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The Vegetable Garden

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By JOHN S. GARDNER

The purpose of a vegetable garden is to provide an ample supply of fresh vegetables for the family thruout the growing season, and a surplus for canning or storing thru the remainder of the year.

THE PLAN

The way to start a garden is to make a plan. This is especially desirable for small gardens, but any garden is more satisfactory if the details are worked out before the planting time.

Planning is begun by measuring the garden and making a plat of it on paper. The plat should show any differences in slope or nearness to trees, or other conditions that might affect the vegetables in any way. This information will help in placing the various crops properly.

Next, the family's tastes should be consulted as to what vegetables should be included, but the better known vegetables should form the basis for the garden. However, there should be included some of the more unusual crops, to assure variety. It is wise, too, to try to estimate the number of servings of vegetables to be made, in order to proportion the plantings of each.

Assuming that the garden is of average fertility and that the family consists of five persons for whom a serving would be the equivalent of a quart of canned vegetables the following table will serve as a guide.

TABLE 1. PLANTINGS FOR FIVE PERSONS

Vegetable	Garden Space	Servings
Beans	30 feet	10–12
Tomatoes	20 plants	50
Cabbage	20 heads	20
Beets	50 feet	30
Carrots	50 feet	30
Parsnips	75 feet	50–60
Corn	100 hills	25

If beans are to be served five times a week for example, 30-foot plantings should be made every two weeks between April 15 and August 1. From such plantings, surpluses for canning will occur from time to time, but additional plantings may be required to furnish a sufficient quantity for this purpose.

Tomatoes, likewise, may be served fresh five times a week for ten weeks, which is the average harvest season for a planting of tomatoes. A second planting about the middle of June will assure a supply of tomatoes for the table during the remainder of the season, and for canning. The quantities of the other vegetables in the list may be computed in the same way.

COMPANION AND SUCCESSION CROPPING

It must not be supposed that the total amount of the vegetables determined from Table 1 is to occupy the garden at one time, but advantage should be taken of space secured thru the removal of early rows, for making later plantings.

The table that follows gives the length of time the more usual vegetables occupy the garden:

TABLE 2. LENGTH OF TIME THAT THE GROUND IS OCCUPIED

Beans	50– 70 days
Beets	30– 60 days
Carrots	50– 70 days
Peas	40– 60 days
Tomatoes	about 80 days
Peppers	all season
Early cabbage	90–120 days
Early potatoes	120–150 days
Corn	50– 60 days
Radishes	25– 40 days
Lettuce	30– 40 days
Early greens	40– 50 days
Parsnips	all season
Late greens	from August 1 on

Since our average gardening season in Kentucky begins April 1 and ends October 1, that is, lasts 180 days, it is seen that:

Late beans may follow early beans, early peas, and even sweet corn.

Late beets and carrots may follow early beans or early peas.

Late greens (not of the cabbage family) may follow early cabbage.

Late greens belonging to the cabbage family may follow early potatoes.

Besides these, a number of other "succession" schemes may be used, depending on the resourcefulness of the gardener

Another way to utilize garden space intensively is to plant small early maturing vegetables near those which are larger and slower in maturing. The first are harvested and the second allowed to occupy the whole area. Examples are placing rows of lettuce, spinach or even green onions between those of cabbage. Tomatoes may be set in rows of peas; so may peppers. If radish seed and parsnip seed are sown mixed together, a full crop of radishes may be harvested without injuring the parsnips. Salsify, or oyster plant, lends itself to the same arrangements.

Place all permanent crops, as rhubarb, asparagus, horseradish, grapes and berries to one side of the garden, to avoid interfering with the plowing. The same applies to parsnips, winter and spring greens, and salsify, which may be left during the winter in the rows where they grew. The perennials should be located in ground that drains freely, even in wet winter weather.

SOIL MANAGEMENT

The planning done, the next consideration is the soil and its condition. Altho a sandy loam is ideal, it is not essential, for even an undesirably tight clay may be transformed into a good garden. Location rather than soil conditions govern the choice of a garden plot.

Most garden vegetables are prized because of their succulence, and this depends on quick growth. Quick growth is secured thru an ample supply of moisture and readily available plant-food. To enable soil to hold moisture, it must be well filled with "humus," or rotted vegetable matter. This may come from straw, manure, a "green manure" crop of rye from vegetable tops or even from weeds. The best of these is barnyard manure, for it contains plant-food, and rots quickly.

Excellent as manure is, it is not balanced in its plant-food elements, nitrogen, phosphorus and potassium in the proportion most vegetables need. Fresh manure because of its high nitrogen content, is a valuable fertilizer for such leaf crops as greens, cabbage or onions, but for the fruit and seed crops, it should be supplemented by phosphate fertilizers.

It is difficult to give specific directions for fertilizing gardens in all parts of Kentucky, but here are a few general suggestions.

Plow under a two-inch coat of manure, follow with a disk, then broadcast superphosphate at the rate of a 125-pound bag on a space 100 feet square, if 16% superphosphate is used, or 112 feet square if the 20% superphosphate is used. Soil so fertilized will grow excellent tomatoes, peas, beans, squash, and sweet corn. The rows of cabbage, greens, and onions should be side-dressed with nitrate of soda, at the rate of one pound to

100 feet; two dressings should be made, the first, a month after sowing or setting, and the second, from two to four weeks later.

If manure is hard to get, the humus must be obtained from some other source. If sufficient space is available for a double garden, one-half may "rest" in grass in alternate years, or better still, one-half may be sown in a crop of Japanese clover, soybeans or cowpeas. This will provide green matter to turn under. Since it is not always possible to spare the space for a double garden, some green matter for turning under may be provided by sowing a winter cover crop. Manure crops of this class are rye, hairy vetch, fall greens and oats.

Rye may be sown thru September and October, but does not make much growth to turn under until late spring. For this reason, rye should be used in the parts of the garden which may be broken in late April or May. The rate of sowing is two pecks to a space 100 feet square.

