

# THE SMALL VEGETABLE GARDEN

SUGGESTIONS FOR UTILIZING  
LIMITED AREAS



FARMERS' BULLETIN 818

UNITED STATES DEPARTMENT OF AGRICULTURE

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Prepared under the Direction of the Bureau of Plant Industry  
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Washington, D. C.

April, 1917

**B**Y THE exercise of care and forethought in planning succession crops and rotations and by the utilization of every foot of available space it is possible to grow considerable quantities of vegetables on limited areas and so supplement the family food supply. The principal factors in accomplishing this are the use of seed boxes and hotbeds to give plants an early start in spring before seeds may be planted outdoors, the use of outside seed beds to carry plants for main-season crops while early crops are occupying the garden space, and the planting of late or succession crops as soon as earlier plants have been removed.

In order that gardening may be carried on successfully in such an intensive way it is especially important that soil of good texture be available, and that it be well supplied with humus and plant food. It is essential also, as in all gardening, that sufficient moisture be present, that the garden be kept free of weeds, and that the soil be cultivated frequently and well.

*In the following pages specific suggestions are made for planning an intensive garden enterprise, for preparing the soil and maintaining its fertility, and for planting and growing the crops.*

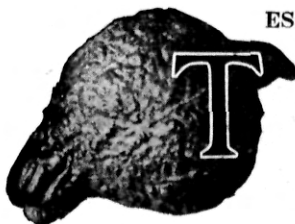


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## ESSENTIALS OF GARDENING.



THE primary needs for successful vegetable gardening on a small scale are the same as those for gardening on a large scale. On limited plots, however, greater emphasis must be placed on intensive culture and carefully arranged rotations so that every available foot of space may be made to produce the maximum yield.

The essentials of all gardening are soil of suitable texture containing available plant food, water to dissolve the plant food so that the plant rootlets may make use of it, seeds or plants which will produce the desired crops, sunshine and warmth to bring about germination and plant development, and cultivation. Much also depends upon the gardener and the care he bestows on his enterprise.

Other factors—location and exposure—can not always receive much consideration in gardening small plots since there is ordinarily little room for choice. Such spaces are located usually in yards, or the choice of location is restricted in other ways by the necessity that the spaces be accessible to dwellings. When a possibility for the exercise of choice does exist, however, several considerations should be kept in mind by the gardener. It should be recognized that frost is less likely to injure vegetables planted on high ground than those planted in low places or valleys into which the heavier cold air commonly settles; that crops will mature more rapidly on land that has a sunny, southern exposure than on other plots; that the garden should be fairly level, but well drained; and that a warm, sandy loam will produce an earlier crop than a heavier soil that retains more water and less heat.

The soil is the storehouse of plant food and should, therefore, have a relatively open texture so that the rootlets of vegetables may extend themselves readily in their search for sustenance. A high proportion of humus or rotted vegetable material is desirable in the soil, since it produces an open texture, adds nitrogen, insures the presence of beneficial bacteria, aids in unlocking plant food from mineral particles, and increases the moisture-retaining properties of the soil.

About 50 per cent of ordinary earth is not soil at all, but consists of air and water. Water makes the soluble plant food that is present in the soil freely available, while the air in the soil makes possible bacterial development and facilitates chemical action, which makes additional plant food available.

#### IMPORTANCE OF A GOOD SEED BED.

The cultivation of crops is important because the stirring and loosening of the soil directly conserves moisture to some extent, kills weeds, which draw moisture and plant food at the expense of the crops, and incorporates air into the soil.

Too much emphasis can not be laid on the preparation of a good seed bed. A seed bed of fine tilth—made such by deep plowing, careful harrowing, and fining of the soil—is the foundation of good gardening. It is essential for the proper germination of seeds and growth of young plants. The soil must be friable and free from clods. A clod locks up plant food and prevents its utilization by the plant. Good soil and fine tilth furnish best conditions for root development. Upon the fine, hairy, fibrous, feeding roots, which are possible only in well-tilled soil, the plant depends for its stockiness and growth.

The careful gardener will regard his whole garden as a seed bed and will cultivate and fertilize it accordingly.

#### FERTILIZERS.

Fertilizers, the plant foods for the garden, should be carefully selected. Nitrogen, which stimulates leaf growth, is best supplied by turning under rich, well-rotted, or composted manure or rotting vegetable matter. Sheep manure and poultry droppings will hurry plants along more rapidly than most chemical fertilizers. These substances, as well as bone meal, also a valuable fertilizer, usually may be obtained from seed stores.

#### PLANNING THE SMALL GARDEN.

With a little forethought a comparatively small tract of land may be made to supply the average family with fresh vegetables throughout the growing season. Most owners of small gardens are content

to raise a single crop on each plot of land at their disposal. It is quite possible, however, to grow two or three crops of some vegetables in one season, and if these are properly selected the home-grown produce should be both better and cheaper than any that can be purchased on the market.

Just what vegetables are to be grown depends, of course, upon the individual tastes of the family. In general the aim of the home gardener should be to raise vegetables in which freshness is an important quality. Peas, string beans, Lima beans, asparagus, and sweet corn, for example, lose much if they are not cooked almost immediately after they are picked. On the other hand, as good



FIG. 1.—A back-yard vegetable garden which gives evidence of having received the care and attention that are essential to success in small-scale gardening.

potatoes usually can be bought as can be grown. Moreover, potatoes occupy a large area in proportion to their yield and consume in a back yard or small garden valuable space which, in most cases, could be put to much more profitable use. This may be true also, in some cases, of corn, cucumbers, squashes, and melons.

It will pay the home gardener to grow certain specialties of which he may be fond, and which may be troublesome or expensive to purchase. Okra is an example of this class, and little beds of parsley, chives, or other herbs take up very little room and provide the housewife with additions for her table, which are most welcome if they can be picked at the right moment without trouble.

### THE GARDEN DIAGRAM.

If the small garden plot, however, is to be made to bring the maximum returns in economy and pleasure to the owner, every available foot of it must be made to work continuously. This can be accomplished only by careful planning, and it is recommended, therefore, that a complete lay-out for the garden be drawn up in advance. A typical plan of this character is shown in figure 1. This plan, of course, will be of use chiefly as an example, and in most cases a different arrangement will be necessary to meet the conditions surrounding individual garden spaces. On the plan the gardener may indicate the approximate date when each of his projected crops is to be planted. No more space should be allotted to each than is needed to furnish a sufficient quantity of the vegetable for family consumption or for other known needs. In many cases, also, space should be left between the rows for the interplanting of later crops and for easy cultivation. Plants which make a high growth and cause heavy shade should not be located where they will interfere with sun-loving small plants. It is well also to separate perennials, such as rhubarb and asparagus, which are not cultivated, from plants which must be tilled.

### THE DIAGRAM AS A RECORD.

If a garden is planned in this way and the scheme carried out, the plan should be kept for use the following year, with notes of the success or failure of the different items in it. For example, if too much or too little of any vegetable was grown, this fact should be recorded. It is not desirable, however, to follow too closely the same plan in succeeding years. The same kind of vegetables should not be grown twice, if this can be avoided, in the same part of the garden. The danger of attack by diseases and insects is heightened when vegetables of the same kind follow each other repeatedly in a given space, such as a row or bed. If a radically different kind of plant is grown in a space, on the other hand, disease spores and insects, though present in the soil, probably will not attack the second crop.

In making a diagram of the garden it is well to use a tough paper, such as heavy wrapping paper, which will stand repeated handling and use out of doors. A fairly large scale should be adopted, so that full notes can be kept in the spaces representing rows. If the garden is fairly large or abnormally long, the diagram may be made in separate sections for the sake of convenience.

### A BACK-YARD GARDEN.

The garden shown in the diagram (fig. 2) was a city back yard 25 by 70 feet in dimensions near New York City. It happened

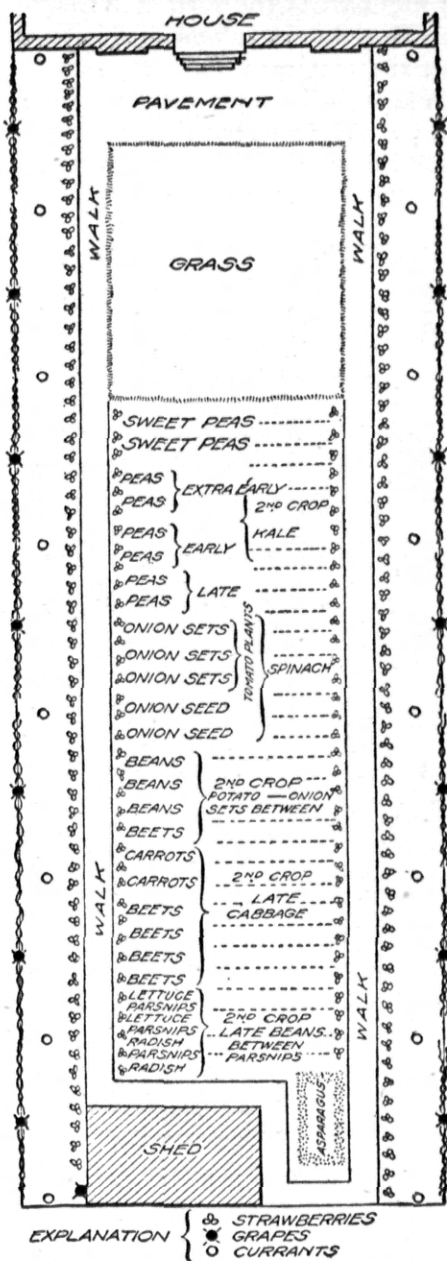


FIG. 2.—A typical back-yard garden plan, showing a possible arrangement for permanent and annual plants.

to be bounded on two sides by a board fence, and advantage was taken of this fact to plant and train grape vines. Strawberry plants were set alongside the flagstone walks and currant bushes between the walks and the fence. In the space between the bushes and the strawberries low-growing vegetables, such as bush beans, peppers, eggplants, and the like, were set out. In a space about 12 feet wide between the walks low-growing, quick-maturing varieties of early vegetables were planted in such a way that later-maturing varieties could be put out at proper intervals between them. The early plantings consisted of radishes, early beets, lettuce, carrots, and a few parsnips. The beets gave way later to a few late cabbage plants. The sunniest portion of the yard was turned over to tomatoes, of which there were about a dozen plants trained to a single stem and set about 18 inches apart in each direction. Early and late peas were put out in the least sunny portions of the yard. Later, in the fall, spinach, kale, and potato-onion sets were planted in order to provide a supply of green succulents for the winter and early spring.

#### IMPORTANCE OF SUNLIGHT.

In making the garden plan the gardener should recognize that no amount of fertilizer, watering, and cultivation will make up for the absence of sunlight in a garden. Careful consideration should

be given to how many hours a day any part of the yard is in shadow from buildings, fences, or trees. If a successful garden is to be maintained, the greater portion of the plot must have at least five hours of sunlight a day. As a rule foliage crops, such as lettuce, spinach, and kale, do fairly well in partial shade, but even these need sunshine two or three hours a day. Plants which must ripen fruits, such as tomatoes and eggplant, should have the sunniest locations.

### CHOOSING CROPS.

Vegetable seed should be ordered in advance of the time for planting in the open, so that they will be on hand for planting in flats or frames and also for use outdoors as soon as the weather and the condition of the soil make planting possible. Before ordering seed it is a good idea to look over the garden plot, decide on the best location for each vegetable, and determine how much seed will be required for the space available for each variety. The garden plan may then be drawn.

#### SEED FOR A FAMILY OF FOUR.

The following are the approximate quantities of seed that should be purchased for a garden which is to supply vegetables for successive plantings throughout the season for a family of four:

Beans, snap	1 pint.	Parsnips	$\frac{1}{2}$ ounce.
Beans, pole-Lima	$\frac{1}{2}$ pint.	Salsify	1 ounce.
Beans, bush Lima	$\frac{1}{2}$ pint.	Squash, summer	$\frac{1}{2}$ ounce.
Cabbage, early	$\frac{1}{2}$ ounce.	Squash, Hubbard type	$\frac{1}{2}$ ounce.
Carrot	1 ounce.	Cauliflower	1 packet.
Celery	1 ounce.	Eggplant	1 packet.
Cucumber	$\frac{1}{2}$ ounce.	Parsley	1 packet.
Kale, or Swiss chard	$\frac{1}{2}$ ounce.		

