

MSU Extension Publication Archive

Archive copy of publication, do not use for current recommendations. Up-to-date information about many topics can be obtained from your local Extension office.

The Home Vegetable Garden
Michigan State University Extension Service
C.W. Waid
Issued May 1916
36 pages

The PDF file was provided courtesy of the Michigan State University Library

Scroll down to view the publication.

PUBLISHED BY

MICHIGAN AGRICULTURAL COLLEGE

EXTENSION DIVISION

R. J. BALDWIN, DIRECTOR

EAST LANSING

Printed and distributed in furtherance of the purposes of the cooperative agricultural extension work provided for in the Act of Congress, May 8, 1914.

Michigan Agricultural College and U. S. Department of Agriculture cooperating.

BULLETIN No. 4

EXTENSION SERIES

MAY, 1916

THE HOME VEGETABLE GARDEN.

By C. W. WAID.

The primary object of the home vegetable garden is to furnish the owner's table with a regular supply of fresh vegetables. Vegetables should be an important part of the food supply of every family. When well grown, fresh and properly prepared, they are wholesome, nutritious, palatable and usually cheap as compared with meats and some other food products. An abundant and easily accessible supply of fresh vegetables will greatly reduce the money outlay, not only for vegetables, but for many other kinds of table supplies. The professional or business man does not as a rule look only at the monetary value of his garden; he realizes much pleasure and satisfaction from seeing the crops grow and often secures real enjoyment spending a little time each day working in "his garden." The novelty of having vegetables of one's own growing often adds considerably to the pleasure of eating them. The fact that they can be used when strictly fresh not only makes them more palatable, but tends to induce a more liberal consumption of vegetables.

The children often become interested in the garden work, especially if they are given an opportunity to earn a little money from the selling of the surplus vegetables. The use of vacant lots in towns and cities for garden purposes should be a more frequent practice and the children should be encouraged to do that kind of work.

There are three types of home gardens: 1. The farmer's garden; 2. The village or suburban garden; and 3. The city garden.

THE FARMER'S GARDEN.

SELECTING THE LOCATION.

On most of the older farms the garden site has been made permanent. When there is an opportunity for a choice of location the following points should be considered in making the selection:

(1) The garden should be as close to the house as practicable, because of the convenience in caring for and gathering the crops. This is especially important when the women of the family take an active interest in the garden.

(2) A soil that can be worked easily is to be preferred; either a sandy loam or a clay loam. A heavy clay may be made fairly satisfactory if it is thoroughly drained and well supplied with organic matter through addition of manure or the plowing under of green crops. A light sand will require heavy applications of manure each year to make it produce well. A muck soil is easily worked, but such a soil is usually on low ground which is subject to frost, both late in the spring and early in the fall.

(3) A gentle southern or southeastern slope is to be preferred.

(4) A long comparatively narrow strip should be selected when possible. The reasons for this are given under the heading "Labor Saving Methods."

(5) A good water supply is important. Many gardens would prove much more satisfactory if more water was applied to the crops. The overhead system of watering can be used to good advantage in many cases. (See Irrigation.)

(6) Some form of protection from the prevailing winds is desirable. A grove, orchard, row of trees, if not too close, a hill, or set of buildings, will afford such a protection.

LABOR SAVING METHODS.

The farmer's garden should be so planned that the labor of caring for it will be reduced to a minimum. Economy of time is of greater value to the farmer than economy of land. As previously stated, it is advisable, when possible, to select a long narrow strip for the garden site, as it will permit of field methods in the preparation of the garden for planting. By spacing the rows wide enough apart practically all cultivation can be done with a horse cultivator, and if the work is done at the proper time and with sufficient care very little hoeing or weeding will be necessary. The cultivating can be done more easily and quickly if the rows run the long way of the garden.

A definite plan of the garden should be made before the time for planting has arrived. This should be drawn on heavy paper and kept from one year to another for reference. If the plan is well made and consistently followed no time will be lost in deciding which vegetables to plant, where to plant them, or how much room to give to each.

By doing a considerable amount of preliminary work in the fall or during warm periods in the winter, such as clearing off rubbish, applying manure and plowing the garden, the labor in the spring may be considerably reduced.

If the vegetables are grouped according to cultural requirements, each group of crops may be planted and tended as one crop. If this plan is followed, the planting may begin on one side of the garden and extend across it as the season advances. This makes it possible to harrow each strip to be planted just before planting, thus putting the soil in good condition for a seedbed and at the same time destroying any weed seeds

which may have germinated. This plan also permits the placing of the early maturing crops together. After these crops are harvested, it is possible to prepare quite a strip of land at one time to be used for turnips or other late maturing crops.

PLANNING THE GARDEN.

The size of the garden will depend on the number in the family and whether or not there is a local demand for surplus vegetables. As a general thing, it is not advisable to plan a garden any larger than is necessary to meet the actual needs of the family. A small garden well cared for is much to be preferred to a large one which is neglected. With plenty of room between the rows, it makes little, if any, difference whether the garden runs north and south, or east and west. The direction will be decided by the relation of the garden to adjacent fields, or lots, or the lay of the land.

If the garden is to include bush fruits, such as blackberries, raspberries, and currants, these should be located on the north side, if the garden runs east and west, and preferably on the west side if it runs north and south.



Fig. No. 1.—A farmer's garden which the owner values at \$100.00.

The vegetables which will be included in a garden will depend very largely upon the personal tastes of the members of the family. The accompanying table gives a list of vegetables grown in W. E. Patterson's garden. (Figure I) in the season of 1915. Mr. Patterson values this garden at not less than \$100.00 for each season. The size of the garden is 50 x 200 feet and the rows run the narrow way. Beginning at the south end, crops were planted as indicated in the table:

MICHIGAN AGRICULTURAL COLLEGE.

PLAN OF A ONE HUNDRED DOLLAR FARMER'S GARDEN.

No. of rows.	Crop grown.	No. of rows.	Crop grown.
15.....	Potatoes, early.	3.....	Peas, early, followed by late cabbage and celery.
14.....	Potatoes, late.	1.....	Beets.
3.....	Corn, early.	1.....	Cabbage, late.
2.....	Peas, followed by turnips.	1.....	Cabbage, medium and early.
1.....	Lettuce.	2.....	Peas, followed by turnips.
2.....	String beans.	3½.....	Celery, late.
1.....	String beans.	3.....	Peas, medium and early.
1.....	Carrots.	1.....	Radishes, medium and early.
1.....	Parsnips.	2.....	Radishes, early.
1.....	Celery, late.	1.....	Tomatoes.
1.....	Peppers.	4.....	String beans.
1.....	Parsley.	1.....	Radishes.
2.....	String beans, early.	2.....	Corn.
1.....	Celery, early.	9.....	Strawberries.
3.....	Flowers.	1 doz..	Currants.
2.....	Cucumbers.	½ doz..	Gooseberries.
5½.....	Cabbage, medium and late.		

The garden was surrounded by a chicken-tight woven wire fence. This fence served as a trellis for several vine producing flowers, such as sweet peas and nasturtiums, and for several vegetables such as pole beans. Asparagus and rhubarb were also planted along the fence.

An analysis of this garden shows that the important crops for this family were potatoes, string beans, peas, cabbage, celery, radishes, corn and strawberries, with a fairly liberal amount of many other vegetables and small fruits.

The accompanying plan is one possible arrangement for a farm garden. It provides for a large assortment and a supply of vegetables extending over a long season. The size of the plot is 40 x 200 feet; the rows run the long way. The same general plan can be used on any sized garden of similar proportions. Row one is 4 feet from the edge; row two, 5 feet from row one, and row three, 4 feet from row two; all other rows are 3 feet apart.

A SUGGESTIVE PLAN FOR A FARMER'S VEGETABLE GARDEN.

Size of plot 40 x 200 feet; rowed the long way.

Row No.	Crop.	Space occupied.
1. (a)	Blackberries	1/3 row.
(b)	Blackcap raspberries	1/3 row.
(c)	Red raspberries	1/3 row.
2. (a)	Currants	1/5 row.
(b)	Gooseberries	1/5 row.
(c)	Asparagus	2/5 row.
(d)	Rhubarb	1/10 row.
(e)	Perennial onions	1/10 row.
3. (a)	Strawberries	1/3 row.
(b)	Early potatoes followed by strawberries	1/3 row.
(c)	Early potatoes	1/3 row.
4. (a)	Parsnips	1/4 row.
(b)	Salsify	1/4 row.
(c)	Spinach	1/4 row.
(d)	Carrots	1/5 row.
(e)	Parsley	1/20 row.
5. (a)	Leaf lettuce	1/10 row.
(b)	Head lettuce	1/10 row.
(c)	Turnip radishes	1/10 row.
(d)	Long radishes	1/10 row.
(e)	Onion sets	1/5 row.
(f)	Early peas, followed by bush lima beans	2/5 row.
	} Followed by string beans	
6. (a)	Early cabbage	1/4 row.
(b)	Beets	1/4 row.
(c)	White onions	1/4 row.
(d)	Red or yellow onions	1/4 row.
7. (a)	Medium early peas	1/4 row.
(b)	Late peas	1/4 row.
(c)	String beans	1/4 row.
(d)	Cauliflower	1/4 row.
8. (a)	Tomatoes	1/2 row.
(b)	Peppers	1/10 row.
(c)	Late cabbage	2/5 row.
9. (a)	Early corn	1/2 row.
(b)	Medium early corn	1/2 row.
10. (a)	Late corn	1 row.
11. (a)	Bush summer squash	1/4 row.
(b)	Cucumbers	1/4 row.
(c)	Sweet potatoes	1/2 row.

THE VILLAGE OR SUBURBAN GARDEN.

The gardener in the village or suburb needs to conserve ground more than labor. The successful suburban gardener makes a garden fully as much because he enjoys the work as he does because he wants to supply his table with fresh vegetables. He usually has sufficient room so that he can make rows wide enough to permit the use of the wheel-hoe and other garden tools run by hand.

