

UNITED STATES SCHOOL GARDEN ARMY
DEPARTMENT OF THE INTERIOR

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BUREAU OF EDUCATION
WASHINGTON



FORTY LESSONS IN GARDENING FOR THE
NORTHEASTERN STATES

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School Garden Army.



FORTY LESSONS IN GARDENING.

These lessons are designed for the use of teachers in the Northeastern States in connection with instruction in the work in school-supervised gardens. They are based upon the Northeastern States Leaflets, the Fall Manual, and the Spring Manual of the United States School Garden Army.

In addition to these forty lessons, the following Northeastern States Leaflets have been printed as 4-page circulars and are available to any teacher in this region on request:

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| 66. Lettuce for Home Gardens. | 79. Parsnips. |
| 67. Cabbages. | 80. Onions from Seed. |
| 68. Feeding the Fishworms. | 81. Rutabagas. |
| 69. Cutworms. | 82. Celery. |
| 75. Plans for Small Gardens. | 83. Winter Squashes. |
| 76. Plans for Larger Gardens. | 84. Sweet Peppers. |
| 78. Kohlrabi for Young Gardeners. | |

Various mimeographed leaflets are also sent out at frequent intervals to all teachers who request them.

The garden operations of the pupils make an excellent basis for language stories. Such stories embody real first-hand knowledge. In telling them the pupils feel the interest of a personal experience.

One advantage in developing such stories is that they can readily be adapted to the different grades. The length of the story depends chiefly upon the number of details mentioned. In the lower grades where the stories are made up of few sentences, only the principal facts are mentioned. In the upper grades details of development and structure are readily included.

The following model stories are suggestive of the work that may be expected of pupils in the fourth grade:

MY BEAN SEEDS.

Yesterday I planted half a pint of bean seeds in my home garden. I put down a line to keep the row straight. I made a furrow along the line with a hoe. I dropped bean seeds in the bottom of the furrow, one seed every two inches. I covered the seeds two inches deep. I hope they will come up soon.

MY BEAN PLANTS.

Early last week I planted some bean seeds in my home garden. This morning I saw them coming up. The stem is curved over at first. It pulls up the two thick seed leaves. Then the stem becomes straight and the large leaves begin to grow. I hope they will grow rapidly.

Such stories may be oral or written or both. They help to make the language lessons real.

FORTY LESSONS IN GARDENING.

Lesson 1: FIRST, CATCH YOUR RABBIT.

You remember the story of the boy who was telling about the rabbit he was going to eat, and his father said, "Son, first catch your rabbit." Well, that's the way you must do with these school gardens. Before you can eat the crops you expect to grow, you must get the garden.

For you boys and girls living in the country this will probably be an easy matter. Your fathers will be glad to give you a piece of land for your own use, as large as you are able to handle, where you can grow as many kinds of crops as you wish.

For you boys and girls living in the towns or cities it may be a little harder to get the land for your garden. But many of you will have a back yard of your own where many vegetables can be grown; or your next-door neighbor will be glad to let you use his back yard. At any rate, don't be discouraged if you can't find a place for your garden the first thing. By looking around and sticking to it you will find that there are a great many back yards and vacant lots near your own home which the owners will be proud to let you use after you have told them of the wonderful work the School Garden Army is doing.

If your garden is to be in a back yard, pick out one that is not shaded too much by trees or buildings. Growing things need sunlight and plenty of it. And try to pick out land that isn't all clay or gravel. You can't expect to grow much on soil like that. Ask one of your friends who is a farmer or who has a garden of his own to help you pick out the right place for your garden.

Lesson 2: HOW TO PLAN YOUR GARDEN.

Many of us think of gardening as work to be done only during a few brief weeks in the spring. This is wrong. Your garden will do its best for you if plans for it are made in the autumn and much of its preparation done then.

Here are some things you should think of in planning a garden:

1. *Size.*—The average boy or girl can easily spade and care for a garden 10 by 30 feet. A garden of this size will go far to supply vegetables for a family of four. Your garden should be sufficiently large to grow enough vegetables to make it worth while, but not so large as to make its care too much of a task.

2. *Width between rows.*—Rows must be farther apart if a horse or hand-wheel cultivator is used than if you use hand tools, such as a hoe or rake.

3. *Paths.*—Since your plants must receive personal attention, you should plan your garden with paths so that you can reach all parts of it without tramping down the plants.

4. *Rotation.*—This means using the same ground for the growth of one kind of crop, followed by another of a different kind, as a crop of corn followed by a crop of beans. Your planting scheme should avoid growing the same kind of plants over and over on the same ground.

5. *Keeping your garden at work.*—A planting calendar will tell you how, by second and third sowings, you can have fresh vegetables at all times during the gardening season.

6. *Use all your land.*—Vegetables which ripen quickly may be grown among those which ripen slowly. Thus lettuce, radishes, spinach, and like vegetables may be planted in the soil between tomato plants, potatoes, corn, etc.

7. *Plants to grow.*—The kinds of plants to be grown will determine very largely the nature of your plan. Radishes and lettuce may be planted closer together than cabbages or corn.

8. *Adding a touch of beauty.*—Finally, if you wish to make your garden not only productive but attractive, flowers may be grown about the borders.

An easy way to draw a plan is to measure the length and width of your garden and then make a map of it. Allow half an inch on your map for each foot in your garden. Then decide what you are going to plant and rule in your rows. In making your plan remember these things:

Put tall crops—like sweet corn and pole beans—on the north or west side.

On level ground run the rows north and south.

On hilly ground run the rows across the hill.

Plan for parsley, Swiss chard, or carrots along the front border.

In shady places plan for lettuce, chard, cucumbers, or squashes.

Plan for companion or succession crops, or both.

Lesson 3: USING THE SEED CATALOGUES.

The seed catalogues are excellent textbooks on school gardening. They are always up to date. They have attractive pictures. They give prices of seeds in packets or in bulk. They describe the best varieties. Many of them give directions for planting.

These seed catalogues appeal strongly to pupils. Boys and girls know that they are the real thing. They see their value and soon learn how to use them.

Here is a little plan for getting and using these catalogues:

1. Tell the pupils to look in the advertising columns of the magazines for the names and addresses of seed houses that offer their catalogues free to those who apply.

2. Make a blackboard list of all the firms reported. Get a list of at least six or eight such firms.

3. Divide these firms among the pupils so that only a few will send to each firm.

4. Have a lesson on the form of the application, allowing each pupil to make the request in his own way, provided it is in clear and simple English, with proper courtesy. Let the lesson end when the request is written on a post card or as a letter ready for mailing. Find stamps some way and see that the requests are mailed.

5. When the catalogues come, have each pupil keep his own in his desk. Use these in connection with every crop which is planted. Let pupils look up lists of varieties and compare prices and descriptions. Many pupils will be able to bring recent seed catalogues from home. Let these be brought in such cases rather than to send for new ones.

A live teacher can make these seed catalogues one of the liveliest features of a live school.

Lesson 4: THE SEED ORDER.

All seeds of a given kind may look alike yet the crops they produce may vary greatly—some good, some fair, some poor. For a seed is simply a baby plant wrapped in an outer covering. What it will grow into depends largely upon its parentage.

The best seeds have had their ancestors carefully selected by the men who grew them. The fields in which they were being produced have been gone over frequently and all unpromising plants removed. This has left for seed production only those true to the type desired.

Such selection costs money. So the selected types are likely to be a little higher in price than those unselected, but they are well worth the difference. The reputable seedsmen make it a rule to handle only selected seeds.

The first result of selection is the production of varieties. It is much better for you to buy a packet of French breakfast radish seed than simply a packet of radish seed. You are likely to get a better crop and will learn more about gardening in growing the crop.

So in planning for the seed order, the first thing is to plan to buy good seed and the second is to plan to buy named varieties.

Seeds may be bought in bulk much cheaper than in packets. The making of small envelopes or seed packets is an excellent school exercise. So is the dividing of the seeds in bulk into small sets. The working out of the cost of the smaller portions when a pound is so divided up furnishes a good problem in arithmetic.

The following suggestions are made as to the buying of seeds:

1. Where practicable buy in bulk of reliable seed houses, and subdivide the seeds with the help of the pupils.
2. Buy named varieties, selecting either those recommended on the lists sent out from this office or those which have been found successful by local gardeners. An excellent way to get the pupils interested is to ask them to find out the names of successful varieties grown locally by home or professional gardeners. Make the basis of the list the varieties which the pupils have grown themselves.
3. When the seeds are bought in prepared packets, get named varieties, if possible.
4. The supply of seeds this year is very short. There must be no waste. So calculate carefully and order only what are needed.

ESTIMATING THE NEEDS.

The vegetable garden, so far as possible, should supply the needs of the family. The practicability of doing this depends of course on many things, but chiefly on the size of the garden and the number in the family. In a general way it is possible to estimate the needs in advance and to make up the seed list accordingly.

Here is a little table that shows the amount of seed needed to supply a family of four with vegetables throughout the year:

Bean:		Onion sets.....	quarts..	4-6
Bush lima.....	pint ..	Pea, garden.....	quarts..	4-6
Pole lima.....	do....	Parsley.....	packet..	1
Snap.....	quarts..	Parsnip.....	ounce..	$\frac{1}{2}$
Beet.....	ounces..	Radish.....	do....	1
Cabbage:		Spinach:		
Early.....	packet..	In spring.....	pound..	$\frac{1}{2}$
Late.....	ounce..	In fall.....	pound..	$\frac{1}{2}$
Carrot.....	do....	Squash:		
Celery.....	packet..	Hubbard.....	ounce..	1
Corn, sweet.....	pints..	Summer.....	do....	1
Cucumber.....	ounce..	Tomato:		
Eggplant.....	packet..	Early.....	packet..	1
Kale.....	ounces..	Late.....	ounce..	$\frac{1}{2}$
Lettuce.....	do....	Turnip.....	do....	2-3

It is not supposed that any family will use all the vegetables listed, nor will all families require the same amount of any crop. The pupil should select his seed from this list and make successive plantings.

Lesson 5: GETTING YOUR GARDEN READY.

The success of your garden depends largely upon the condition of the soil in which you sow the seeds. Soil that has not been spaded or plowed for some time becomes so hard that the roots of plants can not easily go through it. So you must get the ground ready by digging it up and working it over so that the bits of soil will be loosened from one another. This makes it easy for roots and root hairs to penetrate between them and get from them the moisture and plant food needed for rapid growth.