For most of the vegetables listed the plantings may consist of the entire quantities mentioned. Relatively small quantities of cauliflower, eggplant, and parsley will be sufficient for most families, however.

The following vegetables undoubtedly will be planted in larger amounts than those just mentioned, and the amounts of seed given will be a guide for ordinary requirements. Some families may need more of the various vegetables and others less:

Beet	2 ounces.	Radish	1 ounce.
Cabbage, late	$\frac{1}{2}$ ounce.	Spinach	$\frac{1}{2}$ pound in spring and $\frac{1}{2}$ pound in fall
Corn, sweet	1 pint.	Tomatoes, late	$\frac{1}{2}$ ounce.
Lettuce	$\frac{1}{2}$ ounce.	Turnips	1 ounce.
Muskmelon	1 ounce.		
Onion sets	2 quarts.		
Peas, garden	2 to 4 quarts.		

The entire supply of seeds of string bean, bush Lima bean, sweet corn, lettuce, peas, and radish should not be planted at one time, but



successive plantings two to three weeks apart should be made so that a fresh supply of the vegetables may be had throughout the season.

Of early Irish potatoes 1 peck to  $\frac{1}{2}$  bushel will be required, and of late potatoes  $\frac{1}{2}$  bushel to 1 bushel, or more, depending upon the amount of ground available for this purpose. If abundant space is available, it may be well to grow enough Irish potatoes to last throughout the winter.

If the family wishes to raise vegetables to supply current needs and also to supply a surplus for canning, the amounts indicated above should be increased considerably.<sup>1</sup>



FIG. 3.—A hill of beans started in a berry box in the house long before the seeds may be planted in the open garden.

### AIDS TO EARLINESS

The hotbed, the "flat" or seed box, and the cold frame are the gardener's greatest aids in raising early crops. The hotbed and the flat enable him to plant seed and produce seedlings long before most of the seeds may be planted out of doors and before those which have been planted in the plot have begun to germinate. The cold frame enables him to get the seedlings produced in the hotbed gradually

accustomed to outdoor conditions and to raise these into strong, sturdy planting stock by the time the garden is ready for them. Resetting from a hotbed into a cold frame, or from one flat into another, or into pots, gives most plants a better root system and makes them stockier and more valuable for transplanting into the open ground. Besides being used in hardening plants that have been

<sup>1</sup> The home gardener should find useful Farmers' Bulletins 359, Canning Vegetables in the Home; 521, Canning Tomatoes, Home and Club Work; 255, Home Vegetable Garden; and 647, Home Garden in the South. The latter is designed particularly for use in the warmer climates, but contains many suggestions that can be adapted readily by home gardeners in the North. The Department of Agriculture will supply these bulletins free on application as long as its stock for free distribution lasts.

started in the hotbed, the cold frame is utilized in mild climates instead of a hotbed for starting plants before seeds can be planted safely in the open. In the extreme South the cold frame is much more extensively used than the hotbed, but each has its place in garden economy.

Still another method of giving plants an early start is used extensively for beans, cucumbers, melons, sweet corn, and other warmth-loving plants. This consists in planting enough seeds for a "hill" in berry boxes filled with soil. (Fig. 3.) The boxes are kept in the house or in greenhouses until the garden soil becomes warm, by which time the plants should have reached a considerable degree of development. The bottoms of the boxes are then cut away and the remaining frame is sunk with the plants in their permanent location in the garden.

#### STARTING EARLY VEGETABLES IN THE HOUSE.

The flat or seed box (fig. 4) which is kept in the house is perhaps the most practical device for use by the home gardener for starting early vegetables. By its use earlier crops of tomatoes, cabbage, cauliflower, Brussels sprouts, peppers, eggplant, and lettuce can be had with little outlay for equipment. Early potatoes sometimes are forced in the same way. Seeds

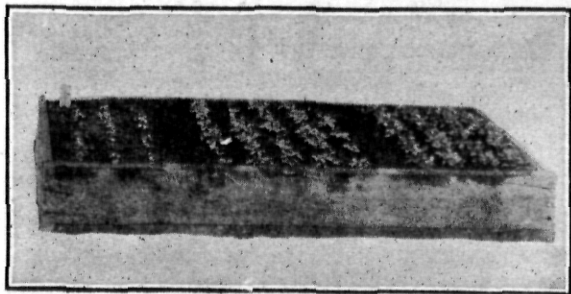


FIG. 4.—Flat or seed box for use in starting plants in the house.

so planted germinate and are ready for transplanting by the time it is safe to sow the same kind of seed in the open ground. When danger of frost is over and the soil is dry enough to work, therefore, the early garden may be started with seedlings well above the surface. Transplanting, if properly done, instead of injuring seems to help such plants to develop a strong root system.

#### HOW TO MAKE AND USE A SEED BOX.

Any sort of wooden box filled with good soil answers the purpose, but the following specific suggestions for a box of convenient size may be useful. Construct a box 3 to 4 inches deep, 12 to 14 inches wide, and 20 to 24 inches long. A layer of about 1 inch of gravel or cinders should be placed in the bottom of the box. It should then be filled nearly full with rich garden soil or soil enriched with de-



cayed leaves or manure. The rich soil beneath the family woodpile or around decaying logs is splendid for this purpose. The soil should be pressed down firmly with a small piece of board and rows made one-fourth to one-half inch deep and 2 inches apart crosswise of the box. The seed should be distributed 8 or 10 to the inch in the rows and be covered. The soil should be watered and the box set in a warm place in the light. The best location is just inside a sunny window. Water enough must be given from time to time to cause the seeds to germinate and grow thriftily, but not enough to leak through the box. If a piece of glass is used to cover the box, it will hold the moisture in the soil and hasten the germination of the seeds.

When the plants are from an inch to an inch and a half high they should be thinned to 1 or 2 inches apart in the row, so as to give them space enough to make a strong stocky growth. If it is desired to keep the plants which are thinned out, they may be set 2 inches apart each way in boxes similar to the seed box. When the weather becomes mild the box of plants should be set out of doors part of the time so that the plants will "harden off" in preparation for transplanting to the garden later. A good watering should be given just before the plants are taken out of the box for transplanting, so that a large ball of earth will stick to the roots of each one.

#### THE HOTBED.

Locate the hotbed in some sheltered but not shaded spot which has a southern exposure. The most convenient size is a box-like structure 6 feet wide and any multiple of 3 feet long, so that standard 3 by 6 foot hotbed sash may be used. The frame should be 12 inches high in the back and 8 inches in the front. This slope is for the purpose of securing a better angle for the sun's rays and should be faced toward the south.

The hotbed not only must collect any heat it can from the sun, but also must generate heat of its own from fermentation in fresh manure. Fresh horse manure, free from stable litter, is best for generating heat.

If the hotbed is to be an annual affair, make an excavation 18 inches to 2 feet deep, about 2 feet greater in length and width than the frame carrying the sash. Line the excavation with plank or with a brick or concrete wall. A drain to carry off surplus water is essential. This may consist of either tile or pipe extending to a low portion of the garden or a trench partially filled with coarse stones covered with a layer of hay or sod and then filled level with soil.

After a sufficient amount of fresh horse manure has been accumulated fill the hotbed pit, and while it is being filled tramp the manure as firmly and as evenly as possible. When the ground level is

reached, place the frame in position and bank the sides and ends with manure. Place about 3 inches of good garden loam on top of the manure inside the frame and cover it with the sash. After the heat has reached its maximum and has subsided to between 80° and 90° F. it will be safe to plant the seeds. Select the plumpest, freshest seeds obtainable. Use standard varieties, and get them from reliable seed houses.

Keep the bed partially dark until the seeds germinate.

After germination, however, the plants will need all the light possible, exclusive of the direct rays of the sun, to keep them growing rapidly. This is a crisis in plant life, and ventilating and watering with great care are of prime importance. Too close planting and too much heat and water cause the plants to become spindling. Water the plants on clear days, in the morning, and ventilate immediately to dry the foliage and to prevent mildew.

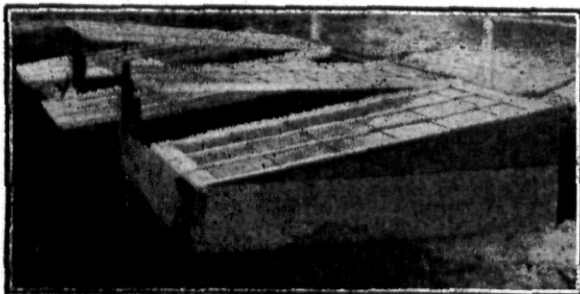


FIG. 5.—Cold frame open for ventilating plants.

#### THE COLD FRAME.

The cold frame (fig. 5), so useful in hardening plants started in the hotbed and for starting plants in mild climates, is constructed in much the same way as the hotbed, except that no manure is used, and the frame may be covered either with glass sash or with canvas. A cold frame may be built on the surface of the ground, but a more permanent structure suitable for holding plants over winter will require a pit 18 to 24 inches deep. The cold frame should be filled with a good potting soil. The plants should have more ventilation in the cold frame, but should not receive so much water. It is best to keep the soil rather dry.

In transplanting, remember that plants usually thrive better if transplanted into ground that has been freshly cultivated. Transplanting to the open field is best done in cool, cloudy weather and in the afternoon. This prevents the sun's rays from causing the plant to lose too much moisture through evaporation. In transplanting the gardener will find a child's express wagon an excellent trolley tray for bedding out his seedlings.

#### TOOLS.

The necessary tools for preparing and caring for the small garden are few. A spade or garden fork for digging, a hoe, a steel-tooth

rake, a trowel, and a dibble or pointed stick complete the list of essentials. The gardener will find it convenient, however, to possess some additional implements. (Fig. 6.) If tree roots underlie any portion of the garden plot and must be cut away, a hatchet, ax, or mattock will be a real necessity. If the soil of the plot has become compacted, as where walks have existed, a pick may be needed for digging. Perhaps in such cases it will be most economical to fill both cutting and digging needs by purchasing a pick-ax which has a pick point at one end of the head and a cutting blade at the other. Apparatus for watering plants also should be included. This may be a watering pot of generous proportions or, where running water is available, a hose. In order that rows may be made straight and uniform a substantial line or cord should be provided. It will pay the gardener to prepare in advance two to six strong, smooth, well-pointed stakes about 18 inches or 2 feet long, rather than to depend on picking up such sticks as may be available when the line is to be used.