Hairy vetch should be sown in August so that it may become established before the fall frosts come. Vetch is particularly valuable as it furnishes nitrogen in addition to humus. Since vetch makes its most rapid growth in the spring, it is useful for the "late" garden. The sowing rate is one-half peck to 100 feet square.

The fall greens are more important as a cover crop than is generally recognized. The ease with which they can be sown makes them desirable particularly in the small handworked garden. It is an excellent plan to begin sowing vacated portions or rows of the garden from August 1 on, to assure a plentiful table supply of greens, and surplus organic matter to turn under. Seven top turnips and hardy kale are best. The sowing rate is one pound to 100 feet square.

Fall-sown spring oats fit well into the plans of a gardener who has a small area. If sown as space becomes available, from August 1 to September 15, they sometimes make as much as 15 inches of growth before the frost kills them. They keep down crab grass and foxtail, and furnish a winter cover for the soil which helps to prevent soil washing. The sowing rate is two pecks per 100 feet square.

When the humus is to be furnished thru green "manure" crops, the plant food should be supplied by means of a complete fertilizer; usually a 3-8-6 mixture will be found satisfactory. The rate of application should be two 125-pound bags to 100 feet square of garden, and the manner of application the same as for superphosphate, described in the foregoing.

SEED

The use of good seed is an important part of satisfactory gardening. Too often, buying seed is put off until they are needed, and then there is no opportunity for selecting the variety and quality of seed desired. It is here that planning helps, for a gardener who has prepared his plan is in a position to buy the kind of seed he desires to plant. No better advice can be given than to deal only with firms whose seed has proved satisfactory. Price is not always a guaranty of quality, but it is generally a good indication. The seed law requires that each packet of garden seeds offered for sale in the state shall be plainly marked with the approximate percentage of germination and the year in which the packet was filled. The buyer should look for this information and be guided accordingly.

In selecting varieties it is usually safer to depend upon the older sorts which have been found satisfactory. On the other hand, novelties and "special" varieties should not be discriminated against, for some of them have real merit. They should be chosen with caution, however, and preferably only when they are offered by more than one seedsman, or by the same seedsman for two years at least.

SEEDBEDS

Many gardens are unsatisfactory because of poor seedbed preparation. Sometimes breaking is done when the soil is too wet; and, sometimes, too dry. Frequently, the operations that should follow breaking are neglected or hurriedly done, and a cloddy seedbed may result.

No set rules can be given for making an ideal seedbed, but the specifications for a good one can be laid down. They are, that the soil particles should be as fine as the seed to be sown.

for a depth of a least two inches below the seed, or, better still, to the depth of the plowed soil.

The general rules for preparing a seedbed start with breaking the soil as deep as possible, turning the manure under. Next, should follow a thoro disking, to cut the furrow slices fine. Then, the commercial fertilizer should be broadcast and worked in, by smoothing the seedbed with an A-harrow or a plank drag, or, better, with both.

The depth of seed sowing is determined by the size of the seed; the larger the seed, the deeper it may be sown. It has been determined by experiment that the proper depth is eight times the thickness of the seed.

CULTIVATION

Cultivation should always be level. This is true even for the earliest "cool" vegetables, but much more so for those whose growing season extends into the dry weather of the summer. Altho drawing a ridge to the row may be of benefit in an extremely wet season, it places a hardship on the vegetable roots later on by dropping the soil moisture level below them.

Cultivation should, likewise, always be shallow, or, if deep stirring must be done to loosen middles that have become beaten down, it is important to stay beyond the reach of any roots. Generally speaking, a depth of working no greater than one-half inch will suffice for uprooting the small weeds that may have started and to leave a broken surface that can absorb even any light rain that falls.

THE CROPS

The vegetables will be discussed in the approximate order they are planted in the garden. Those which have similar cultural requirements may be grouped as follows:

Group 1. The Perennials (page 10). Asparagus Rhubarb.

Group 2. The "cool" sown crops (page 12). Peas.

Group 3. The "cool" transplanted crops (page 13). Cabbage, Cauliflower, Celery.

Group 4. Greens and salads (page 16). Foliage Turnips, Spinach, Kale, Rape, Lettuce, Swiss Chard, Cos.

Group 5. The root vegetables (page 18). Parsnips, Salsify, Turnips, Radishes, Beets, Carrots.

Group 6. The "warm" sown crops (page 19). Beans, Okra, Sweet Corn.

Group 7. The "warm" transplanted crops (page 22). Tomatoes, Peppers, Eggplant.

Group 8. The onions (page 24).

Group 9. The "melon" crops (page 26). Squash, Watermelons, Cucumbers, Cantaloupes.

GROUP 1. THE PERENNIALS

	Variety	Spacing
Asparagus	Washington	Rows 4 feet; 3 feet in row
Rhubarb	Victoria	3 feet square

The perennials should be placed at the edge of the garden to avoid interference with plowing. They should be set in a location where drainage is good, even in the Winter. Since they occupy the ground for a long time it is important that the soil should be well prepared and well enriched before they are set. The seedbed should be deep, particularly for asparagus; 10 inches or even 12 inches is recommended. For rhubarb 8 inches is sufficient. A plentiful supply of humus is important. This is best assured by spading in or plowing in a generous quantity of stable manure, altho any rotted vegetable matter will serve. To supplement the plant-food in the manure it is well to work in bone meal or a high-grade complete fertilizer at the rate of 10 pounds to 200 square feet of space.

Setting. The setting time for both rhubarb and asparagus is as early in the spring as the ground can be prepared.

Asparagus crowns should be set in a trench eight to ten inches deep, and barely covered. The rest of the soil should be drawn into the trench, an inch or so at a time until the surface is level. Rhubarb roots, on the other hand, should be set shallow, with the pink buds barely showing.

