq. ft. and mix with 2 - 3 inches of soil before planting. 2) Band—a more efficient use of fertilizer but takes more time. With a hoe, make a furrow 3 inches deep. Put 1/3 - 1/2 cup of 16-16-8, 16-20-0 or similar fertilizer along each 10 ft. of row. Seed or transplants should be placed about 2 inches away from the fertilizer band at their proper planting depth.

Most plants will need additional nitrogen during the season. This is especially true if leaves, sawdust or other not-composted organic materials have been used for soil improvement. Plants show nitrogen deficiency quite readily by turning a yellow or pale green color. Look for this about 4-5 weeks after planting. Green them up quickly by supplying a soluble nitrogen fertilizer such as ammonium sulfate (21-0-0) 1/2 cup, or ammonium nitrate (34-0-0) at 1/3 cup per 10 feet of row. Scatter the product over the soil surface just before an irrigation and the water will take it to the root zone. Tomatoes may produce excessive foliage and few ripe fruits if they receive too much nitrogen. Use little if any fertilizer after planting.

## USE SPACE WISELY

A single file row isn't the way to get high yields. Precision planting to give each plant its space to develop will permit wide row or bed planting. Lay out the garden to provide a 16-18 inch walkway for your feet. Arrange the plants in 3 1/2-5 feet wide areas where there is no traffic to compact the soil and inhibit root growth.

### SUGGESTED VEGETABLE SPACING IN INCHES

Beans (Bush)	6 x 6	Lettuce-Leaf	6 x 6
Beans (Pole)	4 x 36	Lettuce-Head	12 x 12
Beets	4 x 4	Onions	3 x 3
Broccoli	18 x 18	Parsnips	4 x 4
Cabbage	18 x 18	Peas	2 x 2
Cantaloupe	36 x 48	Peppers	12 x 12
Carrots	2 x 2	Potatoes	9 x 9
Cauliflower	18 x 18	Radish	1 x 1
Chard	6 x 6	Spinach	4 x 4
Corn (Sweet)	9 x 24	Squash (Summer)	48 x 48
Cucumbers	12 x 48	Squash (Winter)	60 x 60
Egg Plant	18 x 18	Tomatoes	24 x 24
Kohlrabi	4 x 4	Watermelon	60 x 60

Retaining walls to raise the soil level can help make neat gardens. If the soil is well drained and easily worked, raised beds aren't necessary so you may save work and expense.

Train sprawly plants up fences. Use netting for cucumbers, beans and tall peas to climb. Stake tomatoes upright or use a wire cage. Plant only the crops your family will use. Concentrate on those that you prefer really fresh over supermarket kinds or that you will process for later use. Examples of those that produce well for the space they occupy are snap beans, cucumber, chard, broccoli, zucchini, tomatoes, carrots, lettuce, beets, onions. Some that do not yield very much for the space taken are corn, cauliflower, peas, potatoes, celery and radishes.

Grow radishes or leaf lettuce while widely spaced plants such as squash or tomatoes are developing. Some low growing plants such as parsley or chives will survive among taller plants. Plant pole beans when corn is about 12-15 inches high and they will have ready-made supports. Seed catalogs list some varieties that have a smaller growth habit.

## SEASON-LONG CROPPING

Several vegetables including onions, spinach, peas, cabbage, radishes, turnips, kohlrabi and broccoli may be planted

very early in the spring. Properly prepared soil with drainage and good tilth make this an easier task. Some of these early planted, short season crops will be harvested in time for a planting of beans, lettuce or cauliflower to mature. In fact many of these early, cool season crops may be planted as late as July 10-15 and extend the garden season until well after the last frost.

It's best not to try to rush the planting time of peppers, tomatoes, cucumbers, squash and other warm season vegetables. They perform much better if planting is delayed until the soil has warmed, about two weeks after the last frost.

Several techniques will allow extending the growing season earlier and later and may hasten vegetable maturity. A clear plastic plant covering supported by wires or frames can give some freeze protection and provide faster growth. Hot caps may protect newly set plants when they are small. The wall o' water is a relatively new, improved cover for individual plants. This plastic cylinder of water-filled tubes provides an amazing degree of cold protection.