The process of digging up and working over the soil is called *tillage*. Plowing and spading are examples of *deep tillage*. Cultivating, hoeing, or raking are examples of *surface tillage*.

In small gardens deep tillage is best done with a spade or tined digging fork. The spade or fork should be thrust down in a nearly vertical direction to its full depth and the soil turned over. After this is done it is well to spread broadcast over the freshly turned soil a light dressing of commercial fertilizer. Then rake the surface smooth. The soil is now ready to be lined out and planted.

In tilling clay soils it is important to wait until the ground is so dry that it crumbles easily between the fingers. Here are two simple tests which any pupil can make:

1. Take about a heaping teaspoonful of the damp clay soil. Work it into the shape of a marble. Roll the marble along the ground. If it does not crumble, the soil is too wet to work.

2. Take about a heaping teaspoonful of soil. Squeeze it tightly in the hand so that the water runs out between the fingers. Now, drop the ball upon hard ground. If it simply flattens out, the soil is too wet to be tilled. If it crumbles, it is in the right condition to till.

Sandy soil can be greatly improved by spading in fallen leaves, stable fertilizer, lawn rakings, or almost any kind of vegetation. As this material gradually decays it furnishes the right conditions for holding moisture and supplying food to plant roots. Such decaying vegetation in the soil is called *humus*.

Many garden soils are infested with witch-grass roots. These should be dug out before the crops are planted. A tined potato digger is one of the best tools for this purpose. A hoe or a spade that cuts the roots is worse than useless. Each piece will grow into a new plant.

Lesson 6: SEED TESTING IN THE SCHOOL.

A seed consists of two parts—an embryo plant and an outer covering.

If the embryo plant is alive, it will sprout into growth under favorable conditions. If dead, the seed is worthless.

It is a simple matter to test this sprouting ability of seeds by furnishing them with warmth, moisture, and air. Air is everywhere, so practically we need to provide only moisture and warmth.

Here are some simple ways of testing the viability or sprouting qualities of seeds:

1. Fill a water tumbler, a cup, or a bowl half full of clean moist sand. Place on top of the sand 10 or more seeds. Place over the top of the tumbler a small pane of glass or a saucer.

2. Pour a little water into a soup plate or pie pan. Set a flower-pot saucer right side up in the water. Place 10 or more seeds in the saucer. Cover the saucer by inverting over it another flower-pot saucer, preferably slightly smaller. Keep in a warm room.

3. Cut three or more pieces of blotting paper or heavy carpet paper so they will lay flat in a pie plate, a soup plate, or some similar dish. Place 10 or more seeds between each two layers of paper. Add enough water to moisten the paper, and either cover the receptacle or else add more water to keep the paper moist. Keep in a warm room.

4. Plant the seeds in soil in a paper flower pot, an earthen flower pot, or a window box. Keep the soil moist and warm.

In each case the seeds should germinate in a few days. After the root sprout is well developed let the pupils examine the seeds to see the baby plant and the wrapper that incloses it.

This seed testing offers excellent opportunities for problems in percentage. If a pupil places 10 radish seeds in a germinator dish and 7 grow, let him work out the percentage of viability.

It is especially important to test seeds that have been held over from previous years. It is worth while, however, to have pupils test samples of all seeds.

Lesson 7: WHEN TO PLANT YOUR CROPS.

You can easily arrange the different vegetable crops in two groups—those which are hardy to frost and those which are tender to frost. The time of planting of any crop depends largely upon whether it belongs to the first or the second of these groups.

For this reason you can plant the seeds of lettuce, onions, parsnips, or turnips as soon in spring as the ground is in good condition to work, even though frost may occur after the seedlings come up. But it would be foolish for you to plant at that time the seeds of tender vegetables like sweet corn, beans, cucumbers, or squash.

It is highly desirable that every garden supervisor and teacher in the Eastern States should have a copy of the planting zone map issued by the Department of Agriculture, Washington, D. C. This map, entitled "Planting Zones for Vegetables in the Eastern Half of the United States," is based on the average dates of the last killing frost in spring. The map is issued as a separate document and also as a part of Farmer's Bulletins 934 and 937, and may be obtained by writing to the Department of Agriculture.

In general, it has been found practicable to classify vegetables into four groups with relation to the time of planting. These are indicated as follows:

Group 1.—Consisting of early cabbage plants from hot bed or seed box, radishes, onions, early smooth peas, early potatoes, turnips, and mustard. These crops may be planted two weeks before the last killing frost.

Group 2.—Consisting of beets, parsnips, carrots, lettuce, salsify, spinach, wrinkled peas, cauliflower plants, celery seed, parsley, and sweet corn. These crops may be planted about the date of the last killing frost.

Group 3.—Consisting of snap beans, okra, and tomato plants. These crops should be planted two weeks after danger of frost is over.

Group 4.—Consisting of lima beans, pepper plants, eggplant, cucumbers, melons, squash, and sweet potatoes. These crops can not be planted until all danger of frost is over, which is about four weeks after the last killing frost.

Find out the usual date of the last killing frost in your town.

Lesson 8: HOW TO PLANT YOUR CROPS.

Well begun is half done in gardening as in other things. To get good crops, you must begin by sowing the seeds at the right time and in the right way.

One of the easiest mistakes you can make is to sow the seeds too deep. When this happens, you are likely to wonder why the plants do not come up. But if you dig down you will find the buried seedlings trying hard to reach the surface.

The smaller the seed is the smaller is the baby plant that comes from it. So in general you should cover small seeds with only a little soil and large seeds with more soil.

A good deal depends, however, upon the kind of soil and the condition it is in. In early spring when the soil is wet, the seed does not need to be covered so deeply as in summer when the soil is dry.

It is also especially necessary in summer to firm the soil down upon the seeds, by walking over it or by pressing a board down upon the rows after the seeds are planted. This serves to bring the soil particles in closer contact with the seeds so that they absorb moisture better. It also enables the root hairs that soon appear upon the sprouting roots to get moisture for growth more easily and it helps the rise of soil moisture from below by capillary attraction.

The depth of seeding also depends somewhat upon the character of the soil. A sandy loam through which the little seedlings can easily poke their heads is of a very different consistency from a clay soil which often bakes into a hard crust that effectually smothers the plants, which are unable to break through. Consequently, one can cover the seeds deeper in sandy soils than in those of clay.

The thickness of seeding depends upon various conditions. In a great many cases one must sow many more seeds than can possibly mature. One reason for this is that a lot of seedlings growing close together can break through the ground more easily than they could by pushing up singly. Consequently, this ability to work together in coming up is one important reason for thick seedage. Another is that by thus having a surplus of seedlings one can use a process of selection when it comes to thinning the plants, leaving in each case the strongest ones to grow.

Lesson 9: RADISHES FOR SCHOOL-SUPERVISED GARDENS.

The radish is one of the most important crops for school-supervised gardens. Its season is so short that even in the most Northern States it can be planted in spring and harvested before school closes. It may be planted very late in the season and makes a good succession crop. This makes it one of the few crops that can be used to advantage in any school garden.

GRADES I-III.

The essential thing in these grades is to give the children *experience* rather than *information*. The only real knowledge they have they get through feeling, seeing, smelling, tasting or other sense-perceptions. The teacher's voice may be ever so pleasant, but her telling about radishes is no adequate substitute for a child's experience with radishes.

Most young children have eaten radishes, and every child in these three grades should have the experience of growing radishes in a real garden. The great advantage of the crop for use with young children is that the seeds sprout quickly, the plants grow rapidly, and the roots are ready to harvest a few weeks after the seeds are sown.

Much can be done in the schoolroom as a preparation for the work in the outdoor garden. Valuable experience with the sprouting seeds and the growing seedlings may be given the pupils in practically all primary schools if the teacher realizes the fundamental importance of letting each pupil do and see and feel things for himself.

You can get a packet of radish seeds for a nickel or an ounce for a dime. Or very likely your Congressman will send you some for the asking. Here are a few simple things that you can have your pupils do with them:

Take a platter, a soup plate, a dinner plate or a pie pan. Cut three pieces of blotting paper to fit the bottom. Add enough water to moisten the blotting paper. Let each pupil put a radish seed on top of the blotting paper. Lay a pane of glass over the seeds and the paper. Keep in a warm room where the pupils can see what happens. Add water as necessary to keep the blotters moist.

In a day or two the seeds will sprout. The white root will come out of the brown coats. It will grow rapidly. When it is about an inch long it will send out a fuzzy growth of root hairs.

In many cases the seed leaves will also break out of the brown seed coat. The children will be thus able to see for themselves that the radish seed was made up of a *baby plant wrapped in an outer covering*.

They will also learn from this experience that when a seed has *water, warmth, and air* it will sprout—that is, the baby plant will break out of the brown wrapper and begin to grow.

II. Fill a flower pot or a window box with moist soil up to within an inch and a half of the top. Let each pupil place a radish seed on the surface of the soil. Then cover these seeds with half an inch of soil. Water carefully and place near a sunny window. If necessary, move the flower pot about during the day so it will be in the sun as much as possible.

In two or three days the seedlings will break through the soil. The two seed leaves will open out and a few days later the shoot between them will show itself. In a week or two the shoot will grow into the true leaves or *sun leaves*—very different in shape and appearance from the seed leaves. Dig up one or more of the seedlings to see the root and stem.

From this bit of experience with real things the children become acquainted with radish seedlings and will learn:

That when a seed is planted in the ground it sprouts by sending *the root downward and the shoot upward*.

That a radish seedling has two kinds of leaves—the seed leaves and the sun leaves.

That the roots and root hairs take hold of the fine bits of soil.

III. Such exercises as these will be helpful in getting the pupils ready for the outdoor experiences of growing radishes. Even a small bit of ground in or near the school yard may be used for this purpose. Details of planting and culture are given on the two following pages of this pamphlet.

LANGUAGE STORIES.

These experiences may readily be utilized as a basis for oral and written language stories. Three, four or five clear cut sentences should be obtainable from third grade pupils. The following may serve as a model story:

I planted a radish seed in a flower pot. I put the pot near a window. A little radish plant soon came up. It has two seed leaves. I am going to watch it grow.

GRADES IV-VI.