Fertilizing. Both asparagus and rhubarb need annual manuring to keep them productive, but differ in the time of application. Rhubarb should be manured always in the spring, before growth begins; asparagus likewise, for the first three years after setting and before the plants are mature enough for cutting. After asparagus plantings are old enough to be harvested manure should be applied at the close of each cutting season and spaded or disked in.

Cultivation. After the manure has been worked in, rhubarb should receive light cultivation adequate to keeping down the weeds, and the ground should be left level. For asparagus, the first working in the spring should be deep enough to break up the packed soil, so that the tender shoots may readily break thru. The surface should be left level if "green" asparagus is desired, but if "white" asparagus is sought, a ridge should be thrown over the row, by plowing two furrows together with a turning plow. This ridge may need rebuilding from time to time. As with rhubarb only shallow, level working of the soil to uproot the weeds as they start, is needed.

Harvesting. Cutting asparagus may begin in the third year after setting, but should not be continued longer than four weeks. Thereafter harvesting or cutting should be continued no longer than six weeks, for the plants need the rest of the summer to replace plant food reserves in the crowns. A well cared for asparagus planting will be productive for 20 years or longer.

Rhubarb pulling may begin in the second year. A safe rule is to take no more than two-thirds of the leaves large enough to remove, at any one pulling. Following this rule pulling may continue all summer. It is a good practice to cut off the flower stalks, as soon as they appear. The profitable life of a planting of rhubarb is only 4 years from setting, after which it is best to lift the roots, divide them, and reset.

Pests. Rust is the most harmful disease that attacks asparagus. Altho it may be controlled by spraying with Bordeaux mixture (u. 15), the best practice is to grow the rust-resistant strain of asparagus, called "Washington".

The asparagus beetle is sometimes an annoying pest. Commercial growers have found that this insect may be controlled by letting a small flock of chickens range over the asparagus planting. This is not practicable in a general garden, but insecticides may be applied if the beetle becomes too injurious. During the cutting season, pyrethrum or hellebroe (p. 13) should be used because they are insecticides non-poisonous to man. After cutting season is past, arsenical dusts or sprays (p. 15) are recommended.

Rhubarb is seldom attacked by insects but is subject to a leaf-spot disease which sometimes destroys planting in a year or two. This disease cannot be wholly remedied, but partial control is possible by spraying with 4-4-50 Bordeaux mixture. The first spraying should be given just as the buds start, and the second and third, and even a fourth, at two weeks' intervals thereafter.

GROUP 2. THE "COOL" SOWN CROPS

Variety		Spacing Between Rows	Seed to 100 Ft.
Peas	Alaska	30 inches	1 pound
	Little Marvel	30 inches	
	Blue Bantam	30 inches	
	Gradus	36 inches	
	Telephone	36 inches	

The correct sowing time for peas is from February 15 to April 1; however, for sowing before March 15, only the smooth-seeded sorts, like Alaska should be used. The seed for the earlier plantings should be sown about one inch deep, but for later planting if the soil has dried out somewhat, it is advantageous to make the seed furrow as deep as 4 inches, and to cover the seed only an inch. The balance of the soil should be drawn to the row during cultivation. Peas sown in this manner will continue bearing farther into warm weather. A good practice is to sow these in two rows 6 inches apart. The smaller bush sorts will support each other, and for the taller sorts only one

line of poultry wire or brush set between the rows will support both.

Cultivation. Except for the earliest plantings and in wet gardens, cultivation should be level.

Pests. Peas are attacked by only one insect of any importance, the plant louse. This insect may be controlled by tobacco extract in spray or dust form, or by any of the several recently introduced compounds of pyrethrum. Altho a tobacco spray may be prepared at home, by soaking trash tobacco in water, it is better to use a commercial tobacco extract which has a definite strength. The 40 percent nicotine solutions are recommended*. Directions for using are found on the container. Two percent nicontine dust is the material to use if dusting is preferred. This is obtainable of the manufacturers of nicotine solution.

GROUP 3. THE "COOL" TRANSPLANTED CROPS

Crop	Variety	Spacing Between Rows	Spacing in Rows
Cabbage	Jersey Wakefield	2 feet	15 inches
	Charleston Wakefield	2½ feet	18 inches
	Copenhagen Market	2½ feet	18 inches
	Flat Dutch	3 feet	24 inches
	Drumhead	3 feet	24 inches
Cauliflower	Snowball	2½ feet	18 inches
Celery	Golden Self Blanching	2½ feet	6 inches
	Giant Pascal	3½ feet	6 inches

Early cabbage plants should bet set in the spring as soon as the ground can be prepared. The plants should be 6 to 8 weeks old at setting time.

The gardener may raise his own plants in a hotbed (see Kentucky Extension Circular No. 120) or he may purchase the so-called "frost proof" plants from southern states. These

*Sold under different trade names, such as "Black Leaf 40," "Hall's 40-percent Nicotine Sulfate," "Doch's 40-percent Nicotine Sulfate," and others.

plants are called "frost proof" because they are grown in the field and have become "frost-hardy." Before he purchases "frost proof" plants, however, the gardener should assure himself that they are free of the Clubroot and Black Rot, for these diseases may be introduced into a garden by the use of infected plants. Also "frost proof" plants should be examined carefully for plant lice. If any lice are found, the plants should be dipped in a solution of nicotine sulfate prepared according to the instructions on the container.

For the late crop, the plants are set toward the end of June. Plants may be started in a seed bed four to six weeks prior to setting time, or 2 or 3 seeds may be planted at each place where a head is to stand, and the seedlings thinned to one.

Cauliflower does best in Kentucky as a spring crop. It is handled exactly like cabbage, except that it is advisable to set it a week or so later. Cauliflower requires special treatment while the head is forming. As soon as the "flower" head appears, four or five of the lower leaves of the plant should be lapped over it and fastened with soft twine or with a toothpick. This protection serves to keep the cauliflower white and tender.