The individual preference will prevail in the arrangement and plan of a suburban or village garden to even a greater extent than with the farm garden, and as a consequence they will vary greatly. The kinds of vegetables and the varieties selected to grow will also vary according

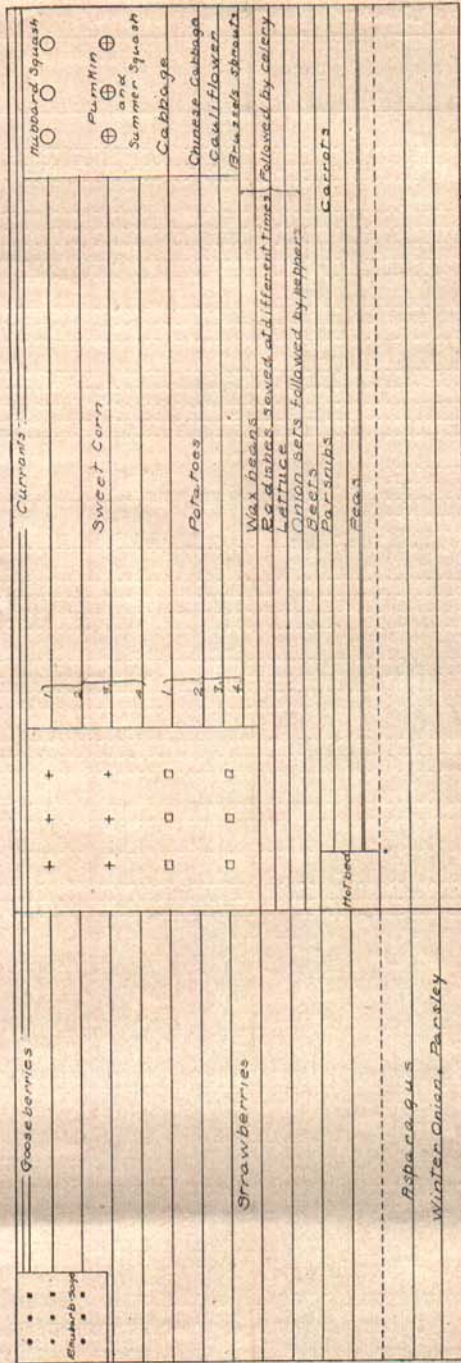


Fig. No. 3.—Plan of a typical village garden.

- Hubbard Squash
- ⊕ Pumpkin
- Eubarb
- Sage
- + Melons
- Cucumbers

to individual tastes. It is generally better to have one choice variety of any vegetable than two average varieties of the same season of ripening. Quality should be considered of greater importance than a large assortment of varieties.

On page 6 is shown the plan of a garden which is always an attractive spot on the M. A. C. campus. A photograph taken of this garden last summer (1915) is reproduced in figure II. This garden is planned, planted and cared for by A. M. Brown, Secretary of the State Board of Agriculture. The plan of this garden is one which is well adapted to a town or suburban lot where there is considerable room.

THE CITY GARDEN.

Economy of space is of first consideration in a city garden. In order to produce the greatest amount of vegetables from a limited area, it is necessary to have a succession of crops. The ground should be at work all through the growing period. Transplanting from a hotbed, or cold frame may be practiced to good advantage in the city garden. Rapid growth may be secured by making the soil very rich and supplying it with a liberal amount of water. Quality is of even greater importance in the city garden than in the gardens where room is not so limited. It seems like throwing time and money away to grow low quality vegetables on a crowded city lot. The city gardener takes much pleasure in showing his friends the fine crops in the garden and letting the guests sample portions of them at dinner. His garden supplies one form of recreation, and that is by no means its least benefit.

It is surprising how much can be grown on a small area. In order that dependable data might be secured along this line, Dean R. S. Shaw, assisted by Mrs. Shaw, who did all the weighing, recording and keeping of records, has secured the weight of the various crops grown on their garden at the college during the years 1907, 1908 and 1910. The garden is $16\frac{1}{2}$ feet wide and 33 feet long and contains one eightieth of an acre. The vegetables were weighed in the condition they would be prepared for market. The accompanying table gives these weights.

TABLE GIVING WEIGHTS OF VEGETABLES GROWN IN DEAN R. S. SHAW'S GARDEN.
Size of Garden is 16½ feet by 33 feet, containing 1-80 acre.

Vegetable grown.	Total annual yield—Number of pounds.			
	1907.	1908.	1910.	Average three years.
Beans, string.....	30.50	31.50	39.75	33.91
Beets.....	45.00	44.60	69.35	52.98
Beet greens.....		5.70	25.85	15.77
Cabbage.....	149.25	55.00	71.00	91.75
Carrots.....	67.50	18.70	53.85	46.68
Cauliflower.....		16.30		16.30
Corn.....	12.50	35.20	37.90	28.53
Cucumbers.....	41.00	36.80	14.05	30.61
Garden cress.....		2.50	3.35	2.92
Lettuce.....	12.00	18.90	25.00	18.63
Onions.....	1.75	16.80	24.30	14.28
Parsnips.....	64.00	47.00	36.60	49.20
Peas.....	6.00	1.90		3.95
Salisify.....	27.00	18.00	31.00	25.33
Squash.....	87.00	82.60	53.35	74.31
Summer radishes.....	23.75	8.50	44.33	25.53
Tomatoes, ripe and pickling.....	95.75	101.40	80.70	92.61
Winter radishes.....	6.50	12.00	8.00	8.83
Total weight per plot in pounds.....	669.50	553.40	618.38	613.76

The following was written by Dean Shaw:

"The garden was prepared from sod plowed up in the spring of 1907. The soil over two-thirds of the area is a heavy loam, the balance being somewhat sandy. No fertilizer was used the first season, but liberal applications of stable manure were made each subsequent year. During the first year extra cultivation was needed because of the solid mat of quack grass which was completely eradicated before the end of the second year. The location was not ideal, there being a little too much shade from trees near by on two sides. The tree roots also invaded the premises.

"The garden was enclosed with a woven wire fence thirty-six inches high intended to protect it from pedestrains accustomed to short-cut across the plot during hours of darkness, but it proved to be almost indispensable in working out the intensive system. The corn was planted just within the fence, some years on two sides only and sometimes on all four sides. The four or five hundred onion sets were planted beneath and just inside the fence throughout its entire length; as these were planted and harvested early they did not interfere with subsequent cultivation or planting. Tomatoes were planted between the corn hills on the long sides of the garden and were tied up to the fence. Cucumbers were grown at one end trained up on the fence for a trellis and squashes were planted at the opposite end.

"As indicated by the accompanying diagram of the garden, rapid growing, quick maturing crops such as garden cress, dwarf beans and turnips were grown in succession in the same row, as well as other rotations. An attempt was made to locate the varieties growing throughout the entire season with profuse tops in alternate rows with early variet-

ies between, thus furnishing the former more room during the latter part of the season. While the cabbage plants were grown somewhat close together, they occupied alternate rather than opposite positions in the rows.

"A border of eighteen inches outside the fence was planted in part to flowering plants, such as aster, nasturtium and mignonette, and also to parsley, pepper and egg plant, none of which were included in the weights.

"The smaller vegetables were grown in rows one foot apart, the early, medium and late varieties alternating more or less so as to permit producing from two to three successive crops in some parts of the garden. The vegetables grown for the second crop were lettuce, radishes, garden cress, beans, carrots, etc., while the following were grown for the third crop: icicle radishes, winter radishes, turnips and lettuce.

"The plantings were not all made at one time in the case of the permanent crops such as beets, beans, etc., but were separated by intervals of from one to three weeks in order to extend the time they would be available for use.

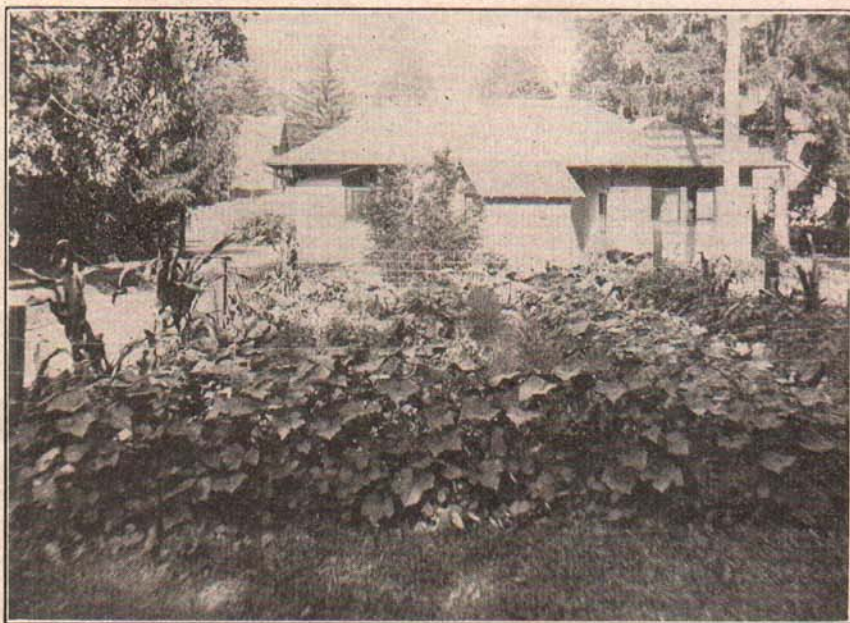


Fig. No. 4.—A miniature garden, typical of a city lot.

"At the first planting parsnips and radishes were sown in the same trench. The former came up slowly and the latter so quickly as to be ready for removal for use before any injury was done the young parsnip plants. In some cases cabbage plants were set in radish or lettuce rows of the second crop without any injury to either. By planting the beets very thickly and delaying the thinning until they reach a good size, large yields of beet greens can be produced.

"A garden cannot look well unless the rows are properly spaced and straight. Ordinarily a line is used in making the trenches for planting. In making short rows in a small garden a strip of board 1" x 6" sixteen or eighteen feet long will give better results. By placing the edge of the board on the line of the row a trench can be scratched in the earth by means of a pointed stick drawn in short strokes along the board. The board can then be moved back a few inches and used as a foot board by the person planting and covering the seeds, thus avoiding undue trampling or packing of the soil.

"Insect pests, and diseases seemed to increase as time went on. Cabbage worms were easily controlled by occasional dusting with pyrethrum powder while the dew was on. Infected vines were promptly removed and destroyed as soon as evidences of cucumber wilt appeared. There seemed to be no way of checking the "White fly." Care should be exercised not to set out plants infested with them; in fact, plants with a single fly on them should be refused.

"Comparatively little time was spent on the making and keeping of the garden. On one occasion the garden was spaded by the writer in two hours and twenty minutes and in no case was more than three hours required. After the bulk of the planting was done in the spring, not more than two hours a week were spent in cultivation and other necessary care.

"One of the most interesting features consisted of a comparison of the actual results obtained with the descriptions of the seedsmen and printed on the packages in which seeds were procured. In many cases the product answered the description fairly well, but occasionally the variety bore no resemblance whatever to what would be expected from the written description.

"The results heretofore given present a fairly definite idea of the amount of produce that can be procured from a small vegetable garden. There are innumerable small plots of ground, unused, in the back yards of our villages, towns and even large cities which could be put to good use not only in providing a healthful pastime, but in furnishing innumerable fresh dainty morsels for the table as well."

PLAN OF A MINIATURE GARDEN.

"In the accompanying diagram the placing of the various crops is shown in addition to the order of succession in rotation.

