

THE HOME VEGETABLE GARDEN

J. C. WHITTEN

A small backyard garden may be made to produce more food than one acre of wheat or an acre of corn. Intensively managed, it may become a profitable family asset. Intelligently planted and tilled, it is a source of education and of inspiration. The main drawback to successful home gardening is the drudgery entailed. The usual tendency is to plant too large an area to admit proper preparation of the soil. Summer tillage of the crop then becomes tedious. Often the plants fail to make satisfactory growth, especially if drouth occurs. By mid-summer many gardens become weedy and the soil becomes crusted and baked. The gardener's ambitions of spring turn to indifference in summer. Such frequent discouragement may be changed to satisfaction providing one plants only such an area as may be properly prepared and frequently tilled. More satisfactory results may be obtained on a small area, intensively worked, than on a larger area which cannot be properly cared for.

THE GARDEN SOIL

A garden soil should be mellow, loose, deep, rich, well aired and well drained. A light, mellow, well drained condition is of first importance. Such a soil may be worked early in spring; it warms up quickly and stimulates early production of vegetables. It drains and may be worked soon after a rain, while a heavy soil would still remain soggy. It does not bake or crust in drying; it is rarely too wet and never too dry to work. One does not have to wait for it to get in condition. It is easy to work, thus relieving much of the drudgery of gardening.

The soil should be mellow to a good depth. A heavy, tight sub-soil will not drain out quickly and remains cold. Rains do not quickly soak into it, but flow off over the surface as soon as the surface soil is

saturated. The richer the soil, the better, other things being equal, but a soil, mellow to a good depth is of greater importance than mere fertility. Necessary plant food may be added.

It is not always possible to select an ideal soil for gardening. Once the home is selected one has to use the soil that is at hand for the garden. The foregoing suggestions are useful, however, as a guide in preparing the soil for gardening. Almost any soil may be fitted for successful gardening if one understands the soil conditions which should be brought about.

PREPARATION OF GARDEN SOIL

Most Missouri soils are too heavy for the best results in gardening. They tend to remain cold and wet in spring. They also remain wet and heavy too long after a rain. They soon crust or bake after drying and are hard to work if attention is not given promptly. Baked soils do not stand drouth well. Rain flows from heavy soils instead of sinking into the subsoil to be stored there for later dry weather.

The first object in preparation should be to secure a deep, mellow, loose surface soil. If the soil is a heavy clay loam, tile drains will help greatly. If a lower outlet can be secured, porous, three inch tile drains may be laid. The drain lines should be 15 to 30 feet apart, across the garden, and 24 to 30 inches below the surface. If there is a good slope, the tiles will drain readily. If the ground is nearly level, the tile ditch should be dug deeper at the outlet than at its source to give free drainage of the tile. A slope of only one inch in 100 feet will answer if the fall is uniform, tho the greater the fall, the more thoro the drainage will be.

In case tile drainage is not possible, surface drainage will help greatly. This may be secured by plowing the area in raised lands, turning the furrows the same way for several seasons. This raises the soil at the back furrow and leaves a lower, dead furrow which may act as a surface drain. Dead furrows around the border of the garden also help to drain the area.

In case the garden is too small to admit plowing it may be spaded in broad, shallow ridges, with lower, surface drains between. It is a common practice to arrange the garden in small, raised beds with narrow, shallow, depressed walks between them. It is better to have these raised areas extend entirely across the garden so the rows of plants may be continuous, across the entire plot. It is easier to cultivate rows across the entire garden than across small beds.

If the soil is moderately well drained, level treatment of the soil is better. If the soil is loose enough to receive water readily, to a good

depth, surplus water in a wet time will be stored in the subsoil for a subsequent dry time. Subsoiling will help greatly in making the soil deeper and in enabling the surface soil to drain and become mellow and workable.

Subsoiling consists in loosening the subsoil without turning it up to the surface. A subsoil plow or a single shovel may follow in the furrow behind the turning plow, thus loosening the subsoil which is covered when the next furrow is turned. If the soil is to be turned by a spade or fork in a small garden the subsoil may be loosened in a similar way. Stable manure, leaves, plant stems or other available organic matter should be turned under to mellow and ameliorate the soil.

Subsoiling preferably should be done in the fall. Usually at this season the subsoil is not wet and therefore will not be puddled by handling. The winter freezing acting on the subsoil mellows and disintegrates it. Leaves or similar loosening materials to be worked in are more plentiful in autumn. The soil has time to settle before spring planting. Soil worked deep in spring, leaving openings below, may dry out badly, especially if much coarse organic matter is worked in shortly before planting.

Plowing in the fall is preferable where land is to be planted in early spring, as it will be dry enough to work much earlier. If forked, no attempt should be made to level it, but on the other hand it should be left as rough as plowed furrows. Winter rains soak in better and settle the subsoil below; more soil moisture is stored; some of the surface soil finds its way into the openings in the subsoil, thus loosening and ameliorating the latter. The higher masses of surface soil granulate, under the influence of alternate freezing and thawing, sun and rain.

During the first sunny days of early spring the rough surface of fall turned land dries and flocculates. It is in condition to work down and plant to early vegetables in March, or sometimes in February, in Central Missouri. On the other hand, land which lies unturned, smooth and flat during a wet winter has no dry flocculent surface and remains too wet to handle until late.

FERTILIZERS FOR THE GARDEN

Stable manure is the best fertilizer for garden soils. It furnishes necessary plant food; it mellows and loosens the soil, making it work easier; it makes the soil warm up earlier in spring; it enables the soil to take in more water to be stored in the subsoil; it renders soil cooler and more drouth resistant in the heat of summer; it tends to equalize extremes of heat and cold during changeable weather.