Both cabbage and cauliflower respond to fertilizing in addition to the general fertilizer suggested (p. 6). Sidedressing with chicken manure at the rate of a bushel to 200 heads, is recommended or, better still, with nitrate of soda, at the rate of one pound to 100 feet of row.

Celery is handled in the same manner as cabbage, except that when the plants are about half grown, the leaves should be gathered together so they stand upright, and held so by firming a low ridge of earth against them. Usually this is done about 8 weeks after setting. Three or four weeks later, the summer and early fall varieties should be blanched by excluding light from the bases of the stalks, with boards or paper. Winter varieties, such as Giant Pascal, usually are blanched with a bank of earth. Blanching causes the green coloring matter of the stems to fade out and induces heart growth. The sharp flavor of green celery is toned down, as well.

Pests. The cabbage worm is the most serious pest on cabbage and cauliflower, but it is effectively controlled by using arsenicals. The best method is dusting, altho a spray applied as a mist fine enough to stick may be used.

The dust is:

1 pound of calcium arsenate,
6 pounds of fine lime.

The spray is:

1 tablespoonful of lead arsenate,
1 gallon of water.

Two diseases trouble these crops. They are Black Rot and "yellows". Those who grow their own plants may insure themselves against the Black Rot by treating the seed. The procedure is as follows:

1. Dissolve one 7½ grain tablet of bichloride of mercury in one pint of water. (This solution corrodes metal; only wooden or crockeryware containers should be used.) Bichloride is a deadly poison, but does not burn the hands.
2. Put the seed into a cloth bag, and wet thoroly.
3. Dip in the solution for 30 minutes.
4. Wash in five changes of water and spread to dry quickly, but not in the sun.

The "yellows" is a disease that infects the soil of a seedbed or a field which has been used too often for cabbage. No treatment is effective, but varieties resistant to the disease should be used. These are Iacope, Marion Market and Hollander, in the order of their season.

Celery sometimes is attacked by foliage-eating insects; the control is poisoning as suggested for cabbage.

A serious disease of celery is leaf-spot, which causes spotting at first but, later, the yellowing and rotting of the entire plant. Its control is to spray with Bordeaux mixture. Bordeaux may be home-mixed, but it is more convenient to use the ready-prepared form obtainable from all druggists and seedsmen. Full directions for use are given on the container. If the gardener wishes, he may apply Bordeaux mixture in dust form. The material to use is "Copper-lime

Dust,'' obtainable from most seedsmen or druggists. Whichever form of Bordeaux is used, three to five applications should be made, the first just after setting, and the others from ten-day to two-week intervals.

GROUP 4. GREENS AND SALADS

A. The "Cool" Greens and Salads:

Crop	Variety	Spacing Between Rows	Seed to 100 Ft.
Turnip	Seven Top	15 or 30 ins.	½ ounce
	Japanese	15 or 30 ins.	½ ounce
Spinach	King of Denmark	15 or 30 ins.	1 ounce
Kale	Siberian	15 or 30 ins.	½ ounce
Rape	Dwarf Essex	15 or 30 ins.	½ ounce
Endive	White Curled	15 or 30 ins.	(see p. 17)
Lettuce	Grand Rapids	15 or 30 ins.	1 ounce
	Hanson (heading)	15 or 30 ins.	1 oz. (see p. 17)
	Wonderful (heading)	15 or 30 ins.	1 oz. (see p. 17)
Chinese Cabbage	Wong Bok	15 or 30 ins.	(see p. 17)
	Pe Tsai	15 or 30 ins.	(see p. 17)

B. The "Warm" Greens and Salads:

Spinach	Prickly seeded summer	15 or 30 ins.	1 ounce
	New Zealand	15 or 30 ins.	(see p. 17)
Kale	Scotch Curled	15 or 30 ins.	½ ounce
Swiss Chard	Lucullus	15 or 30 ins.	2 ounces
Cos Lettuce	White Trianon	15 or 30 ins.	(see p. 17)

The ''cool'' greens are so called because they are suited to quite severe weather in the spring or in the fall. The spring crop should be sown as early as the ground can be prepared, and that for use in the fall or in the spring following, during August and September.

Because the ''warm'' greens are not frost-hardy, they should not be sown until after the ground is warm. The only exception is Swiss chard, which can survive mild frosts, and so may be sown as early as April 15, even in the northern parts of the state.

Fertilizing. All the greens and salads need nitrogen in addition to that furnished by the general fertilizing suggested on page 6. Side dressings with chicken manure or with nitrate of soda, as suggested for Group 3 (p. 4), are worth while.

General Culture. When the seed for spinach, mustard and kindred greens are sown at the rates just given the stand will be found to be satisfactory, but it is sometimes advisable to thin the seedlings to one inch. For Swiss chard, New Zealand spinach, Chinese cabbage, endive and lettuce, special procedure should be followed.

Swiss chard should be thinned to a stand of 10 inches or one foot. Greens may be gathered thru the summer by taking only the outer leaves, and leaving the central bud intact.

The seed for New Zealand spinach may be sown in the same manner as for late cabbage (p. 14). The spacing for the plants should be no closer than two feet, in rows three feet apart. New Zealand spinach is harvested by pinching off the clusters of leaves at the ends of the branches. The plants will continue branching all summer, making the supply of greens a continuous one.

Chinese cabbage and endive may be sown in continuous drills and thinned to the proper stand, or the plants may be grown in a bed and set, in the same manner as late cabbage (page 14). The final stand of either should be ten inches or one foot. Chinese cabbage forms its head of itself, but endive needs special treatment to blanch it. Two weeks before endive is to be harvested, the plants must be tied up loosely with soft twine, so as to shade the heart and to induce center growth. This should not be done too far ahead of harvest or rotting may result.

Lettuce may be sown in continuous drills, or it may be thinned to a stand of six inches for the leaf sorts or ten to twelve inches for the heading varieties.