Any adequate teaching in these grades also requires personal experience on the part of the pupil. Mere information given through the teacher's voice or by reading a text book without supplementary activity on the part of the pupil is of little value. This activity of the pupils should, of course, culminate in the growing of radishes in each pupil's home garden, and in general this should include the growing of the principal types of radishes in order that the garden experience may be as broad as possible.

But here also much may be done in the schoolroom in advance of the outdoor planting season to enlist the interest and increase the real knowledge of the pupil. Some of these schoolroom activities are suggested below:

I. Have the pupils look up varieties of radishes in the seed catalogues. See that they find the name of a variety of each of these types: Round or turnip-shaped; oval or olive-shaped; long or finger-shaped. Have them find also the names of varieties of these colors: red, white, red and white, yellow.

II. Utilize this opportunity to have each pupil write a formal letter ordering a packet or an ounce of one variety of each type. Have it written as a business letter addressed to one of the seed firms, and see that it is correct in form, expression, and punctuation.

III. Take two small panes of glass. Put one or two pieces of blotting paper on top of one of them. Let each pupil put a radish seed on the blotting paper. Lay the other glass over the seed and hold it in place with rubber bands or spring clothespins. Leave it in a warm but not hot place where the pupils can see what happens. Dip the glass plates in water occasionally if necessary to keep the blotters moist.

The seeds will soon sprout, each sending out the white root on which root hairs will develop. Now place the glass plates on edge so they rest vertically. After a day or two have the pupils see whether the roots are growing downward or upward. After two or three days in this position reverse the plates so the roots point upward. Have the pupils see what happens.

From this experience the pupils will learn that *roots grow downward* under practically all conditions and should get the idea that a root is a living thing seeking for itself the right conditions for growth and adjusting itself to its surroundings.

IV. Utilize this same apparatus for testing the viability or sprouting quality of the seeds. Place 50 seeds on the blotter and let the pupils determine the percentage that sprout.

If you can get the old radish seeds, try these also and compare their percentage of viability with that of fresh seeds.

These germination tests can, of course, be made with many other bits of apparatus. Any device that gives the seeds the air, warmth, and moisture will serve.

V. Let the pupils plant some radish seeds in soil in a window box or a flower pot near the window. Let them watch the growth of the seed leaves or cotyledons and of the shoot between that grows into sun leaves or foliage leaves.

Dig up gently some of these radish seedlings. Let the pupils see that many particles of soil cling to the roots. Use a reading glass to show that the root hairs touch these bits of soil.

From this experience the pupils will better understand the importance of having garden soil in so fine a condition that the particles are readily reached by the root hairs.

VI. It is well worth while to give the pupils practice in strewing radish seeds on a table or desk. If the type of desk used by the pupils has a groove for holding pencils and penholders such a practical exercise is very easy.

To understand the importance of this preliminary seed strewing one should realize that without it most children sow the seeds in the garden row much too thickly. To make good gardeners frequent practice is needed in all the essential operations. Classroom drill in seed strewing is most helpful as a preparation for outdoor gardening.

Give each pupil about 50 radish seeds. Tell him to lay them out in a straight line. Four to the inch. Make an arithmetic exercise if you wish and let him find out how many seeds this would be to the foot. Then let him measure the distance he has covered by the 50 seeds and try again. Repeat until the results are satisfactory.

VII. Sound practical garden knowledge should result from the study of the radish. Some of the more important points to be emphasized are these:

The radish is a quick-growing, cool season crop.

It should be used as a catch crop or companion crop.

Good quality requires rapid growth.

A constant supply requires succession sowing.

It is easy to plant at one time more seeds than are needed for the family supply.

Culture in the school-supervised garden.

A quick-growing, cool-season crop like radishes should be planted in spring or autumn. A rich sandy loam soil is much better for growing them than a clay soil.

Here is a little list of good varieties of the three principal types:

Round or turnip-shaped.—White-tipped Scarlet Turnip, Early Scarlet Globe; Rapid Forcing, Crimson Giant.

Oval or olive-shaped.—French Breakfast, White-tipped Rocket.

Long or finger-shaped.—Early Long Scarlet, Cincinnati Market, White Icicle.

PLANTING.

Prepare the soil thoroughly as soon as it is dry enough to work. Apply broadcast a light dressing of commercial fertilizer. Rake the surface smooth. Line the rows 8 or 10 inches apart. Make the drills an inch deep. Sow the seeds about four to the inch. Cover an inch deep. Firm the soil lightly over the seeds.

GROWING.

Thin the seedlings a week after they come up to an inch apart. Weed early and as often as needed. If the soil is not rich apply a light dressing of commercial fertilizer, between the rows, two weeks after the plants come up. Do not let it touch the plants. Pull the roots as fast as they are large enough to eat.

SUCCESSION.

Sow radish seeds between rows of long-season crops. Sow a few seeds with seeds of carrots, lettuce, beets, parsnips, parsley, and other slow-growing crops. Sow for succession whenever vacant space is available.

Be careful not to sow too many radish seeds at one time. Ten feet of row sown once a week is likely to suffice for the family supply.

Lesson 10: GROWING ONIONS FROM SETS.

Next to radishes, the vegetable crop that can be raised the quickest is probably that of the small bunch onions or "scallions" grown from onion sets. Planted in April, these will be ready to pull in a few weeks and later will furnish an early crop of large onions for more general use.

Buy a pound or more of one of these kinds of onion sets: Yellow, white, red, potato onions, top or button onions. These are commonly quoted at about 40 cents a pound. Order as early as possible, before the sets have begun to sprout.

Prepare the soil thoroughly as early as it can be worked. Rake the surface smooth. Line the rows 8 inches or more apart. Make the drills 2 inches deep. Place the sets in the drills 2 or 3 inches apart, right side up with care. Cover an inch deep.

Give good surface tillage between the rows from the time the sprouts come up. Weed thoroughly. Pull the onions as soon as they get large enough to eat. Leave any not gathered to grow larger for later use. Do not try to save these large onions until winter.

Lesson 11: PEAS.

Garden peas or English peas are among the most valuable of all vegetables. This is a cool-season crop, making its best root growth in early spring. Because of this it is well to plant then several sorts that mature in succession.

Here is a little list of good varieties of wrinkled peas: *Early*: Sutton's Excelsior, Gradus; *midseason*: Thomas Laxton, Telephone, Alderman; *late*: Potlatch, Champion of England.

GROWING.

Prepare the soil thoroughly. Apply broadcast a rather heavy dressing of commercial fertilizer or of wood ashes. Wait until the heavy frosts are past. Line for double rows with 6 or 8 inches between each pair. For dwarf sorts have the pairs of rows 15 or 18 inches apart. Make the drills 3 inches deep. Sow the seeds about 1 inch apart in the rows. Cover 2 inches deep. Thin only as necessary when the seedlings are too crowded. Weed early and often. Hoe the surface only, being careful not to disturb the roots. If the growth in rich soil is very rank, pinch off the ends of the vines.

GROWING IN TRENCHES.

In regions where the season is too hot and dry for peas to succeed by the ordinary methods of culture, dig long trenches. Cover seeds with 2 inches of soil. After the seedlings are a few inches high fill in the trenches gradually at each hoeing, until the soil is level. This gives the root a chance to develop in the deeper, cool soil.

Look up varieties of peas in the seed catalogues.

Lesson 12: SHORT SEASON COMPANION CROPS.

Companion cropping consists simply in growing two or more crops together on the same area at the same time. It usually takes advantage of a difference in rapidity or in habit of growth of two crops. Thus button radishes mature to edible condition in a few weeks, so that they may be sown and harvested before some slow-growing crops are fairly started. These may be called short season companion crops.

Some practical combinations of this sort are indicated below:

Sow lettuce seeds as usual. Before covering the seeds sow radish seeds of the early button varieties in the open furrow very sparsely—perhaps one radish seed to every 2 inches. Then cover and firm the soil. The radishes will come up before the lettuce, helping to break the soil and showing the row lines so the spaces between can be easily hoed. Weed and thin the lettuce as usual, leaving the radishes to grow for three or four weeks. Then pull them for table use.

Apply the same procedure to these crops: Beets, carrot, Swiss chard, parsley, parsnip, salsify.

Here is a method of companion cropping of cabbage, lettuce, and radishes: Set out the cabbage plants in carefully lined rows 3 feet apart. Ten inches from the cabbages sow rows of radish seed. Half way between the radishes sow a row of lettuce seed or transplant lettuce plants. The space between the rows will allow hoeing from the start. The radishes will mature and be out of the way in four or five weeks, leaving a good chance to continue hoeing the whole space between the cabbage and lettuce. A month or so later the lettuce will mature and be removed. The cabbages are now reaching a good size and have all the ground to meet their needs. With varieties of small-headed early cabbage the distances between the rows might be less.

In small gardens most plants which are set out as transplants—like cabbage, peppers, eggplants, and tomatoes—should be interplanted in some such way as this:

Set out tomato plants from 18 inches to 3 feet apart in the row. Between each two tomato plants set out two or three lettuce seedlings. Give good surface tillage and pick the lettuce as soon as it is of good size for use. It will be out of the way before the spreading tomatoes reach the lettuce.

In a similar way set out lettuce seedlings in the rows of cabbage, cauliflower, eggplants, and pepper.

Lesson 13: LONG-SEASON COMPANION CROPS.

Some crops grow tall and others near the ground, both continuing through a long season. Thus corn and pumpkins are commonly grown together. The pumpkins begin to run over the surface after the cultivation of the corn ceases. Notwithstanding the shade, the pumpkin leaves get sufficient sunlight to grow. This may be called long-season companion cropping.

Comparatively few crops are thus planted together to grow throughout the season. In the garden this principle may be applied in these ways:

I. Mix leek and onion seed at the rate of one part leek seed to ten of onion seed. Sow together in the row. Thin and cultivate in the usual way. Harvest the onions when ready and leave the leeks to grow until the ground is plowed or spaded.

II. Have the garden soil rich. Sow sweet corn as usual. In every third hill along the outer rows sow three squash seeds. When danger from cutworms and striped beetles is past thin to one squash plant for each hill.

III. Sow sweet corn as usual. In every other hill sow three seeds of string beans or horticultural shell beans. Or sow these beans half way between each two hills of corn. Give good surface tillage and keep the hills always weeded.

Lesson 14: HUMUS—THE FOOD PRODUCER.