Horse manure is warm and quick and consequently is best for heavy soils and for early crops. Cow manure is a heavier manure for

light soils and cooler for hot season crops. Poultry manure is quick, warm and the richest of farm manures. It should be used sparingly as a heavy application temporarily may be too strong for tender plants. It is better when applied with a liberal amount of litter. Any farm manure may be applied liberally in the fall even if fresh from the stable. Old, well rotted manure is preferable for spring application.

Leaves, straw, vegetable stalks, grass from the lawn or other organic matter which will speedily decay may be turned under in the fall. These contain more or less plant food and they improve the physical condition of the soil. If procurable at intervals during the summer, they may be stored dry or composted in a heap until needed.

Green manures (plants grown on the land) are often the cheapest fertilizers to be applied. The legumes, clover, cowpeas, soy beans and vetches, obtain nitrogen from the air and add it to the soil when they are turned under. Rye or other green crops, turned under, help the physical condition of the soil. So far as possible, green crops should be grown to turn under, on any part of the garden which is for a time not otherwise employed.

If any early crop, like radishes, is not to be followed immediately by some later crop, the area may be planted to cowpeas and these turned under in time for an autumn crop like turnips. Wherever an area is to be idle for as much as five or six weeks in summer, it should be sown to some quick growing legume to be used as a green manure. Land which becomes idle in July may be sown to winter vetch which may be turned under in the fall or the following spring. Rye, sown from August 15 to October 15, may be turned under the following spring where the area is not needed for early spring vegetables. If a plot is to be idle fewer than five weeks in summer, it may be sown to corn or other quick, rank growing crop which may be turned under when the land is needed for subsequent vegetables.

While green manure crops other than legumes do not add more plant food to the soil than they take out of it, they prevent waste and may increase the plant food in the surface soil where shallow rooted vegetables can use it.

When plants are not growing on the land some plant food such as ammonia is wasted by passing into the air; by erosion or by leaching down to lower strata. Green manure crops use this plant food and give it back to the surface soil when they are turned under. They also prevent the land from washing. Bare soil also often settles and bakes. A growing green manure crop keeps the soil mellow by means of shade and permeating roots.

Commercial fertilizers are sometimes used to advantage, especially where stable manure is not available. Ordinarily a good garden ferti-

lizer may be secured from a local dealer. The three chief elements needed are nitrogen, phosphorus and potassium. Nitrogen may be secured in the form of nitrate of soda or in dried blood. Fertilizers containing nitrogen tend to induce vigorous plant growth, strong green leaves and stout stems. Nitrogen is especially valuable for the production of plants grown for their leaves or vegetative parts, like lettuce spinach, chard or cabbage. On thin soils it may be needed to start strong plants which are grown for their seeds, fruits or roots. Phosphorus is present in acid phosphate, bone meal and also in dried blood. Potassium is available in wood ashes and in muriate of potash. Phosphorus and potassium are especially useful in enabling plants to produce seeds, fruits, or thickened roots. If potatoes, tomatoes, peas or beans make rank top growth but fail to produce a crop, owing to an excess of nitrogen in the soil, the addition of either phosphorus or potassium, or perhaps both, may induce the plants to make tubers, fruits or seeds.

HOW MUCH GARDEN FOR THE FAMILY?

The following table will be helpful in determining the size of the garden. The figures are based on the needs of a family of five. They may be varied according to the size of the family. If some vegetables are to be preserved for winter use, the size of the garden must be increased accordingly.

Ft. of row for 5 persons	Kind of vegetable	Planting time	Dist. in rows (inches)	Least dist. between rows (inches)	Seed for 100 feet of row
200	*Beans—dwarf, snap.....	Apr. to June	2-5	20	1 qt.
100	"—dwarf, lima.....	May 15 to June 1	6	20	1 qt.
150	*Beets.....	Apr. 1.....	2-4	18	2 oz.
200	Cabbage.....	Mar. 25.....	16-24	24	50-75 plants
50	Cauliflower.....	Mar. 25.....	16-24	24	50-75 plants
50	*Carrot.....	Apr. 1.....	2	18	1 oz.
50	Celery.....	June 15 to July 1....	4-8	18	200 plants
500	*Corn, sweet.....	Apr. 10 to June 15	16-36	30	¼ pt.
100	Cucumber.....	May 10 to June 1....	Hills 48	48	½ oz.
25	Eggplant.....	June 1.....	20-30	24	15 plants
150	*Lettuce.....	Mar. 15 to June 1....	4-8	Beds 6	¼ oz.
150	Muskmelon.....	May 10 to June 1....	Hills 72	72	½ oz.
200	Onions, from sets.....	Feb. and Mar.....	2-3	16	3 pt. sets
50	Parsnip.....	Feb. and Mar.....	3-5	18	½ oz.
300	*Peas.....	Feb. to May 15.....	¾ to 1½	30	1 qt.
25	Peppers.....	May 15 to June 1....	16	24	20 plants
800	Potatoes, early.....	Mar. 25 to May.....	14-18	30	4 lbs.
150	*Radish.....	Mar. 15 to June.....	1-2	16	1 oz.
200	Spinach, fall.....	Sept.....	1-3	18	1 oz.
25	Squash, summer.....	May 10 to June 1....	Hills 42	42	½ oz.
100	Tomato.....	Apr. 10 to May 17..	30	36	40 plants
800	*Turnip (after potatoes)....	July 25.....	2-4	18	½ oz.

*Plant in succession at intervals of one month so that a continuous supply may be had.