Pests. A variety of chewing insects injure the greens and salads, but not often seriously. If it becomes necessary to control them and the plants are small, the same recommendations as for cabbage (page 15) are applicable. If harvest is close at

hand it is suggested that non-poisonous pyrethrum sprays be used instead of arsenicals.

Occasionally plant lice are troublesome. Their control is given on page 13.

The summer-sown greens and salads are sometimes attacked by Black Flea-Beetles. These beetles riddle the foliage with holes, sometimes wholly destroying the plants. They are controlled by spraying with Bordeaux mixture (see page 15), to which should be added arsenate of lead, at the rate of one tablespoonful to one gallen of spray.

To make insect control easier, row-sowing of all greens is suggested, rather than broadcasting.

GROUP 5. THE ROOT VEGETABLES

Crop	Variety	Spacing Between Rows	Seed to 100 Ft.
Parsnips	Guernsey	30 ins.	1 ounce
Salsify	Sandwich Island	24 or 30 ins.	1 ounce
Radish	Scarlet Turnip White Tip Icicle French Breakfast Chinese Winter	12 or 24 ins.	1 ounce
Turnip	Purple Top Strapleaved Purple Top Globe	15 or 30 ins.	½ ounce
Beet	Crosby's Egyptian Detroit Dark Red	15 or 30 ins.	2 ounces
Carrot	Chantenay	15 or 30 ins.	1 ounce

With the exception of parsnips and salsify, which should be sown as early in the spring as the soil will permit, and which occupy the ground the summer long, the root crops fall into two plantings, early and late. The early crop should be sown as soon as the soil can be prepared, and the late crop between June 15 and July 15, except radishes and turnips, which may be sown as late as September 15 to October 1.

The root crops do not require "rich" ground in the sense that cabbage does, but they must be well supplied with humus to hold an abundance of moisture and to make shapely roots.

The general manuring recommended previously (p. 6) will suffice.

Pests. Root vegetables are remarkably free from insect attack, except the radishes and turnips, which sometimes suffer because of the plant lice (see p. 13), and the Black Flea-Beetle (see p. 18).

The diseases that are sometimes troublesome are salsify blight and cabbage Black Rot, the latter disease also attacks turnips and radishes. For salsify blight control, Bordeaux mixture (p. 15) should be used, and crop rotation should be practist for the Black Rot of turnips and radishes.

GROUP 6. THE "WARM" SOWN CROPS

Crop	Variety	Spacing Between Rows	Seed to 100 Feet
Lima Beans	King of the Garden (Pole)	Hills 36 inches each way	1 quart
	Fordhook (Bush)	30 and 36 inches	1½ pints
	Henderson (Bush)	30 and 36 inches	1½ pints
Snap Beans	Red Valentine	30 and 36 inches	1 quart
	Stringless Greenpod	30 and 36 inches	1 quart
	Full Measure	30 and 36 inches	1 quart
	Kentucky Wonder, (Pole)	Hills 36 inches each way	1 pint
	Kentucky Wonder, Wax (Pole)	"	1 pint
Okra	White Velvet	(See text)	
	Green Velvet	"	
Sweet Corn	Extra Early Adams	Hills 30 inches each way, or rows 30 inches apart, 10 inches in row	
	Whipple's Yellow	"	
	Whipple's Early	"	
	Howling Mob	Hills 30 inches each way, or rows 36 inches, 12 ins. in row	
	Country Gentleman	"	
	Stowell's Evergreen	"	
	Hickory King	"	

The first planting of beans (except Limas) and that of the first group of corn varieties should be made as soon as danger of frost is past. Since Lima beans are somewhat tender their planting time should be delayed until the ground is warm.

Later plantings of beans should be made so that a continuous supply of fresh beans may be had until frost. The plantings made in June and July should be doubled to assure a canning surplus.

The corn varieties in the second part of the list require a season longer than those in the first. These should be planted with the first group to maintain the supply after the early corn is gone. In a good season the early corn may be put into corn again. If early varieties are used for these plantings, sweet corn will furnish a supply until killing frosts come.

Altho okra plants may be started in hotbeds in the same manner as tomato plants, and at the same season, the usual custom is to sow the seed in the open garden. It is best to wait until the ground is warm, for okra seed rots easily. In order to assure a stand, two seeds should be dropped at a place. The rows should be thirty inches apart in hand-worked gardens or if horse-drawn cultivation is to be followed, thirty-six inches. The spacing in the rows should be from eighteen to twenty-four inches. Since all the vegetables in this group are "fruit" or "seed" vegetables, their main fertility requirement is phosphorus. Altho the general fertilizing recommended (p. 6) will give good results, it is advantageous to double the amount of superphosphate in the manure-superphosphate combination of that recommendation. If a complete fertilizer is to be used it is suggested that it be of 4-12-4 analysis.

Bean Pests. Early beans are sometimes infested with the spotted cucumber beetle and the Southern bean beetle. Usually these insects do little damage, but if the damage becomes serious, as in a cool season when growth is slow, arsenical sprays or dusts should be used.

Because of the tenderness of bean foliage, the following materials are suggested:

Spray: Magnesium arsenate, 1 tablespoonful; water, 1 gallon.

Dust: Magnesium arsenate, 1 pound; fine lime, 6 pounds.

Or: Calcium arsenate, 1 pound; dusting sulphur, 1 pound; fine lime, 4 pounds.

Ordinary spraying or dusting methods will suffice, for both these insects feed on the upper surfaces of the leaves.

A more serious pest than either of those just named is the Mexican Bean Beetle, for its habit is to feed on the undersides of the leaves. Furthermore, it remains on the beans thruout the season. Since it is a chewing insect, the same dust and spray mixtures just recommended are effective against it, but the dusters or the sprayers must have upturned nozzles to put the material where the insects feed. Because this insect feeds so voraciously both in the larval and adult stages, it is highly important to spray or dust as soon as the first sign of injury is seen.