Humus is a little word of two syllables—hu-mus—that sounds a bit extraordinary. So did the word automobile 30 years ago. Yet humus is of vastly greater importance to America than are automobiles.

It is up to the teachers of America to make the word humus as common as the word automobile, and its meaning as well known by the man on the street.

Humus is the great basis of food production. The best way to Hooverize is to increase the humus in the soil. An ounce of humus will produce a pound of bread.

Humus is simply the decayed or decaying parts of plants or animals in the soil. Even if derived directly from animals it came first from the growth of plants. The black leaf mold on top of the soil in the woods is almost pure humus in an early stage of decay. The black soil of swamps is also nearly pure humus in a late stage of decay.

The great trouble with most of our poor soils is that for them every day is a humusless day. The first duty of many soldiers in the United States School Garden Army is to furnish humus to such soils. Old leaves, straw, grass, animal or plant refuse of any kind—even garbage when it can't be used to feed pigs or poultry—may be worked directly into the soil or made into a compost heap, which you may learn about in lesson 30, to decay and be dug in later.

An appalling waste of humus is taking place all the time. We throw it away. We burn it. We let the rivers carry it off. We neglect to produce it as we should.

Let's get down to the real basis in this great business of food production. Let's teach the children of America that to save humus and put it to work is the first duty of the patriot. If food will save the world, humus will produce the food.

Lesson 15: COMMERCIAL FERTILIZERS.

Compost, or manure from the stable, hen house, or pigeon loft, are the best fertilizers for the garden. When these are not available in sufficient quantities, then we find it necessary to secure commercial fertilizers. It is also often advisable to use commercial fertilizers as a supplement to manure.

The better commercial fertilizers contain plant food in a readily available form, and will, therefore, help materially in producing a good garden crop. The three elements most common

are nitrogen, phosphorus, and potassium. The nitrogen can be supplied in the nitrate of soda and sulphate of ammonia, which are the most common chemical sources of this plant-food element. The most common nitrogenous fertilizers from organic sources are dried blood, tankage, fish scraps, and cottonseed meal. The phosphorus needed for soils is supplied through chemical sources from phosphate rock and Thomas slag; through organic sources by ground raw bone, ground steamed bone, and bone black. The organic sources of potash fertilizer come from unleached and leached wood ashes and tobacco stems. The chemical sources of potash come from kainit, muriate of potash, and sulphate of potash. Because of the war the prices on the chemical sources of potash are too high to be profitable. It is advisable, therefore, to use ashes for this food. Wood ashes also contain about 30 per cent lime and hence serve a double purpose of furnishing the lime and a small per cent of potash.

For a garden containing 1,000 to 1,250 square feet, 10 pounds of nitrate of soda and 30 pounds of acid phosphate will make a good application. The nitrate of soda is applied by placing half of a quantity in the row at planting time and the other half scattered broadcast and raked into the soil. A ton of stable manure could be used on a garden 1,000 or 1,250 square feet in size. Results on a garden of the above size would be better, however, if to this amount of stable fertilizer 50 pounds of acid phosphate could be added and well raked in just as soon as the ground is plowed.

Most seed houses now sell ready prepared garden fertilizers. These can be purchased in small quantities. A good garden fertilizer will contain 3 to 5 per cent nitrogen and 8 to 10 per cent phosphoric acid. The dealer will explain the best mixtures for the different types of soil. Most gardeners count on using about 5 pounds of commercial fertilizer for each 100 square feet of garden space.

A little study of the best methods of using commercial fertilizers on any garden will yield the gardener a splendid reward for his time spent.

Lesson 16: SWISS CHARD FOR SUMMER USE.

Swiss chard furnishes two distinct vegetables for table use. The young plants and the green leaf blades of the older plants are excellent to boil as potherbs and use as greens. The thick leaf stalks make a very palatable vegetable when boiled and served as asparagus or celery is served, usually with a white sauce.

This chard is really a leaf beet and thrives best in a rich soil which is not sour. If the soil is sour, it should be thoroughly limed before planting the seed. The best variety is Giant Lucullus Swiss chard.

PLANTING.

Select soil which is rich and not sour. Prepare thoroughly by deep tillage as soon as it is well dried out. Apply broadcast a liberal dressing of commercial fertilizer. Rake the surface smooth. Line the rows 14 inches apart. Sow also a few seeds of a small early radish to mark the rows. Cover about three-quarters of an inch deep. Firm the soil over the seeds.

GROWING.

Hoe or rake the soil surface between the rows as soon as the seedlings come up. Pull the radishes as fast as they are large enough to eat. Thin the young chard seedlings, which are likely to come up in little bunches because there are commonly several seeds in the seedlike fruits you sowed, until there is only one seedling in a place, an inch or more apart. Thin again two weeks later so that the plants are at least 6 inches apart. Transplant some of the seedlings if needed to fill gaps or to make a larger planting. Weed at times of thinning and when

ever necessary. Till the soil surface between the rows at least once a week until the ground is shaded by the leaves. Apply a light dressing of nitrate of soda or a good commercial fertilizer if the soil is poor or the growth of the leaves is slow. Cut the outer leaves as fast as they become large enough to use, but not so closely that the plants have not enough leafage to continue thrifty growth.

Lesson 17: CARROTS FOR EVERY GARDEN.

Carrots are among the most healthful and delicious of all root crops. They are easy to grow. They may readily be stored for winter use. There are three main types of carrot roots: The short or round, the half-long, and the long. Earliest short-horn or French Forcing is a good variety of the first. Chantenay and Danvers half-long are good varieties of the second. The half-long sorts are desirable for the main crop.

PLANTING.

Wait until the ground is well dried out so that it can be easily worked. Prepare thoroughly by plowing and harrowing or spading and raking. Apply broadcast a dressing of commercial fertilizer. Rake the surface smooth. Line the rows 12 inches apart. Make the drills an inch deep. Sow the seeds sparsely in a continuous row, being very careful not to sow too many of these very small seeds. Sow also in the same drills a few seeds of early radish like Early Scarlet Globe to mark the rows. Cover one-half inch deep.

GROWING.

Hoe or rake the soil surface between the rows as soon as they are plainly to be seen through the coming up of either radishes or carrots or both. Pull the radishes as fast as they are large enough to eat. Weed early and carefully. Thin the seedlings twice, first when they have two or three true leaves in addition to the slender seed leaves, to about an inch apart, and second, two weeks later, to 2 inches apart. Hoe or rake at least once a week until the tops shade the ground.

SUCCESSION.

Early in spring sow French Forcing or Early Scarlet Horn for early summer use. At the same time or a month or two later, sow Coreless, Chantenay, or Danvers for late summer and winter use.

Look up varieties of carrots in the seed catalogues.

Lesson 18: BEETS FOR BOTH SUMMER AND WINTER.

Beets thrive best in a rich, sweet, mellow, well-drained soil. It is not worth while to try to grow them in a sour soil. Such a soil must be sweetened by liberal applications of agricultural lime, thoroughly worked in. Beet "seeds" are really little pods, each having several seeds, so thinning is necessary, no matter how far apart the "seeds" are sown. This vegetable is used when small for greens and the roots are cooked at all stages from the time they are large enough to pull.

Good varieties are: Crosby's Egyptian, Early Eclipse, Detroit Dark Red, Crimson Globe.

PLANTING.

Prepare the soil thoroughly. Apply broadcast a good dressing of commercial fertilizer and rake it in. Line the rows 12 inches apart. Make the drills an inch deep. Soak the seeds in warm water for 8 to 10 hours. Sow the seeds sparsely about half an inch apart. Sow also in the same drills a few seeds of an early radish. Cover about an inch deep.

GROWING.

Hoe or rake the soil surface between the rows as soon as the rows are plainly to be seen through the coming up of either radishes or beets. Pull the radishes as fast as they are large enough to eat. Weed early and carefully. Thin the beets twice, first to an inch apart and second to 2 or 3 inches apart. Use for beet greens the plants thus pulled up. Hoe or rake the soil surface every five days until the leaves shade the ground. Pull as needed, choosing each time the largest beets and leaving the smaller ones.

SUCCESSION.

The main crop of beets for fall and winter use should be planted several weeks after the early crop. In middle and northern regions June is a good month for sowing the main crop, and Detroit Dark Red is a good variety for the purpose.

Lesson 19: SPINACH.

Spinach is one of the best of all the plants used for potherbs or greens. It is a cool-season crop, doing best when started so early in spring that the crop can be cut before warm weather.

If seed is sown as early in the spring as the ground is dry enough to work, the crop is likely to escape attack by the leaf maggot. This pest often spoils the leaves of later crops.

Buy an ounce of seed of one or more of these varieties: Victoria, Longstanding, Round-seeded Savoy.

PLANTING.

Wait only until the soil is dry enough to work easily. Select a rich, loamy soil. Prepare thoroughly by plowing, harrowing, and raking or by spading and raking. Apply broadcast a heavy dressing of commercial fertilizer and rake it in. Line the rows 12 inches apart. Make the drills an inch deep. Sow about six to the inch. Cover three-quarters of an inch deep, and firm the soil lightly.

GROWING.

Hoe or rake the soil surface between the rows as soon as the seedlings come up. Thin the young plants twice—first, to an inch apart as soon as there are two or three true leaves in addition to the slender seed leaves; second, to three inches apart when there are several true leaves developed. Use for greens the plants pulled up at the second thinning. Weed at times of thinning and whenever necessary. Hoe the soil surface at least once a week. Fertilize between the rows with a light application of nitrate of soda if the soil is not rich. Cut as fast as the plants are large enough to use.

NEW ZEALAND SPINACH.

The common kind of spinach is good for use in spring and fall, but does not thrive in summer. New Zealand spinach may well take its place during hot weather. It withstands heat and drouth and produces plenty of greens from July until October.

New Zealand spinach is not grown as much as it ought to be. Many people do not even know about it. Let the pupils look it up in the seed catalogues.

The seeds of New Zealand spinach are quite large. They sprout soon after they are sown. They soon grow into thrifty plants that spread out and send up thick shoots well stocked with leaves. These shoots are broken off for use as greens. The plants at once begin to send out other shoots. Soon there is a bushy growth that yields a good crop.

Buy a packet of New Zealand spinach seed. Plant an inch deep in rich garden soil in hills a foot apart, two or three seeds to a hill. Thin the seedlings to one plant to a hill. Hoe frequently. Apply a light dressing of nitrate of soda between the plants a month after the seedlings come up. Do not pick until the branches are well grown; then break off the tips, taking 6 inches or so of each leafy stem.