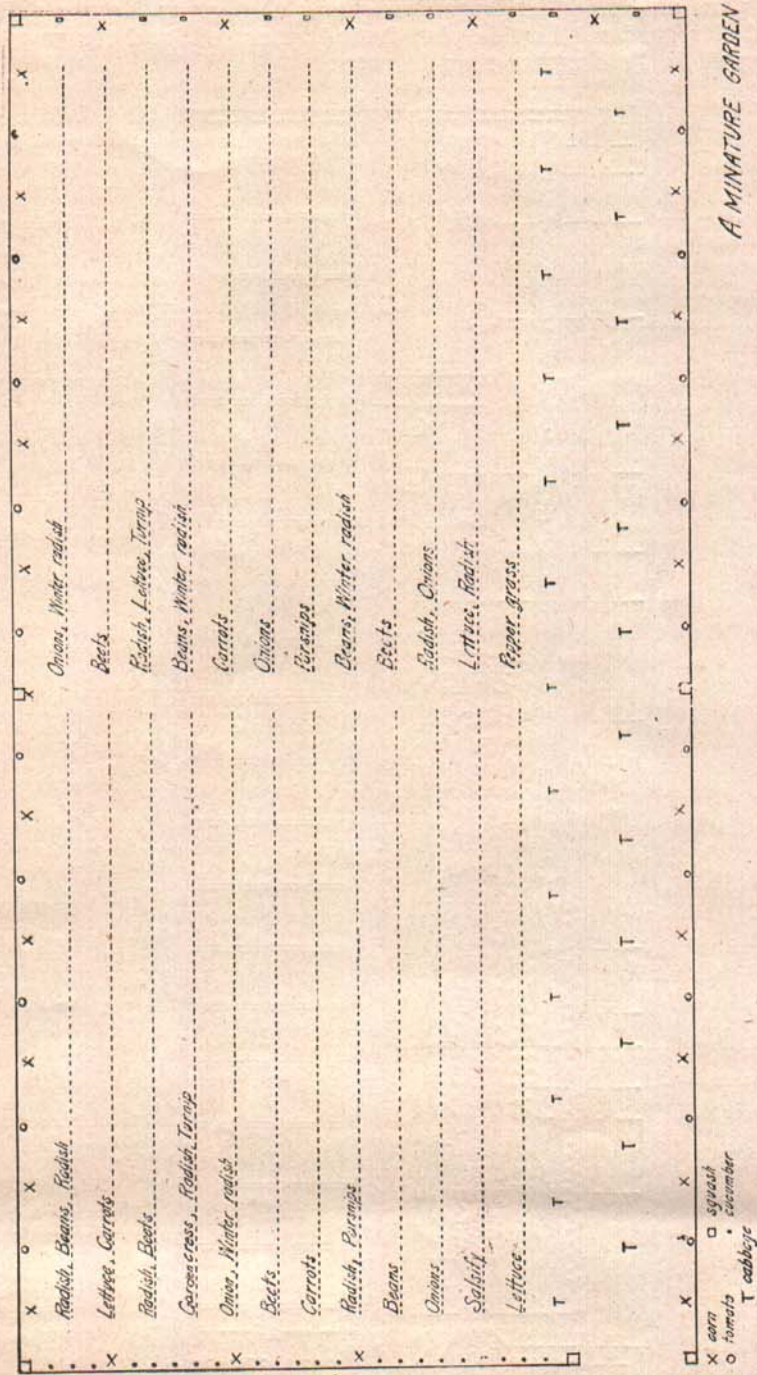


Fig. No. 5.—The plan of a miniature garden.

The plan of Mr. Seifert's garden shows another and quite different type of city garden. In this plan fruit is included, and the vegetables are planted in beds rather than in rows.

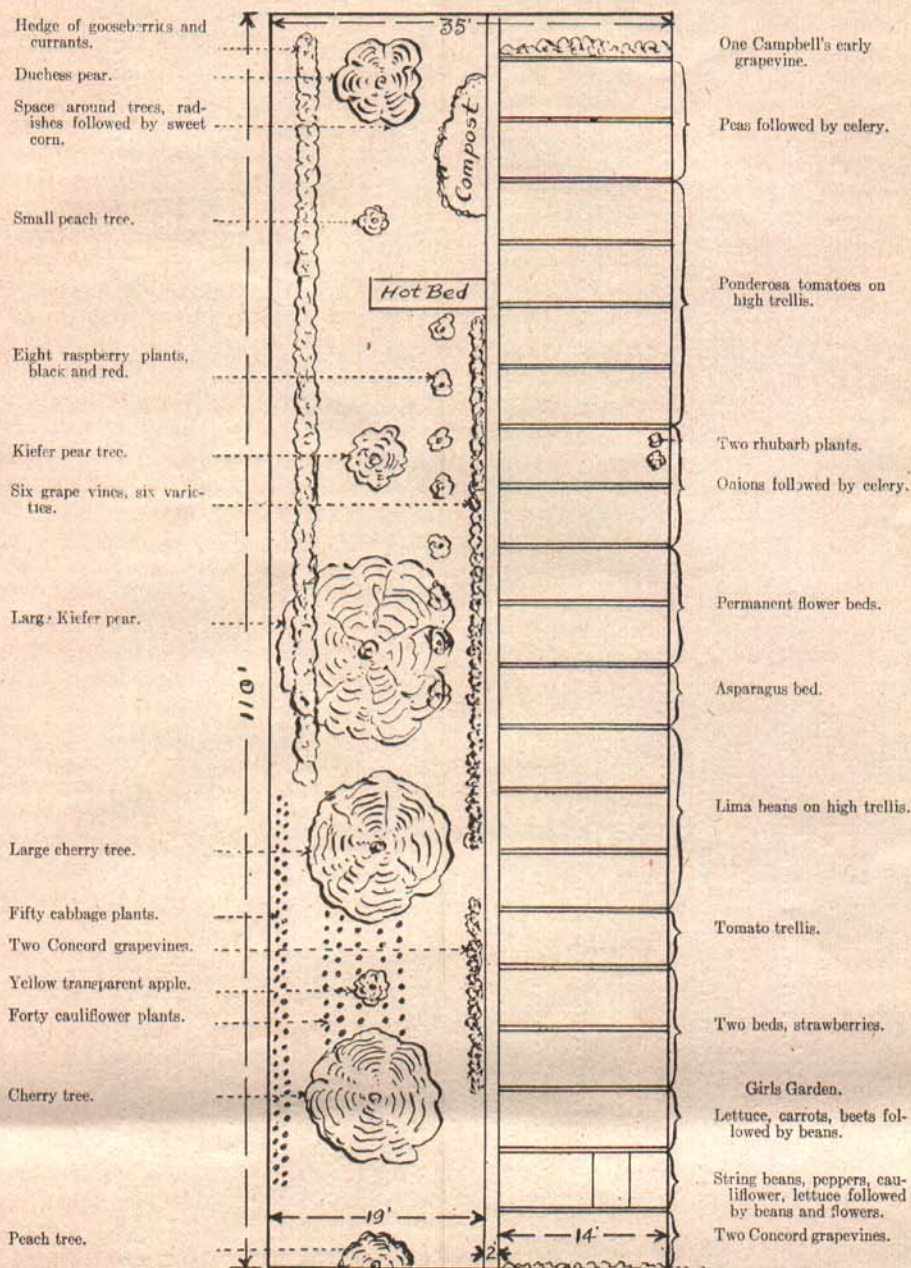


Fig. No. 6.—Plan of Mr. Seifert's garden.

Mr. Seifert made the following comments on the garden:

"With a clean space to begin with, I could improve on the plan. Some trees, shrubs, etc., were growing in the yard when I began using it for a garden. Most gardeners prefer long rows, but I can grow more vegetables on the beds the shape we use, especially on the loose black soil which we have in the garden. I do most of the cultivating with a rake having five prongs, and with this I can reach across the beds from the aisles. The hotbed is 9 feet long by 30 inches wide. It was made that shape because I picked up three discarded window frames.

"We buy practically no vegetables all summer, except potatoes, melons and cucumbers which we do not try to grow. The surplus vegetables are canned for winter use. We ate all of the green onions we cared for last summer, (1915) and had a bushel of mature onions to store for winter. We began eating celery in September and when freezing weather came, we placed four wheelbarrow loads of celery stalks, roots and all in the hotbed. The stalks were set upright and a little dirt thrown over the roots. The celery lasted well into the winter. We had all the green Lima beans we cared for and saved seven pounds of dried Limas for winter from about sixty plants.

"From the fruit in the garden, we had about five bushels of Kiefer pears. Mrs. Seifert evaporated a good many as we prefer them to canned pears. There were about thirty quarts of strawberries. The patch was smaller than in previous years when we picked as high as 100 quarts. Most of the clusters of grapes were covered with paper bags. This protected them from insects and to some extent from disease attack, and because they were hidden from view they were not so great a temptation to the neighborhood boys. We began using the grapes in August and continued to use them fresh from the vines until freezing weather occurred which was about the middle of October. A bushel of grapes was gathered from one vine near the alley before they were fully ripened and these were made into jelly. The currant, gooseberry and raspberry plants supplied these fruits for our entire needs.

"We start cabbage, cauliflower, tomato and celery plants in the hotbed; also certain flowering or bedding plants, such as salvia for the front yard. The cash outlay for the hotbed last year was manure fifty cents, and five cents worth each, of cabbage, cauliflower and celery seed. We save our own tomato seed. This makes a total cost of sixty-five cents. Besides those used on the place, we sold plants to the value of \$6.50 to the neighbors. Thus the hotbed made a profit of nearly \$6.00 not considering labor. Some seasons we sow a five cent package of Prize Taker Onion seeds in the hotbed, and these when transplanted to the garden make fine large onions.

"The other items of cash outlay for the 1915 garden were onion sets twenty-four cents, peas for seed fifteen cents, lettuce seed five cents, beans for seed ten cents, beet and carrot seed six cents, and one dozen pepper plants ten cents, making a total of seventy cents. Other seeds, such as sweet corn, radishes, and Lima beans were saved from the previous season.

"One of the most pleasing features of the garden work was the success of the little twelve year old girl in her part. A small section was set aside for her use and she entered in the back-yard school children's

garden contest, and secured a 100 per cent grade. An exhibit from her garden made at the County Fair, and another at a special children's back-yard garden show secured for her two blue ribbons."

HOTBEDS—THEIR USE, LOCATION, CONSTRUCTION, PREPARATION AND CARE.

USE: A properly constructed and well managed hotbed can be used to grow such crops as lettuce and radishes to maturity early in the season, thus providing them for the table sooner than they could be secured if grown in the open garden. Hotbeds are also used very commonly in which to start and grow plants to be set in the garden or field. They can frequently be used to good advantage for the growing of certain crops late in the season, and by making use of the protection which they afford, fresh vegetables may be supplied for the table after the outdoor crops have been killed by frost. In some sections of the country such crops as melons, cucumbers and tomatoes are started in hotbeds before the weather will permit outside planting. As soon as frost danger is over the sash are removed and the crops allowed to mature in the frames. In the warmer sections of the country, but where freezing weather occurs, hotbeds are made use of during the entire winter months. Hotbeds can be made an important part of any home garden.