HOT BEDS AND COLD FRAMES

A hot bed is usually made by constructing a box-like frame of boards, one foot high on the south side, sixteen inches high on the north side and with ends sloping to join flush with the sides. This frame should be six feet wide from north to south so that it may be covered with six-foot sash. The sash slope toward the south. The frame may be as long as desired. A convenient width of sash is three feet. A bed six to nine feet long, covered by two or three sash is sufficient for the average small garden. It should be located on the south side of a building or other shelter. For early spring use, a layer of six or eight inches of heating horse manure should be tamped firmly, in a level layer, into the bottom of the frame. The manure should be covered with three or four inches of fine mellow soil. Seeds are sown in the soil. The fermenting manure furnishes bottom heat. The sash cover affords protection on cold nights. In such a hot bed plants may be started four to eight weeks earlier than they can be grown in the open field. A cold frame is like a hot bed except that it has no bottom heat.

Early cabbage and cauliflower, tomatoes, sweet potatoes, peppers and eggplants are usually started in hot beds. Lettuce, cucumbers, beets and other species may also be started in this way. They transplant readily and may be moved directly from the hot bed soil to the open field when the weather permits.

Plants in the hot bed should be watered only often enough to keep them in health and prevent their wilting. The hot bed should be ventilated by raising the sash during the day or by removing it entirely during warm, sunny days. Plants grow long, slender and weak if they are not given sufficient ventilation and sunlight. They should be hardened off by being given more exposure and less water for a period previous to transplanting in the field.

TIME TO PLANT VEGETABLES

The beginner often asks: "How early in the spring can I safely make my garden?" This question is founded upon the supposition that along in the spring, there comes a day when it is best for gardens to be planted, irrespective of the species of plants that grow in them. Not infrequently, on the farm, it is customary to take a day off and make the garden. The idea is that once this troublesome job is out of the way, it will no longer interfere with farm work. There is no best day on which to make a garden, but there is a proper time for planting each species which is grown in the garden.

It should be borne in mind that different garden vegetables have different temperature requirements. Some do best in cool weather and in a cool soil. Others grow successfully only after the weather and soil have become warm later in the season. Some garden vegetables are tropical plants, and need great heat for their growth; others are natives of colder countries and will not thrive well after the burning heat of summer comes. Not infrequently, the grower fails entirely with certain vegetables because he plants all his garden vegetables at the same time. Some species may have been started much too late, and other species too early.

In gardening, it should be remembered that there are two extremes of temperature, above or below which garden seeds of any species cannot grow. The lower temperature is just above the freezing point of water. The higher temperature is somewhat above 100 degrees Fahrenheit. In between these two extremes, each species finds a temperature at which it will make its best growth. This most favorable temperature is called the optimum temperature for that species.

Early, medium and late spring groups.—There are a number of species of vegetables which do best if started while the weather is cool. They will make growth at slightly above the freezing point, and they will endure more or less freezing without serious injury. Such species should be planted as early as the ground can be worked in spring. Among them are onions, garden peas, sweet peas, parsnips, spinach and salsify. In Central Missouri, these may be started in February or early March.

Another group which can be planted only slightly later, perhaps about the middle of March, consists of lettuce, radishes, parsley and chard. These may be followed in late March or early April with carrots, beets, spring turnips and potatoes.

The next group which may be planted between the first and the middle of April, consists of sweet corn and early garden beans. A still later group comprises those which will not make growth until the soil is warm, and which will be killed even by a slight frost. This comprises lima beans, okra or gumbo, cucumbers, melons, cantaloupes. The latter should not be planted until May or early June. They are vegetables which will not only be killed by frost, but if cool evenings prevail after they come up, they will, even tho not literally killed, be so stunted and injured by the cold as never to make satisfactory plants. This attention to planting so as to give each species its proper temperature is one of the most important points in successful vegetable growing.

Certain plants should be started in the hot bed or cold frame and transplanted to the open field at the proper season. Cabbage, canta-

loupe and early celery seeds should be started in late January or early February. For success, the cabbage and cantaloupes should be set in the open field during the last week in May, if possible; early celery should be set in the open in late June. Late cabbage and late celery may be started in April and transplanted to the open field in July. Tomatoes, sweet potatoes, peppers and eggplant should have the seeds started in February or March. Tomato and sweet potato plants should be set in the open field after danger of frost is over which will be in late April or early May. Peppers and eggplants should not be set in the open field until late May or even early June if the spring is cold. Like lima beans, these two species require a very high temperature for their growth. If they are started while the soil or weather is cold, they often will be permanently stunted.

ARRANGEMENT OF THE GARDEN

Perennials, such as asparagus, rhubarb, berries, and sweet herbs, should be planted at one side of the garden where they will not be disturbed in working the rest of the ground in a block. If the garden is to be plowed or worked with a team, the perennials should be located where it will not be necessary to drive over them.

Vegetables should be planted in rows, running entirely across the garden, instead of in the customary, small, isolated beds. This saves time in cultivation, whether the work is to be done with a horse or with a wheel hoe and other hand tools. Small, raised beds dry out unless the soil is very moist. If the garden is to be irrigated in dry times, continuous rows facilitate convenient application of water in shallow ditches along the rows. If only a few plants of a given kind are needed the row may be completed with other kinds of vegetables.

Vegetables of similar size and character should be planted in adjacent rows, so far as feasible. This facilitates giving them the similar treatment they need. Similar vegetables do not crowd or overshadow each other. If this point is kept in mind one soon learns the mutual adaptations of the different sorts.

It is also well to group together those vegetables which mature at the same time. In following them with a second crop a continuous area is more conveniently prepared and planted than are scattered rows. Often seeds of a second crop fail to come up well, or the young plants do not make satisfactory growth in a limited area between other sorts which are still in a vigorous stage of growth.