Lesson 20: WEEDING YOUR GARDEN.

A weed is a plant out of place. A carrot growing in a row of onions is a weed. It is out of place. It belongs in a row of carrots. A poppy growing in a row of carrots is a weed. It belongs in a bed of poppies. But most weeds are neither good to eat, like the carrot, nor beautiful to look upon, like the poppy. They are vagrant plants—the tramps of the garden—ready at any time to steal food and moisture, air and sunlight from the useful crops to which the garden belongs.

In most gardens there are vast numbers of weed seeds of many kinds ready to sprout into life whenever there is a chance. So when we plant the garden to radishes or carrots or lettuce or other crops and wait for these seedlings to appear, the eager weed seeds make the most of the opportunity and come up by the thousands. Many of these young weeds are sturdy plants, ready to grow so rapidly that they will crowd out the seedlings we wish to raise. Consequently, we must pull up the tramps, roots and all, and cast them on the ground to wither and die.

This process of pulling or otherwise destroying the weeds in the row of seedlings is called *weeding*. It is one of the most important garden operations, especially in the spring when so many crops are getting started.

To pull weeds intelligently we should know them by sight, and be able to distinguish them from the young seedlings of the crop plants. So if one does not know just how the crop seedlings look, be sure to find out before the weeding begins.

Weed seeds are easily distributed. Wind and animals help this distribution. In general, weed seeds are very hard to kill. Changes of temperature have little effect upon them. They sprout readily in small amounts of soil and will thrive well even under disadvantageous conditions.

To assist in destroying the weeds various small tools called hand weeders are used. They enable one to stir the soil nearer the crop seedlings than can usually be done by the hand. In case the seedlings are to be thinned to several inches apart, these weeders can be used to dig out seedlings and weeds together.

Make a blackboard list of the weeds the pupils know by sight.

Lesson 21: THINNING YOUR YOUNG VEGETABLES.

When we plant garden seeds, we generally sow them thicker than we wish the plants to grow. All seeds do not sprout, and therefore we sow many of them to get the desired number of plants. Then, when the seeds do sprout and grow, the mature plants will require more room for development than the seedlings. In order to give the best plants room enough, we remove the others. This removal of plants is called *thinning*.

In the case of most crops it is important to make the first thinning early enough to avoid disturbing the roots of the plants left in the soil. At first each seedling has only a few short roots, but as it grows these roots become longer and reach out in all directions. If two seedlings are close together, the roots will mingle with each other so that one plant can not be pulled up without breaking off many of the roots of the other. Such a breaking off of roots is liable to injure the plant left and to check its growth.

This early thinning is particularly important in the case of cucumbers and other vine crops. These plants are especially sensitive to the disturbance of their roots, and if two are left close together until they are of good size, it is difficult to pull up one without serious injury to the other.

The final aim of thinning is to give to each plant plenty of room in the soil for adequate root development and plenty of room above ground for its leaves, flowers, and fruits to mature successfully. There is a constant struggle among all plants for food, moisture, light, and air. The more crowded they are the fiercer is this struggle.

The aim of the gardener is to give to each plant the most favorable conditions for growth. So he allots to each the space it needs to make the most of itself. If it is naturally a large plant, he leaves the seedlings far apart, and if a small one he leaves the seedlings nearer together, thinning as may seem necessary for the best growth of each.

Lesson 22: PLANTING TURNIPS EARLY AND LATE.

The turnip is a good crop for rich moist soils. It is not so likely to thrive on poor sandy soils or on new clay soils. It is a cool-season crop and should be grown both in spring and fall.

To be good to eat, turnips should grow right along from the time the plants come up. If they grow slowly or stop growing they get stringy or woody and are not good to eat.

Some turnips are white, others yellow. The white kinds have the mildest flavor. These are good white varieties: Early Snowball, Early Purple-Top Milan, Early White Egg. Golden Ball is a good yellow turnip.

PLANTING.

Select a rich, cool, mellow soil, preferably with no manure added this season. Wait only until it is dry enough to work easily. Prepare thoroughly, raking the surface to get it in fine condition. Apply broadcast a dressing of commercial fertilizer. Line the rows 12 inches apart. Make the drills one-half inch deep. Mix the small seeds with fine sand and sow sparsely. Cover one-half inch deep and firm the soil lightly.

GROWING.

Hoe the soil surface between the rows as soon as the seedlings appear, and at least once a week afterwards until the leaves shade the ground. Thin early, pulling out a large proportion of the seedlings before they begin to crowd. Repeat the thinning two or three times at intervals of a week or two, until the plants left are 3 or 4 inches apart. Weed carefully at times of thinning. Pull as needed for use, removing each time the largest roots and thus making more room for the smaller ones to grow.

Let the pupils look up turnips in the seed catalogues. Let each learn at home the different ways turnips are cooked. Let them draw outline pictures of turnips for the booklet on vegetables.

Don't overplant the early crop of turnips. Two sowings of 15 feet of row is likely to furnish a family supply for early summer. The fall and winter crop is to be sown in June, July, or August, depending on the latitude.

Lesson 23: SWEET CORN TO EAT AND TO CAN.

Sweet corn can be grown to advantage in those home gardens that have room for the cultivation of the larger vegetables. Corn can be canned or dried if desired and kept for winter use.

The Indians used to plant corn at the time in spring when the oak leaves are as large as squirrels' ears. This is a good rule to-day. It is about the time of the last killing frost. Later plantings should be made for succession.

In growing sweet corn it is important to have a good-sized patch. One or two rows alone are likely not to do well, because the yellow powder, called pollen, that comes from the tassels

is blown away. To get good ears, some of this pollen must fall upon the silk of the young corn ears. So it is a good plan to have the corn in a square block rather than in long rows.

When two gardens are near together it will help to have the corn plots in the two gardens next to each other. You thus double the chances for the pollen to do its work.

A good succession of varieties is Golden Bantam, Country Gentleman, and Stowell's Evergreen. A pint of seed is sufficient for 200 feet of rows.

PLANTING.

As soon in spring as the ground has warmed up and danger from frosts has about passed, prepare it thoroughly. Apply commercial fertilizer broadcast and rake it in. Line the rows 30 inches apart for dwarf varieties; 3 feet apart for tall kinds.

For drills, make the furrows 2 inches deep and sow a kernel of corn every 4 inches. Cover 2 inches deep.

For hills, hoe out a space every 2 feet and scatter six kernels in each hill, having each kernel at least an inch away from the others. Cover 2 inches deep.

GROWING.

Hoe and weed the corn plants as soon as they are up and continue hoeing the surface at least once a week. A month after the corn comes up thin the plants—if in drills to 10 or 12 inches apart; if in hills to three plants to a hill. Leave always the most vigorous plants to grow. It is sometimes advised to pull off the suckers at the base of the corn plants, but careful experiments have shown that it is better to leave them to grow.

Lesson 24: SUCCESSION CROPPING.

The result we are after in succession cropping is to have a continuous supply of fresh vegetables in the best condition for use. You can get this result in either of two ways: (1) By planting early, medium, and late varieties; or (2) by making successive plantings of an early variety.

Practical results under the first of these methods may be obtained by following these directions:

Sow at least three varieties of peas—one early, one medium, and one late. The seed catalogs classify the various sorts under these three headings.

Sow seeds of two or more varieties of carrots, as early French Forcing for early, Chantenay, Coreless, or Danvers Half-long for later crop.

Sow seeds or transplant seedlings of at least two varieties of celery, as White Plume or Golden Self Blanching for early crop and Boston Market or Easy Blanching for late crop.

Sow seeds of at least three varieties of sweet corn, as Golden Bantam or Golden Rod for early, Moore's Early Concord or Black Mexican for medium, and Country Gentleman or Stowell's Evergreen for late.

Sow seeds of these beets in early spring: Crosby's Egyptian, Eclipse, or Boston Market for early, Detroit Dark Red and Crimson Globe for succession.

In May, when the ground is warm enough, sow these beans for use as string beans: Bountiful, Hodsdon, or other early bush sorts; Golden Cluster Wax, to be trained on poles and to furnish an abundant supply for the latter part of the season.

Plant at least three varieties of cabbage, as Jersey Wakefield for early, Succession for summer, Danish Ballhead for fall and winter.

Plant sets of onions for early use. Sow seeds of onions for succession crops.

Plant at least two varieties of potatoes, as Bovee or Early Ohio for early and Green Mountain or Uncle Sam for late crop.

The other method of succession cropping is very simple. Select one favorite variety of a given vegetable and sow the seeds at intervals of 10 days or two weeks as long as there is good prospect of its being able to reach edible maturity. Thus many people prefer Golden Bantam to other varieties of sweet corn. They sow a small plot to this variety every two weeks during May, June, and the first half of July.

Lesson 25: HOW TO TRANSPLANT.

When you dig up a plant from a box, a hotbed, or a row in the garden and set it out in a new place you *transplant* it. If you are to be a really good gardener, you will need to know how to transplant several of your crops in such a way that they will grow.

You drop a seed into the open drill. You cover it with soil. The rain waters it. The sun warms it. The seed sprouts into a seedling that sends out roots below the surface and a shoot above the surface. When the seedling has been growing for a few days it becomes connected with soil particles by hundreds of tiny rootlets and thousands of root hairs.

If you dig up your seedlings most of these rootlets and nearly all of the root hairs will be broken off. This is, of course, a shock to the plant. It stops growing because food materials that have been coming through the root hairs and rootlets are no longer sent up. A new lot of these must be developed for growth to continue.

One of the best ways to prevent this injury is to grow the seedlings in a flower pot or something similar in which the roots will develop in a compact space. Then the seedling can be carefully taken out, or if the receptacle is of paper the whole may be set directly in the soil. The paper will soon rot away.

The great trouble in transplanting is that the seedling wilts. This is because the water evaporates from the leaves and no water comes in through the roots to replace that which evaporates. It helps to have lots of water in the plant when it is dug up. So the soil in which the seedlings are growing should be soaked a few hours before they are dug up.

The hotter the sunshine the more rapidly does evaporation take place. So it is desirable to transplant on a cloudy, moist day, or else in the late afternoon.

The greater the leaf surface the larger the amount of water evaporated. So it is often desirable to remove the larger leaves, or cut them through the middle. This is a great help in letting the plant get hold in its new position.