LOCATION: The hotbed should be built in a location which will be convenient to the house and garden and which will afford protection from cold north and west winds. A south or southeastern exposure is to be preferred. An abundant water supply is important. Good surface and under ground drainage is also essential.

CONSTRUCTION: A hotbed is a box-like structure covered with glazed sash and artificially heated. The most common width for the frame is about six feet outside measurements. The standard size for the sash is three by six feet. There is, however, no serious objection to the use of other widths of frames, nor sizes of sash. It is frequently possible to make use of odd sizes of sash or glass, and where only a small hotbed is needed, as is the case in connection with most home gardens, this will be no great disadvantage. The frame should, however, be built to accommodate a definite number of sash of the size to be used.

For a farmer's garden or a large sized town or city garden, a three or four sash hotbed would be a suitable size to use. A one or two sash hotbed will answer the purpose very well when the garden is small. The frame for the hotbed may be made of wood or concrete. If of wood, only that which is durable should be used. A concrete frame is the most lasting if properly made. It is a good plan, however, to attach a 2x4 to the top of the frame as the sash will usually fit closer and work easier on the wood than on concrete. Then too, it is often necessary to kneel or sit on the edge of the frame and cement is not suitable for this purpose.

The most simple form of hotbed is one made, by placing a sash covered frame on top of a flat pile of fermenting manure. The permanent struct-

ure, however, is the form most commonly used. A practicable and permanent wooden hotbed can be made with two twelve inch planks on the south side and two twelve inch and one six inch on the north side. This will make the north side of the frame six inches higher than the south side and thus provide a satisfactory slope for the sash. About one foot of the back of the frame and six inches of the front should be above ground. The pit in which the manure is placed should be from two and one-half to three feet below the surface. This will permit the use of from eighteen inches to two feet of manure, two inches of straw or leaf mold to distribute the heat and four to six inches of good garden soil, and also give room for the plants between the surface of the soil and the sash.

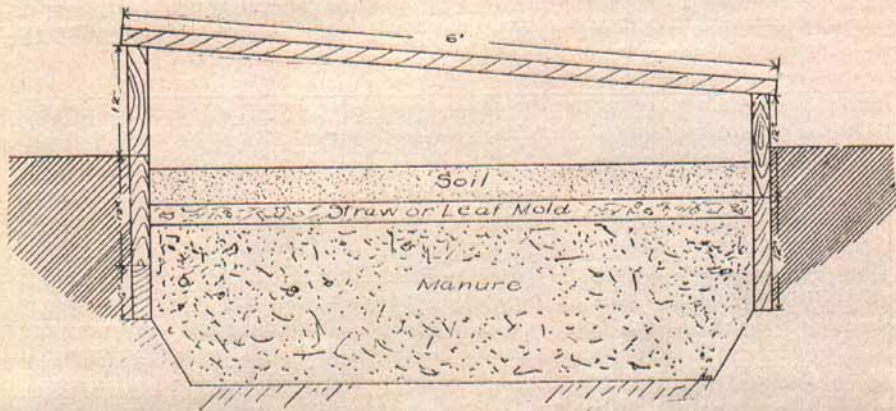


Fig. No. 7.—Showing construction of a hotbed.

The posts should be made of 2x4, durable timber. If twelve foot plank are used posts should be driven at each corner and one on each side midway between the corners. Two by fours or pieces of similar weight should also be placed across the frame at the junction and edges of the sash. The cross bars should be mortised in on the sides flush with the top. If there is any trouble about the sash sliding down too far, a piece of board four inches wide can be securely fastened on the lower end of the cross bar, it being allowed to extend an inch or so above the bar. The frame should be so constructed that the sash will extend over a half inch at either end of the sash. Precautions should be taken to have the sash tight enough but not too tight to work freely.

Hotbed sash should be made from sound material. Lumber which will plane to $1\frac{3}{8}$ inches makes a satisfactory thickness for the sash.

When purchasing sash inquiry should be made about the material used and manner of putting together. The joints should always be leaded to make a tight sash and to prevent decay. A light rod fastened across the sash at the center will give strength and prevent spreading.

The sash should be primed before the glazing is done. Only "A" quality glass should be used, as the cheaper grades will often cause the sun's rays to burn the leaves of the plants. Double strength glass will be the most durable especially in sections where hailstorms are of fre-

quent occurrence. Ten by twelve inch glass fit nicely in three by six feet sash requiring 18 panes to each sash. The glass should be lapped and will make the tightest sash if it is imbedded in putty. After glazing, the sash should receive at least one more coat of paint. They should be stored under cover when not in use.

Double glass sash have some advantages over the single glass sash, but because of their extra weight and greater cost are not used very commonly.

PREPARATION: Horse manure from grain fed animals containing one part litter to two parts excrement makes the most desirable and economical heating material for hotbeds. The manure should be fresh, as that which has been exposed to the rains for a considerable length of time or which has been kept in a pile and has become "fired" will not produce the required amount of heat. When the manure is taken directly from the stable, it should be piled in a compact heap. If the

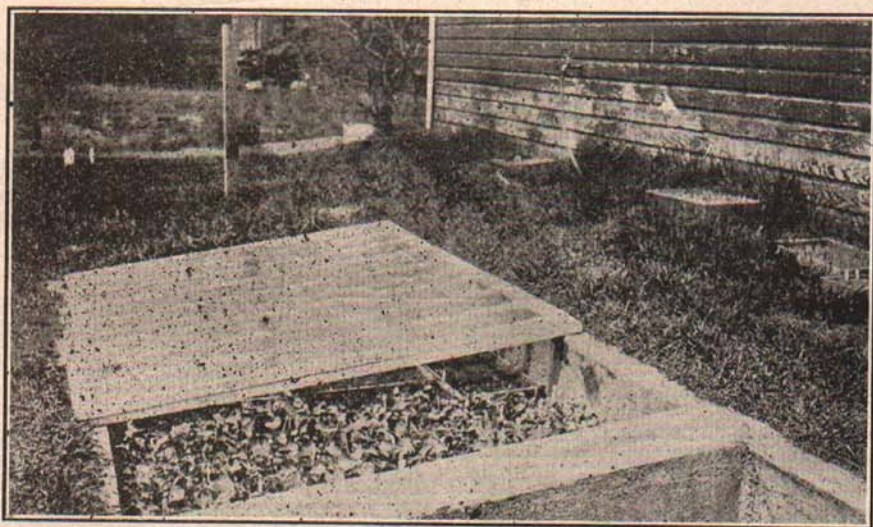


Fig. No. 8.—A cement hotbed.

amount of straw or litter is too limited more can be added. Forest leaves make good litter, but shavings are not suitable. As soon as fermentation begins freely after piling, the manure should be repiled, placing that which was on the outside on the inside of the new pile and vice versa.

The preparation of the manure should begin at least ten days before the hotbed will be wanted for seed sowing. Some form of protection from rains and excessively cold weather is essential for the best results. Manure which has stood in a pile for a few days may have begun fermentation before the preparation for hotbed use began. Such manure should be forked over and repiled to insure an even distribution of heat.

When the entire mass of manure is steaming hot but not "firing" it is ready to be placed in the pit. It should be put in in layers and firmly

tramped especially around the edges and in the corners. Allowance should be made for the settling of the manure. As soon as the manure is in place, a layer of two inches or straw should be put on to help distribute the heat. From 4 to 6 inches of well prepared garden soil is then placed on top.

If flats are used in which to grow the plants the soil in the hotbed need not be as deep as when the seeds are sown in the hotbed soil.

As soon as the manure and soil are in place in the hotbed, the sash should be put on to protect the bed from rain or snow and to help retain the heat. In no case should seeds be sown nor plants set until the manure has had a chance to heat freely and cool down to at least 85°. The violent heating does not take place for three or four days in some cases. A temperature sufficiently high to kill weed-seeds in the soil and in the manure frequently occurs. If the manure fails to ferment after it is placed in the hotbed either it was not suitable for the purpose or it was not properly prepared.

CARE: Hotbeds require careful attention in the spring when the weather is changeable and the nights frosty. The sash must be raised, slid down or removed entirely, each morning, depending on weather conditions. They must be replaced each evening. The plants must be watered when necessary and the weeds kept out. The soil between the rows should be stirred frequently. Thinning out, transplanting, and re-seeding must be resorted to at times. The watering must be done carefully and at the proper time. As a general rule, it is best to water in the morning only and on bright days when the sash can be left open to dry off the plants.

Constant vigilance and careful attention to details are essential qualities having to do with the successful handling of hotbeds. One failure to protect the plants on a frosty night will mean that the work must all be done over again or the hotbeds abandoned. However, the advantages to be gained by their proper use are so many and the pleasure of securing good crops or growing early strong plants in them is so great that they are well worth their cost and effort.

COLDFRAMES.

USE: Coldframes are used in much the same way as hotbeds, except that the crops grown in them are not started as early and the seeds for plants are not sown as early as in the hotbeds. They are used very generally in which to develop and harden off plants which have been grown in the greenhouse, hotbed or kitchen window.

Commercially, coldframes are used more extensively than hotbeds. When used in connection with the home garden, they require less expense in the building and trouble in the preparation and not as close attention in their operation as hotbeds. These differences are due to the fact that the hotbeds must protect the plants from more severe weather than the coldframes. On the other hand, a coldframe will not be as

satisfactory as a hotbed if early crops and early grown plants are greatly desired.

LOCATION: The statements previously made relative to the location of the hotbed apply equally well to the coldframe.

CONSTRUCTION: Coldframes are built on much the same general plan as hotbeds. No manure is used to supply heat in the coldframe; therefore, little or no excavating is needed. The frames usually rest on the surface of the ground with a little dirt or manure banked against the outside. Thinner boards and lighter stakes and cross bars can be used than are used in connection with hotbeds. For the home garden glazed sash are much to be preferred to cloth as a cover. When coldframes are used in which to grow plants for late crops, or to harden off plants only, cloth covers will be fairly satisfactory. If the cloth is of good quality, carefully handled and properly stored when not in use, such protectors should last two or three years.

When steam or hot water is used in a greenhouse or residence, the frames may be piped and heated from the same boiler. This method of heating is gaining in popularity among greenhouse men, but it is not usually practicable for the small frames used in connection with the home garden.

CARE: Coldframes do not require as constant care as hotbeds, but for the best results they should receive considerable attention. The ventilating is perhaps of greatest importance, although the watering should never be neglected. The most common and serious trouble with frame grown plants is a fungous disease known as "Damping off." This can usually be prevented by watering only on bright days and early in the day and by giving the plants an abundance of fresh air. When the sash are left in place too long, the air becomes saturated with moisture and the "damping off" fungus flourishes in such an environment.