Long season root crops like parsnips and salsify should be planted adjacent. They are dug late in the fall, just before the ground

freezes. They may be harvested most conveniently when the area is fall plowed or forked. A furrow is opened adjacent to the first row, turning the furrow away from the vegetables. The rows of roots adjacent to the furrow will be loosened so they may be pulled. The next furrow loosens the next row of roots so they may be removed and so on across the patch. In this way fall turning the garden and harvesting the roots may be accomplished as one job.

COMPANION CROPS

In small gardens space and labor may be economized by planting together, on the same area, such vegetables as are mutually adapted. In at least a few cases mixed species are mutually helpful. Onions, lettuce, carrots and small, weak seedlings often find difficulty in pushing above ground. This is particularly true in heavy soils that have not had time to become mellowed by repeated deep working and the incorporation of organic matter. A few radish seeds may be mixed with seeds of these sorts. The radish seeds sprout promptly, the seedlings break the crust and allow their weaker companion plants to come up readily. The radishes soon mark the row, so that early tillage may be given even before the other plants are up.

Pole beans may be planted in the same hill with sweet corn, tomatoes that are to be staked or with sunflowers. The beans climb on the corn, sunflowers or the tomato stakes. In addition bush (string) beans may be planted between the rows of these plants. Garden peas may be planted between the hills of Irish potatoes or sweet potatoes, and string beans may be planted between the rows. Squashes, pumpkins, summer squashes, melons and other plants of the gourd family may be planted with corn or tomatoes. Early cabbages may be set between late, wide-row crops like corn or tomatoes. Careful observation enables the gardener to determine what plants do well together and how to get the most out of limited space by companion cropping.

It should be borne in mind that maximum development of plants under crowded conditions requires rich soil. The richer, deeper and mellowed the soil, the more intensively may companion cropping and crowding in narrow rows be employed with profit. Where abundant space is available and where the soil has not yet been brought to intensive gardening condition it may be better to plant nearly all vegetables in rows far enough apart to permit horse cultivation. The smaller vegetables, however, cannot be given by horse power quite the tillage they need. In addition they require hand work. The aim should be to ameliorate the soil as rapidly as possible and work toward the intensive, hand method. Once a satisfactory soil condition

is obtained, a man with a wheel hoe can cultivate a row of onions about as quickly and easily as he can with a horse drawn implement and do better work.

SUCCESSION CROPS

To get the best results from a garden, the land should be kept constantly producing thruout the season. Whenever an early crop is removed a later one should be grown in its place. The following crops may be of the same species or of a different species. A succession of radishes may be grown on the same ground by reseeding parts of the row as fast as the radishes are used. Lettuce may be grown in the same way. In the southern part of the state an early crop of potatoes may be followed by a potato crop for winter. Seed from the first crop may be used to plant the second. Early sweet corn may be followed by winter cabbage or celery set in early July or by turnips sown broadcast the last of July. Beets, particularly in this climate, become woody with age and lose their crispness and sweet flavor. Those to be started for winter should not be planted earlier than the first of July. Carrots are a delicious garden vegetable when young. One reason why they are not more often grown for winter storage is because they are usually planted in early spring, and by autumn they become so woody as to be unpalatable. Carrots for keeping over winter should be started in July.

Where good tillage is given, the ground following an early crop will be in the best possible condition for a second crop. The early crop shades the ground keeping it mellow; its permeating roots fit the soil for the rooting of the following crop; tillage of the former crop conserves moisture and kills weeds; the second crop requires less labor than the first or, in other words, a part of the benefits of tillage given the first crop is bestowed upon the second. On poor soils where a single crop uses most of the available plant food, the foregoing statements may not hold fully true. On rich soils they are to be emphasized.

Succession cropping can be made much more effective if a hot bed or cold frame is available in which to start a supply of plants to set in the garden whenever space is made available.

CULTIVATION SHOULD BE FREQUENT

The garden soil should be given frequent and thoro cultivation. Crops like sweet corn and potatoes which are planted two feet or more apart may be cultivated with horse drawn implements, especially in large gardens. In small gardens and in the case of plants grown in narrow rows, the cultivation may be done largely by means of a wheel

hoe. In addition, hand hoeing close to the plants, and weeding the row may be necessary.

Cultivation should begin as soon as the plants are up. It should be repeated at frequent intervals. The crust should be broken after every rain, as soon as the ground is dry enough to work. It is poor economy to wait for weed growth to force cultivation. Once the soil is allowed to settle, become firm or to bake it can be worked only with great difficulty. So long as it is kept loose and mellow on top, by frequent working, the labor will be light. Furthermore the plants grow rapidly if the soil is kept aired and the moisture retained by frequent tillage.

THINNING PLANTS IN THE ROW

Plants seeded in drills should be thinned while they are small and may be removed readily without injury to the permanent plants. Parsnips, salsify, onions, beets, and similar vegetables should be thinned so that the permanent plants will stand four or five inches apart in the row. This gives opportunity for selection of the best plants by removing the weaker ones. Thinning is usually done along with the first hand weeding. Surplus vegetable plants should be treated as weeds. Two or more vegetables crowded close together where there is room for only one will each be practically worthless.

IRRIGATION MAY BE NECESSARY

In dry times the garden should be watered, if possible. Water may be applied by sprinkling if it can be applied in liberal quantity. Barely wetting the surface causes the soil to crust over when it dries and is worse than no watering. An economical way also is to apply water in shallow furrows along the vegetable rows. As soon as sufficient water has soaked in, the furrows should be filled with loose earth.

INSECTS AND DISEASES

Insects which attack vegetables may be divided into two groups—those which eat or chew the leaves or fruit, and those which suck the plant juices.