A most convenient implement for use in the home garden, especially where the plot is fairly large, is a hand cultivator or wheel hoe. (Fig. 7.) This implement is a miniature

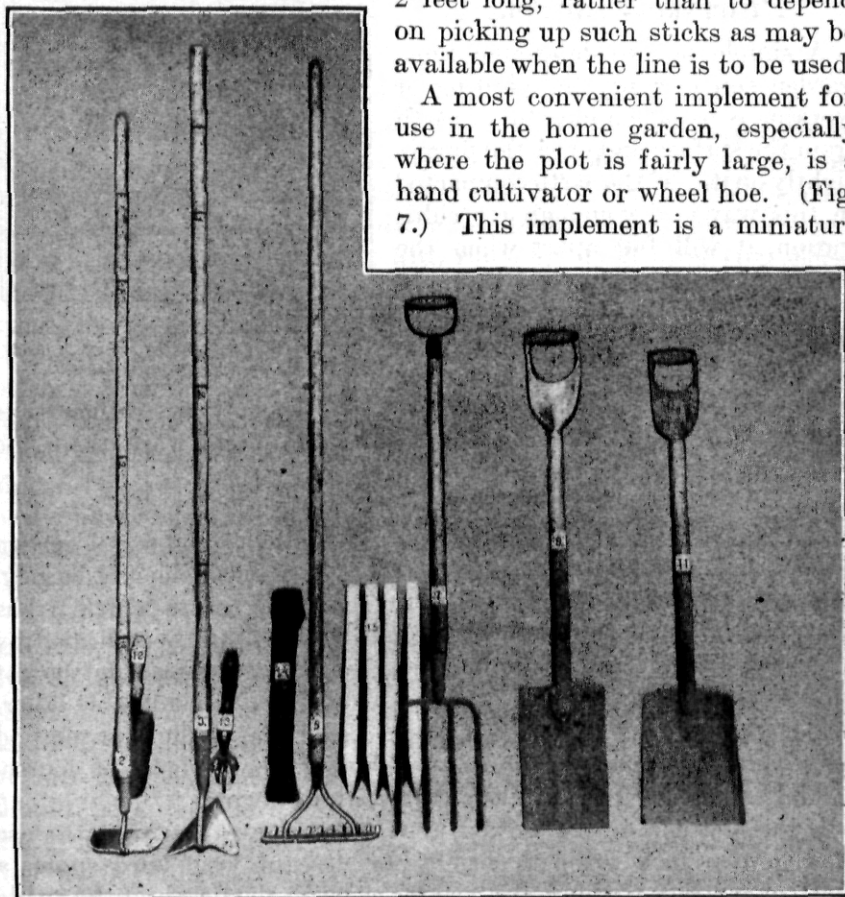


FIG. 6.—A set of garden tools, including the essential implements and a few others. (2) Hoe, (3) heart-shaped furrow hoe, (5) steel-tooth rake, (7) fork, (9) spade, (11) shovel, (12) trowel, (13) scratch weeder, (14) line, (15) stakes. Note that the handles of some of the longer implements are marked off in feet and half feet for convenience in measuring.

cultivator or plow, with adjustable blades, mounted on a wheel or wheels, and is pushed along by hand. Attachments make possible either the turning of small furrows, the stirring of the soil, or the removal of weeds. Much time and labor may be saved by such a device.

Among the other implements which may be useful in the home garden but which are not essential are planting and cultivating hoes of special shapes, a combination hoe and rake, a wheelbarrow, a shovel, hand weeding tools, and other small implements for special uses (fig. 8).

#### PREPARING THE SOIL.

A simple test to determine when garden soil is ready for plowing or working is to take a handful of earth from the surface and close the fingers tightly on it. If the earth compacted in this way is dry enough for cultivation, it will fall apart when the hand is opened. This test is applicable only to comparatively heavy soils, but it is these which receive the most injury if they are worked when wet. On such soils overzealous gardeners not only waste their time but frequently do actual damage by attempting to work them too early.

#### BREAKING.

The kind of preparation that must be given to the small garden and the amount of work that will be required will depend largely, of course, on the condition of the plot and the use to which it has been put. If the ground selected for the garden has been firmed by much tramping, as is often the case in back yards, it can not be got into proper condition without the expenditure of considerable labor. When plowing with a team can be practiced that is the best method for giving the ground its initial breaking. The surface, of course, should be harrowed as soon as possible after plowing.

If the plot can not be plowed, the gardener must resort to the use of a garden fork or spade or, in the case of very hard spots, a mattock. The soil should be well loosened to the depth of the spade or fork. If heavy clay is encountered at this depth, it should not be turned up to the surface, but the slices of soil should be kept in



FIG. 7.—A single-wheel type of hand cultivator. Such an implement reduces considerably the labor of stirring the soil.

their normal position. As soon as each spade or fork full of earth is loosened, it should be broken up by blows with the back of the implement. Later the freshly dug surface should be fined and smoothed with a steel-tooth rake. It is not sufficient that the surface be made fine; the soil should be well pulverized to the depth of the digging. Any sod or plant growth on the garden plot should be turned under to rot and form humus. In turning under sod with a spade or fork it is well to reverse each segment so that foliage will be down and roots up.

The first digging of a plot of ground which has not before been cultivated is likely to be a laborious task, and may even take away the enthusiasm of the would-be gardener. After this portion of the work is done, however, the fining of the soil, planting, and cultivation are not arduous. It may be well in many cases for the gardener to employ some one to break his ground, whether this be done with plow, spade, or fork.

#### IMPROVING SOIL TEXTURE.

It is desirable that the soil of the garden be as open and light as possible. Where a natural loam exists in the plot good texture can be given by digging and cultivating. Where the soil is heavy, containing much clay, however, other steps are necessary. If clean sand is available this may be mixed with the soil. Well-sifted coal ashes, which, unlike wood ashes, have no fertilizing value, are useful in lightening the soil. Care should be taken that no coarse cinders or pieces of partly burned coal are added to the soil with the ashes.

Lime added to the soil also will tend to lighten it and will, at the same time, correct acidity. A thin coat of air-slaked lime should be spread on the ground and worked in well. Lime is not a plant food, but its function in gardening is important none the less. By correcting acidity it makes possible the development of countless soil bacteria which aid in unlocking plant food from the mineral particles of the soil and

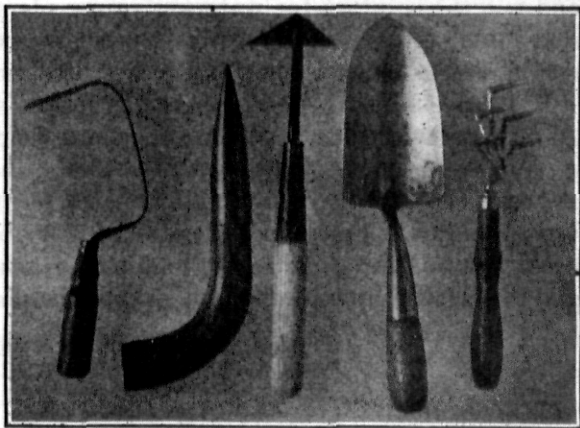


FIG. 8.—Small hand tools for the garden. From left to right they are: Hand weeder, dibble, onion hoe, trowel, and scratch or claw weeder.



in making these substances available for the plants. In acid soils these helpful organisms do not thrive, and in their absence vegetables do not grow at their best.

#### FERTILIZERS.

After the soil has been got into good mechanical condition, it usually is desirable to apply some form of fertilizer. Barnyard or stable manure, which furnishes both plant food and humus, undoubtedly is the best, and applications of from 20 to 30 tons to the acre are satisfactory. This is roughly equivalent to from 400 to 600 pounds, or several wheelbarrow loads, for each plot 20 by 20 feet. The manure should be distributed evenly over the surface, and later worked in with a hoe and rake.

Frequently it is advisable also to apply commercial fertilizer. An application of 1,000 to 1,500 pounds to the acre, or 10 to 15 pounds per plot 20 feet square, usually is sufficient. In order to supply potash, if this is needed, unleached wood ashes may be distributed over the garden at the rate of 1,000 pounds to the acre, or 10 pounds to each plot 20 feet square. Wet or leached ashes have less fertilizer value. Double the quantity of these should be used. In order to start the plants in the spring, applications of 100 pounds to the acre of nitrate of soda, or 1 pound to each 20-foot square, may be used. By far the best way to use nitrate of soda in the small garden, however, is to dissolve a teaspoonful of the chemical in a gallon of water and use the solution for watering young plants. It is important to remember that no form of commercial fertilizer will yield good results unless the soil is well supplied with humus.

Reference already has been made to the use of prepared sheep manure as a fertilizer. When this plant food can be obtained at a reasonable price, it is perhaps the safest concentrated fertilizer for use by the home gardener. It will not pay to broadcast prepared sheep manure. Small quantities should be applied under the drill when the seeds are planted or the plants set out. Later applications may be worked in with a trowel around the plants.

#### PLANTING VEGETABLES IN THE OPEN.

##### WHEN TO PLANT.

Vegetables may be divided into two classes—"cold temperature" and "warm temperature" vegetables. When peach and plum trees are in blossom, or, where these trees do not occur, when silver maples put forth leaves, or catkins appear on willows and poplars, it is time to sow in the open ground the seeds of lettuce, spinach, kale, endive, radish, parsley, beets, turnips, cabbage, cauliflower, Brussels sprouts, carrots, round-seeded peas, and onions. The wrinkled peas should not be planted until later, as they are more likely to rot in

cool ground than are the smooth varieties. When the apple trees bloom, or when the dogwood and white oak buds unfold, it is time to plant the heat-loving vegetables, such as cucumbers, beans, sweet corn, okra, pumpkin, and squash. This is an old approximation for planting dates, but has been found in most cases to be satisfactory.

Planting times may be fixed in still another way on the basis of the occurrence of frost. Frost ordinarily will kill tender growths of vegetables, but young plants of a few kinds will survive light frosts. Among the latter are cabbage, lettuce, Irish potatoes, early peas (smooth seeded), onion seeds and sets, parsnips, salsify, beets, radishes, and such salad plants as kale, spinach, and mustard.

A "second early" group of vegetables may be planted as soon as danger of frost is over. In this group are included lettuce plants and seeds, radishes, wrinkled peas, carrots, and early sweet corn.

A week or 10 days after the seeds and plants of the second group are placed in the ground, string beans and late sweet corn may be planted.

A fourth group should be planted only after the ground has begun to warm up. In this group are cucumbers, melons, squashes, pumpkins, Lima beans, and tomato, eggplant, and pepper plants.

Detailed suggestions for planting are given in a table on pages 18 and 19.

#### DEPTHS OF PLANTING.

No general rule can be given with regard to the depth for planting seeds, since different varieties of vegetables and different soils necessitate different practices. The smaller the seeds, usually, the shallower the planting should be. In heavy clay or moist soils the covering should be lighter than in sandy or dry soils. When exceptionally small seeds are to be planted they may be scattered on the surface of the prepared bed and then covered with a light sprinkling of soil. Unusual depth may be given to seeds without covering them deeply at first by planting them in open furrows and later drawing the earth about the plants as they grow. This method is often practiced for late plantings of peas, which thus are fortified against drought.

## GARDENER'S PLANTING TABLE.

*Quantity of seeds or number of plants required for a row 100 feet in length, with distances to plant, times for planting, and period required for production of crop.*

[Brackets indicate that a late or second crop may be planted the same season.]