Black or clear plastic that covers the soil 2 1/2-3 feet wide through which plants grow can hasten maturity of warm season crops like melons or tomatoes. The clear plastic provides more soil warming than does black. Black plastic allows no weed growth. In most Utah gardens, the weeds will germinate under the clear plastic, but the heat during a summer day will burn off most of them.

## GENERAL GUIDELINES

The foundation of a successful garden is the proper choice of suited varieties. Select from those tested and recommended by Utah State University. A healthy, vigorous garden will be less subject to insect and disease attack. Visit the garden frequently to discover problems before they become epidemic. Control the pests after identifying them and choosing proper methods.

Don't let weeds win. Beds of closely spaced plants that quickly shade the soil reduce weed germination. Organic mulches such as lawn clippings or leaves drastically reduce need for hoeing. They cool the soil so wait until later to mulch warm season crops like tomatoes, peppers and melons. Plastic mulches, discussed above, also provide weed control. *Shallow*, regular cultivation destroys small weeds before they compete with crops for moisture, nutrients and light. Consider a drip system as an efficient water and labor saving method. It costs a little extra to install, but it is easily done and makes gardening a lot more fun. Other methods may be used, but remember that quality, fast growing vegetables are about 90-95% water and you need to apply it properly.



# FERTILIZING LAWNS

## HORTICULTURE FACT SHEET—FS - H4

By *Larry A. Sagers*, USU Extension Horticulturist



### FERTILIZERS

All fertilizers have their contents printed on the bag or label. A bag of fertilizer marked 10-8-6 contains 10% nitrogen, 8% phosphate ( $P_2O_5$ ) and 6% potash ( $K_2O$ ).

The rate of solubility and availability of the nutrients varies with individual brands and analyses. Inorganic fertilizers are usually more rapidly available and higher in analysis than organic forms. Some fertilizers are combinations of organic and inorganic forms.

The order of importance of the three fertilizer nutrients for lawns is nitrogen, potassium, and phosphorus.

Nitrogen is the most important element in developing a dense, attractive turf. Unless fertilized regularly, most lawns are deficient in nitrogen. This causes slow growth, narrow leaves, and a light yellow-green color. There is no direct test for soil nitrogen. Recommendations are based on experimental results. These may be modified according to the amount of watering and whether or not clippings are removed. Soils vary in the amount of available phosphorus and potassium. This information is given in a soil test report. Deficiencies are not as obvious as that of nitrogen, but may cause stunted growth and winter damage.

Soil test summaries in the Salt Lake City area have shown that 90 percent of lawn samples are high or very high in phosphorus. Potassium is also usually adequate for lawn grasses. Nitrogen is often the only fertilizer element needed unless a soil test specifically shows a deficiency of phosphorus or potassium. Sandy soils or subsoils from which topsoil has been excavated should be tested to determine needed elements. This is especially important as soil is being prepared for planting.

### TYPES OF NITROGEN

The fertilizer label indicates, besides the amount of nitrogen, whether it is water soluble or water insoluble. The water soluble form is more rapidly available to the plant. Water insoluble nitrogen is more slowly available. The latter form is more expensive but may be more convenient as a single application will supply the needs of the plant for a longer period of time.

### FERTILIZER RATES

For a well kept lawn in Utah, apply 1 pound of available nitrogen per 1,000 square feet each 4 to 6 weeks throughout the growing season. The following chart indicates how much of various fertilizers will supply 1 pound of nitrogen.

<u>% N on Label</u>	<u>Pounds of Fertilizer Per 1000 Square Feet</u>
12-15	7-8
18-21	5-5½
24-28	3½-4
30-34	3-3½
45-46	2-2¼

### FERTILIZER APPLICATION

Read and follow the instructions on the lawn fertilizer bag. Many commercial lawn fertilizers will state the proper spreader setting for various rates of application. If spreader settings are not on the bag you'll need to calibrate the spreader. Fertilizers in general weigh about a pound per pint.