Biting insects may be poisoned by spraying the plants with poisonous solutions or by dusting them with poison powders. Potato beetles, flea beetles, cabbage worms, striped cucumber beetles and similar biting insects may be held in check by spraying the plants with arsenate of lead paste at the rate of 2 pounds to 50 gallons of water. The spray sticks better, especially on smooth plants like cabbage, if a little soap or molasses is dissolved in the spray. The arsenate of lead may be ob-

tained as a dry powder, mixed in a quantity of flour or air slaked lime and dusted on the plants.

Sucking insects like plant lice may be held in check by spraying with soap suds, kerosene emulsion or tobacco decoction. Most insects are also repelled to a greater or less degree by the presence of fine dust, which tends to close their breathing pores. For that reason, it is best to keep the surface soil well tilled to maintain a dry, surface dust mulch. Wood ashes, air slaked lime, insect powder or tobacco dust sprinkled on and about the plants also help to keep down insects.

Most fungous diseases such as celery rust and potato blight, may be held in check by spraying with bordeaux mixture: 4 pounds copper sulphate; 4 pounds lime; 50 gallons water.

Where both insects and fungi are present, it is well to add 2 pounds of arsenate of lead paste to the 50 gallons of bordeaux mixture. This combination spray is to be recommended especially for potatoes to control the potato beetle and potato blight. Detailed information on the control of garden insects will be found in Agricultural Extension Service Circular 15.

CULTURE OF GARDEN CROPS

Asparagus.—Asparagus should be set 18 inches apart in rows 3 or 4 feet apart. The crowns should be set 4 to 6 inches deep. One or two year old plants should be selected for setting the bed. The Palmetto is perhaps the best variety for Missouri conditions as it is resistant to rust. The plants will not be strong enough to cut for the table until they have made at least one summer's growth. They may then be cut from early spring until mid June or early July. After that they should be allowed to grow strong until the leaves are killed by autumn frost when the stems (and so far as possible, their berries and seeds) should be removed from the ground. A liberal dressing of manure should then be applied. This manure should be worked into the soil in the early spring. Tillage should then follow at frequent intervals throughout the season. Asparagus should be manured more liberally than almost any other garden plant except rhubarb and celery.

Beans.—Navy beans should be more widely grown for home use. They will make a better yield on poorer soil than almost any other garden crop; they may be planted then on soil which would not produce a good crop of other vegetables. Even on thin Missouri soils they will not require fertilizer. They can be planted late and consequently will fit in well as a succession crop after early vegetables have been harvested. They do not demand as much cultivation as some other garden crops, and with average care will give good yields in a favor-

able season. These advantages together with their high food value and the ease with which they can be stored make navy beans an excellent garden crop.

Navy beans should be planted any time between June 15 and the second week in July in Missouri. This gives time for previous plowing the soil to turn under weeds, frequent working to kill sprouting weed seed and permits settling the soil and preparing a fine seedbed before the beans are planted. If the soil is handled in this manner, practically all the weeds can be killed and most of the cultivation completed before the beans are planted. The seed should be tested to determine their viability and germinative capacity.

The rate of seeding varies with the size of the seed, the distance between the rows and the space between the plants in a row. Usually the seed is planted about 1 inch deep and approximately 3 inches apart in rows varied from 20 to 36 inches apart to admit horse cultivation. If corn cultivators are to be used, it is best to make the bean rows the same distance apart as the corn to avoid changing the cultivators.

As soon as the beans are up, they should be thoroly cultivated to break the crust. If the soil is fine, this may be done with a spike tooth harrow without killing the plants. Only one or two subsequent cultivatings will be needed unless the land is weedy.

Beans should be harvested when the seeds are fully ripe; in small areas the plants may be pulled by hand. As the stems get fully ripe, the roots rot sufficiently that the plants frequently may be gathered with a horse rake. Small lots of beans may be threshed on a barn floor with a flail or stick.

If beans are to be stored after threshing, weevil can be kept out during the entire winter by fumigating once with carbon bisulphide. For small quantities of beans such as would be raised in the garden, one ounce of carbon bisulphide should be used for each 75 to 100 pounds of seed. The bisulphide may be sprinkled over the seed in a tight box or barrel or it may be placed in a saucer on top of the seed. Cover the container tightly and let the gas act twenty-four hours. Carbon bisulphide is highly inflammable and consequently must not be handled near fire.

Snap bean culture is about the same as that of navy beans except that they may be planted as early as April 15 to May 1. A succession may be produced by planting every three or four weeks until July 1.

Bush lima beans should be planted from May 15 to June 1 as they need warm weather. They should be planted 5 or 6 inches apart in the row.

Pole beans should be planted, five or six seeds to the hill, in hills 3 feet apart each way. They may be allowed to run on poles, sunflower plants grown in the hill with them, on corn or on the stakes with tomatoes. They should be planted in early May.

Bulb and root crops.—Beets, carrots, parsnips, salsify and onions are given similar treatment. The seeds are sown about one inch apart in drills 15 inches apart. Beets and carrots will endure only slight frost and hence should not be sown before April 15 for early summer use. Those for winter use should be sown about June 1 as they are likely to become woody if grown during the fall season in this climate.

Radishes endure frost and are ready for the table in about six weeks. Frequent sowings may be made from late March until mid-summer.

Parsnips and salsify are hardy. The seeds should be sown in February or as soon as the soil is in condition and the roots harvested just before the ground freezes. If desirable, a part of the crop may be left in the soil for late winter and early spring use as they are not injured by freezing.