THE COMPOST HEAP.

It is very convenient to have a supply of well prepared soil available at all times for use in the hotbed or in flats or boxes in which plants are to be grown. Then too, most housewives have more or less difficulty in securing suitable soil in which to grow flowering plants either in pots in the house or in beds in the yard. A compost heap will supply this need. It can be made by plowing or spading up a quantity of bluegrass or other good turfy sod and piling it grass-side down with alternate layers of fresh stable manure. The proportion should be about one-third manure to two-thirds sod. If the soil from which the sod is taken is heavy, muck or sand should be added. Such a heap should be allowed to stand for several months, preferably over winter before it is used. After the frost is out of the heap in the spring, the soil should be cut down in thin layers with a sharp spade and repiled. (Figure 9). It should be shoveled over once or twice more before it is used. When it is well mixed it should be run over a wire screen if the soil is to be used in which to sow

seed. For small seeds such as many kinds of flower seeds, a second sifting through a finer meshed screen will be very desirable.

When the compost heap is not available, a fairly satisfactory soil in which to grow plants can be made by mixing good garden loam with well rotted stable manure. Muck soil which has not been submerged under water for some time, will be found very satisfactory in which to grow plants of most kinds.

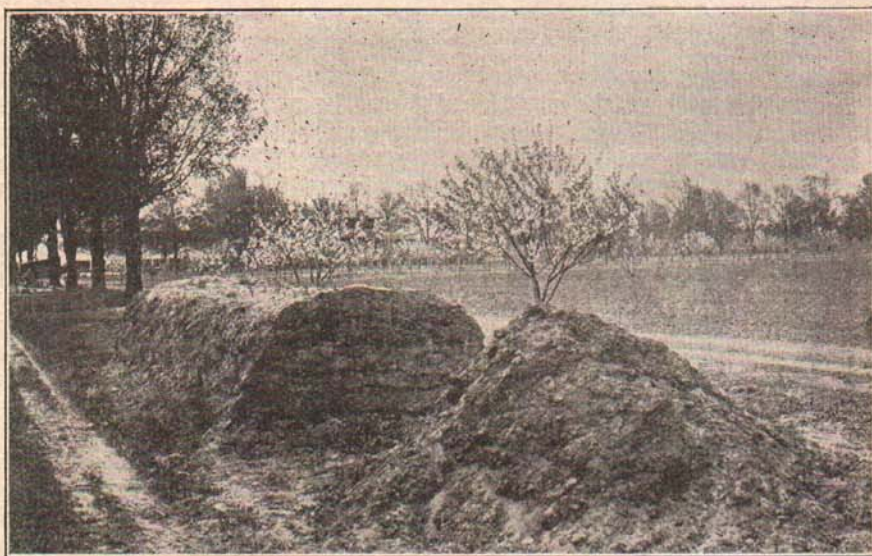


Fig. No. 9.—A typical compost heap.

CULTURAL SUGGESTIONS.

PREPARING THE SEEDBED.

Plowing and Spading: The garden should be plowed or spaded thoroughly, and at least six inches deep. Fall plowing is desirable on the heavier types of soil. If left until spring, the garden should be plowed or spaded as early as the condition of the soil will permit. Heavy soils should not be plowed when wet. Care should be taken to get the manure well covered. If the garden is spaded it is a good plan to make a trench on one side of the area to be spaded, place a few inches of manure in it and turn the soil from the next trench lower side up in the first trench. More manure should be placed in the new trench and the operation continued until all of the garden has been spaded and manured in one operation.

Harrowing and raking: In preparing the seedbed, the soil should be worked over several inches deep. The plants will do better in a soil

which is well pulverized to a good depth than in one that may be smooth on the surface and lumpy underneath.

FERTILIZING.

Manure: Heavy annual applications of manure are very essential for the success of any garden. If fresh manure is used it should be applied several weeks before the garden is to be plowed or spaded, preferably in the fall, unless the garden is so located that the leachings from the manure will run off the surface of the ground. The manure should be scattered when applied and never left in piles. When manure is scattered over the surface of the ground, the rains and melting snows will remove some of the plant food from the manure and carry it into the soil. The plant food is thus made accessible to the root hairs through which it is taken up and carried to the plant. When manure is applied just before the garden is plowed or spaded and buried underneath several inches of soil, it takes considerable time for the plants to develop a root system which will penetrate deep enough to reach the manure. If for any reason the manure is applied a short time before planting is to begin, at least a part of the manure should be worked into the upper surface of the soil after plowing or spading. Only fine well rotted manure should be used for this purpose. It is very important for most kinds of vegetables that there be an abundance of plant food available where the roots can get to it as soon as the plants can make use of more food than is stored in the seed.

Stable manure, because it is the most common and abundant, is the chief source of plant food and humus for the garden. Chicken, hog and sheep manures are all desirable for this purpose, but usually not available in sufficient quantity to supply all of the needs of the garden. As the last named manures are very concentrated forms of plant food, they do not need to be applied in as liberal amounts as stable manure. If they do not contain too much foreign matter, such as corn cobs, feathers, etc., they will give very satisfactory results applied as top dressing.

Commercial fertilizers: Commercial fertilizer can be used as a supplement to manure in the garden, but it will not take the place of manure. If all of the available manure has been plowed or spaded under or there is none sufficiently well rotted to be suitable to work into the surface soil, a quick acting fertilizer may be used to advantage, Nitrate of Soda or some other form of nitrogen is often used to give plants a quick growth. In applying Nitrate of Soda, it should be used only in small amounts and care should be taken not to get it on the foliage. One pound to fifty feet of row is considered a liberal application. As Nitrate of Soda becomes exhausted in a few weeks after it is applied, two or three light applications during the growth of the crop are better than one heavy application when the seed is sown.

It is a good plan in all garden operations to add 40 to 50 pounds of high grade acid phosphate to each ton of manure. This should be done in the stable providing the manure is not thrown into the barnyard or in piles where it will be exposed to the rains or snows. If the manure is hauled from another place the acid phosphate should be applied while the manure is being loaded or unloaded. The addition of the acid phos-

phate to the manure not only adds phosphate, which is an important plant food, but helps to fix the nitrogen in the manure and thus lessens the loss of nitrogen.

The application of an additional amount of acid phosphate besides that supplied with the manure and of a small amount of potash is frequently necessary for best results in the garden. If the three elements, nitrogen, phosphoric acid and potash are applied in the form of a ready mixed fertilizer the percentages under normal conditions should be, nitrogen 2 to 4 per cent, phosphoric acid 8-10 per cent and potash 8 to 10 per cent. At the present time about the only source of potash at reasonable cost is wood ashes.

Lime, while not a fertilizer, can frequently be applied to the garden with good effect. It should not, however, be applied with the manure.

PLANTING HINTS.

SOURCE OF SEED: The very best seed is none too good. It always pays when buying to send to a reputable seed firm and secure the best seed offered rather than buy cheap seed from any source. The seed for several vegetables such as lettuce, radishes, corn, cucumbers, melons and tomatoes can be saved from the plants grown in the garden. In making selections for this purpose keep in mind that the entire plant should be considered rather than a few individual fruits. A tomato plant, for example, to be satisfactory for seed saving purposes should be a vigorous grower, prolific, and the fruits should be of a desirable shape, size and color. Vegetables which mix easily when planted close together, such as corn, should not be saved for seed if there are two varieties which bloom at the same time, planted in the garden.

GERMINATION TESTS: The vitality or germinating ability of many vegetable seeds is so uncertain that it is a good plan to make germination tests before the seeds are to be planted. This is a simple matter and can be done in the following manner:

Count out 25, 50 or 100 seeds of each kind to be tested. Place these without mixing between blotting papers or thick cloths which are saturated with warm water. Keep in a warm place and add more warm water as needed. In a few days the seeds which have germinated should be counted and the percentages determined.

A more dependable test can be made by planting the seeds in soil. If a green house or hotbed is available the testing can be done there. If not, a shallow box in which is placed a few inches of sandy soil or other kind of loose soil can be used. In either case the seed should be sown in drills and close together. If the box is used it should be placed where the temperature will be high night and day. For the cool weather vegetables, such as lettuce and radishes, the seeds will germinate best if the temperature is 60 to 65 degrees Fahrenheit. For such heat loving vegetables, as cucumbers and melons, a temperature of from 70 to 75 degrees Fahrenheit will cause the best germination.

The seeds should not be covered over $\frac{1}{2}$ inch deep and a lighter covering is better for small seeds. The soil in which the test is made should be firmed and carefully watered to insure an even distribution and constant supply of soil moisture. A gunny sack or other coarse material may be placed over the seed when the watering is done to keep the water from washing the soil off from the seeds.

After the seeds have been in place a sufficient length of time for them to have germinated, which will vary with different vegetables as shown in the table on page 33, the seedlings should be counted and the percentages secured. If the percentage falls much below that given in the table on page 33, the seeds should not be used. Those showing only a slight falling off in germinating ability may be used, but the seed should be sown more thickly than when they show strong vitality. Seeds which germinate so slowly that the resulting plants are weak should be classed with those which fail to germinate when counting to secure the percentages of germination.



Fig. No. 10.—Straight rows help the appearance of the garden.

LAYING OUT THE GARDEN: Straight rows not only add to the appearance of a garden but they make it easier to cultivate (Figure 10). They are also a good indication that a person is systematic and takes pride in his work. When long rows are to be made a "garden line" will be found very satisfactory. For short rows a straight board one inch by six and ten or twelve feet long is better than a line.

DEPTH OF PLANTING: The proper depth to plant varies not only with the kind of vegetable but with the soil, season and amount of moisture in the soil. When seeds are sown in the greenhouse or hotbed where the temperature and soil moisture are quite well under control, the seeds should be covered very shallow. Some growers use gunny sacking or heavy paper with which to cover seed in the greenhouse, no dirt being

placed over them. When seeds are planted in the garden, they can be covered deeper in sandy or muck soil than in heavier types of soil. It is also necessary to cover deeper to insure a sufficient supply of moisture in midsummer than in spring or fall. In some cases such as with peas and early potatoes, a shallow covering is given when the seed is planted and more dirt worked over the seed as the seedlings come up. If weeds are very troublesome, the soil can be placed over the seed at the time of planting to a greater depth than is usually necessary and in the form of a ridge. After a few days have passed the top of the ridge can be knocked off with a rake, thus killing the weeds which may have started in the soil just over the row of garden seeds. When such crops as cucumbers and melons are planted in hills, the dirt may be placed over the seed to a depth of about three inches, then the top part raked off just before the plants come to the surface. This practice is especially advantageous when there is danger of the soil becoming packed or baked over the seed during, or after a heavy rain.