It is, of course, necessary that there should be plenty of moisture in the soil about the roots. So to be sure of this we may pour water before transplanting into the hole where the plant is to go or we may pour water on the surface after it is set out. On a larger scale we will be sure the soil is freshly tilled.

It is important that the soil particles be directly in contact with the roots. This will enable the rootlets and root hairs to get moisture more easily. So in setting out the seedlings we should press the soil down firmly with the hands.

Lesson 26: CUCUMBERS FOR SALADS AND PICKLES.

Cucumbers are easily injured by the cold. They grow best in a rich mellow soil. If an early crop is desired, the plants should be started in a hotbed and transferred later to the garden. Two or three weeks may be saved by using this method.

These are good varieties of cucumbers: White Spine, Davis Perfect, and Emerald.

PLANTING.

Cucumbers are usually planted in hills. When all danger of frost is past, prepare the soil thoroughly and open the hills a foot deep and 2 feet across. Fill each hole two-thirds full of barnyard manure and mix in a spade full of soil. Cover this with about 3 inches of soil. Drop 8 or 10 seeds on the hill and cover with an inch of fine soil. If the cucumbers are planted in rows, open the furrows about 5 feet apart. Scatter manure along the furrow and mix with the soil. Plant the seed about 2 inches deep. Thin young plants to 12 or 18 inches apart in row. It is advisable for early cucumbers to plant seed in berry basket or paper pots in a sheltered place. Later, after danger of frost is over, move and place in the ground. The plants will not wilt and the roots will develop rapidly.

GROWING.

When danger from bugs is past thin to three or four plants to hill. Cucumbers should have frequent cultivation until the vines are well grown. Protect the plants from the cucumber beetle by spraying with arsenate of lead, or by covering the hills with cheesecloth. Air-slaked lime sprinkled over the plants will help to keep off pests.

If cucumbers are planted in hills, the waste land between the hills may be used by sowing rows of bush beans. As fast as the beans mature gather them and remove the plants as soon as the crop is gathered.

Lesson 27: SETTING OUT TOMATO PLANTS.

The tomato is one of the most valuable garden crops. It is easy to grow. It thrives on a great variety of soils. It yields an appetizing food that can be used in many ways, both fresh and preserved.

When the ground is warmed up and danger from frost is over, prepare the soil thoroughly and rake in a dressing of commercial fertilizer. Line the rows 3 feet apart. Set the plants the distances apart in the rows, according to the method of training to be adopted, indicated below:

	Inches.		Inches.
Trained to single stakes.....	18	Trained to horizontal trellises.....	30
Trained to hoop trellises.....	24	Untrained, to spread on the ground.....	36

Set each plant deeper than it was before, burying part of the stalk. Fasten a piece of tin or a cardboard collar around each stalk to protect it from cutworms. Hoe once a week. Two weeks after setting out apply nitrate of soda near the plants and hoe it in.

A large proportion of the tomato plants set out are bought in small boxes. The best of these have been growing in these boxes for several weeks and have a well-developed root system. Sometimes, however, plants are dug up from hot beds and set in the boxes at the time they are offered for sale. Such plants are not so good as the others. One can learn about it by pulling gently on the stalk. If it comes up easily with few roots attached, it has not been growing long in the box.

TRAINING.

The three most important systems of training tomato plants are these:

- I. Single-stake training.
- II. Barrel-hoop training.
- III. Trellis training.

I. Drive a stout stake 4 or 5 feet long down beside each tomato plant. Cut off all the suckers near the root, so as to send up only the main leader. Tie this to the stake with rags or

raffia, tying anew from time to time as the leader grows upward. Pinch off the side branches back to the first fruiting stem. Continue this treatment as the vine grows until you have a tall plant loaded with ripening fruit.

II. Drive three stakes about 4 feet long down around the plant at such a distance that a barrel hoop will fit them snugly. Nail one hoop to them about 15 inches from the ground and another at 30 inches. Pinch off some of the branches at the base of the plant so as to have three or four leaders growing up. As these reach the first hoop, tie them to it with cotton rags or raffia, and start them up to grow inside the second hoop. When they reach this tie again.

III. To make a single trellis, drive a stake down by each plant, having it project 3 or 4 feet above ground. Fasten two or three strands of light wire horizontally on the stakes, having the first about 15 inches above the ground. Pinch off the suckers at the roots and tie the main shoot to lower wire as soon as it is tall enough. Let the side branches run along the wires, tying if necessary. Train on the second wire when it is reached.

A double trellis may be made in this way: Drive stakes down each side of the row 6 inches away from the plant, with their tops about 15 inches from the ground. Nail narrow strips along the tops of the stakes, and as the tomato plants grow train the branches over the strips.

Lesson 28: THE CARE OF THE GARDEN.

Much of the waste in gardening is due to lack of care after the garden has been successfully started. It is easy enough to plant a garden but it takes patience and continued care to grow a full crop. You ought not to waste anything, now that there is so much demand for food products. Every plant you have in your garden that is neglected and allowed to die is just so much loss to your country.

You should cultivate the soil shortly after each rain in order to break the dried crust and make a layer of dust on top to keep the ground moist underneath. Never work your soil when it is too wet. It should be dry enough to crumble in your hands before a garden plow or hand hoe is used.

Practice regular and thorough stirring of the soil throughout the season. Gardeners sometimes neglect this during dry times. Even if a layer of dust is already present your garden will be helped by regular cultivation. Cultivation, besides making a layer of dust on top, will:

1. Loosen and break up the ground into smaller pieces.
2. Increase the amount of food that the plants live on, and make it easier for them to get it.
3. Make it easier for the air to get to each piece of soil.
4. Mix the fertilizer better with the soil.
5. Destroy weeds and insects.

While your vegetables are small, cultivate close to the plants and as deeply as the plants are in the soil. As your vegetables grow larger, do not cultivate so deeply but farther from the row. You should cultivate at regular intervals until the plants have grown so large as to make it difficult to use a cultivator. In a small garden a hand hoe or weeder may then be used if more stirring seems necessary.

The wheel hoe is set up on wheels and has several different kinds of shovels. These may be changed for different kinds of work. The wheel hoe is used to cultivate between the rows. It is also used to get the garden ready to plant. It is one of the most useful garden tools. A spade is used to dig up the soil. If you use a garden line in your garden, you can keep your rows straight, thus giving your garden a better appearance.

Lesson 29: MULCHES AND HOW TO USE THEM.

Every living thing needs water. This is as true of plants as of animals. In many regions the greatest trouble in keeping the crops growing through the summer is to get water enough for the plants.

In winter the soil gets saturated with water. As the days become warmer and the sunshine hotter this soil water begins to go off into the air—to evaporate as people say—just as steam comes out of the teakettle when you put it on the fire.

If the soil is not plowed or spaded in spring, the water evaporates rapidly and by early summer most of it is gone—leaving the dry soil behind. Every time the ground is stirred it holds the moisture better, and even a stirring of an inch or two of surface helps to save the soil water.

Did you ever lift up a board in summer and find that the ground was moist beneath it? The board had held the moisture so it could not escape into the air. You will find much the same condition under an old bag or piece of carpet lying on the ground, or even a pile of leaves or straw left upon the garden.

When the boards, or bags, or old carpets, or leaves, or straw are thus left upon the soil surface each acts as a mulch. For a mulch is anything placed upon the ground to stop evaporation of soil moisture.

A mulch of any kind prevents evaporation. Soil moisture is continually coming to the surface and evaporating into the air. The moisture passes up through the soil in the same way that oil climbs the wick of a lamp. This movement of soil moisture is called capillary attraction.

This movement can not take place unless the soil particles touch one another. So it happens that if you stir the soil for an inch or two at the surface you get much air between the particles of soil and make a *surface mulch*, without using straw or bags or anything but the soil itself.

A shower of rain will destroy this surface mulch, and so after each shower it is necessary to prepare another mulch. Even if no rain falls, there is generally sufficient dew to destroy the mulch after a few days. The maintenance of a mulch throughout the growing season is best for most garden crops.

Lesson 30: THE COMPOST HEAP.

The chief need of most poor garden soils is humus. This is the great basis of food production, as explained more fully in lesson 14.

It is getting harder every year in cities, villages, and suburban communities to obtain stable fertilizers to enrich the gardens, because automobiles are displacing horses. Consequently, commercial fertilizers are being used more largely to enrich our gardens. But commercial fertilizers contain practically no humus, so the soils are not being prepared for that permanent production which should be the aim of every gardener.

The best way for most gardeners to improve upon these conditions is to start a compost heap and keep it as a permanent part of the garden outfit. Select for this an out-of-the-way corner, preferably behind the screen of an arbor or fence. Then, pile upon it all refuse vegetation from the garden or the kitchen and mix with it enough soil of any kind to keep it moist and help it to decay.

This compost heap soon becomes the handy place about the garden that gets everything for which there is no other destination. Its size increases surprisingly as one piles on from week to week the tops from the gathered root crops, the clippings from the lawn, the fallen leaves from the trees, the rakings from the paths, everything, in fact, that contains plant tissue—the raw materials for humus making.

The compost heap should be forked over about twice a season. This mixes the materials more thoroughly and makes them decay more rapidly.

As soon as part of the compost heap has rotted down sufficiently to mix readily with the soil it should be spaded in wherever needed. The coarser portions, which are slow to decay, may well be buried in the bottom of border beds for perennial flowers or vegetables.

But there is this danger in a compost heap: It may easily become a means of spreading the germs of various plant diseases. So be careful not to put upon it rotting cabbages or leaves of vegetables infested by blights and rusts. The leaves of trees are safe, and so are lawn clippings and many other parts of plants that you will readily find in your gardening operations.

Lesson 31: HOW TO KILL THE BITING INSECTS.

Insects that feed on plants get their food in two ways—some bite out pieces of the leaf, stem, or fruit; others stick a pointed beak into the plant and suck up the sap. Some insects may be killed by putting arsenate of lead or other poison on the plant. Other insects are not hurt in this way, but must be killed by some poison which gets directly on their bodies.

Cabbage worms, flea beetles, potato beetles, celery caterpillars, and tomato worms are good examples of insects that bite plants. Aphids or plant lice, leaf hoppers, squash bugs, scale insects, and various plant bugs are good examples of insects that suck up the sap. As a rule, the biting insects are rather easier to kill than the sucking insects, because it is only necessary to dust or spray the plant at almost any time before the insects attack it. In the case of the sucking insects it is necessary to put the poison on the plants at the time when the insects are present and to repeat it until all are killed.