Kind of vegetable.	Seeds or plants required for 100 feet of row.	Distance for plants to stand—				Depth of planting.	Time of planting in open ground.		Ready for use after planting.
		Rows apart.		Plants apart in rows.	South.		North.		
		Horse cultivation.	Hand cultivation.						
Artichoke, globe	$\frac{1}{2}$ ounce.....	3 to 4 ft.....	2 to 3 ft.....	2 to 3 ft.....	1 to 2 in.....	Spring.....	Spring.....	15 months.	
Artichoke, Jerusalem.	2 qts. tubers.....	3 to 4 ft.....	1 to 2 ft.....	1 to 2 ft.....	2 to 3 in.....	Spring.....	Spring.....	6 to 8 months.	
Asparagus, seed	1 ounce.....	30 to 36 in.....	1 to 2 ft.....	3 to 5 in.....	1 to 2 in.....	Autumn or early spring.....	Early spring.....	3 to 4 years.	
Asparagus, plants	60 to 80 plants.....	3 to 5 ft.....	12 to 24 in.....	15 to 20 in.....	3 to 5 in.....	Autumn or early spring.....	Early spring.....	1 to 3 years.	
Beans, bush	1 pint.....	30 to 36 in.....	18 to 24 in.....	5 or 8 to ft.....	$\frac{3}{4}$ to 2 in.....	February to April. [August to September.]	April to July.....	40 to 65 days.	
Beans, pole	$\frac{1}{2}$ pint.....	3 to 4 ft.....	3 to 4 ft.....	3 to 4 ft.....	1 to 2 in.....	Late spring.....	May and June.....	50 to 80 days.	
Beets.....	2 ounces.....	24 to 36 in.....	12 to 18 in.....	5 or 6 to ft.....	1 to 2 in.....	February to April. [August to September.]	April to August.....	60 to 80 days.	
Brussels sprouts	$\frac{1}{2}$ ounce.....	30 to 36 in.....	24 to 30 in.....	16 to 24 in.....	$\frac{1}{2}$ in.....	January to July.....	May and June.....	90 to 120 days.	
Cabbage, early	$\frac{1}{2}$ ounce.....	30 to 36 in.....	24 to 30 in.....	12 to 18 in.....	$\frac{3}{4}$ in.....	October to December.....	March and April. (Start in hotbed during February.)	90 to 130 days.	
Cabbage, late.....	$\frac{1}{2}$ ounce.....	30 to 40 in.....	24 to 36 in.....	16 to 24 in.....	$\frac{3}{4}$ in.....	June and July.....	May and June.....	90 to 130 days.	
Cardoon.....	1 ounce.....	3 ft.....	2 ft.....	12 to 18 in.....	1 to 2 in.....	Early spring.....	April and May.....	5 to 6 months.	
Carrot.....	1 ounce.....	30 to 36 in.....	18 to 24 in.....	6 or 7 to ft.....	$\frac{3}{4}$ in.....	March and April. [September.]	April to June.....	75 to 110 days.	
Cauliflower.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	24 to 30 in.....	14 to 18 in.....	$\frac{3}{4}$ in.....	January and February. [June.]	April to June. (Start in hotbed during February or March.)	100 to 130 days.	
Celery.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	4 or 5 to ft.....	$\frac{3}{4}$ in.....	Late spring.....	May and June. (Start in cold frame during April.)	100 to 150 days.	
Celery.....	$\frac{1}{2}$ ounce.....	3 to 6 ft.....	18 to 36 in.....	4 to 8 in.....	$\frac{3}{4}$ in.....	August to October.....	May and June. (Start in hotbed or cold frame during March or April.)	120 to 150 days.	
Chervil.....	1 ounce.....	30 to 36 in.....	18 to 24 in.....	3 or 4 to ft.....	1 in.....	Autumn.....	Autumn.....	1 year.	
Cilantro.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	4 or 5 to ft.....	$\frac{3}{4}$ in.....	March and April.....	May and June.....	5 to 6 months.	
Citron.....	1 ounce.....	8 to 10 ft.....	8 to 10 ft.....	8 to 10 ft.....	1 to 2 in.....	May and June.....	May and June.....	100 to 130 days.	
Collards.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	24 to 30 in.....	14 to 18 in.....	$\frac{3}{4}$ in.....	January and February. [September and October.]	Late spring.....	100 to 120 days.	
Corn salad.....	2 ounces.....	30 in.....	12 to 18 in.....	5 or 6 to ft.....	$\frac{1}{2}$ to 1 in.....	January and February. [September and October.]	March to September.....	60 days.	
Corn, sweet.....	$\frac{1}{2}$ pint.....	36 to 42 in.....	30 to 36 in.....	30 to 36 in.....	1 to 2 in.....	February to April.....	May to July.....	60 to 100 days.	
Cress, upland.....	$\frac{1}{2}$ ounce.....	30 in.....	12 to 18 in.....	4 or 5 to ft.....	$\frac{1}{2}$ to 1 in.....	January and February. [Autumn.]	March to May. [September]	30 to 40 days.	



Cress, water.....	$\frac{1}{2}$ ounce.....	Broadcast.....	4 to 6 ft.....	4 to 6 ft.....	On surface.....	1 to 2 in.....	Early spring, February and March. [September.]	April to September, April to July.....	60 to 70 days, 60 to 80 days.
Cucumber.....	$\frac{1}{2}$ ounce.....	$\frac{1}{2}$ ounce.....	4 to 6 ft.....	4 to 6 ft.....	1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring or autumn, February to April.....	Early spring, April and May. (Start in hotbed during March.)	6 to 12 months, 100 to 140 days.
Dandelion.....	$\frac{1}{2}$ ounce.....	30 in.....	18 to 24 in.....	8 to 12 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	February to April.....	April, [July].....	90 to 180 days, 1 to 2 years.
Endive.....	$\frac{1}{2}$ ounce.....	30 in.....	18 in.....	8 to 12 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring, October to February.....	August and September, [March and April.]	90 to 120 days.
Horse-radish.....	70 roots.....	30 to 40 in.....	24 to 30 in.....	14 to 20 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	February to April.....	March to May.....	60 to 80 days.
Kale, or borecole.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	13 to 24 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to March.....	March to May.....	120 to 150 days.
Kohl-rabi.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	4 to 8 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	May to September.....	March to May.....	60 to 90 days.
Leek.....	$\frac{1}{2}$ ounce.....	30 in.....	14 to 20 in.....	4 to 8 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to March.....	March to September.....	60 to 90 days.
Lettuce.....	$\frac{1}{2}$ ounce.....	30 in.....	12 to 18 in.....	4 to 6 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	February to April.....	April to June. (Start early plants in hotbed during March.)	120 to 150 days.
Melon, muskmelon.....	$\frac{1}{2}$ ounce.....	6 to 8 ft.....	Hills 6 ft.....	Hills 6 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	March to May.....	May and June.....	100 to 120 days.
Melon, watermelon.....	$\frac{1}{2}$ ounce.....	8 to 12 ft.....	Hills 10 ft.....	Hills 10 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Autumn or early spring.....	March to May. [September]	60 to 90 days.
Mustard.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	4 or 5 to ft.....	4 or 5 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring.....	May and June.....	60 to 100 days.
New Zealand spinach.....	$\frac{1}{2}$ ounce.....	30 in.....	24 to 36 in.....	12 to 18 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	February to April.....	April and May.....	90 to 140 days.
Okra, or gumbo.....	2 ounces.....	4 to 5 ft.....	3 to 4 ft.....	24 to 30 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	October to March.....	Autumn and February to May.....	130 to 150 days.
Onion, seed.....	$\frac{1}{2}$ ounce.....	24 to 36 in.....	12 to 18 in.....	4 or 5 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring.....	September and early spring.....	90 to 120 days.
Onion, sets.....	$\frac{1}{2}$ ounce.....	24 to 36 in.....	12 to 18 in.....	3 to 6 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to May.....	April and May.....	125 to 160 days.
Parsley.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	5 or 6 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to April.....	March to June.....	40 to 80 days.
Peas.....	$\frac{1}{2}$ ounce.....	3 to 4 ft.....	30 to 36 in.....	15 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring.....	May and June. (Start early plants in hotbed during March.)	100 to 140 days.
Peppert.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	15 to 18 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	March to May.....	May and June.....	130 to 160 days.
Physalis.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	14 to 18 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	January to April.....	March to June.....	80 to 140 days.
Potato, Irish.....	5 lbs. (or 9 bu. per acre).....	30 to 36 in.....	24 to 36 in.....	14 to 18 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	April and May.....	May and June. (Start plants in hotbed during April.)	140 to 160 days.
Potato, sweet.....	3 lbs. (or 75 slips).....	3 to 5 ft.....	3 to 5 ft.....	14 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	April and May.....	May to July.....	100 to 140 days.
Pumpkin.....	$\frac{1}{2}$ ounce.....	8 to 12 ft.....	8 to 12 ft.....	Hills 8 to 12 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to April.....	March to September.....	20 to 40 days.
Radish.....	$\frac{1}{2}$ ounce.....	24 to 36 in.....	12 to 18 in.....	8 to 12 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Early spring.....	Early spring.....	2 to 4 years.
Rhubarb, seed.....	$\frac{1}{2}$ ounce.....	36 in.....	30 to 36 in.....	6 to 8 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Autumn or early spring.....	Autumn or early spring.....	1 to 3 years.
Rhubarb, plants.....	33 plants.....	3 to 5 ft.....	3 to 5 ft.....	3 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	August and September.....	May and June.....	60 to 80 days.
Rutabaga.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	6 to 8 in.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to February.....	Early spring.....	120 to 180 days.
Salsify.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	18 to 24 in.....	2 to 4 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	September to February.....	September or very early spring.....	30 to 60 days.
Spinach.....	$\frac{1}{2}$ ounce.....	30 to 36 in.....	12 to 18 in.....	7 or 8 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Spring.....	April to June.....	60 to 80 days.
Squash, bush.....	$\frac{1}{2}$ ounce.....	3 to 4 ft.....	3 to 4 ft.....	Hills 3 to 4 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Spring.....	April to June.....	120 to 160 days.
Squash, late.....	$\frac{1}{2}$ ounce.....	7 to 10 ft.....	7 to 10 ft.....	Hills 7 to 9 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	December to March.....	May and June. (Start early plants in hotbed during February and March.)	100 to 140 days.
Tomato.....	$\frac{1}{2}$ ounce.....	3 to 5 ft.....	3 to 4 ft.....	3 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	August to October.....	April, [July].....	60 to 80 days.
Turnip.....	$\frac{1}{2}$ ounce.....	24 to 36 in.....	18 to 24 in.....	6 or 7 to ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....	Spring.....	April to June.....	110 to 140 days.
Vegetable marrow.....	$\frac{1}{2}$ ounce.....	8 to 12 ft.....	8 to 12 ft.....	Hills 8 to 9 ft.....	$\frac{1}{2}$ to 1 in.....	$\frac{1}{2}$ to 1 in.....			

## SEED BEDS.

The gardener may find it desirable to reserve a small area of his garden for a seed bed in which some of the second crops for his rotations may be grown while the ground in which they are to develop is still occupied. In this way also advantage is taken of the fact that transplanting makes for stockiness. In seed-bed culture much the same practices are in force as in growing plantlets in flats and frames. The rows of seeds, however, are not spaced so closely in the outdoor seed beds as in the boxes and frames. When the plantlets crowd they may be thinned out or transplanted to another part of the seed bed. Late cabbage, lettuce, Brussels sprouts, cauliflower, etc., are plants that in many cases may be treated conveniently in this way.

## PLANTING PRACTICES.

In planting many kinds of seeds in the garden thick sowings are made to insure a good stand, and the superfluous plants later are pulled up. Straight rows or drills should be used in all cases. The use of a line will make accuracy possible. The line is stretched between stakes at the ends of the row, and with this as a guide the furrow is then opened. This may be done with the end of a hoe or rake handle (fig. 9), with the corner of a hoe or the point of a special furrow hoe, with a hand plow, or with the edge of a board pressed into the loosened soil. Small seeds may be shaken out of the packet by hand in a thin stream while the packet is held close to the bottom of the furrow. Larger seeds, like peas and beans, may be dropped from the hand. Mechanical planters, built like wheel hoes, may be purchased if the size of the garden justifies their use.



FIG. 9.—Use of a rake handle and line in opening a furrow for planting.

## DRILLS, ROWS, AND HILLS.

Small plants which are to be left almost touching each other, as is the case with onions and carrots, are said to be grown in drills. Plants grown at fixed distances, as cabbages or potatoes, are in rows. When plants are grown at distances of several feet apart in both directions they are said to be in hills. Furrows are opened for planting in both drills and rows. Hills, however, may be opened

with a spade or trowel. An excellent method of using fertilizer is to apply it in the drills, rows, or hills before planting. In such cases the fertilizer should be mixed carefully with the soil in the bottom of the opening before the seeds are deposited.

#### FINAL PLANTING TOUCHES.

In planting the gardener should keep in mind that to germinate and develop properly into sturdy plants the seed must be firmly embedded in well-fined, moist soil. The condition of the soil beneath the seeds is most important, since it is in this soil that the rootlets on emerging must find sustenance. Air spaces or cracks may cause the rootlets to shrivel. It is well, therefore, especially if the soil is at all dry, to force the seeds gently into the soil, compacting it slightly. This may be done with the back of a hoe in the case of small seeds, or with the ball of the foot when large seeds such as beans and peas are being planted. The seeds should then be covered immediately with soil. This should be very slightly compacted over the seeds with the back of the hoe. If weather conditions are such that there is a tendency for the soil to bake over the drills and rows before the plants appear, it is well to rake very lightly with a steel-tooth rake. It may be necessary, also, to work the ground at the sides of the rows as the plants are breaking through the surface. This should be done very carefully to avoid injury to the tender shoots.