Some very small seeds, such for example as celery, should simply be pressed into the soil. When planting so shallow the soil moisture must be abundant even at the surface. When sowing seeds which germinate very slowly, it is a good plan to sow some radish seed with the others to mark the rows for cultivation before the slow germinating seed has come up. Late potatoes should be planted deeper than early potatoes.

DISTANCE OF PLANTING: The distances it will be best to plant seeds or set plants depends upon the amount of room available, the nature of the growth of the top of the plant and the method of handling or training. The distances the rows are commonly spaced in the different types of gardens can be ascertained by consulting the various garden plans and tables given in this publication. Such spreading plants as tomatoes can be planted much closer when trained to stakes or trellises than when allowed to grow untrained. An economy of space can be secured sometimes by alternating vegetables which grow with small tops with those which produce large tops. Pole beans can be planted in corn hills, thus economizing space and providing a way of training the beans at the same time. Certain crops can be planted between the rows or hills of other crops when the first planted crop is nearly ready to harvest or to be removed.

It is usually advisable to sow or plant more seed than would be necessary if all should grow. It is better to thin out than to have to replant several days after the first planting is made. With some crops, such as beets and radishes, the thinning can be delayed until the plants are large enough to use. For most vegetables, however, the thinning should be done when the plants are very small. The work is much easier to do then and the other plants which are left will not be injured so much as when the thinning is done after the plants have grown to good size.

CULTIVATION POINTERS.

REASONS FOR CULTIVATING: (a) To kill weeds which, if allowed to grow unmolested, act as parasites or robbers to the growing crop; (b) to conserve the soil moisture so that the plants can be properly supplied with plant food which is carried to the plants in suspension; (c) to aerate the soil so that the beneficial soil bacteria will have favorable conditions in which to work; and (d) to improve the general appearance of the garden.

WAYS OF CULTIVATING: There are three ways of cultivating gardens: (a) with horse tools; (b) with hand tools of large size and usually operated on small wheels; and (c) small hand tools such as the hand rake, weeder, etc.

In the farmer's garden, provision should be made to use the horse tools as much as possible as a matter of economy of time as well as because of the efficiency of these tools when properly handled. In the larger sized town or city gardens, the wheel-hoe and other similar tools will be found very desirable. The man with a miniature garden will have to do the best he can with small tools. By using a garden rake as much as possible together with a long handle on a small hand weeder it is possible to do very satisfactory cultivating while standing erect.

WHEN TO CULTIVATE: It is well to keep in mind the old saying "a stitch in time saves nine" in connection with the cultivation of the garden. It is very much easier to destroy weeds when they are very small than when they have grown to considerable size. When a crust forms after a rain the soil moisture escapes into the air very rapidly. Such a crust should be broken up as soon as possible after it has formed. Every garden should be cultivated at least once a week during the growing period and in many cases twice a week is better.

IRRIGATION IN THE GARDEN.

Many gardens, large and small, suffer greatly from the lack of water during the growing season. One reason why water is not more frequently supplied artificially is that to apply it to the garden with the hose is a tiresome, dirty task. Gardeners who have installed an overhead system of watering have met with excellent success. The water is forced through galvanized gas pipes in which special nozzles are screwed. By turning the pipes with a handle arranged for that purpose the water can be thrown at least 25 feet each way. Thus one pipe line will answer for a garden 50 feet in width. A water pressure of 25 pounds is necessary for the nozzles to work and 40 pounds is better. Water applied in this manner will not cause the ground to bake nor will it burn the leaves of plants even when applied during the heat of the day. Because

of the saving in the amount of water lost through evaporation, it is usually best, when watering outside crops, to apply the water in the evening or night.

Where the overhead system of watering is in use very little trouble is experienced in getting seeds to germinate unless they are of low vitality. Because of the rapid growth induced by the constant supply of water, the plants grow tender and never become tough and of strong flavor be-

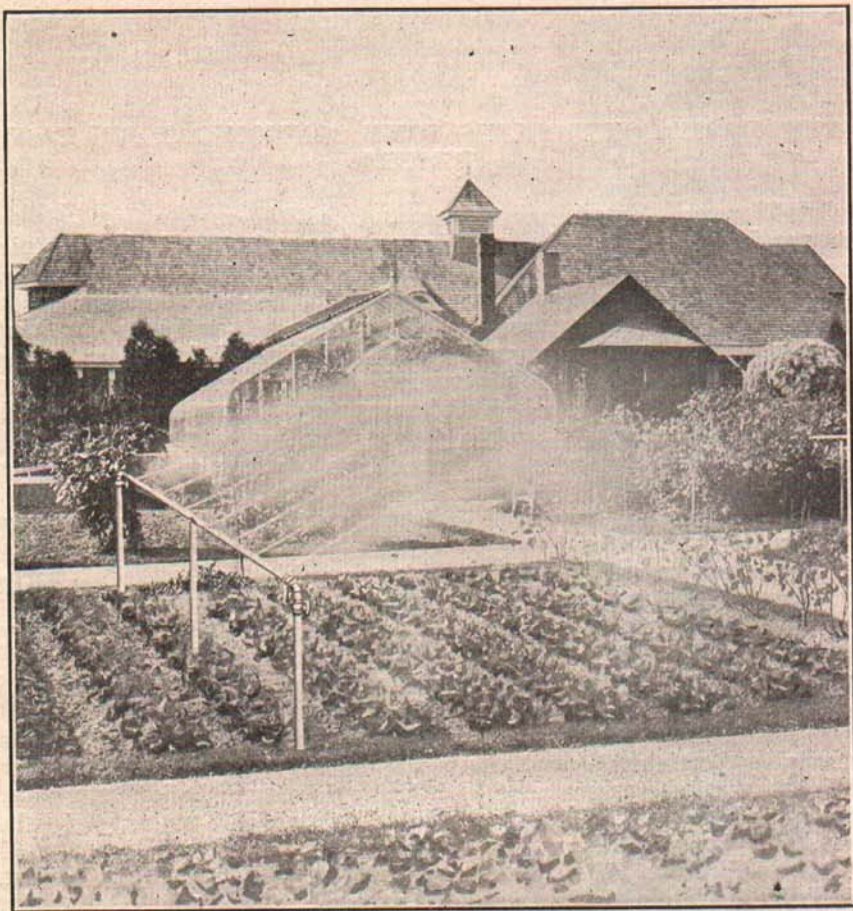


Fig. No. 11.—Skinner Irrigation System.

cause of slow growth as is often the case where dependence must be placed entirely upon the rainfall for the water supply. The water can be applied in any amount desired providing the source is ample and the system in running order. Practically all crops are improved when this system is made use of during average seasons, and in all sections of the country where the normal rainfall is insufficient to supply the needs of the crops.

The cost of installing such a system will vary according to the distance the water supply is from the garden upon which it is to be applied, and the size of the garden. For a garden 100 feet long by 50 feet wide the cost of the pipes, nozzles, pipe supports and installation should not exceed \$25. This of course does not cover the cost of a gasoline engine, or windmill and tank. One or the other will be needed where city water is not available. The cost of the water used on the garden during the season would be very small as compared with the benefits received.

METHODS OF CONTROLLING SOME COMMON GARDEN INSECT PESTS.*

CUT WORMS: A multitude of insects infest the garden, but it is to a few persistent and therefore well-known forms that we look for serious depredations. All early garden truck is open to attack by cut-worms.

Now to be brief, cut-worms are insects of grass sod; the eggs are laid in grass sod, and the young, partially grown "worms" pass the winter there in numbers. The "worms" will travel from their winter quarters to quite a distance to get to a garden, and furthermore spring plowed grass sod is apt to be stocked with young cut-worms that escape being crushed by the plow. When the "worms" or larvae appear there is no better plan than to distribute poisoned bran over the garden. The formula is as follows:—

"Sift together one pound of paris-green and twenty pounds of bran. Add half a gallon of molasses or syrup, and a little water, then stir in three oranges ground fine in a foodchopper, skins and all. This may be broadcasted over from two to five acres." (Kansas formula).

Use about four or five pounds to the acre and let it break up finely so that it will not be so attractive to poultry. Apply in the evening to get the best results and in case the place is regularly frequented by poultry it may be necessary to shut up the fowls for a little time or until the "worms" are killed off, when a cultivator or rake will place the remaining particles beyond the reach of the most industrious fowls. Do not substitute arsenate of lead for paris-green. It is not nearly so strong and works much more slowly. The bran also attracts grasshoppers, and is useful against sow-bugs and some millepedes.

POTATO BEETLE: The potato-beetle can be handled in the garden very nicely by dusting with dry, powdered arsenate of lead diluted with flour, hydrated-lime, air-slaked lime or any other inert powder to serve as a carrier.

If you mix one part of the poison with five of flour for instance, you will not need to apply quite so much to each plant as when you mix one part of the poison with ten of the flour. Dust on through a piece of coarse cloth or sacking. While one would hesitate to use the dust method in a large commercial potato field, nevertheless its convenience recommends it highly to the gardener when, even if one has it, the large spray-

*Contributed by R. H. Pettit, Professor of Entomology.

ers do not fit well into the short rows of the garden. One soon learns to use the dry powdered arsenate of lead on his currant-bushes and gooseberries, before the fruit gets very well formed, and on cabbages before they begin to form heads, and on other chewing insects when there is no danger of poisoning the useful part of the plant.

USE OF PYRETHRUM: A safe remedy to use at all times is a spray of Persian Insect powder or Pyrethrum applied at the rate of half an ounce to a gallon of water. It is harmless if a little does cling to the plant but it is expensive and loses its value if left too long or if exposed in open packages to the air. Always get it from a dealer who keeps it in tight metal drums or containers and keep your own supply in tight glass fruit-jars. If fresh, this material will kill all insects that are hit, but they must be hit to be killed. Cabbage, after the cabbage heads are formed, and berries when it is too late to use arsenicals, can be saved by a spray of Pyrethrum.

CUCUMBER BEETLE: The striped cucumber beetle offers a sort of special problem. The grubs or larvae of this yellow and black pest dwell in the roots and under-ground stems of the plants. It is not difficult to keep the beetles away by a repellent dusted on the leaves. One of the favorite repellents is turpentine and lime. Mix a teaspoonful of spirits of turpentine into a bushel of air-slaked lime and dust it on the plants.

The writer has used hydrated lime and flour of sulphur for many years, using one part of the sulphur to five or six of hydrated lime and dusting it on rather freely. If one can get good tobacco dust, throw a handful around the roots of the plants in each hill to prevent the beetles from laying their eggs. The difficulty now is in getting dust that has not lost all its nicotine.

TOMATO WORMS: Tomato-worms must be destroyed by hand, for while it is possible to poison them, it is far easier in a garden to hand pick.