Apply fertilizer only when the grass blades are dry, unless instructions on the bag state otherwise.

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Travel in two directions—at right angles to each other—when applying fertilizer. This is particularly true with drop-type spreaders. The cyclone or rotary type spreader applies the fertilizer more rapidly and uniformly with less streaking.

## **IRON**

Iron deficiency (chlorosis) shows as a distinctive yellowing on grass blades in mid to late summer. Iron is actually abundant in Utah soils but their alkaline nature prevents its absorption by plants. Iron chlorosis is rather quickly and easily corrected. Iron may be applied alone or in combination with other fertilizers. A simple method to apply iron is to dissolve two tablespoons of iron sulfate in one quart of hot water. Dilute this with 2 1/2 gallons of cold water and apply uniformly to 1,000 square feet of lawn with hand sprayer. Do not water for at least 24 hours after applying iron liquid spray. Permanent rust stains will appear if you spray concrete walks or driveways.

## **GENERAL GUIDELINES**

It is important to fertilize on a regular basis every 4 to 6 weeks to maintain an attractive lawn. Begin when lawns start to green in the spring, mid to late April. Earlier applications may cause a lawn to become greener faster, but may also increase spring disease problems. Summer applications of nitrogen fertilizers will not burn lawns if you apply them to dry grass and water immediately. Fall applications are important for good winter cold tolerance, extended fall color, and fast spring green-up. A complete fertilizer containing nitrogen, phosphorus and potassium should be applied in the

fall every 3 to 4 years. This will prepare the lawn for winter conditions and allow the phosphorus to penetrate into the root zone by the next growing season.

## **LAWNS ON SANDY SOILS**

Lawns on very sandy soils may need more frequent fertilizer applications (every 4 weeks) at smaller rates per application. The total amount of fertilizer applied will be the same. Consider the use of slow release nitrogen fertilizers, such as sulfur coated urea or urea formaldehyde, to increase time between applications.

## **CLIPPING REMOVAL**

Grass clippings are a valuable source of nutrients. Research has shown that when clippings were removed, one-third more nitrogen fertilizer was necessary to maintain the same color and density as in areas where clippings were returned. Contrary to popular belief, grass clippings do not contribute to thatch accumulation if the turf is maintained at its recommended cutting height and not more than one-third of the leaf surface is removed at one mowing. If clippings leave a residue on the lawn you should mow more frequently.

## **FERTILIZER AND PESTICIDE COMBINATIONS**

Fertilizer and pesticide combinations are readily available. Herbicides, insecticides and fungicides are blended with fertilizers for easy applications and convenience. Use them wisely and precisely follow manufacturers directions for maximum benefit.

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# SOIL TESTING GUIDE FOR HOME GARDENS

## HORTICULTURE FACT SHEET—FS - H5

By *Duane Hatch*, USU Extension Horticulturist



All soils naturally contain some plant nutrients derived from decomposition of soil minerals and organic matter. Phosphorus P and potassium K added in fertilizers, manures and crop residues generally remain in the soil until used by crops.

Many soils along the Wasatch Front are naturally high in phosphorus and potassium. With the regular use of composts or manures, many gardens will have adequate P and K levels. Overfertilizing can lead to salt and micronutrient problems.

Garden sites on poor soils or subsoils frequently benefit from phosphorus and potassium fertilizers. Where nutrients are low, plant growth may be limited unless fertilizer is applied to establish a basic fertility level.

A soil test is the best method to indicate whether P or K fertilizer is needed. It is recommended that home gardeners have their soil tested every 5 years.

### WHAT A SOIL TEST WILL TELL YOU

At the U.S.U. Soil Testing Laboratory, samples are tested for P and K levels, pH, salt, and lime content. Technicians estimate soil texture.

Results of your test will tell you if you need to apply phosphorus and/or potassium fertilizer. Salinity and pH values indicate whether you have problems with accumulated salt or sodium. A general fertilizer program will be outlined for you, including nitrogen needs for various crops under average conditions.