#### SETTING OUT PLANTS.

Plants grown in flats, hotbeds, or cold frames should be "hardened off," as has already been suggested, before they are to be planted out of doors. Another preliminary step, if the plants are too tall or succulent, is to trim away about one-half of the large leaves. Several hours before transplanting the plants should be watered thoroughly, so that the soil will be moist enough to stick to the roots in balls of considerable bulk. After staking out rows and marking planting positions, lift the plants out with a trowel, keeping as much soil as possible on the roots. Cut or tear the plants apart when their roots are intertwined.

If the ground is moist, merely open a hole with a trowel or dibble, insert the earth-incased roots of a plant, draw soil up to the stalk, and firm with knuckles and the balls of thumbs. If the soil is at all dry, pour about a pint of water into each hole before the plant is set. The surface about each plant should be raked carefully when all the plants are set.

Transplanting (fig. 10) should be done if possible in cloudy weather or late in the afternoon. If the weather is especially bright it may be necessary for a day or two to shade the plants with newspapers folded in inverted V shape and held in place with stones, earth, or other material.

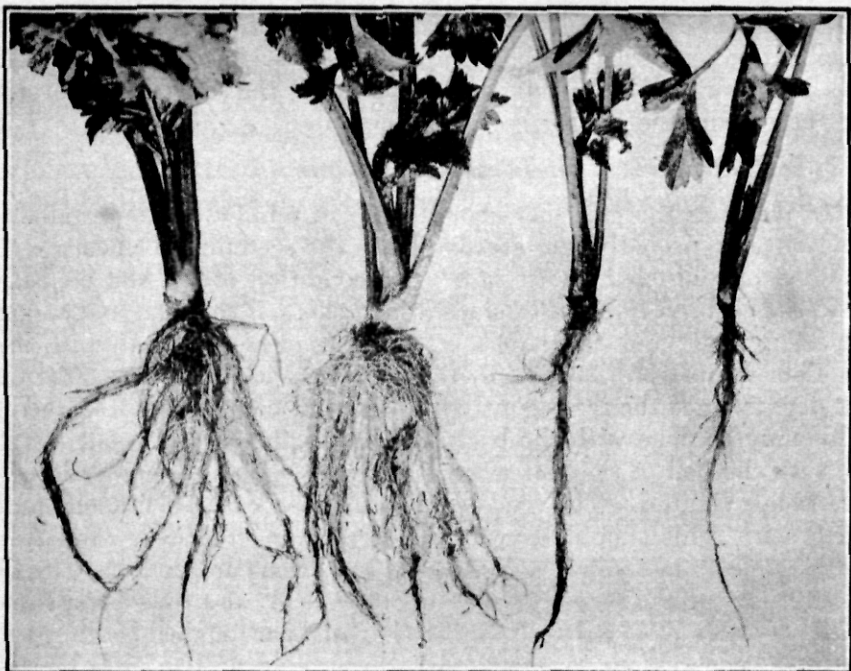


FIG. 10.—Transplanting stimulates branching root growth. Celery plants on the left were transplanted; those on right were not transplanted.

The quickest crop to mature is the radish. Lettuce, turnips, peas, beets, and beans usually require 6 to 9 weeks to mature; cabbage, potatoes, early peas, onion sets, and salad greens, 10 to 12 weeks; corn from 11 to 13 weeks, and potatoes from 15 to 16 weeks.

#### SUCCESSIONS AND ROTATIONS.

Since a number of vegetables reach maturity early in the season, it is possible to utilize the space they occupied for successive plantings of the same vegetables or for rotation plantings of different plants. The earliest of all the vegetables to mature is the radish. The gardener generally can count on being able to utilize anew the space occupied by the first planting of these vegetables in from 5 to 7 weeks, depending on the rapidity with which they are consumed. In intensive gardening, however, it is not necessary to wait until all the radishes of the first planting have been removed before other plantings can be made. Enough of the roots can be removed at intervals to make places for setting lettuce, cabbage, cauliflower, Brussels sprouts, or other plants, and the two crops—radishes and the interplanted crop—can continue growing side by side until the former is used. In a similar way onion sets may be set out in rows that are to be occupied later by tomato plants, room being made for the latter by the removal of a few onions when the proper planting time for tomatoes



arrives. Various combinations of this sort can be worked out between quick-maturing crops and the plants grown in frames or seed beds for later planting in the open.

The gardener should not plant all of his radish, lettuce, or spinach seed at once, but should make several successive plantings at intervals of about two weeks. In this way the season for these vegetables will be lengthened greatly. Successive planting is possible also with beets, peas, beans, sweet corn, and a number of other vegetables. The best of the successive crops of the quick-maturing vegetables must be crowded into the early part of the season, since most such plants do not thrive well when planted in hot weather. This is especially true of radishes and lettuce. In the case of lettuce this disadvantage can be overcome to a certain extent by artificial shading.

In all sections but the extreme north it usually is possible to grow fall crops of certain vegetables, notably carrots, beans, radishes, Irish potatoes, and turnips. In the southern part of the country an even larger number of vegetables may be grown in the fall. The seeds for these late crops are planted from July to September, depending on whether the garden is in the northern or southern States.

In planting rotations of crops, whether the rotations be during the same or in succeeding seasons, certain general principles should be kept in mind. In type and character of growth the succeeding plant should differ as widely as possible from the plant which it follows. This is both for the purpose of avoiding attacks by insects and diseases, and to insure that the second crop shall be properly nourished. A good plan is not to have root plants, such as beets and carrots, nor plants of the same family, such as cabbage and Brussels sprouts, or tomatoes and peppers, follow each other. It is well to divide the plants into root crops, fruiting crops, and foliage crops, and have members of the different groups alternate.

For the convenience of gardeners who wish to plan to use their soil to best advantage by means of successive plantings and rotations, the following lists of vegetables are given:

#### 1. CROPS OCCUPYING THE GROUND ALL SEASON.

Asparagus.	Salsify.	Eggplant.
Rhubarb.	Corn, late.	Peppers.
Beans, pole snap.	Cucumbers.	Onions (from seeds).
Beans, pole Lima.	Melons.	Leeks.
Beets, late.	Squash.	Okra.
Carrots, late.	Pumpkins.	Potatoes, main crop.
Parsnips.	Tomatoes.	Rutabagas.

#### 2. SUCCESSIVE CROPS.

Radish.	Peas.	Turnips.
Spinach.	Beans, dwarf.	Kohl-rabi.
Lettuce.	Parsley.	

3. EARLY CROPS WHICH MAY BE FOLLOWED BY OTHERS.<sup>1</sup>

Onion sets.	Turnips, early.	Corn, early.
Beets, early.	Carrots, early.	Cabbage, early.

4. LATE CROPS WHICH MAY FOLLOW OTHERS.<sup>2</sup>

Beets, late.	Cabbage, late.	Kale.
Spinach.	Brussels sprouts.	Endive.
Peas, late.	Cauliflower.	Flat turnips.
Celery.		

## CULTIVATION.

The importance of cultivation has been referred to in the discussion of the preparation of the seed bed. It is, however, after the seeds have sprouted or after the plants have been set in their permanent locations that cultivation becomes of major importance. The gardener should never permit the surface of the soil to become baked or even to form an appreciable crust. Constant stirring with hand tools or a wheel cultivator should be practiced between the rows and about the plants. Such a stirring permits the air to penetrate the soil, where it facilitates chemical action and bacterial activity, destroys weeds which otherwise would utilize large amounts of plant food, and, finally, conserves the moisture supply. The rake is perhaps the gardener's most valuable tool in cultivating. This can be passed backward and forward over the ground until it is in an open, mellow condition. Where the ground has become compacted beneath the immediate surface other tools must supplement the rake. Close chopping with a hoe will break up such hard areas satisfactorily and put the soil in good condition. If a wheel hoe or hand cultivator is available, stubborn soil may be put into condition by its use with a minimum of labor. Whatever implement is used for this work, the clods should be broken and the finishing touches given to the surface with a rake. Where vegetables grow closely in the rows it often will be necessary to supplement the cultivation by hand weeding. Small implements are made for this purpose, and may be purchased cheaply. It is well also in some cases to pull up weeds by hand, especially where they grow closely about the stalks of the garden plants. Weeding may be done to best advantage on a warm, bright day when the weeds will be promptly shriveled up by the sun. In damp weather many of the weeds may survive and again take root.

## STIRRING THE SOIL AFTER RAINS.

Just as the gardener should be careful in early spring not to dig the ground when the soil is too moist, so he should be careful later in the season not to cultivate too soon after rains. The stirring of very muddy soil "puddles" it into a compact, cement-like mass in which the plant food is securely locked. The garden will require attention,

<sup>1</sup> In addition to the vegetables in this list, all of those in list 2 may be followed by other crops.

<sup>2</sup> List 2 crops also may follow early crops.

however, as soon as the excess moisture from a rain has soaked in or partially evaporated. Unless the ground is stirred at this time a crust will form almost inevitably. Such a crust, besides restricting the plants, prevents the access of air, and also facilitates the loss of moisture through evaporation.

### IRRIGATION.

When, during prolonged dry spells, the plants give evidence of suffering because of the lack of moisture, water must, if possible, be supplied artificially. Where a supply of piped water is at hand, perhaps the most usual method of irrigation is by sprinkling with a hose. If sprinkling is practiced it should be done late in the afternoon. It is not sufficient merely to dampen the surface; a thorough wetting should be given. A more satisfactory and more economical method of irrigation, however, is to open small furrows between the rows of growing plants and to supply water in these ditches from a hose or pipe. Several hours after the water has soaked in, the dry earth should be drawn back into place.

### PROTECTING PLANTS FROM DISEASES AND PESTS.

Unfortunately the gardener is not assured of success when his plants have started to grow thriftily. He must count almost inevitably upon the presence in his garden of plant diseases and pests, which, if not combated, will interfere seriously with his yields or even destroy his plants. It is hard for some gardeners to realize the importance of making early provision to combat these enemies of plant life. It can not be too strongly emphasized, however, that such provision is of equal



FIG. 11.—A good type of sprayer for the small garden.

importance with other phases of gardening and that it should under no circumstances be neglected. The wise gardener does not wait for the appearance of insects and diseases, but takes steps to combat them by spraying the plants at reasonable intervals from early spring until his crops have been harvested, or by other protective measures. He thus insures himself against the likelihood of loss.

The necessary implements and materials for protecting the home garden against insects and diseases should be assembled early in the season. These consist of a substantial hand sprayer and the necessary concentrated solutions, which, after dilution with water, are to be sprayed on the plants.

The diseases which affect garden plants may be divided into two groups, parasitic and constitutional diseases. The parasitic maladies, such as the blights, are caused by fungi or germs, and usually may be prevented or controlled by spraying with Bordeaux mixture. Little is known, however, of the so-called constitutional diseases, and little can be done to prevent their ravages. If some malady which does not yield to treatment with Bordeaux mixture manifests itself on isolated plants in the garden, it may be well to pull up these plants and burn them.

The insects which attack garden plants may be divided into two groups—those which eat or chew the fruit or foliage, and those which suck the plant juices. Eating insects may be killed usually by spraying poisonous solutions or dusting powders on the plants which they attack. Arsenate of lead is the poison in most general use for this purpose. This substance is poisonous to persons as well as to insects and must be used with care. It should not be applied to vegetables that are to be used soon. All vegetables should be washed carefully before they are eaten, regardless of whether they have been sprayed.

Most of the garden plants may be guarded against disease and at the same time protected from attack by eating insects by spraying at intervals of two weeks with a combination of Bordeaux mixture and arsenate of lead.

Other methods of protecting plants from the larger eating insects are to pick the pests by hand or knock them with a stick into a pan containing water on which a thin film of kerosene is floating. Insects collected by hand should be destroyed promptly. Young plants may be protected by setting over them wooden frames covered with mosquito netting, wire mesh, or cheesecloth. Cutworms may be kept from plants by setting tin or paper collars into the ground around the stalks.