PLANT LICE: Plant lice, being insects that suck, must be dealt with somewhat differently. The old remedies, kerosene-emulsion and whale-oil soap, are just as efficient as formerly but the greater convenience in preparing and using nicotine and the comparative safety to the plants is leading us more and more to depend on it as a contact spray. Nicotine is on the market under many trade names, but all of the brands fall under one of two classes, viz., the true alkaloid nicotine in various strengths, and the combined nicotine sulphate. Those products falling into the first class are volatile, and are especially adapted to green-house work or to any work in enclosed spaces. It should be used diluted to the proper strength with water and should not be combined with anything else when applied unless especially recommended by the makers. On the other hand the sulphate sold usually as a 40% solution can be used in certain combinations when desirable, although in the garden, we commonly use the nicotine sulphate alone. Dilute the 40% nicotine sulphate with 800 times its volume of water, or better still, of soap suds which will make it spread much better, and then be sure to hit every louse. Pea lice, those on roses, and those on cucumbers are easily killed, although it may be necessary to turn over such vines as cucumber vines to reach the lice on the under sides of the leaves, replacing them after spraying. When 10% nicotine is used, then dilute with 200 times as much water or soap suds, always maintaining this rate of dilution.

ROOT MAGGOTS OF ONIONS, RADISH, CABBAGE: Root maggots are the bane of the gardener's existence. There are three of special interest in Michigan, namely the one on bean roots and seed-corn,—the one on onion, and the one on cabbage, radish, turnip, etc. The adults of these maggots are flies resembling house-flies but smaller. The eggs laid by these flies hatch into the maggots. Now it has been found that these flies love sweets just as dearly as do other flies, and Prof. J. S. Sanders, State Entomologist of Wisconsin, believes that he has hit on a scheme to take advantage of this weakness. Prof. Sanders makes use of fifteen to twenty small pans to the acre. He keeps those pans supplied with a little syrup from the time that the plants appear above ground until the danger is past. The pans should be covered over with wire screen of a mesh too small to allow bees to get in but coarse enough to accommodate the flies. This screen will also make it difficult for poultry to drink. The syrup is made by dissolving 5 grams of sodium arsenite in one gallon of hot water and adding half a pint of New Orleans molasses.

CONTROL OF COMMON GARDEN DISEASES.*

CAREFUL CULTURAL METHODS: The greatest helps in the control of plant diseases in the garden are to be found in cultural practices. The rotation of beds, the destruction of trash from the preceding crop, and the prompt removal of diseased plants are well known and efficient methods in preventing serious loss. Weeds in and near the garden in many cases harbor parasites which attack garden plants, and this fact furnishes another reason for urging the prompt and complete removal of weeds. Many plant diseases, (such as the wilt disease of cucumbers and muskmelons) are spread through the agency of insects. The control of aphids and leaf-eating beetles thus becomes doubly important.

VIGOROUS PLANTS: With healthy plants the gardener experiences less trouble from diseases than with plants injured by over crowding or damping off in the hot bed or cold frame.

The plant must be given good conditions in the garden. Some of the things necessary for good plant growth are: a well drained soil abundantly supplied with available plant food and organic matter; a deep mellow and finely pulverized seed bed; seed from vigorous plants of good vitality; planting adjusted to proper soil conditions, time, spacing and depth; thorough and timely cultivation; sufficient and regular supply of water; efficient protection from insect and fungous attack.

Protection from fungous diseases can in general best be obtained by frequent sprayings with Bordeaux mixture. Bordeaux mixture is made by mixing dilute copper sulphate (2%) and dilute milk of lime (2%). A mixture made in this way consists of fine particles which settle out of the solution slowly. The spray mixture must be applied before the parasite bores into the leaf and the new growth must be kept covered by re-

*Contributed by the Department of Botany.

peated spraying. Bordeaux mixture gives plants a protective coat and is therefore a preventative not a cure.

A standard strength Bordeaux mixture for large acreages is made by using 4 lbs. of copper sulphate (bluestone, blue vitriol) 4 lbs. of fresh stone lime ($4\frac{1}{4}$ lbs. hydrated) and 50 gallons of water. Dissolve the bluestone in 25 gallons of water, and the lime in the remaining 25 gallons. Pour these solutions together, stirring vigorously and the Bordeaux is made. Smaller quantities may be prepared using a part of this formula. A convenient amount for the small garden may be made by using 1-16 of the above quantities. Dissolve $\frac{1}{4}$ lb. of copper sulphate in $1\frac{1}{2}$ gallons of water ($\frac{1}{2}$ a candy pail). Make a lime paste by slaking $\frac{1}{4}$ lb. fresh stone lime in a little water (use about $\frac{1}{3}$ lb. hydrated). Dilute the lime paste to $1\frac{1}{2}$ gallons. Dip equal parts of the dilute bluestone solution and the milk of lime into a third pail and stir vigorously. The light blue mixture is Bordeaux and should be applied at once.

SPRAYER: The type of sprayer to be recommended depends upon the area to be sprayed. For most gardeners, a Knapsack sprayer (\$5.00) is to be recommended. Where the garden is small a hand force pump (\$2.00) or an atomizer (75c) will be sufficient.

VARIETIES OF VEGETABLES FOR THE HOME GARDEN.

In the accompanying list of varieties, no attempt has been made to include all of the varieties of vegetables, suitable for the garden. Those that are given are standard and usually of high quality. They are also adapted to Michigan conditions.

TABLE GIVING VARIETIES SUGGESTED FOR THE HOME GARDEN.

Vegetable.	Variety or varieties.
Asparagus.....	Palmetto.
Beans:	
I. (a) Bush, Kidney—	
(a) Wax Pod.....	{ 1. Kidney-wax.
	2. Improved Golden Wax.
	1. Burpee's Stringless.
	2. Red Valentine.
	3. Refugee.
(b) Green Pod.....	1. Henderson's Bush Lima.
	2. Burpee's Improved Bush Lima.
(b) Bush, Lima.....	
II. (a) Pole, Kidney—	
(a) Wax Pod.....	{ 1. Golden Carmine.
	2. Golden Cluster.
	1. Creaseback.
	2. Kentucky Wonder.
	1. Leviathan.
	2. New Giant Podded.
	1. Eclipse.
	2. Crosbys Egyptian.
	3. Detroit Dark Red.
	4. Early Model.
(b) Green Pod.....	1. Long Island Improved.
(b) Pole, Lima.....	
Beets.....	
Brussels Sprouts.....	
Cabbage:	
(a) Early.....	{ 1. Jersey Wakefield.
	2. Copenhagen Market.
	1. Succession.
(b) Medium.....	2. Early Summer.
	1. Surehead.
	2. Danish Ballhead.
	3. Drumhead Savoy.
	1. Danish Half Long.
(c) Late.....	2. Oxheart.
Carrots.....	
Cauliflower:	
(a) Early.....	{ 1. Dwarf Erfurt.
	2. Snowball.
(b) Late.....	1. Dry Weather.
Celery.....	1. White Plume.
Chard.....	2. Golden Self Blanching.
Chinese Cabbage or Pe-Tsai.....	1. Lucullus.
Corn, Sweet:	No varieties listed.
(a) Early.....	
	{ 1. Golden Bantam.
	2. Howling Mob.
(b) Late.....	1. Country Gentleman.
	2. Stowell's Evergreen.
Cucumbers.....	1. White Spine.
Egg Plant.....	2. Chicago Pickling.
Endive.....	1. Early Long Purple.
Garden Cress.....	2. Black Beauty.
Kale or Borecole.....	1. Giant Fringed.
Kohl-rabi.....	2. Green Curled.
Lettuce:	1. Fine Curled.
(a) Leaf.....	1. Dwarf German.
	1. Early White Vienna.
(b) Head.....	
Melons:	
(a) Musk.....	1. Grand Rapids.
	1. May King.
(b) Water.....	
Okra.....	{ 1. Rocky Ford.
	2. Tip Top.
	3. Osage.
	4. Hoodoo.
Onion, sets.....	1. Cole's Early.
	2. Kleckley Sweet.
	1. Perfected Perkins Long Pod.
	1. Potato.
	2. Egyptian (Perennial).
	1. Yellow Globe Danvers.
	2. Southport Red Globe.
	3. Prizetaker.
	4. White Queen (Pickling).
Onion, seed.....	1. Double Curled.
Parsley.....	1. Guernsey.
Parsnips.....	2. Hollow Crown.
	3. Offenham Market.
Peas:	
(a) Early.....	{ 1. Extra Early.
	2. Gradus.
	3. Nott's Excelstor.

TABLE GIVING VARIETIES SUGGESTED FOR THE HOME GARDEN.—Continued.

Vegetable.	Variety or Varieties.
(b) Medium and Late.....	1. Improved Stratagen. 2. Telegraph. 3. Champion of England. 4. Giant Sugar (Edible Pod).
Peppers.....	1. Long Red Cayenne. 2. Bird Eye or Creole. 3. Bull Nose. 4. Ruby King.
Pumpkins.....	1. Small Sugar. 2. Improved Large Field.
Potatoes:	
(a) Early.....	1. Quick Lunch. 2. Early Ohio. 3. Irish Cobbler. 1. Rurals. 2. Russet Rural. 3. Green Mountain. 4. Seneca Beauty. 5. California Russet.
(b) Late.....	
Radish:	
(a) Turnip Shaped.....	1. Scarlet Globe. 2. Scarlet Turnip (White Tip).
(b) Long.....	1. Cincinnati Market. 2. White Icicle.
(c) Winter.....	1. Chinese Rose. 2. New White Chinese.
Rutabaga.....	1. Golden Neckless. 2. Breadstone (White Flesh).
Salsify.....	1. Sandwich Island Mammoth. 2. Long White.
Spinach.....	1. Victoria (for spring sowing). 2. Prickley or Winter (for fall sowing).
Squash:	
(a) Summer.....	1. Golden Summer Crookneck. 2. Early White Bush, Scalloped.
(b) Winter.....	1. Hubbard. 2. Golden Hubbard.
Sweet Potato	1. Yellow Jersey.
Tomatoes:	
(a) Early.....	1. Earliana (Red). 2. June Pink (Purple). 3. Bonny Best (Red). 1. Livingston's Globe (Purple). 2. Livingston's Matchless (Red). 3. Dwarf Stone (Red). 4. Ponderosa (Purple).
(b) Late.....	1. Early Purple-Top Strap-Leaved. 2. Red-Top White Globe.
Turnips.....	

Dates for Planting Vegetable Seeds.

It is impossible to give dates for the planting of garden seeds which will be applicable to a very wide range of territory and to different years. There is not only a great difference in seasons between the northern and southern parts of Michigan, but there is frequently considerable variation in times for planting garden seeds between sections of the country located nearly in the same latitude. Variations in soil and distance from or nearness to large bodies of water are the chief factors which cause such differences in seasons of planting.