### WHAT A SOIL TEST WILL NOT TELL YOU

The standard soil test does not check the nitrogen level as it is continually changing and plants usually require a yearly application. A standard soil test will not indicate levels of micronutrients although tests for these are available at addi-

tional cost. Most Utah garden soils supply adequate micronutrients for normal crops although certain crop varieties can become deficient in iron. Select varieties suited for low-iron soils and be alert for deficiency symptoms.

Nutrient supply is only one of many factors affecting plant growth. A soil test will give no information about other problems limiting your garden's performance. It will not indicate if your irrigation is adequate, if you over water or under water, if you have poor drainage, poor soil structure, weed competition, too much shade, poor varieties or just neglect. Soil tests do not detect toxic chemicals, herbicide residues in the soil, insect populations or disease problems.

### HOW TO TAKE A SOIL SAMPLE

The results of your soil test are no better than the sample you send to the lab. The sample must be representative of the yard or garden being considered. **GARDENERS WHO TRY TO SHORTCUT THE SAMPLING PROCEDURE WILL NOT RECEIVE A RELIABLE DIAGNOSIS.** Your sample sent to the lab should represent a composite of several sampling sites, with a sampling depth of 0 to 12 inches. If you shortcut your sampling, you have wasted your money and lab time!

### STEPS TO TAKE FOR A SOIL SAMPLE

1. With a shovel, make a deep hole in the soil. **SAMPLING DEPTH SHOULD BE 0-12 INCHES.** Do not just sample the surface.
2. Throw this shovel full of soil aside.
3. Cut a 1/2 to 1 inch slice of soil from the side of the hole. Be sure the slice is fairly even in width and thickness.
4. Place the slice in a bucket.

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5. Repeat steps 1 through 4 at about 6 different locations. This step is important to obtain a representative sample.
  6. Thoroughly mix the 6 sub-samples.
  7. Send about 1 pint of the thoroughly mixed garden soil for the test. Obtaining the soil sample will be easier if you have a soil probe or bulb planter.
  8. Supply the information on the test form for better interpretation of results.

#### **WHERE TO SEND YOUR SOIL TO BE TESTED**

Soil samples are sent to the:

**SOIL TESTING LABORATORY  
UTAH STATE UNIVERSITY  
LOGAN, UT 84322**

Soil shipping bags, boxes and test forms are available through any U.S.U Extension Office. FEE FOR THE STANDARD TEST IS \$10.00 PER SAMPLE, and should be sent with the soil and test forms.

Test results and fertilizer recommendations are mailed directly to your residence. It takes about 10-14 days on the average to receive results. If you have questions after receiving your report, call the U.S.U. Extension Office.

**HOME SOIL TEST KITS ARE OF LITTLE TO NO VALUE.** They are designed for eastern soils and give very poor accuracy on our western soil types.



# ONIONS IN THE GARDEN

## HORTICULTURE FACT SHEET—FS - H7

By *Duane Hatch*, USU Extension Horticulturist



Onions are one of the most widely grown vegetables. They can be a major flavor additive, used raw, or cooked in a variety of recipes. Chopped onions contain only 65 calories per cup, but contribute relatively small amounts of essential nutrients to our diet.

Onions will grow in many types of soil but prefer it to be light and well drained. Enriching it with manure or other organic matter will loosen the soil and large onions will be easier to produce.

### GREEN ONIONS

Green or bunching onions are usually a by-product of bulb production. Harvesting to thin the onion row will usually furnish an abundance. Planting onion sets in the spring is a good way to have green onions earlier than from seed.

Evergreen White Bunching or Welsh Onion (He Shi Ko) produce green onions only and do not bulb. They are very winter hardy and form a clump from which green onions may be harvested for a prolonged period.

### FALL BULB ONIONS

Onions may be grown directly from seed, dry sets or green plants. Onion seed will germinate in cool soils and may be planted as early as March 1st if the soil can be properly prepared. Thin the stand and use for green onions to leave 3 to 4 inches between plants. Multiple rows or a broadcast pattern may be used as long as you have the 3 to 4 inches between final bulbs.