Onion seed or sets may be planted in February or as soon as the soil can be worked in spring. Onions from sets are ready for the table in a few weeks. The onion is a biennial hence those grown from sets will tend to make seed stalks. The seed stalks should be removed in order to prevent exhaustion of the bulbs by seed production. Onions from seeds do not usually make seed stalks the first season. The bulbs usually mature in late summer or early autumn. When the tops dry down they should be harvested. The bulbs should be dried or cured well before storing for winter.

Cabbage and cauliflower.—Early cabbage and cauliflower plants should be started in the hot bed in early February, and transplanted to the garden in late March. They may be set 20 inches apart in rows 24 to 36 inches apart. They will be ready for the table during June and July.

Late cabbage plants should be set in the garden in early June so they will form their heads during the cool weather of autumn.

Cantaloupe and cucumber.—These plants are usually grown in hills 3 by 5 feet apart. About a dozen seeds should be planted in each hill in early May. Unless the soil is light and loose the hill should be raised slightly and old manure or other decayed organic matter worked in to afford aeration and warmth of the soil. When the plants are well established they should be thinned to 4 or 5 plants to the hill. They should be given frequent and thoro cultivation to keep the soil

warm and well aired. They will not thrive in a settled, crusted soil that is not well aired.

Carrots.—To insure good, succulent, sweet, tender carrots for winter, the seed should not be sown before early June. Carrots that are planted early become too hard and woody late in the season to be suitable for the table. Those planted later so that most of their growth is made during cool weather of autumn are best for winter storage. The soil should be prepared early enough to be thoroly worked down with a harrow so that a good seedbed can be secured. After the soil has been settled by rains it should again be harrowed to break the crust just before sowing the seed. The land should be raked over with a garden rake to remove clods and get the surface into fine shape for the growth of the tiny seeds and for cultivating conveniently while the plants are small.

The seed should be sown about one-half inch apart in drills 15 inches apart where hand tillage is to be given. If it is desired to cultivate the patch with horse and cultivator, the rows should be wider apart. As soon as the carrots are up so the row can be seen, tillage should begin. In hand-weeding along the row, the crust should be carefully broken about the little plants. When the plants are 1½ inches high, they should be thinned to about 3 inches apart. Frequent cultivation between the rows should be given to break the crust after every rain, to maintain a fine loose dust mulch and to keep down all weeds.

Carrots will stand light frosts in the fall but will be injured by a heavy freeze. Before hard freezes come, the carrots should be dug from the ground, the tops trimmed off and the roots pitted for winter protection.

Celery.—Celery seed should be planted in spring, and plants will be ready for the field by June 1 or a little later. The soil should be stirred frequently in the seedbed to prevent baking and to keep the seedling plants growing. Shear once or twice. There is no definite rule for transplanting in the field, as the distance apart of the rows should be governed largely by the method to be employed for blanching. If horse cultivation is to be practiced the rows should be four feet apart and the plants set six inches apart in the rows. This distance will enable the grower to blanch by pulling up the soil, or using boards, as the choice of the grower would suggest. Mark the rows with a wheel hoe or line. When the plants are set in the ground and the soil well pressed down around them, they should be just a little below the general level of the soil, but not low enough to become covered by heavy rains.

If possible, the planting should be done when the soil is rather moist and the atmospheric conditions suitable to the subsistence of the

plants until the roots can again furnish sufficient moisture to supply them. The bed should be thoroly watered a few hours before the plants are removed, and a knife or trowel should be run between the plants so that they may be lifted with a clump of earth and with most of their roots attached.

Where celery is planted in single rows and mulched, it will only be necessary to maintain shallow cultivation between the rows, not allowing the cultivator teeth to come nearer the plants than the edge of the mulch. Where no mulch is used the cultivation may be carried a little closer to the plants, but should be very shallow, and at no time should deep cultivation be practiced, as the roots are to be found very near the surface of the soil. If a mulch is used no hand cultivation will be required, either along the side or between the plants in the row, except to pull any weeds that may spring up. Where no mulch is used, it will be necessary to stir the surface lightly with a wheel hoe or iron rake to prevent a crust after each rain or watering. Keep the surface of the soil smooth, and in no case allow lumps of earth to remain near the plants.

When a crop of celery is in good condition, the roots will be near the surface. During a dry season the roots will go deep into the soil to obtain moisture. This can be prevented by keeping the surface of the soil well stirred to a depth of not more than two inches, forming a sort of soil mulch, beneath which the moisture will be drawn upward by capillary attraction, and prevented from passing into the air by the presence of the loose soil on top. Under these conditions the roots will work near the moisture line, and in addition to securing the required water, they will also receive more air and will be at the point in the soil where the natural preparation of plant food is taking place most rapidly; consequently a large growth and a better quality will be produced. The effects of a drouth may, in most cases, be met by frequent shallow cultivation, supplemented by the use of water.

Methods of blanching.—The object of blanching is to secure leaf stalks free from woody strands, crisp and tender, and without the rank flavor found in those that are green. Of the cultivated plant there are two classes or varieties—the large growing or giant, and the dwarf sorts. These are again divided into those which must be blanched by excluding all the light and those which are in a measure self-blanching. Of the former, the Giant Pascal variety is a type, and of the latter the Golden Selfblanching variety is a good illustration.

Blanching is accomplished by the same general method that is employed for destroying the coloring matter in any plant tissue; that is,

by excluding the light and allowing the growth to proceed in the dark. The particular method to be adopted must be determined largely by the time the crop is to be used. If for early use or marketing, the blanching must be completed where the plants are grown; but if the celery be for winter use, the blanching may take place after the crop has been removed from the field and placed in storage. In fact, it is best to blanch as little as possible before storing when the product is to be kept until late, as the keeping qualities are better while it is unblanched. When planting for early use it is necessary to choose one of the self-blanching varieties, such as may be conveniently blanched by the use of boards or other similar means.