Sucking insects, such as plant lice, can not be killed by poisoning the surface of the leaves and fruit, since they feed by puncturing the plants and extracting the internal juices. Poisons which will kill by contact or substances which envelop and smother the pests are, therefore, employed against the sucking insects. The principal remedies of this sort are nicotine solutions, fish-oil and other soap solutions, and kerosene emulsion.



The following table lists the insects most likely to appear in the vegetable garden and furnishes information in regard to the plants attacked and the treatment recommended:

*Principal insects and remedies.<sup>1</sup>*

Insect.	Plants attacked.	Treatment.
<b>Eating type:</b>		
Tomato worms.....	Tomato.....	Hand pick or spray with arsenate of lead.
Cabbage worm.....	Cabbage group.....	Hand pick or apply arsenate of lead.
Cucumber beetles...	Cucumber.....	Cover with frames. Apply tobacco dust or spray with Bordeaux mixture or arsenate of lead.
Cutworms.....	Tomato, cabbage, onion....	Apply poison bait; place tin or paper collars around plants; hand pick; apply Paris green or arsenate of lead.
Potato beetle.....	Potato, eggplant, and tomato	Hand pick and apply arsenate of lead.
<b>Sucking type:</b>		
Squash bug.....	Squash, pumpkin, melons, etc.	Hand pick; spray with kerosene emulsion or nicotine sulphate.
Aphids (plant lice)..	Cabbage group and other plants.	Spray with kerosene emulsion, a solution of hard soap, or nicotine sulphate.

Gardeners desiring additional information in regard to insects affecting the vegetable garden should apply direct to the Bureau of Entomology, United States Department of Agriculture, but it should be understood that there is no publication covering the entire subject. Specimens of insects with some account of food plants and ravages should accompany correspondence.



FIG. 12.—Head lettuce produces very tender, almost white leaves in the center of the heads, but is somewhat harder to grow than the loose-leaf sorts.

The gardener should remember that many plant diseases and insects exist in the garden from year to year. At the end of the growing season, therefore, the garden should be carefully cleaned of rubbish, the stems of plants, leaves, etc. It is necessary to burn this débris promptly, as any disease spores or insects which may be present are then surely destroyed.

## CULTURAL SUGGESTIONS FOR THE COMMONER VEGETABLES.

### RADISH.

Radishes are so hardy that they may be grown through the winter in cold frames in the latitude of Washington and farther south in the open ground. In the north they require hotbeds, but can be sown in the open ground as soon as the soil is moderately warm. They should be planted in drills 12 to 18 inches apart and thinned slightly as soon as the plants are up. On a quick, rich soil some of the earlier

<sup>1</sup> Methods of protecting gardens against grasshoppers are given in Farmers' Bulletin 691, "Grasshoppers and Their Control on Sugar Beets and Truck Crops."



FIG. 13.—Loose-leaf or open-headed lettuce is excellent for growing in the home garden, since its cultural requirements are not so exacting as those of head lettuce.

varieties can be matured in from three to four weeks after planting. If the plants are allowed to remain long in the open ground, the roots lose their crispness and delicate flavor, and in order to secure a constant supply successive plantings should be made every two weeks. One ounce of radish seed is sufficient to plant 100 feet of row. A large percentage of the seed germinates, and if the sowing is done carefully later thinning may be unnecessary. The first radishes to appear may be pulled as soon as they are of sufficient size, and this will leave enough room for those that are a little later. The plant is not suited to hot weather, but should be planted in the early spring and late autumn.

#### LETTUCE.

Lettuce does not withstand heat well and thrives best, therefore, in the early spring or late autumn. In order to have the leaves crisp and tender it is necessary to force the growth of the plant. The usual method of growing lettuce for home use is to sow the seeds broadcast in the bed and to remove the leaves as rapidly as they become large enough for use. It is better, however, to sow the seeds in rows 14 to 16 inches apart, and when the plants come up to thin them to the desired distance. With the heading type this should be about 12 inches apart. This will result in the formation of rather compact heads and the entire plant may then be cut for use. For an early crop in the North, the plants should be started in a hotbed or cold frame and transplanted as soon as hard freezes are over. In many sections of the South the seeds are sown during the autumn and the plant allowed to remain in the ground over winter. Frequent shallow cultivation should be given the crop, and if crisp, tender lettuce is desired during the summer months, some form of partial shading may be necessary.

For head lettuce (fig. 12), Big Boston, Hanson, and California Cream Butter are good varieties. For loose-leaf lettuce (fig. 13), Grand Rapids or Black-seeded Simpson is recommended.

#### PEAS.

Garden peas are not injured easily by light frosts and may be planted as soon as the soil can be put in order in the spring. By selecting a number of varieties it is possible to have a continuous supply of peas throughout a large portion of the growing season. In order to accomplish this plantings should be made every 10 days or 2 weeks until warm weather comes. The first plantings should be of small-growing, quick-maturing varieties, such as Alaska, First and Best, and Gradus. These kinds do not require supports. They should be followed by the large wrinkled type of peas, such as Champion of England, Telephone, and Prize Taker. These may be supported on brush (fig. 14), on strings attached to stakes driven in the ground, or on wire netting.

Peas should be planted about 2 to 3 inches deep in rows 3 to 4 feet apart. Some gardeners, however, follow the practice of planting in double rows 6 inches apart, with the ordinary space of 3 to 4 feet between these pairs of rows. With varieties requiring support this is a good practice, as the supports can be placed in the narrow space between the rows. Cultivation, and irrigation if necessary, can be given outside the double rows, and the narrow space between need not be disturbed. For late plantings peas should be induced to root deeply, as has been indicated, by planting in open furrows and later drawing the soil up at intervals about the growing plants.

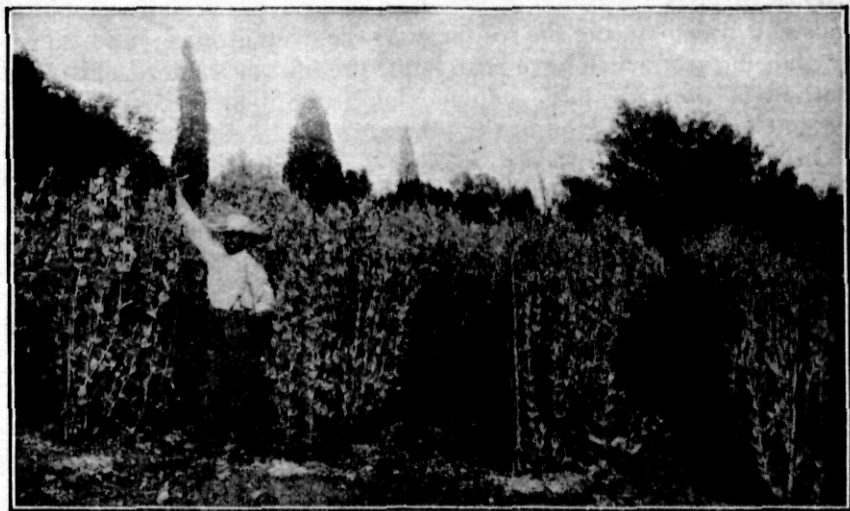


FIG. 14.—Tall-growing garden peas supported by brush stuck into the ground.

## ONIONS.

The onion will thrive under a wide range of climate and soil conditions, but a rich sandy loam containing plenty of humus is best suited to it. (Fig. 15.) As the crop requires shallow cultivation and it may be necessary to resort to hand work in order to keep it free from weeds, it is very desirable that the land should be in such condition that it is easily worked. As a general rule it is well to have the crop follow some other that has been kept under the hoe and free from weeds the previous season.

In the North seed is sown as early in the spring as the soil can be brought to the proper condition. In the South onion sets are frequently put out in the autumn and carried through the winter with the protection of a little hay or straw. There are three methods of propagating onions: The first by sowing the seed in rows where the crop is to grow; second, by sowing the seed in specially prepared beds and transplanting the seedlings to the open ground; and, third, by planting sets which have been kept through the winter. The first method is used by large commercial growers on account of the amount of labor involved in the others.

On small areas, however, it may be preferable to plant sets. Under normal conditions these usually may be obtained at planting time for about 25 or 30 cents a quart. One quart should be enough for the average family. Onions planted from sets will ripen earlier than those from seed sown in the fields.

When the transplanting method is used, the seed is sown in greenhouses, hotbeds, cold frames, or specially prepared beds at the rate of  $3\frac{1}{2}$  to 4 pounds for each acre to be planted. One-half ounce should furnish plants sufficient for the home garden. The seedlings are transplanted when they are somewhat smaller than a lead pencil and rather stocky. The root end of the seedling is pushed into the soil with one finger, and the soil is then firmed about the plant.

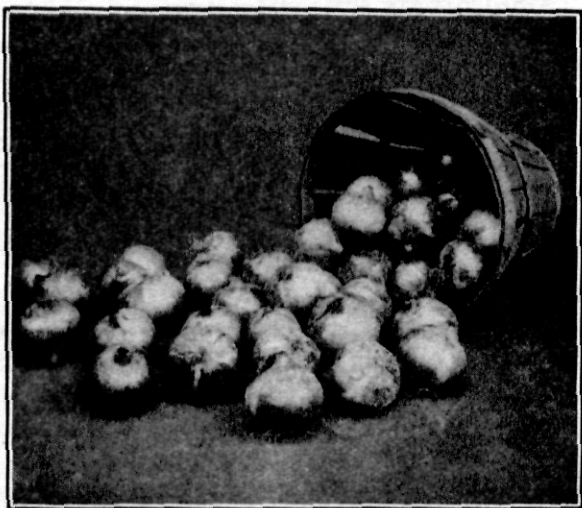


FIG. 15.—Onions are easily grown on good soil and require little attention besides weeding.



The seed is sown thickly in drills about 12 to 14 inches apart. After the plants become established they are thinned to 2 or 3 inches apart. The maturity of the bulbs may be hastened by preventing the continued growth of the tops. This is sometimes accomplished by rolling an empty barrel over the rows and breaking down the tops. After these are practically dead the onion bulbs may be pulled up by hand from the soil and spread in a dry, well-ventilated place to cure. Thereafter they may be stored in crates or bags for winter use. In the North the crop ripens and is harvested during the latter part of the summer and early autumn. In the Southern States, where the crop is grown during the winter, the harvesting and marketing period takes place during the spring months.

There are several kinds of onions that may remain in the soil over winter. The multiplier, or potato onion, for example, can be planted from sets in the autumn and will produce excellent green early onions. A large onion of this type contains a number of distinct hearts, and, if planted, will produce a number of small onions. On the other hand, a small onion contains but one heart and will produce a large onion. A few of the large ones may be planted each year to produce sets for the following year's planting.

The shallot is a variety of small onion that is frequently planted in early spring for its small bulbs, or "cloves," which are used in the same manner as onions. The leaves are utilized for flavoring. Another onion-like plant is the chive, the small, round, hollow leaves of which are used for flavoring soups. These leaves may be cut freely, as they are soon replaced by others.

#### THE PRINCIPAL ROOT CROPS.

Beets (fig. 16) can be planted comparatively early in the season. It is not necessary to wait until the ground has become warm, if the danger of frost is past. The seed should be sown in drills 14 to 18 inches apart and covered to a depth of about 1 inch. As soon as the plants are well up they should be thinned to stand 3 to 4 inches apart. From 2 to 3 plantings should be made in order to have a continuous supply of young, tender beets.

Parsnips, salsify, carrots, and turnips are all handled much like beets. Of the five, carrots can perhaps be left closer in the row than the others, about 2 or 3 inches apart. This plant, too, is less exacting in so far as fertility is concerned. Salsify, on the other hand, demands very fertile and finely cultivated soil.

#### POTATOES.<sup>1</sup>

The potato plant thrives best in sandy or gravelly loam soils. It may be grown with a fair degree of success on any type of soil except loose sand and a heavy, sticky clay, provided the land is well drained and contains the necessary plant food.