You can grow your own green onion plants indoors. Use a sterilized planting mix with extra vermiculite over the seeds. About February 15 sow the seeds thickly and keep at 70°-72° F. As soon as seedlings emerge, place in a sunny window or under a fluorescent light. Transplant them in the

garden April 1st to May 1st with a 3 to 4 inch spacing between plants. Garden stores also sell green onion transplants.

Dry sets may be placed in the garden very early—March 15 to April 1st. Because this early planting gives them a cold treatment, some may make a seed stalk (bolt) which causes a poor bulb. Use those for green onions. Smaller sets (less than the diameter of a dime) are less apt to bolt, so segregate the sets by size. Use the smaller ones for bulb production and the larger ones for green onions.

### VARIETIES

Onions are very sensitive to day length and are divided into long and short day varieties. Many long day varieties will perform well in Utah.

*Early:* Ebenezer sets, Utah Sweet Spanish transplants.

*Seed:* Crystal White Wax (pickling), Walla Walla, Snow White, Utah Yellow Sweet Spanish, Fiesta, Spartan Sleeper, Sweet Sandwich. Fiesta and Spartan Sleeper are longer keeping varieties than the Sweet Spanish types. Sweet Sandwich is a long keeper which loses pungency in storage.

### FERTILIZER

Plant onions in soil that has had 2 lbs. of 16-16-8 or similar fertilizer per 100 sq. ft. added. They respond to extra nitrogen so add 1/2 cup per 10 ft. of row 4 to 5 weeks after planting. Repeat at least one more time during the summer. Add the fertilizer just before an irrigation.

### IRRIGATION

Keep an adequate moisture level during the summer because onion roots are not deep. Onions do not tolerate competition from other plants so keep the area weed free. A mulch of



straw or lawn clippings will help control weeds and conserve moisture.

Onion bulbs need not be kept covered as they grow. Onion roots are very shallow and digging the soil to cover the bulbs may result in root damage and smaller bulbs.

## **OVERWINTERING ONIONS—BULBS IN JUNE**

Sow the seed in a well prepared, fertilized soil August 1-5. The planting time is very critical. In late February weed the area carefully and apply  $\frac{1}{2}$  cup of ammonium sulfate or  $\frac{1}{3}$  cup of ammonium nitrate per 10 ft. of row. Use the fertilizer again April 1-15.

Variety selection is very important. Walla Walla Sweet and Sweet winter will tolerate Utah winters and produce bulbs. Most summer varieties will form a seed stalk without bulbing.

## **HARVESTING AND STORAGE**

Breaking the green onion tops will not hasten maturity. Instead, the rate of food manufactured by the tops is slowed. The bulb is stored food that comes from the leaves. Final bulb size is smaller than when tops mature normally. This practice encourages neck rot and storage problems. Reducing water or cutting the roots with a shovel late in the season are ways to hasten bulb maturity.

Harvest when the tops die and the neck no longer is thick. If some are late maturing and have a thick neck, use them first. Spread the onions in a warm shady place until the outer skins are papery and the roots thoroughly dry.

Onions store best under dry, well ventilated conditions. They should be cool, even close to 32° F. The tops may be braided with a cord for reinforcement if you want to hang them. Otherwise, place them in mesh bags or slatted boxes. Do not store onions in paper sacks or solid side boxes because they restrict needed air circulation.

## **PESTS**

- **Maggots:** Diazinon as a furrow treatment at planting time.
- **Thrips:** Diazinon, malathion or pyrethrins- rotenone combination.
- **Pink Root:** Plant in non-infested soil. Treat with vapam before planting. Use pink root resistant varieties.

## **DISCLAIMER**

Varieties, trade names, and seed company names have been given for clarification and information only. Utah State University Extension Service does not endorse them, nor does it intend criticism of similar varieties, products or companies not listed.

# TOMATOES IN THE GARDEN

## HORTICULTURE FACT SHEET—FS - H8

By *Duane Hatch*, USU Extension Horticulturist



Tomatoes are the most popular home garden vegetable. Their fruit is tasty and can be used fresh from the garden or processed in many ways for later use. They are high in vitamins, especially C and contain about 100 calories per pound.