Use of boards for blanching.—For early blanching on a small scale, such as would be employed on the farm or in the garden of the amateur horticulturist, there are several methods. One of the most common is by means of boards placed on edge along each side of the row of celery. The boards used for blanching should be one inch thick by twelve to fourteen inches wide and twelve to sixteen feet long. In placing the boards in position, slip one edge well under the outside leaves of the plants, then bring this edge upward in a vertical position along the row, having another board at the time placed on the other side, so that when in position there will be as little space between the boards as the thickness of the plants will permit. These boards, when used on a small scale only, may be fastened in position by means of stakes driven in the ground, by nailing short pieces of laths across the top every six or eight feet, or by placing notched sticks over the tops of the boards. Any of these methods would be too inconvenient when applied on a large scale, and a far better one is that practiced by large growers, namely, that of using double hooks, or spanners, about six inches long, made of heavy galvanized wire, bent somewhat in the shape of the thumb and first finger extended. These spanners are slipped over the edges of the boards every few feet, to hold them together, and the plants are rigid enough to keep the boards in an upright position.

After the boards are in position, it is a good plan to run a celery hiller between the rows and to throw a little soil against the lower edges of the boards to close any openings that may result from the uneven surface of the soil.

Two or three weeks will be required to complete the blanching of the early varieties, and the boards must be kept in position until the crop is removed from the ground, after which they may be used again two or three times during the season. If the celery is allowed to remain in the boards too long after it has reached a marketable stage, it loses in weight and flavor and is likely to be injured or even destroyed

by the attacks of blight. This is especially true during the earlier part of the season when the weather is warm. At the end of the season the boards should be piled flat, with strips inserted at every fourth or fifth course, and the whole pile roofed over to shed off rain. Treated in this manner they will last from ten to twelve years.

Use of soil for blanching.—The most common method for blanching celery on a small scale is that of banking with soil, and it is by this means that the finest flavor can be obtained. Where the plants are set in single rows, the soil can often be partially thrown up by means of a plow, or better, by a celery hiller. There are several forms of this implement, but they all work on one principle, that of a diagonally set surface to throw up the soil. Before the plow or banking machine is used, a small quantity of dirt must be placed around the plants by hand to hold them in position while the earth is being thrown around them. This may also be accomplished by tying up the plants with paper twine. Another good method of holding up the celery while the earth is being placed around it is by temporarily setting up boards, which are removed as soon as the soil is in position.

After the crop of celery has been grown, it is not necessary to remove the entire root from the earth, but it may be cut below the surface of the soil by means of a stiff knife. If the harvesting is from the blanching boards, these should not be removed till necessary, and the celery must not be allowed to lie exposed to the sun or wind for any length of time. Care should be exercised in transferring the celery to the packing shed, where it should be washed and all soil removed from the plants. Allow it to drain well before packing. Tie up in bundles of six to twelve bunches in a package, the size of the bunch governing the bundle.

Lettuce.—This is strictly an early season crop. It is difficult to make the soil too rich. The land should be loose, sandy, but full of vegetable fiber. The seeds should be sown early, even tho there may be light frosts or even snow afterwards. Lettuce does not do well after the weather gets hot, unless grown in a half shade. It is strictly a cold season crop, hence it is not grown in Missouri during mid summer. An autumn crop may be grown when the nights begin to get cool.

Cultivate carefully during the season by stirring the soil frequently, especially while the plants are small. To be valuable, lettuce must be grown quickly. This means that all conditions must be right. It grows best when the soil is cool, moist and fertile. The soil must be made fertile by frequent manurings before growing this crop.

Peas.—Garden peas may be planted in late February or as soon thereafter as the soil can be worked. The seeds should be sown two

to three inches apart in the drill and covered two or three inches deep. The rows should be 24 to 36 inches apart to admit cultivation.

Peas do not require an especially fertile soil tho they should be given frequent and thoro cultivation. Where space is limited peas may be planted as a companion crop with potatoes or sweet corn. Four or five peas to the hill may be planted in the rows between the potatoes or sweet corn.

Irish potatoes.—Irish potatoes may be grown on many types of soil but they do best on rich, well drained, rather loose land which contains an abundance of humus. If the ground is not in the best condition, a crop of clover or cowpeas turned under before the potatoes will aid materially in making a good crop. A cropping system of corn-wheat-clover-potatoes gives excellent results in most cases and the corn does better after the potatoes than at any other place in the rotation.

Plow deep and preferably in the fall, turning under a green crop or barnyard manure. On thin soils, which need fertilizer, 125 pounds of steamed bone meal per acre may be applied in the drills at planting time. On stronger soils, especially on the new or sod land, it is doubtful if high priced fertilizers are to be recommended. As early in the spring as possible prepare the seed bed very thoroly by discing and harrowing.

Since the young plants will endure some frost, it is usually safe to plant during the last week in March, south of the Missouri River. If a planter is used, the rows may be as close as 30 inches. They may be planted by hand in furrows 4 inches deep, laid out with a plow and covered by turning the soil back into the furrow. One piece of seed having two good eyes, dropped about every 14 inches in 36 inch rows is the average distance and will require about 9 bushels of average sized potatoes per acre.

Use for seed only the average sized tubers from the best and healthiest hills and reject any that show scabby or diseased spots or that have a dark ring in the flesh near the stem end. The best practice is also before cutting to soak the seed for an hour in a solution of 1 pint of formalin to 30 gallons of water as an additional precaution against scab.