<sup>1</sup> Circular 87 of the Bureau of Entomology deals with the Colorado potato beetle, and Farmers' Bulletin 557 deals with the potato tuber moth.

Successful potato production is dependent to a large extent on the thoroughness with which the land is prepared before planting the crop. Where a horse can be used, the land should be plowed from 8 to 10 inches deep, provided the surface soil is of a sufficient depth to permit it. It is never advisable to turn up more than 1 inch of raw subsoil at any one plowing; so if previous plowings have not been over 6 inches, the maximum depth at which it should be plowed is 7 inches.

Where hand labor is employed the same rule should govern as to depth. In spading, especially on grass or waste land, turn the earth bottom side

up. Whether the land is plowed or spaded, it should be thoroughly pulverized immediately afterwards. Where horse labor can be used, the land after plowing should be thoroughly disked first, then spring-toothed, and finally finished with a smoothing harrow. Where land must be prepared by hand, it is good practice to pulverize the soil as much as possible when spading it up, after which it can be put in a fine condition of mellowness with a steel garden rake. The importance of thoroughly fining the soil can not be overemphasized.

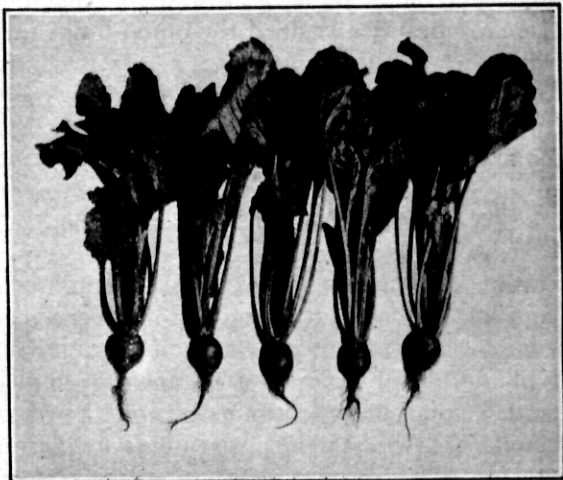


FIG. 16.—Both the roots and foliage of young beets may be eaten, cooked together or separately.

#### VARIETIES ADAPTED TO DIFFERENT LOCALITIES.

*Early varieties.*—In the Northeastern United States and along the South Atlantic seaboard, the Irish Cobbler, Early Petoskey, or Early Standard, all of which are practically identical, may be expected to produce larger crops and be more generally satisfactory for an early crop than the others mentioned. Quick Lunch and New Queen would be regarded as second choices for this section.

In the South Central and Southwestern States, the Triumph may be expected to give results equal to or even better than the Irish Cobbler.

In the Middle West, the Early Ohio should do well, while the Early Harvest and Early Rose may be regarded as second choices.

*Late varieties.*—In the New England States, Long Island, and northern New York, the Green Mountain, Gold Coin, Delaware, and other late varieties of that class do best.

In northern Michigan, Wisconsin, and Minnesota, the late varieties named above do about as well as the Rural New Yorker No. 2, and are superior to it in table quality.

In western New York, southern Michigan and Wisconsin, and Iowa, the Rural New Yorker No. 2, Sir Walter Raleigh, and Carman No. 3 are the best adapted varieties, and divide honors with the Green Mountain in the northern portions of these States.

Throughout Maryland, Virginia, the Carolinas, Tennessee, and Georgia the variety known as McCormick is quite generally grown as a late variety. In a favorable season the Green Mountain can also be grown.

#### WHEN TO PLANT POTATOES.

The date of planting necessarily must be governed by climatic conditions. In attempting to produce as early a crop as possible some risk must always be incurred of the plants being injured by late spring frosts. As a general proposition it is best to plant potatoes as soon as there is little likelihood of killing frosts after the plants are up and the ground is in condition to work.

The following dates of planting for various cities should be regarded only as the approximate time at which early potatoes might safely be planted:

March 15 to 25: Washington, Baltimore, Philadelphia, Cincinnati, Louisville, St. Louis.

March 25 to April 5: New York, Indianapolis, Detroit, Chicago.

April 5 to 15: Boston, Albany, Rochester, etc.

In the northern cities late varieties should be planted from three to four weeks later.

#### PLANTING PRACTICES.

The usual method of preparing potatoes for planting is to cut them into rather large pieces, containing several eyes. When seed potatoes are unusually expensive, however, it may be well to cut cone-shaped segments of meat around each eye and to use the remaining portion of the tubers for food. Under this plan it is not necessary to prepare the seed all at one time. From day to day the cones for seeding can be cut from the potatoes as they are being prepared for the table. The cuttings then should be spread out on a piece of paper in a moderately cool room (about 50° F.) and allowed to remain there until they have cured; that is, until the cut surface has become dry. A day or two should suffice for this, and potatoes then should be put in a shallow box or tray and placed where it is still cooler. Any storage condition that will insure them against frost on the one hand and undue shriveling on the other should prove satisfactory.

These seed pieces can be started indoors, provided it is possible to secure suitable soil and boxes. In such cases it may be desirable to plant the eye cuttings at once, and allow them to start into growth indoors with the idea of transplanting them into the open ground when danger of frost is past and the ground is dry enough to be cultivated.

The smaller the size of the set or seed piece used the more thorough must be the preparation of the soil. The more finely the soil is pulverized and the more uniform the moisture conditions which can be preserved in the soil, the better is the chance for the small seed piece to establish itself. A small set in rough, lumpy, or dried-out soil has little chance to live.

Generally speaking, the smaller the size of the set the closer it should be planted in the row if maximum yields are to be secured. Such sets may be expected to give the best yields if not spaced more than 10 to 12 inches apart in the row. Plant the small eye cuttings from  $1\frac{1}{2}$  to 3 inches deep, depending upon the character of the soil—the lighter the soil the greater the depth of planting. Larger sets may be planted 4 inches deep.

#### SPACING.

If an early variety is planted, and the work is to be done by hand the rows may be spaced as close as 26 inches, whereas if cultivation is to be done with a horse, 30 to 34 inches usually is allowed. In order to give the gardener some idea of the number of sets required to plant a plot of ground 50 by 100 feet at different spacings, the following table is submitted:

*To plant a plat 50 by 100 feet.*

Space between rows.	Space in row between plants.	Sets required.	Space between rows.	Space in row between plants.	Sets required.
<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>	
26	10	2,769	30	10	2,400
26	12	2,487	30	12	2,000
28	10	2,678	32	12	1,874
28	12	2,231	34	12	1,765

If a late variety is planted, the spacing should be greater, say, 34 to 36 inches between the rows and 12 to 14 inches between the plants in the row. The closeness of planting should be determined, first, by the variety, and, second, by the amount of available plant food and moisture in the soil or that can be applied to it.



## CORN.

Corn (fig. 17) to be at its best should be eaten within a few hours after it is picked, for its sugar content disappears very rapidly after it is removed from the garden. For this reason and because of its very general popularity it is an excellent vegetable to grow in the home garden. It should be planted on rich land and cultivated in the same manner as field corn. Beginning as soon as the soil is warm, successive plantings may be made every two or three weeks until late summer. Another method of prolonging the supply is to plant early, medium, and late varieties. The seed should be planted

about 2 inches deep, in drills 3 feet apart, and thinned to a single stalk every 10 to 14 inches.

The following varieties are recommended: For early corn, Golden Bantam and Adams Early, and for medium and late varieties, Black Mexican or Crosby's Early, Country Gentleman, and Stowell's Evergreen. The last-named variety has the largest ears and is the most productive.

Corn should be planted on rich land. The cultivation should be frequent and thorough and all weeds should be kept down and suckers removed from around the base of the plant.

## TOMATOES.

Tomato plants should be started in the house or in a hotbed and should be transplanted once or twice in order that strong and vigorous plants may be secured by the time all danger from frost is past. Pot-

grown plants are especially desirable, as they may be brought to the blooming period by the time it is warm enough to plant them with safety in the garden. If the plants are not to be trained (fig. 18), but are to be allowed to lie on the ground, they should be set about 4 feet apart each way. If trimmed and tied to stakes they may be planted in rows 3 feet apart and 18 inches apart in the row. The home gardener will find the latter method preferable.

In common with all plants grown in a house, hotbed, or cold frame, tomatoes require to be hardened off before they are planted in the garden. By this process the plants are gradually acclimated to the



FIG. 17.—Green corn fresh from the garden is incomparably better than that purchased in the market.

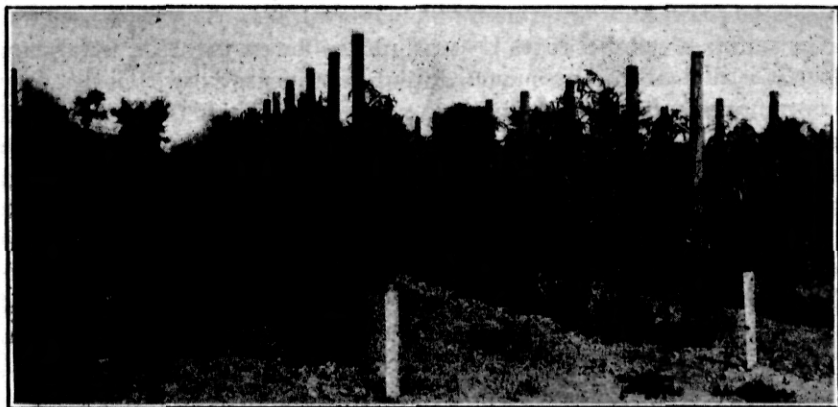


FIG. 18.—Tomato vines tied to stakes produce cleaner, healthier fruit than those permitted to trail on the ground, and give the garden a more attractive appearance. The stakes need not be so large as those here pictured.

effects of the sun and wind, so that they will stand transplanting to the open ground. Hardening off usually is accomplished by ventilating freely and by reducing the amount of water applied to the plant bed. The bed, however, should not become so dry that the plants will wilt or become seriously checked in their growth. After a few days it will be possible to leave the plants uncovered during the entire day and on mild nights.

#### EGGPLANTS AND PEPPERS.

Eggplants (fig. 19) and peppers are started and handled in the same way as the tomato. The soil best adapted for their production is a fine, rich sandy loam, well drained. The plants should be set in rows 3 feet apart and 2 feet apart in the row. Free cultivation is desirable, and the plants should be kept growing rapidly. A dozen good healthy plants each of eggplant and pepper should supply enough fruits for the average-sized family throughout the season. Both of these vegetables are heat-loving and should not be set in the open until the ground has become warm.

#### BEANS.

Beans are more susceptible to cold than peas and should not be planted until danger of frost is past and the ground begins to warm up. They are, however, among the most desirable vegetables that the home gardener can raise. There are many different kinds and varieties of beans, but for garden purposes they may be divided into two classes—string and Lima. Both classes are grown in practically all parts of the United States where the frost-free period is greater than three months and adapt themselves to a wide diversity of soils and climate. They grow rapidly and, therefore, leave the

area in which they have been planted free for another crop. To secure a continuous supply, it is desirable to make plantings at intervals of 10 days or 2 weeks from the time the ground is reasonably warm until hot weather sets in.

Both string and Lima beans are subdivided into pole and bush types. Pole Lima beans (fig. 20) should be planted with from 8 to 10 seeds in the hill, and after the plants become established should be thinned to 3 or 4. The hills should be 4 or 5 feet apart. Bush Lima beans are planted 5 or 6 inches apart in rows 30 to 36 inches apart. Bush beans of the string type may be planted somewhat closer—the plants standing 3 or 4 inches apart in rows from 20 to 24 inches apart if hand cultivation only is to be employed.

Beans of any kind should not be planted any deeper than is necessary to secure good germination. This should never be over 2 inches, and on heavy soil it should not be more than  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches.

Beans will not withstand frost, and the first plantings in the spring are frequently lost in this manner. It is very little trouble, however, to make a planting of beans, and the first planting should be made as soon as the ground is reasonably warm; this to be followed by a second and a third planting at intervals of about a week or 10 days. It sometimes happens that the first planting will be killed by frost, and that the second will come through the ground immediately after the frost and mature several days ahead of those planted to replace the ones that were killed.