### DESCRIPTION

Tomatoes originated in the Andes mountains in South America so are definitely a warm season crop. If it were not for freezing weather, plants would be perennial. Plant growth patterns are classified into determinate or indeterminate. Determinate plants grow about 12 to 18 inches high and set fruits that ripen over a relatively short time. Indeterminate vines keep elongating and setting fruit all season. This type is suited for supporting by cages or stakes.

### PLANTING

You should plant tomatoes in the sunniest part of your garden. Don't crowd them so they receive plenty of light. Since they're a warm season crop, unprotected transplants should be set in the garden 7-10 days after the last expected killing frost. Hotcaps or plastic covering may allow a week or two earlier planting. Special protection such as a Wall O' Water may permit 4 to 6 weeks earlier planting.

It does little good to rush the season too much because most varieties do not set fruit when night temperatures are below about 58°F. Glacier, Oregon Spring, Santiam and some other "super early" kinds are exceptions.

You can plant tomato seed directly into the garden 10-14 days before the last frost date. Seedlings will be sturdier and develop early branching. The root system is not set back by transplanting so harvest will be nearly as early as that from transplants set at their normal time.

Select transplants that are dark green, stocky, have 7-9 leaves and are 6-8 inches tall. Plants that have fruit on them will be stunted and yield poorly.

Space plants that will be supported by stakes or cages 1 1/2 to 2 feet apart. Non-supported plants should be spaced 2 to 3 feet in the row with row spacing of 3 to 5 feet depending on variety.

Disturb the roots as little as possible and set the plants to the depth of the first leaves. Tall leggy plants can have lower leaves removed and all but the upper 4 inches buried reclining in a 4 inch deep trench.

### GROWING TRANSPLANTS

Plant seeds into a sterile seeding mix 6-8 weeks before transplanting time. Cover with glass or clear plastic and germinate at about 70°F. As soon as seeds germinate, move to a very light location where temperatures are 65°-68°F. Adequate light is essential to produce a quality plant. Cool white fluorescent tubes 2 to 3 inches above the plants, lighted for 14-16 hours per day should keep them from getting spindly. After second leaves form, transplant them into cell-packs or individual containers. Water each week with a 1/2 strength soluble complete fertilizer such as 20-20-20.

### FERTILIZER

You can grow a tomato crop with less fertilizer than many garden vegetables. Too much fertilizer will produce excessive foliage and delay fruit ripening. Instead of broadcasting fertilizer over the entire area, place 3-4 tablespoons of a complete fertilizer such as 16-16-8 or double that amount of 5-10-10 or similar formula in a 6 inch deep hole. Set the tomato plant about 4 inches to the side of the fertilizer but don't let roots contact it.



When first fruits are golf ball size, apply  $\frac{1}{4}$  cup of ammonium sulfate a foot or so from the plant and water it in well for continued vine growth and yield.

## IRRIGATION

Soak the soil thoroughly at 7-10 day intervals once plants are well established. Light, frequent sprinkling, especially late in the day will encourage diseases. After the soil warms (mid-late June) a mulch of grass clippings, leaves or sawdust will maintain a more uniform moisture level. Irregular watering or overwatering (especially on heavy soils) can cause blossom-end rot, a leathery, dark colored spot that can occupy the bottom  $\frac{1}{3}$  of the fruit.

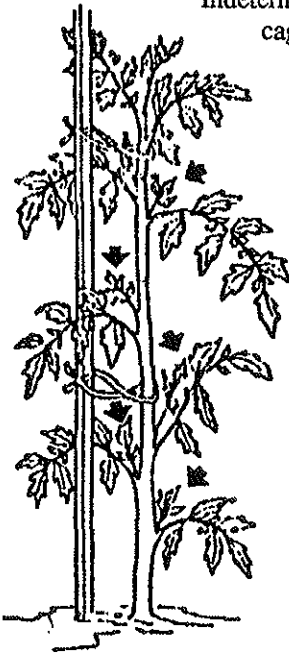
## CULTIVATION

Cultivate very shallow and only to control weeds or break soil crust for water penetration. The mulch described above removes most need for soil stirring.