The best way to kill biting insects is to use arsenate of lead. This may be purchased from all seedsmen and florists, as well as at most hardware and paint stores, in either of two forms—a paste which is especially intended for spraying, or a dry powder which may be used either for spraying or dusting. One great advantage of arsenate of lead is that either as a liquid spray or a dry powder it may be put on the plants in almost any strength without danger of hurting them.

APPLYING ARSENATE OF LEAD.

1. Put the dry powder on the leaves and stems with a powder bellows, powder gun, or duster. The best time to do this is early in the morning before the dew has evaporated. Put the powder on thick enough to show a white coating on the plant. This is the easiest and simplest way to kill most insects that bite plants.

2. Spray the plants with lead arsenate powder in water by means of a small pump or hand sprayer in this strength:

Three level teaspoonfuls lead arsenate powder to 1 quart water; or

One ounce or about 10 level teaspoonfuls lead arsenate powder to 1 gallon of water; or

One pound lead arsenate powder to 25 gallons of water.

3. If the paste form of lead arsenate is used instead of the powder, use twice as much lead arsenate in each case.

4. If you find it difficult to make the lead arsenate stick to the leaves, as you may when putting it on cabbage and asparagus, add resin fish oil soap at the rate of 1 ounce or a piece about 2 inches square to each gallon of water. Dissolve the soap in hot water before mixing with the lead arsenate water.

Remember that arsenate of lead is a deadly poison. It must never be left where young children may get it.

Lesson 32: THE CABBAGE WORMS.

The cabbage worms are the worst enemies of cabbages and cauliflower. They are greenish caterpillars that may easily be found in the garden at almost any time. They eat the leaves of the growing plants, giving them a ragged appearance. As the cabbages head up they eat the inner leaves and often ruin the heads.

Like other insects, this cabbage worm has a life story which is worth telling:

Some fine morning a common white butterfly may come to your garden. She stops to lay an egg on the cabbage leaf and then flies away. A week later the egg hatches into a tiny green worm or caterpillar.

The little caterpillar nibbles at the green surface of the leaf, and begins to grow. It nibbles away for a week or so. Then it has eaten so much that it has become too large for the skin with which it was born. So it sheds this skin or molts and crawls out with a new skin which had been formed beneath the old one.

After the first molt the caterpillar feeds again upon the leaf, and keeps this up for several days before it is ready to molt the second time. Then it sheds its skin as before.

The caterpillar keeps on feeding and shedding its skin for about a month. Then it is full grown so far as this part of its life is concerned. It now crawls to the underside of a cabbage leaf or a stone, or board, and fastens itself by a mat of silken threads. Here it sheds its skin for the last time and becomes what is called a quiet chrysalis.

After another week the quiet chrysalis changes to a white butterfly like the one that laid the egg.

HOW TO PROTECT YOUR CABBAGES.

The injuries of cabbage worms may be prevented in these ways:

1. Dusting the young cabbages with road dust, ashes, or something similar which prevent the laying of the eggs.
2. Catching and killing the butterflies that lay the eggs.
3. Dusting or spraying the young plants—*before they begin to head, never after*—with arsenate of lead.
4. Dusting or spraying the plants with hellebore, after they begin to head.
5. Pouring on hot water—at a temperature of 130° to 150° F.

Lesson 33: HOW TO KILL THE SUCKING INSECTS.

Garden crops are attacked by two great groups of insects—those that bite the leaves and those that suck the sap.

The potato beetle is a biting insect. So you can kill it by putting arsenate of lead upon the leaves. The insect eats the poison with the leaf and is killed.

The green fly or aphid is a sucking insect. It inserts its sharp beak into the leaf and sucks out the sap. So it must be killed with something that destroys it by contact.

The best things to use to kill aphids or plant lice and other insects that suck the sap from the green leaves and stems of crop plants are kerosene emulsions and the nicotine extracts of tobacco.

KEROSENE EMULSIONS.

Kerosene, like other oils, kills any insects that it touches. The oil goes through the breathing tubes to all parts of the body, causing death. But kerosene alone also kills the green parts of leaves and stems, so it can not be used alone on crops that are being attacked by insects.

When kerosene and hot soapsuds are mixed together they make a wash, or what is called an emulsion, which you can put on the green surfaces of plants without hurting them. This mixture is still strong enough to kill the insects.

To make a supply of kerosene emulsion you will need a pail, a small spray pump, and a place to heat water. The emulsion is easily made by following these directions:

Heat one-half gallon of water to boiling. Slice half a bar of soap into pieces and stir it in the water until dissolved. Take it from the fire and pour these hot soapsuds into a pail into which you have put a gallon of kerosene. Then pump the mixture back and forth into the pail until the kerosene is thoroughly mixed with the soapsuds, forming an emulsion.

When the emulsion is made it can at once be diluted with water, mixing easily while still warm. One part of the emulsion should be mixed with 10 parts of water.

When the emulsion cools it becomes a jellylike mass, like soft soap. This will keep for months if stored in a cool place. Some of it may be used at any time, diluting with 10 parts of water to 1 part of emulsion. If it is first mixed with a little hot water it dilutes more easily.

A small amount of kerosene emulsion may be made by dissolving 1 cubic inch of soap in half a pint of hot water and then shaking hard with a pint of kerosene until thoroughly mixed. This is then to be diluted with 10 parts of water.

TOBACCO EXTRACTS.

The nicotine poison in tobacco is one of the best of these contact-killing insecticides. It may be obtained by boiling tobacco stems in water or extracted by various other processes.

Many liquid nicotine preparations are upon the market. The best of these contain about 40 per cent of nicotine sulphate. It is to be very much diluted—generally 1 part of nicotine sulphate to 1,000 parts of water.

These liquid nicotine preparations may be used in this way, unless different directions are printed on the package:

Spray promptly any plants on which plant lice, thrips, leaf hoppers, or other sucking insects appear, either with a spray pump or hand sprayer. Dilute the nicotine preparations as follows:

One teaspoonful nicotine sulphate (40 per cent) to 1 gallon of water. Add to this one 1-inch cube of hard soap dissolved in a pint of hot water.

One fluid ounce nicotine sulphate (40 per cent) to 8 gallons of water. Add to this one-half pound hard soap dissolved in a quart or two of hot water.

One-half pint nicotine sulphate (40 per cent) to 50 gallons of water. Add to this 2 pounds soap dissolved in a gallon of hot water.

Always mix the liquid thoroughly, stirring it up just before spraying. Apply with a fine nozzle that will reach every tiny insect on the plant.

Lesson 34: THE APHIDS OR PLANT LICE.

The aphids or plant lice are probably the most generally troublesome garden insects. They attack nearly all crops, and often cause the withering or death of the plants.

These aphids are sucking insects. Each has a sharp beak that it sticks into leaf, stem, or fruit. Then it sucks out the sap. Although these pests are so small, they increase in number very rapidly. Each gives birth to many young ones, and these young aphids grow up in a week. So one aphid upon a plant may soon cause it to be covered with the little green, brown, or black flies. The large number of sucking beaks soon kills the leaf or plant.

Flowers as well as vegetables are commonly attacked by these little creatures. A black kind is often found in large numbers on nasturtiums. A brown kind attacks chrystemums. Several sorts of green aphids may be found on other flowers.

Because these pests get their food by sucking the sap instead of biting out pieces of the leaf, they can not be killed by putting poisons like arsenate of lead or Paris green on the surface of the plant. When you spray or dust such arsenical poisons on potato leaves, the bits of poison are eaten by the potato beetles and the beetles die. But the aphids, or any other sucking insects simply push their beaks between the bits of poison to reach the sap within the leaf, and are not hurt by such poisons.

The best thing to use to kill aphids is the nicotine poison in tobacco.

In using nicotine washes or sprays against these little pests you must not be content with spraying but once. You should spray your plants two or three times, because if only a few aphids are left they will soon multiply into a great number.

You should use a sprayer that makes a fine mist which will reach all parts of the plants that are being attacked. In the case of vine crops, like melons and cucumbers, you should also spray the under surfaces of all leaves.

Do you remember what you learned about the use of kerosene wash or emulsion to kill these sucking insects?

Lesson 35: QUALITY VEGETABLES FROM THE GARDEN.

One great advantage of the home garden is that with it one can have fresh vegetables for daily use. These are much better than the wilted products of the market.

But knowledge and skill are needed to get the best results even with fresh vegetables. Most of these have a certain period of growth when they are best for use. To know this period and to take advantage of it is the sign of a good gardener.

String beans furnish an example of the truth of this statement. There is a brief period—perhaps two days—after they reach full size when they are best for use. Soon after this they become stringy and less desirable. You can readily learn the right stage for picking by breaking one or two—they snap readily, without strings, and the tips are soft and pliable.

Shell beans must of course be left on the vines until the beans are of good size, but no pods should be allowed to become dry until toward the end of the season. If some are left to mature the plants are likely to stop sending out blossoms and so will cease to produce. These statements apply both to bush and pole shell beans but are especially important in the case of the latter.

Lima beans are best for use when of full size but before they become too hard. To determine this without opening the pod press upon the tip with your finger. A spongy feeling shows that the beans are ready for use.

Kohlrabi is too little grown in American gardens. One reason is because its excellence is too little known. This excellence, however, depends upon gathering the thickened stem bulb before the outer skin becomes at all tough. About the time this part is half the size of a baseball it is likely to be of the best quality.

Every experienced gardener knows that the best time to gather sweet corn is soon after the silks turn black. Not all know, however, that the sugar content of the kernels is lost rapidly after picking. The sooner it is cooked the sweeter it will be. And if it is steamed for about 20 minutes its sweetness and flavor will be preserved better than if it is boiled.

If you take good care of your garden all through the season, following the directions given in this manual, you may expect to gather a good crop. This table tells you when to gather several kinds of vegetables that you will grow.