The most important disease of beans is anthracnose (called "blight") which causes the spotting of the leaves and pods. The leaves ultimately dry up and drop off and this reduces the yield. Sometimes the pods are affected, and this results in complete loss of the crop. The control is to apply Bordeaux mixture (see p. 15). Blight is most severe in a wet, cool season, but in any season it is well to watch carefully for the first sign of spotting on the lower leaves, and to spray immediately to prevent the spread of the trouble. A second application should follow two weeks later.

Okra Pests. Okra is rarely attacked by insects, and then only those of the leaf eating class. Their control is to apply an arsenical dust or spray, as given on page 15.

Occasionally, the leaves become spotted and drop off because of blight. The control is to apply Bordeaux mixture (p. 15) as soon as the damage starts. One application may suffice, but it is well to spray again after two weeks.

Corn Pests. Some insects that attack corn are the corn ear worm and the corn root louse. The corn ear worm feeds on the silks and on the ear itself, sometimes merely preventing the filling out of the kernels, and sometimes destroying the corn after the ears have filled. Since the corn ear worm usually

enters the shuck by way of the silks, some measure of control may be had by poison dust applied to the silks when, or soon after, they appear. The dust may be made as follows:

Arsenate of lead, 1 part, by weight; fine lime, 3 parts.

Short-shucked varieties (Country Gentleman, for example) are most severely attacked; Howling Mob is somewhat free from damage, because of its longer shucks.

The corn root-louse occasionally causes slowness of growth and general unthriftiness in corn by drawing the sap from the roots. There is no direct control for this insect but an indirect way to curb it is to destroy the ants which have placed the lice on the corn roots. The anthills may be destroyed by fumigation with carbon disulfide. The procedure is to punch a one-inch stick as far into the hill as possible, and into the hole thus made pour a tablespoonful of the disulfide. The hole should then be plugged with a handful of earth. The ant colony is thus "gassed."

GROUP 7. THE "WARM" TRANSPLANTED CROPS

Crop	Variety	Spacing Between Rows	Spacing
Tomato	Earliana	36 inches	36 inches
	Break O'Day	36 inches	36 inches
	Bonny Best	48 inches	36 inches
	Greater Baltimore	48 inches	48 inches
	Marglobe	48 inches	48 inches
	Ponderosa	60 inches	48 inches
	Norton	48 inches	48 inches
Pepper	Ruby Giant	36 inches	24 inches
	Pimento	36 inches	24 inches
	Cayenne	36 inches	24 inches
Eggplant	Black Beauty	36 inches	30 inches
	New York	36 inches	30 inches

The seed for this group should be started in hotbeds (see Kentucky Ext. Circular 120), in February or March. The plants should be transplanted once or twice into individual pots or into the bed direct, to stand finally four inches apart each

way. When all danger of frost is past they may be set in the open garden.

All these are "fruit" crops, and the general fertilizing recommended (p. 6) is well suited.

In gardens where economy of space is desired, it it advisable to stake tomato plants and to prune them to one or two stems. This is an aid to earliness and to fruit size, as well. By pruning is meant the removal of the suckers in the axils of the leaves, as soon as they appear. Thus branching is prevented, and the energy of the plant is thrown into the development of the main stems. It is advisable to set the stakes at the time the plants are set. As the plants grow they should be tied to the stake with loose loops of soft cord placed under each alternate fruit cluster.

Setting the plants should be done while the ground is somewhat moist. If dry weather prevails, an excellent precaution is pouring water into the hole, but never on top of the soil.

Pests. Peppers are rarely, if ever, visited by insects, but tomatoes and eggplants are frequently injured by several kinds of leaf-eating beetles chief among which is the Black Flea-Beetle. The control for the flea-beetle is Bordeaux mixture to which arsenate has been added (p. 15).

The fruitworm is sometimes troublesome to tomatoes. It bores holes in the fruit, rendering it worthless. There is no means of control for them. The tobacco hornworm may be controlled by spraying with an arsenical or by hand picking.

Tomatoes and eggplants are subject to blight, which destroys the foliage and reduces the yield. An indirect damage to tomatoes is sunscalding of the fruit. The control for blight is Bordeaux mixture (see p. 15). From four to six sprayings are suggested, the first while the plants are still in the bed, and the others at 10-day to two-weeks' intervals, depending on rapidity of plant growth.

Another disease that attacks tomatoes is "wilt". It occurs principally in gardens where tomatoes have been grown for a long time, or where rotation has not been practist. It is a soil disease and spraying or other plant treatment is ineffective

against it. The "control" is to use wilt-resistant varieties, such as Break O'Day, Marglobe, and Norton, listed in their order of earliness.

GROUP 8. ONIONS

There are five kinds of onion culture. Onions may be raised from seed sown in the rows; from slips raised in a seed-bed and set in the row; from "sets" or bulblets raised the year previously; from "top sets" of the hardy "multipliers", and from "bottom sets" or divided bulbs of the so-called "potato" onion.

Danvers Globe, red, yellow and white, and Red Wethersfield are the varieties raised from seed. The distance between rows should be from ten to fifteen inches in a garden worked by hand, and from eighteen to thirty inches, when cultivation is done by horsedrawn tools. The seed should be sown as early as the ground can be prepared. One-half ounce will sow 100 feet of row.

Bermuda, Giant Silverskin and Prizetaker are the varieties raised from slips. They may be of the gardener's own growing, but usually it is more convenient to purchase them. The width of the row should be the same as for onions raised from seed, and the spacing in the row should be from three to five inches. The slips should be set slightly deeper than they were in the seedling bed. The time for setting is the same as for sowing onions raised from seed.