## SUPPORT

Wood or wire cages 12-16 inches in diameter and 2-3 feet high will keep most of the ripening fruit off the ground.

Indeterminate plants will require taller cages or staking and pruning.



Staking requires more work but fruit is not in contact with the soil and is easier to harvest. Select the main stem and remove side shoots where they arise at leaf joints. As it gets taller, loosely tie the stem to an upright stake 4-6 feet tall.

*Leave one main stem for each plant, removing the shoots (arrows) to eliminate extra side branches.*

## INSECT CONTROL

Flea beetles attack small plants. Control with sevin but don't "dump" dust heavily. Leaves are eaten by tomato horn worms. Control by hand picking. White flies may build to tremendous numbers late in the season. Control with Thiodan, Cygon or insecticidal soap if yield is being reduced.

## DISEASE CONTROL

Use resistant varieties that have V, F, N (Verticillium, Fusarium, nematode) designated in their name. Improve drainage in heavy soils or use raised beds. Let soil dry between waterings and don't sprinkle late in the day. If you use tobacco, don't handle plants unless you've washed hands thoroughly with soap. Control foliar blights with Daconil.

## HARVEST

Pick when fully colored but firm, especially for canning. They will ripen with high quality if picked as first color shows. At the end of season, gather any that have a tinge of pink. Store 1-2 layers deep in a box and keep at 50°-60°F. Individual wrapping is not necessary.

## VARIETIES

All determinate, except those marked (I):

- **Earliest:** Sub Arctic Maxi, Pixie Hybrid, Glacier(I), Oregon Spring.
- **Cherry Types:** Presto, Toy Boy Hybrid, Sweet 100 Hybrid(I), Sweet Million Hybrid(I).
- **Medium Size Fruits:** Early Girl Hybrid(I), Early Cascade Hybrid(I).
- **Large Fruit:** Moreton Hybrid(I), DX52-12, Celebrity Hybrid, Jet Star Hybrid, Red King Hybrid, Red Express(1) Hybrid, Pole King Hybrid(1).
- **High Solid:** Square Paste, Royal Chico, Roma VF.



# COMPOSTING

## HORTICULTURE FACT SHEET—FS - H10

By Jerry L. Goodspeed & Larry A. Sagers, Extension Horticulturists, USU



In the growing season 30% or more of the landfill waste is organic yard refuse. This wastes land, tax dollars, and natural resources. Composting these products at home eases landfill problems. Composted materials are excellent soil amendments for increasing the tilth, workability, fertility, water holding capacity, and drainage of existing soils.

Composting is a natural process by which organic material is decomposed into humus, a soil like substance. Humus improves the water holding capacity, drainage, workability, and fertility of existing soils. Decomposition is done by microorganisms, earthworms, small insects, and other soil inhabiting organisms. These organisms decompose the organic matter as their food source. The process requires carbon, nitrogen, water, oxygen, and heat.

Carbon is the principle component of all organic matter. A material must have a proper ratio of carbon to nitrogen, termed C:N ratio, to compost properly. The most efficient ratio for composting is 15-30 parts carbon for every 1 part nitrogen. If the ratio is too high or too low the composting process is slowed.

Oxygen (air) is also necessary. If oxygen is eliminated, the materials decompose anaerobically (without oxygen). This decay process is slow and causes foul odors. Adequate oxygen, supplied by mixing the compost, eliminates the odors. The correct ratio of carbon, nitrogen, water, and oxygen produces heat which speeds the process and kills most weeds, seeds and harmful pathogens. Composting, done correctly, is simple, odorless, and produces a valuable, natural soil amendment.

### Steps for a successful compost pile:

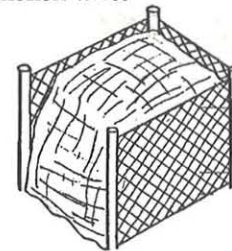
#### I. SITE SELECTION

- a) At least 6 hours of sunlight a day.
- b) A site that does not detract from the landscape.
- c) Convenient for adding materials and removing compost.
- d) Available water.