Crop.	Time to gather.	Remarks.
Beets.....	When young.....	Beet greens, when tender, make a delicious dish.
Brussels sprouts.....	After frost.....	Cold improves this vegetable.
Cabbage (early).....	When three-fourths headed.....	May be left until frost.
Carrots.....	When young.....	Should always be gathered young when used for soups.
Chard.....	When outside leaves are about 1 foot high..	Cut lightly at first. Midribs of leaves can be used like asparagus.
Kohlrabi.....	Before skin hardens.....	The bulb should be about two-thirds as large as a baseball.
Lettuce.....	While leaves are tender.....	Small, young lettuce leaves make best salads.
Lima beans.....	While still green.....	Pods should be spongy at the tip
Melons.....	When they crack around the stem.....	Let your melons ripen on stem if possible.
Potatoes.....	When vines are dry.....	Harvest a few at a time except at end of season.
Radishes.....	When young.....	Radishes get tough and spongy with age.
String beans.....	When they snap readily.....	Tips should be soft and easily bent or twisted.
Shell beans.....	When pods are well filled.....	Do not let them dry on vines.
Sweet corn.....	When it has just come to milk with blackened silks.	Should be used as soon as picked.

Lesson 36: PLANT DISEASES.

Garden crops are subject to injury by two principal groups of enemies—plant-feeding insects and parasitic fungi. The plant-feeding insects may attack any part of the plant from the underground root to the ripened fruit. Parasitic fungi also may attack root, stem, leaf, flower, or fruit, causing various maladies, which are commonly spoken of as fungous diseases. Were it not for these two great types of enemies the work of the gardener would be much easier.

While most insects are of such comparatively large size that they are readily seen, the parasitic fungi reproduce and spread from plant to plant by spores so minute that they are practically invisible to the eye. Consequently, in attempting to prevent fungous diseases, it is necessary so to treat the crops likely to be attacked that the spores of the disease will be unable to get started. Of course, this may sometimes involve spraying a crop which possibly might never be attacked if it were not sprayed. But such spraying should rightly be considered an insurance against loss, and in many cases it has been found that such fungicides as the Bordeaux mixture have a tonic effect upon the health of the plant that makes it worth while, even if there were no danger from disease.

There are now available from seedsmen, florists, and other dealers a great variety of fungicides in prepared form, ready to be diluted and sprayed or dusted upon the crops. For the average amateur these are cheaper and more convenient than any homemade preparation, and as a rule they are more likely to be successful, because they are prepared by experts under the best scientific conditions. The most important of these fungicides are the Bordeaux mixture, lime-sulphur solution, Bordeaux-arsenate of lead, and various special preparations.

There are better ways, however, to combat some fungous diseases than by spraying with fungicides. Sometimes injury may be prevented simply by rotating the crop; sometimes by care in selecting seeds that are free from spores; sometimes by planting disease resisting strains.

The convenience of preventing injuries by insects and fungi depends very largely upon the apparatus one has for the work. Fortunately there are now available a great variety of small, efficient, and inexpensive sprayers and dusters which are very useful. One of the best types of sprayers for gardens is a small brass sprayer that gives a continuous spray.

*Lesson 37: TWO FRIENDS OF THE GARDENER.***1. THE CHIMNEY SWIFT—THE GARDEN ACE.**

During the great war the most thrilling battles "over there" were fought when one airship met another far up among the clouds. Both aviators flew swiftly about—up and down, to one side and then the other—piercing the air with machine-gun bullets while each strove to get into a position to send his enemy crashing to the ground.

Sometimes a hero became so adept that he outclassed his fellows. He could fly better and shoot more surely than the others. When he had brought down several enemies, he was called an ace—a term of honor that his mates were proud to give.

The ace is provided with the best of airships. It is frequently one of the small machines with which he can fly through the air like a swallow, gliding up and down or turning suddenly, as suits his fancy.

We have above our gardens a bird which always reminds me of one of these aces over the battle fields of France. I mean the chimney swift—the most compact bunch of feathers that darts above the earth. You have all seen him winging his way hither and thither, flying low before a rain, high at other times, or suddenly dropping out of sight into some convenient chimney.

Whether we know it or not, these garden aces are fighting our battles for us. The other day I caught a chimney swift as it was coming down a chimney with a mouthful of insects to feed its young. As gently as possible I got the bird to let me have this particular mouthful, and then let it go to get another breakfast for the birdlings.

I took the mass of insects to a Government scientist in Washington and asked him to look them over. This is what he found: Two hundred insects and 3 spiders. Among the insects were 56 aphids or plant lice, 59 leaf hoppers, and 63 two-winged flies. So these three groups of garden enemies made up much the largest part of the morning meal.

If one chimney swift catches 200 garden insects for 1 meal, how many will 100 catch for 100 meals?

2. THE TOAD—THE GARDEN TANK.

You have all heard of the tanks that helped so much in winning the latest Battle of the Marne, as well as many other battles of the war. You know these tanks are clumsy looking monsters that crawl along the ground with their hidden machine guns sending forth a hail of deadly bullets into the ranks of the enemy.

Sometimes when a war is on one of these tanks gets into a good position and stops to fire away at whatever enemy target shows itself. The tank is so camouflaged by its dull-brown color that it is hard for the enemy to see it at a distance, and it is so protected by its outer shell of steel that even cannon balls do not destroy it.

Did you ever stop to think that you have a helper against your garden enemies that may well be called the garden tank? You have often seen the clumsy brown toad half buried in the soil. Probably you have dug him up in hoeing potatoes or other vegetables, and have wondered why you did not notice him before. Now, this toad tank in your gardens is one of the most useful weapons you can use in fighting your garden enemies. He selects some good location, partly buries himself in the soil, and sits quietly until some insect comes passing by. Then he shoots out his long sticky tongue, strikes the insect, pulls it quickly inside the great jaws and swallows it for food.

The toad is so camouflaged by its brown color and its partial covering of brown soil that its victims come within striking distance without seeing the danger. And it is so protected by its thick, slimy, poisonous skin that birds and animals leave it alone.

So when you see a toad in your garden, say in a loud cheerful voice: "Good morning, Mr. Toad Tank; I am glad to see you. You are very welcome to make my garden your home."

And should your garden have none of these useful tanks, find one along the roadside and bring it gently home. It will do no harm to have several of them fighting your battles for you.

Lesson 38: SELLING YOUR VEGETABLES.

After your own home table has been supplied with all the vegetables that it needs, you should sell your extra products as fast as they are ready for the market. Your home needs should be supplied first before you attempt to sell to your neighbors. If you raise enough vegetables to supply the needs of your own family, you are doing a patriotic duty, because in so doing you are making it possible for other vegetables to go to hungry people.

You should not only supply your family needs and pay for the cost of your garden, but you should make a neat profit on the vegetables you raise. Don't you think it would also be a fine idea to invest your vegetable profits in war savings stamps?

Most selling from our village or city gardens is done by peddling among our neighbors. This encourages thrift and business system on your part. It is a training that you boys and girls ought not to neglect. To sell your vegetables readily, there are a few rules that should be followed.

1. Gather all vegetables when they are ripe and ready for the market. Do not pick half-ripe fruits; choose only those that are ready for a quick sale.

2. Grade your vegetables according to size and quality. Do not have a mixture of large and small sizes and good and poor vegetables.

3. Make your display of fruit attractive. Customers will buy more quickly and pay more if the goods offered for sale look neat and clean.

4. Do not put the best vegetables on top while poorer ones are hidden beneath. It would be better to separate the kinds and sell them separately.

5. Be honest. Do not claim for your goods what they will not show. Try to keep your customers by honest dealing.

6. Whatever boxes or baskets are used for selling or displaying your vegetables, make them attractive.

Build up a reputation for yourself for honesty and fair dealing.

Lesson 39: STORING YOUR VEGETABLES.

The storing of vegetables that are not used as soon as gathered is very important, as it is a fine way to lay up food for future use. It is a way to Hooverize many vegetables that you can't eat at once. Especially at this time, we must save and use every product possible, and we must not have any waste.

Potatoes, carrots, onions, beets, turnips, and many other of your garden products may be kept for winter use by storing. You will get the best results from storage if care is taken regarding the proper temperature and ventilation needed, the amount of moisture necessary, and the quality of the vegetables when first put in storage.

Some vegetables may be stored on your mother's pantry shelves while others should be put in the cellar, and still others kept in outdoor pits. Sometimes several neighbors join together and build a pit or storage cellar for their vegetables. This is known as community storage. When several gardeners do this the cost to each is small, and the vegetables can be handled more easily.

If you store your vegetables in the cellar, you must take care to see that there is enough ventilation and that the proper temperature may be easily kept. The cellar should have a good dirt floor, or, if it has a concrete floor, the floor should be covered with 3 inches of sand. This floor should be kept moist. Beets, celery, cabbage, parsnips, turnips, and potatoes may be stored in the cellar.

The best way to store vegetables outdoors is to use a pit. To build this, dig a hole in the ground 6 inches deep and as wide and long as necessary to hold the vegetables to be stored when piled up. Before putting the vegetables into the pit it should be lined with hay or straw. Cover the piled vegetables with several inches of hay or straw, and then cover the mound with 4 or 5 inches of soil. As cold weather comes on, add 10 or 12 inches of soil to the covering of the pit.

Lesson 40: JUDGING THE HOME GARDENS.

The fairest way to judge a garden is to visit it while it is in operation. The judges can then see the conditions involved in making it successful, and can estimate pretty fairly the various points to be considered. Such an estimate is difficult at best, and the following score card is offered simply as a suggestive guide, which any set of judges may modify to suit themselves. Any such modifications should, of course, be agreed upon in advance.

STORE CARD FOR JUDGING HOME GARDENS.

A. General appearance.....	20
Arrangement of rows.....	5
Freedom from weeds.....	5
Cultivation and care.....	5
Proper thinning.....	5
B. Choice of vegetables.....	15
For home use.....	5
For marketing.....	5
For canning.....	5
C. Freedom from pests.....	15
Spraying for insects.....	5
Spraying for disease.....	5
Other remedial measures.....	5
D. Evidences of.....	15
Continuous cultivation.....	5
Companion cropping.....	5
Succession cropping.....	5
E. Care of tools.....	10
F. Value of produce.....	15
Used at home.....	5
Sold in the market.....	5
Used for canning.....	5
G. Accuracy of garden records.....	10
Total.....	100

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THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth and expansion. It begins with the first settlers who came to the eastern coast of North America. These settlers were mostly from England, and they brought with them the ideas and customs of their home country. Over time, these ideas and customs spread to other parts of the continent, and the United States grew into the nation we know today.

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