Cultivation should begin by harrowing lightly a few days after planting and continuing at frequent intervals until the plants may be seen in the row. Then use an ordinary two horse cultivator with not less than 8 shovels after each rain or often enough to prevent a crust forming and to keep a good dust mulch. A 12 spike tooth single cultivator is an excellent tool to use in holding a dust mulch after the tops

have begun to spread out. Nearly level cultivation conserves moisture better and is gaining in favor.

Since potatoes are subject to several wilts and blights besides being attacked by the potato beetle and flea beetles, some protection is usually necessary to insure the maximum crop. Experience has shown that a spray of 5 lbs. lime, 5 lbs. copper sulphate, 5 lbs. arsenate of lead paste and 50 gallons of water will control the diseases and insects very well, if applied first when the plants are about 4 inches high and thereafter at intervals of about 10 to 15 days thruout the growing season. (This is known as the arsenate-bordeaux mixture.)

The early crop is most valuable since it does not have much competition from the northern potato growing districts. The best early varieties are Early Ohio, Triumph and Irish Cobbler. Good late varieties are Rural New Yorker, Sir Walter Raleigh and Burbank.

Sweet potatoes.—Among the sweet potato varieties usually planted are Nansemond, Jersey, Cuban Queen and Vineless. Sweet potatoes are propagated by sprouts, or draws produced in hot beds, from old sweet potatoes. The hot bed should be made in early spring, and the sweet potatoes imbedded, close together in a layer and covered with 2 or 3 inches of soil. As soon as the sprouts are well up, they may be broken off close to the sweet potato, each containing a few roots near the base, and planted out. If desirable, these draws may be made into cuttings and a larger number of plants thus secured. The cuttings are made long enough to contain three buds; one bud at the base of each cutting, and two above. These cuttings may be rooted by inserting them an inch apart in rows 5 or 6 inches apart in soil or sand in the hot bed. Cuttings should be set deep enough so that the upper bud will be above the soil. Roots will quickly be produced below—especially from the vicinity of the two buds which are beneath the soil. Plants may be secured from truck gardeners and grocery stores in almost any town or village.

The land should be plowed to a good depth and thoroly harrowed and pulverized. The aim should be to give level culture. Plants may be set out any time up to June 20 in most seasons.

If possible, the time selected for setting out the plants should be when the soil is fairly moist, but not wet enough to be sticky. Plants should be set 2 feet apart in rows 4 feet apart. Many growers run a furrow with a turning plow, drop the plants in the furrow and cover the bases with the loose soil which was turned out. Other growers simply mark the rows with a marker and set the plants with a spade.

Frequent and thoro cultivation should be given. On very wet land, it may be desirable to grow the plants in ridges. Level cultiva-

tion, however, is preferable on most soils: Cultivation may continue until the vines cover the ground. In the later cultivations, growing vines will be dragged lengthwise of the rows. A little later, they will branch laterally and cover all the space between the rows and keep down weeds. The potatoes should be dug just before frost. If a frost accidentally catches the vines the potatoes should be dug as soon as possible.

Sweet potatoes are among the most difficult root crops to store successfully. The most important factors necessary for successful storage are: never bruise the sweet potatoes; keep them dry, and prevent extremes of heat or cold. Since bruises induce rot, the sweet potato should be handled with great care in harvesting. The sweet potato should be allowed to dry thoroly after digging. For that reason, it is well to dig in the forenoon of a sunny day and pick them in the afternoon after their surfaces have dried. If the weather is very wet, it becomes desirable to dry them under shelter.

Rhubarb.—Rhubarb plants for setting are usually obtained by dividing the roots of older plants that are known to produce strong leaf stems. Rhubarb may be grown from seed but the seedling plants vary much in size, vigor and productiveness. If started from seed only the strongest seedling plants should be set in the permanent plantation. These plants may be divided from time to time to increase the area.

The plants should be set 2 feet apart in rows 3 feet apart. They should be given frequent and thoro cultivation and manured as previously recommended for asparagus. Seed stems should be removed as they appear because seed production weakens the plants.

Tomatoes.—Tomato seeds should be started in a hot bed about the first of March. As the plants begin making the third leaf they should be transplanted so as to stand 2 or 3 inches apart each way. This will enable them to develop well until ready to set in the garden about the first of May. The plants should be hardened off by giving them more and more exposure and by watering only enough to keep them from wilting for a week or two before they are planted in open ground.

If tomatoes are to be trained on stakes in a small garden, they should be planted 3 feet apart each way. A stake 6 or 7 feet long should be set, upright, by each plant. As the tomato plants lengthen they should be tied to the stakes for support and all side branches should be pinched off.

In larger areas, where stakes or supports are not used the plants may be set 2 feet apart in rows 3 feet apart and the plants allowed to

grow at will. Tomatoes should be given good cultivation. Beans or peas may be grown between the tomatoes, if desired.

Turnips.—For winter supply, the turnip is one of the cheapest and easiest garden crops to grow.

The seed should be planted about the last week in July. The soil should be prepared beforehand by plowing and harrowing thoroly enough to get a fine seedbed and to retain moisture in the soil. Turnips may follow some early garden crop like radishes, early lettuce or spinach. They may follow early potatoes advantageously.

The seed should be sown thinly, broadcast, after lightly harrowing or raking the soil so the seeds will fall slightly into the loose soil cavities. It is not necessary to cover the seed as they will be beaten into the soil by the first shower. Turnips sown in late July begin to thicken their roots upon approach of cool weather in autumn and make quick, succulent growth of small sweet roots. The tops are not easily injured by light frosts so they should be allowed to stand in the field until somewhat heavy frosts are likely to occur. The turnips should then be pulled and the tops trimmed off close and the turnips pitted and covered for winter.