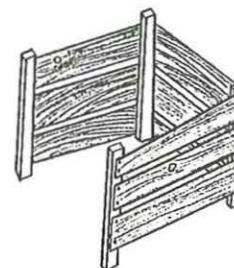
#### II. CONTAINER

Many containers are suitable provided they are accessible, resist decay, and allow air flow. Three containers, next to each other, permits for the pile to be turned to speed the process. Ideas for containers are listed:

- a) Poles with chicken wire.

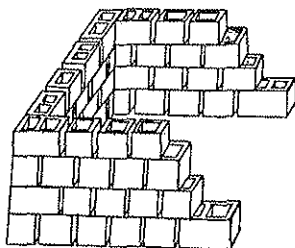


- b) Wooden bins.





- d) Open sided cinder blocks bin (without mortar).



- f) No bin, true compost pile.



### III. SELECT THE PROPER MATERIALS:

#### Acceptable

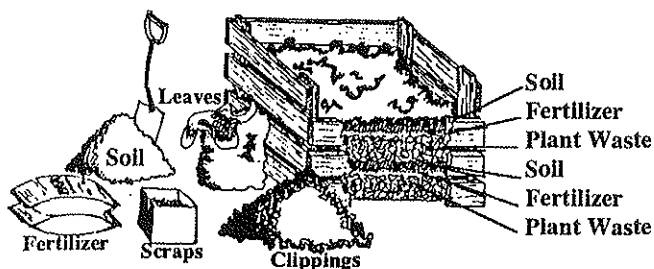
Grass clippings  
Leaves & Weeds  
Manures  
Coffee grounds  
Wood chips & Sawdust  
Bark, stems, stalks  
Garden and canning waste  
Fruits and vegetables

#### Not acceptable

Meats  
Bones  
Large branches  
Dairy products  
Synthetic products  
Plastics

### IV. MAKING THE PILE WORK:

A compost pile is not just rotting garbage. Successful compost piles are structured as follows:



#### HELPFUL HINTS:

- Turn pile every 2 to 4 weeks and keep pile moist to speed composting, allow air circulation and eliminate unpleasant odors.
- Build pile 3 to 5 feet tall, with an equal circumference. Small piles don't heat enough and large piles don't receive enough air in the middle for good composting.

- Apply a 1" layer of soil every 8 to 14 inches of organic waste to increase microbial activity.
- Apply nitrogen fertilizer every 1 to 2 feet to decrease the C:N ratio. Some common materials and their C:N ratio are listed:

<u>Material</u>	<u>C:N Ratio</u>
Garden refuse	20-35:1
Kitchen scraps	20-35:1
Manure	20-50:1
Sawdust	200-500:1
Grass clippings	15-30:1
Straw	50-150:1
Leaves	70-120:1

- Mow lawn every 5 to 7 days and don't bag clippings. Grass clippings break down quickly and do not add to the thatch layer.
- Gather leaves in the fall and till into garden and flower beds. By spring they decompose and add more humus to the soil.

### V. TROUBLE SHOOTING:

#### **Strong odor**

Insufficient oxygen. Turn pile for increased air circulation. Materials may be too wet to allow for good oxygen penetration. Add dry materials.

#### **Pile damp, but won't heat**

Insufficient nitrogen. Add fertilizer or grass clippings. This decreases the C:N ration, and increases decomposition.

OR

Materials too wet. Allow pile to dry or add additional dry materials.

#### **Dry and not composting**

Insufficient water. Form pile so center is the lowest point. This prevents runoff.

#### **Ammonia smell**

Too much nitrogen. Add sawdust or other high carbon materials and turn pile.

### SUMMARY

Compost is an excellent, inexpensive way to increase the productivity and workability of soil. It reduces and recycles yard waste and produces an excellent soil amendment. Help the garden, the environment, and the pocketbook by composting lawn and garden waste.