The onions raised from sets are usually of the Southport variety. The row-width should be the same as for other onions, and the "sets" should be spaced from 1½ inches to 3 inches, depending on whether they are to be used as "bunch" onions or as fully ripe. There is considerable latitude in the setting time of this type of onion. They may be set in the fall under a ridge, and the ridge removed in late February or in March; then a very early crop of "green" onions will result. If the maximum yield is desired, however, spring setting is better and should be done as soon as soil conditions will permit.

The "topset" onions are raised from the sets that form in the blossom cluster of the "multiplier" variety. They are

handled exactly like the ordinary "set" onions, but the spacing in the row should be wider; three inches is suggested. The setting time is in August or early September.

Under "potato onions" are included several sorts whose varietal names have been forgotten, but they are alike in that the bulbs split into "bottom" sets in the second year. These must be set in August or September to make green onions in the spring following, or large onions that fall. They should be spaced the same as "topset" onions.

Onions need fertile ground. It is advisable to supplement the general fertilizer recommendation (p. 6) with nitrate of soda or with chicken manure (p. 14). The soil should be well filled with humus (see p. 7).

Pests. The principal insect pest of onions is the thrip, a minute sucking insect that punctures the skin of the onion "leaves" giving them a grayish appearance, which is often mistaken for mildew. The usual control for sucking insects is tobacco (p. 13), but it is difficult to hit this pest with a spray. Best results are obtained by spraying or dusting the plants in the morning or in the evening, for during midday, the insect takes refuge in the axils of the leaves where spray cannot be driven.

The most common onion disease is the Smut which disfigures the bulbs and reduces the yield. There is no control for it except to treat the seed with formaldehyde, and this is practicable only with special equipment such as commercial onion growers and onion set growers use. It consists of a special seed drill equipped with a tank and a "drip" attachment to apply the treating solution (formaldehyde) to the seed as it is being sown. There is no way for treating sets for Smut, but gardeners may avoid trouble from this disease, in a measure, by using "red" or "yellow" sets, rather than "white" sets, for the colored varieties of onions are less subject to the Smut than the white ones.

Harvesting. Much of the success in onion growing depends on the manner in which harvesting is done. Except for the multiplier onions the sign of approaching maturity is the weak-

ening of the tops which causes them to fall flat. When this has taken place those onions still standing upright should be flattened down with a light roller. When the necks have become dry enough to be twisted off easily, the onions should be lifted, and if the weather is favorable, left on the ground to dry. All earth and surplus skins should be brushed off carefully and the onions taken under cover to dry thoroly. It is suggested that they be spread on gratings or in shallow flats with slatted bottoms, so that air may pass freely about them. When the onions are completely dry they should be put into deeper containers, but always arranged for ventilation. The storage room should be dry, and the temperature should be maintained as near 50 degrees as possible. This manner of storage is necessary for "slip" onions; in fact, it is usually disappointing to store onions of this type except in a cold storage room, at a temperature of 40 degrees.

GROUP 9. THE "MELON" CROPS

Crop	Variety	Spacing
Cucumber	Chicago Pickling	(See text)
	Long Green	(See Text)
	Arlington White Spine	4 ft. each way
Summer Squash	White Bush	3 ft. each way
	Summer Crookneck	4 ft. each way
Winter Squash	Table Queen	6 ft. each way
	Green Hubbard	8 ft. each way
	Warted Hubbard	8 ft. each way
	Cushaw	6 ft. each way
Cantaloupe	Early Hackensack	4 ft. each (see text)
	Netted Gem	4 ft. each way
	Bender	5 ft. each way
	Tip Top	6 ft. each way
Watermelon	Kleckley Sweet	8 ft. each way
	Stone Mountain	10 ft. each way
	Tom Watson	10 ft. each way
	Irish Grey	8 ft. each way

The "melon" crops are "fruit" vegetables and require an abundance of phosporus. Because of their heavy vine growth, however, nitrogen is needed as well.

The generally accepted practice of growing these crops is in "hills" under which small quantities of manure have been put, and sometimes commercial fertilizers added. However, better results may be obtained by applying the fertilizers broadcast. The general fertilizing recommended (p. 6) will prove satisfactory.

Many cucumber and cantaloupe growers follow the method of sowing seed sparsely in drills and thinning the plants sufficiently to leave a stand corresponding to that when the hill method of planting is used. The drill method of sowing provides better opportunity for pest control.

Early cucumbers and early cantaloupes are started in pots or beds, under the protection of frames (see Kentucky Extension Circular 120) and set in the garden after the ground has become warm, and danger of frost is past. Or, the seed may be sown directly in the open garden after the ground has become warm and the likelihood of frost is over.

Pests. The insect enemies of this group are the striped cucumber beetle, the pickle worm, and the squash bug; all serious pests.

The cucumber beetle begins operations when the seedlings begin breaking thru the ground at which time the overwintering beetles enter the cracks in the soil and start feeding on the roots. At this time they lay the eggs which hatch into cream-colored, brown-headed larvae. These also attack the roots. Steps for control of the cucumber beetle must, accordingly, begin when the first beetles come. The best means is dusting with the following mixture:

Calcium arsenate, 1 pound; Gypsum (or "landplaster"), 20 pounds.

The first dusting should be made by sprinkling a small handful over the hill when the ground begins to crack. This serves to keep away the adult beetles, and some of the material falls to the roots, there to poison the larvae.

Following this, a series of dustings should be given, 3 days apart. Altho as few as 5 dustings may suffice, it has been found profitable to continue until 15 have been made. At each application it is advisable to dust the middle of the hill and the growing tips of the vines. No dust gun is needed; even a device as simple as a cheesecloth bag, or a perforated tin can will serve.

The pickle worm hatches from eggs laid on the rind of the fruit, and burrows its way in. Since almost no surface feeding is done, poisoning the worms is not practicable. It has been observed that the adult prefers to deposit its eggs on squash blooms rather than on those of cucumber or cantaloupes. Growers may take advantage of this fact by placing hills of squash among the cucumbers or cantaloupes. Early White Bush squash is the variety best suited for this purpose. As soon as the squash are two inches in diameter, they should be picked and burned, thereby destroying the worms that may have entered. It is advisable to make repeated plantings so as to assure a continous supply of blooms to serve as "traps" thruout the summer.