FIG. 19.—When grown under good soil and cultural conditions the eggplant is a prolific yielder. All the fruits shown in this illustration are on a single plant.



FIG. 20.—Pole Lima beans are prolific bearers, as the illustration shows. Like other beans, they thrive on almost any soil. Vegetables that may be trained on poles or fences help to economize space in the small garden.

In the cultivation of beans, the general rules for the care of garden crops should be adhered to, and frequent shallow stirring of the soil practiced. For a constant supply of bunch or snap beans successive plantings should be made, the final planting being made about eight weeks before time for frost in the autumn.

Beans are useful in the home garden, since they thrive on practically any type of soil. The pole varieties are especially convenient, since they can be planted along the edges of the yard and permitted to climb on the fences. Some of the pole beans, both snap and Lima,

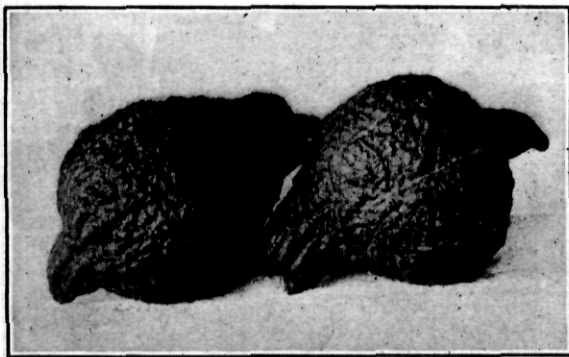


FIG. 21.—Hubbard squash vines occupy considerable space, but may be grown in the larger home gardens.

will continue to bear until frost. If the pole beans are planted in the hills in the garden proper, it will be necessary to sink a pole at each hill or to provide some other form of support. Extra long poles may be used and the tops of three or four from different hills fastened together tent fashion. If it is desired to keep the garden free from poles, substantial posts may be set at each end of the row and a wire or strong cord stretched between their tops. Cords may then be extended from small stakes in each hill to the wire.

#### CUCUMBERS, SQUASHES, AND MELONS.

Cucumbers, squashes <sup>1</sup> (fig. 21), and melons all belong to the melon family and demand much the same treatment. All are heat-loving and should not be planted in the open until the ground has become warm. It is easily possible, however, to give the plants an early start in the house and so gain several weeks in earliness of maturity. One way is to plant seven or eight seeds in berry boxes filled with soil. Each box of growing plants should have its bottom removed at planting time and should then be sunk in the garden to constitute a hill of plants.

Instead of growing the plants in boxes of ordinary soil they may be grown on sods in a suitable receptacle. Cut sods 6 inches square from spots which the growth of grass shows to be rich. Turn these grass side down and press the seeds in among the roots and soil. Cover with about an inch and a half of good soil and keep moist and warm. At planting time the sods may be lifted and placed in hills, which first should have manure worked into them.

These plants are rank growers and occupy much space. In very small gardens it may be well, therefore, to omit them. If squashes are grown, it may be well to plant only bunch varieties. Space may

<sup>1</sup> An insect that attacks squashes and other crops of this class is described in Farmers' Bulletin 668, "The Squash-vine Borer."

be conserved by growing a few cucumber vines near the edge of the garden and training them on a fence. This is possible, too, of course, with some melons and pumpkins, but supports will be necessary for the fruits. If the plants of this group are grown in the main garden, they must be spaced from 6 to 12 feet apart each way.

#### **CABBAGE, CAULIFLOWER, AND BRUSSELS SPROUTS.**

Cabbage and the other two members of the cabbage family mentioned here require much the same treatment.<sup>1</sup> All three are grown in hotbeds, frames, or flats for the early crop and are set out when all danger of frost is past. Of the three, Brussels sprouts (fig. 22) is the hardiest. Cabbage is fairly hardy, but cauliflower is somewhat tender. All require rather moist soil and plenty of plant food. Fertilizer may be conserved by placing it under each "hill" before the plants are set. The settings should be made 18 to 24 inches apart in rows spaced about 24 inches.



FIG. 22.—A single plant of Brussels sprouts. The miniature "heads" on the stalk are cut off and cooked like cabbage.

#### **MISCELLANEOUS SALAD VEGETABLES.**

Besides lettuce there are a number of vegetables for use as salads or cooked greens that may be grown easily in the home garden. Of the salad plants corn salad, garden cress, and endive are perhaps best known. The first two may be planted early. Endive, however, is planted in June and July. All are grown in drills about 14 inches apart and are thinned to proper distances as they grow.

Spinach and mustard are useful greens for cooking. Spinach may be grown either in the spring or in the fall. It is grown in drills, the use of the larger plants first automatically taking care of thinning.

Mustard greens may be produced on almost any good soil. The basal leaves are used for greens and are cooked like spinach. The plants require but a short time to reach the proper stage for use and frequent sowings should be made. The seeds are sowed thickly in

<sup>1</sup> Accounts of two insects that attack cabbage are given in Farmers' Bulletin 766, "The Common Cabbage Worm," and Circular 103 of the Bureau of Entomology, "The Harlequin Cabbage Bug."



drills as early as possible in spring or for late use in September or October. Ostrich Plume is a reliable variety.

For use both as a salad plant and for cooked greens Swiss chard (fig. 23), a beet which has been developed for foliage, should be more extensively grown. One of the good points about this vegetable is that crop after crop of leaves may be cut without injuring the plant. Chard is planted like beets in drills 12 to 14 inches apart and thinned to 4 to 6 inches.

#### PERMANENT VEGETABLES.

A number of vegetables, once established, will furnish a supply of their products year after year. Asparagus, rhubarb, and a number of garnishing and flavoring herbs are the best-known members of this group. Because they permanently occupy the space in which they grow, such plants should be in beds separated from the cultivated vegetables.

For the asparagus bed a well-drained, early location should be chosen. Prepare the bed by digging a trench 18 inches wide and 20 inches deep. Fill this one-third full with well-rotted manure and tramp it down well.

Half fill the remaining space with good soil, and on this set the root clumps of asparagus, 1 foot apart. Such roots, one, two, or three years old, may be purchased from seedsmen or nurseries. Cover the roots by filling the trench to the surface of the ground with good soil. The stalks should not be cut until a year after planting, and then but lightly. Full harvests may be taken after this. From a dozen to two dozen roots should be enough for the average family.



FIG. 23.—Swiss chard, a beet which has been bred for salad foliage instead of for root. The leaves and stalks may be cut repeatedly and used like spinach. Since the plant furnishes salad greens throughout the season it may well be grown instead of spinach, which furnishes but one crop, or after spinach.

Rhubarb is also grown from root clumps. A row of six or eight plants, 4 feet apart, should furnish stalks enough for the average family. Each hill should be well prepared with manure and good

soil. Set the crowns about 4 inches underground. Stalks should not be cut until a year after planting.

Parsley seeds are sown in a drill in spring. The plants will die down in the fall and put out fresh foliage the next spring. The plant is a biennial and must be replanted at two-year intervals.

Sage is a useful perennial herb which can be grown easily in the home garden. One or two bushes will furnish an abundance of leaves. These, when full grown, should be thoroughly dried and stored in cans or jars.

#### ANNUAL PLANTS USED FOR SEASONING.

Chives are small onionlike plants having flat, hollow leaves. These are cut and used for flavoring soups, sauces, etc. The plants are propagated by bulbs. A patch of the plants a foot or so square should be enough for the home garden.

Okra, or gumbo, produces pods which are used to season and thicken soups. The seeds of okra should be sown in the open after the ground has become quite warm, or the plants may be started in berry boxes in the hotbed or in the house and transplanted in the garden after all danger of frost has passed. The rows should be 4 feet apart for the dwarf sorts and 5 feet apart for the tall kinds, with the plants 2 feet apart in the row.<sup>1</sup> If the pods are removed before they are allowed to ripen, the plants will continue to produce them until killed by frost.

Cabbage, carrots, turnips, and rutabagas, in addition to their use as early crops, may be planted early in summer and the products which mature in autumn may then be held for winter use.

#### VEGETABLES FOR WINTER USE.

For a late crop of cabbage it is customary to plant the seeds in a bed in the open ground in May or June and transplant them to the garden in July. For cabbage of this character the soil should be heavier and more retentive of moisture than for early cabbage, which requires a rich, warm soil in order to reach maturity quickly. For the late variety it is not desirable to have too rich a soil, as the heads are liable to burst. Cabbages should be set in rows 30 to 36 inches apart, the plants standing 14 to 18 inches apart in the row.

To store cabbage for winter the heads should be buried in pits or placed in cellars. One method is to dig a trench about 18 inches deep and 3 feet wide and set the cabbage upright with the heads close together and the roots embedded in the soil. When cold weather comes the heads are covered lightly with straw and 3 or 4 inches of earth put in. Slight freezing does not injure cabbage, but it should not be subjected to repeated freezing and thawing.

<sup>1</sup> Detailed information on this plant is contained in Farmers' Bulletin 232, "Okra: Its Culture and Uses."

Parsnips will occupy the ground from early spring until fall. The seeds should be sown as early as convenient in the spring in rows 18 inches to 3 feet apart. The plants should later be thinned to stand 3 inches apart in the row. A rich soil with frequent cultivation is necessary for success with this crop. The roots are dug late in the fall and stored in cellars or pits, much as cabbage is, or else are allowed to remain where they are grown and are dug as required for use. All roots not dug during the winter, however, should be removed from the garden, as they will produce seed the second season and become of a weedy nature. When the parsnip has been allowed to run wild in this way the root is considered to be poisonous.

Carrots may be sown early, used during the late summer, and the surplus stored. If desired, a later crop may be sown after the removal of an early vegetable, especially for winter use. Carrots are grown in practically the same way as parsnips, but are not thinned so much and are allowed to grow almost as thickly as planted. They are dug in the autumn and stored in the same manner as parsnips or turnips.

Turnips require a rich soil and may be grown either as an early or late crop. For a late crop it is customary to sow the seeds broadcast on land from which some early crop has been removed. In the North this is generally done during July and August, but the usual time is later in the South. The seed also may be sown in drills 12 to 18 inches apart as for the early crop. After the plants appear they are thinned to about 3 inches.

The rutabaga is similar to the turnip and is grown in much the same way. It requires more space, however, and a longer period for its growth. It is used to a considerable extent for stock feed and has the advantage of being quite hardy.

## FRUITS IN THE SMALL GARDEN.

### BERRIES.

If there is sufficient space in the home garden, it may be desirable to have it supply fruits as well as vegetables. The small fruits, such as strawberries, raspberries, blackberries, currants, and gooseberries, may be produced with little trouble. A few dozen strawberry plants, and even fewer of the other plants mentioned, should be sufficient for a start. The plantings can be increased from year to year by resetting the young plants which spring up from runners and roots. All the small-fruit plants mentioned may be set out in spring. Since most of these plants will occupy the same space year after year, they should be segregated from the part of the garden devoted to annual vegetables.

Grapes may, in many instances, be grown in the home garden more easily than the small bush fruits, since they may be planted near

fences and permitted to run upon them. Grape plants also may be set out in spring before the sap rises. Fairly large holes should be dug, and these filled with rich soil mixed with wood ashes.

#### TREE FRUITS.

Tree fruits probably can not be grown in most small home gardens because of the relatively large areas of soil their roots occupy. The use of dwarf trees, however, makes possible the growing of a few fruit trees in the larger yards and garden inclosures. Though strawberries, cucumbers, and a few other vegetables may be grown near the trees while the latter are small, most vegetables must be grown in the open, where they will receive abundant sunlight. If fruit trees are grown in connection with gardening operations, therefore, they should, where possible, be well removed from the main garden plot.

Apple, peach, cherry, pear, plum, apricot, and quince trees may be purchased on dwarfing stocks. All may be set out in the spring before growth starts. The trees should be set in holes several feet square, in which rich soil has been placed. They should be set an inch or so lower than in the nursery.