The squash bug is a sucking insect, but it cannot be killed by contact sprays except in its younger stages while its body is still soft. Tobacco and pyrethrum sprays are in some measure effective against the eggs and the younger stages, but the best method for controlling the adults is handpicking. If bits of shingle or trash are placed around the hills, under which the squash bug may take refuge for the night, the insects may be collected early in the morning, and destroyed.

Occasionally, plant lice become troublesome among the members of the "melon" group. The control is tobacco (see p. 13).

The disease troubles of this group are wilt (of which there are two kinds) and several kinds of leaf-spotting diseases, collectively called "blight."

For the wilt itself there is no control, but there are preventive measures worth taking. They are:

1. Insect control, for some forms of wilt are introduced and spread by insects, solely.

2. Crop rotation, for wilt accumulates in soil where melon crops are grown too continuously.

Several resistant varieties of cucumbers and watermelons are being developed, but their value has yet to be established.

"Blight" is the name given to several forms of leaf spotting diseases that affect the melon crops. The field control is spraying with Bordeaux mixture (see p. 15). It is well to anticipate the coming of blight by beginning to spray when the plants begin to run, and giving them 2 to 5 sprays at 2-weeks intervals, thereafter.

A preventive for some forms of blight is seed treatment, which is given as follows:

1. Dissolve one 7½ grain tablet of bichloride of mercury in one pint of water, using anything but a metal vessel.
2. In this solution, dip the seed for five minutes.
3. Wash it in two changes of water.
4. Spread out the seed so that they will dry quickly.

WINTER STORAGE OF VEGETABLES

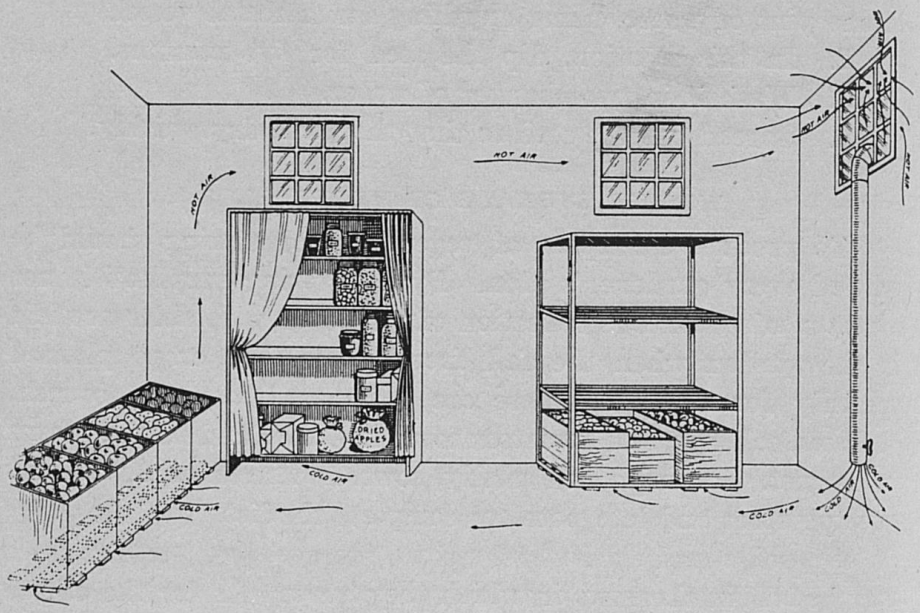
To produce a surplus of vegetables for storing should be part of every gardener's plan. By a "storing surplus" is not meant a miscellaneous collection of whatever vegetables are left in the garden when the fall frosts come, but crops planted specially for storing. These are beets and carrots, squash, cushaws, cabbage, and tomatoes sown in June; and turnips sown in August. Parsnips and salsify, sown in March or April, and sweetpotatoes and late potatoes complete the list.

Parsnips and salsify present no storage problem, for they may be left in the rows in which they grew. As for the others the ideal manner of storage is in a room built especially for the purpose, one in which complete ventilation can be given and the correct temperature for the several kinds of vegetables maintained. Such a storage room is essential to keep the "warm" crops as sweetpotatoes, squashes, tomatoes, and perhaps onions, for these need low humidity, good air drainage, and carefully controlled temperature. For onions the temperature should be 40 degrees; for the rest of the warm crops 50 degrees is satisfactory. A means for heating should be provided and the temperature frequently checked by a good thermometer.

For the "cool" crops a good cellar room the temperature of which can be kept at about 36-40 degrees by means of a ventilation system like that in the figure below is ideal.

It is obvious that "warm" crops and "cool" crops cannot be stored successfully in the same room.

The root crops and cabbage and potatoes can be kept successfully by burying them in a "pit" and providing enough earth cover to keep the temperature at about 36 degrees. For the latitude of Kentucky usually twelve inches of earth will suffice.



A good arrangement for storage in a cool cellar. (Copyright 1918 National War Garden Commission)

The location for the pit should have good surface drainage away from it in all directions. If any doubt exists tile or ditch drainage should be provided. The shape of the pit may be circular or long and narrow. The long shape is desirable if the vegetables are to be removed in small quantities at one time. An excavation should be made about 6″ deep and the bottom covered with straw. On this the vegetables should be piled and covered with about 5 inches of straw. Then cover with about

6 inches of earth when the pit is made in November, and 6 inches additional a month later.

Much of the success in storing vegetables depends on the condition of the vegetables themselves. They should be mature, for underripe specimens may wilt, no matter how good the storage conditions are. They should be sound, free from wounds, disease infection, bruises and cuts received during harvesting or later handling.