In a general way garden vegetables may be classified into the following groups so far as the proper time for planting is concerned:

Group I. This group consists of vegetables, the seeds of which can be planted or the plants set as soon as the soil can be worked up in good condition and when the danger of hard frosts is practically over. For Lansing, this time is from April 15 to 30th. A light frost will retard

PLANTING AND

Name of vegetable.	Date of planting.				Depth of planting (inches).		Distance apart of rows.
	First crop.		Seeds for succession.	Fall and winter use.	Open ground.	Under glass.	
	Seeds.	Plants.					Horse cultivation (feet.)
Beans, bush.....	May.....	May 5-31	June.....		1-2	2½-3	
Beans, pole and Lima.....	May 15-31	May 20-31			1-2	3-4	
Beets.....	April 15-30	April 20-30	May-June.....	July-Aug.....	½-1	2½-3	
Brussels sprouts.....		May.....			½-1	2½-3	
Cabbage, early.....		April 15-30			½-1	2½-3	
Cabbage, late.....		May.....	June (p)*.....		½-1	2½-3	
Carrots.....	May.....				1-1½	2-2½	
Cauliflower.....		May.....			½-1	2½-3	
Celery, early.....		April 15-30			½-1	2½-5	
Celery, late.....				June (p).....	½-1	3-5	
Corn, early.....	May 1-15		June.....		1-1½	2½-3	
Corn, late.....	May 15-31		June.....		1-1½	2½-3	
Cucumbers.....	May 15-31	May 20-31		June.....	½-1	4-6	
Egg plant.....		May 20-31			½-1	3-4	
Endive.....		April 20-30		July-Aug.....	½-1	2½-3	
Kale.....	May.....				½-1	2½-3	
Kohl-rabi.....		May 1-15	June (p).....		½-1	2½-3	
Lettuce.....	April 15-30	April 20-30	May.....	June-July.....	½-1	2½-3	
Muskmelon.....	May 15-31	May 20-31			½-1	4-6	
Okra.....		May 15-31			½-1	2½-3	
Onion, sets.....	April 15-30		May-June.....	Sept.....	½-1	2½-3	
Onion, seeds.....	May.....				½-1	2½-3	
Parsley.....		April 15-30		June.....	½-1	2½-3	
Parsnips.....	May.....				½-1	2½-3	
Peas, early.....	April 15-30				½-1	2½-3	
Peas, medium and late.....	May 1-15		May 15-June.....		1-2	2½-3	
Peppers.....		May 15-31			½-1	2½-3	
Potatoes, early.....	April 15-30				2-3	2½-3	
Potatoes, late.....	May.....			June.....	4-5	2½-3	
Pumpkins.....	May 15-31				1-1½	6-10	
Radishes, early.....	April 15-30				½-1	2½-3	
Radishes, medium and late.....	May.....		June.....	August.....	½-1	2½-3	
Rutabaga.....	April 15-30			June.....	½-1	2½-3	
Salsify.....	May 1-15				½-1	2½-3	
Spinach.....	April 15-30			Aug.-Sept.....	½-1	2½-3	
Squash.....	May 15-31	May 30-31			1-1½	3-8	
Sweet potatoes.....		May 15-31			½-1	2½-3	
Tomatoes.....		May 15-31			½-1	3-5	
Turnips.....	April 15-30		May.....	July-Aug.....	½-1	2½-3	
Watermelons.....	May 15-31				½-1	6-8	

*(p)—plants.

SEED TABLE.

Distance apart of rows.	Distance apart of plants in rows.		For a 100 ft. row.		Ready to use after planting (days).	Seeds in 1 oz.	Wt. of 1 qt. seed (oz.).	Average time to germinate (days).	Germination of one year old seed (per cent).	Length of time garden seed can be kept (years).
	Hand cultivation (inches).	Hills.	Drills.	Seeds.						
18-30	8-12	3-4	1-2 pts.	100-150*	45-65	200-250	30	5-10	90	3
24-36	18-30	5-6	1 pt.	35-65*	50-80	150-200	30	5-10	90	3
18-24		2-3	2 oz.	80-100	60-85	1,500	10	7-10	140	4
18-30	18-24		1 oz.	50-75	95-120		25	5-10	90	3
18-30	12-18		1 oz.	50-90	90-105	8,500	25	5-10	90	3
18-30	18-24		1 oz.	50-75	100-150	8,500	25	5-10	90	3
18-24		3-4	1 oz.		75-110	20,000	9	12-18	80	1
18-30	18-24		1 oz.	50-75	100-130	10,500	25	5-10	80	4
18-30		4-5	1 oz.	250-300	120-130	20,000	14	10-20	60	2
18-60		5-6	1 oz.	200-250	130-150	20,000	14	10-20	60	2
24-36	18-24	8-10	1 pt.	50-65*	65-90		20	5-8	85	1
24-36	24-36	10-12	1 pt.	35-50*	75-100		20	5-8	85	1
48-60	48-60	12-18	1 oz.	80-100*	60-80	1,000	18	6-10	85	5
24-36	24-36		1 oz.	25-50	150-160	7,000	18	5-10	75	5
12-18		12-18	1 oz.	75-100	90-130	18,000	12	5-10	85	2
18-30		8-15	1 oz.	80-150	90-120	8,500	25	5-10	90	2
18-30	12-18	6-8	1 oz.	120-150	60-80	8,500	25	5-10	90	3
12-18		4-12	1 oz.	100-300	60-90	23,000	15	6-8	85	4
48-60	48-60	12-18	1-2 oz.	20-25*	120-150	1,600	13	7-10	85	5
18-30	18-30		1 oz.	40-50		500	22	6-10	80	4
12-18		2-3	2 1/2 qts.		25-50					1
12-18		1 1/2	1 oz.		130-150	7,000	18	7-10	80	1
12-18		6-10	1 oz.	120-200	90-120		18	10-18	70	1
18-24		3-4	1 oz.		125-160	7,000	15	10-10	70	1
18-30		Drilled	1 qt.		40-80	50-150	28	6-10	90	3
24-36		Drilled	1 qt.		65-90	50-100	25	6-10	90	3
18-30	15-18		1 oz.	65-80	100-140	4,500	16	9-14	75	3
18-30	9-15		8-10 lbs.		80-100					1
24-30	12-18		8-10 lbs.		100-140					1
72-96	72-96		1 oz.	12-15*	100-140		9	7-10	85	3
12-18		Drilled	1 oz.		30-40	10,000	25	3-6	90	2
12-18		Drilled	1 oz.		35-50	10,000	25	3-6	90	2
18-24		6-10	1 oz.	120-200	75-100	13,000	25	4-8	85	4
18-24		3-4	1 oz.		120-180	3,000	8	7-12	75	2
18-24		4-6	1 oz.		30-60	2,500	13	7-12	80	2
36-96	36-84		4 oz.	15-35*	60-125	100-500	15	7-10	85	3
24-36		14-18		65-75	120-130					1
24-36	18-36		1 oz.	35-75	100-140	10,000	11	6-12	85	5
18-24		4-6	1 oz.		60-80	13,000	24	4-8	85	4
60-72	60-72		3-4 ozs.	16-20*	100-150	125-150	16	7-10	85	5

*Hills.

the growth, but will not kill the plants in this group. The vegetables which are included in this group are: Beets; cabbage, early (plants); celery, early (plants); endive, (plants); lettuce; onion (sets); parsley; peas, early; potatoes, early; radishes, early; rutabaga; spinach; turnips, early.

Group II. This group consists of vegetables which would be more seriously injured by light frosts or cold wet weather than those in group I. The time of planting the seeds or plants for this group at Lansing is from the first to middle of May. The vegetables in this group are: Beans, bush; brussels sprouts, (plants); cabbage, late (plants); carrots; cauliflower (plants); corn, early; kale; kohlrabi; onion, seed; parsnips; peas, medium; potatoes, late; radishes, medium; salsify.

Group III. This group contains some vegetables given in Group I. By planting these vegetables again from May 1st to May 15th a succession of crops may be secured. The vegetables included in this group are: Beets; lettuce; onion, (sets); peas, medium; radishes, medium; and turnips.

Group IV. The vegetables included in Group IV should not be planted until the ground is warm and the danger from frost is over. The time for the planting of the seeds or setting of the plants for this group at Lansing is from May 15th to 31st. The vegetables included in this group are: Beans, pole and lima; cucumbers; corn, late; egg-plant, (plants); muskmelons; okra; peppers, (plants); pumpkins; squash; sweet potatoes, (plants); tomatoes and watermelons.

Group V. This group includes several vegetables mentioned in previous groups. It is arranged to provide a succession of crops. The seeds or plants are to be planted or set from May 15th to June 1st and are as follows: Beans, bush; beets; cabbage, late (plants); corn, early; celery, late (plants); corn, late; kohlrabi (plants); onion, (sets); peas, medium and late; radishes, medium and late.

Group VI. The vegetables in this group are frequently planted later than June 1st; either to provide a succession or to mature a crop late for winter use. The vegetables in this group are: Beets; celery, late (plants); corn, late; cucumbers; lettuce; onion, (sets); parsley; potatoes, late; radishes, medium and late; rutabagas; spinach; and turnips.

INDEX.

	Page
THE FARMER'S GARDEN	1
Selecting the Location	1
Labor Saving Methods	2
Planning the Garden	3
Plan of a One-hundred Dollar Farmer's Garden	4
Suggestive Plan for a Farmer's Garden	5
THE VILLAGE OR SUBURBAN GARDEN	5
Plan of a Typical Village Garden	6
THE CITY GARDEN	7
Weights of Vegetables Grown on 1-80 of an Acre	8
The Plan of a Miniature Garden	10-11
A City Garden Plan which Includes Fruits and Vegetables	12
HOTBEDS	14
Use	14
Location	14
Construction	14
Preparation	16
Care	17
COLDFRAMES	17
Use	17
Location	18
Construction	18
Care	18
THE COMPOST HEAP	18
CULTURAL SUGGESTIONS	19
Preparing the Seedbed	19
(1) Plowing and Spading	19
(2) Harrowing and Raking	19
Fertilizing	20
(1) Manure	20
(2) Commercial Fertilizers	20
PLANTING HINTS	21
Source of Seed	21
Germination Tests	21
Laying out the Garden	22
Depth of Planting	22
Distance of Planting	23
CULTIVATION POINTERS	24
Reasons for Cultivating	24
Ways of Cultivating	24
When to Cultivate	24
IRRIGATION IN THE GARDEN	24
CONTROL METHODS FOR CERTAIN GARDEN INSECTS	25
Cut Worms	25
Potato Beetle	25
Cucumber Beetle	26
Tomato Worms	26
Plant Lice	26
Root Maggots	27
PREVENTIVE OR CONTROL METHODS FOR DISEASES OF GARDEN VEGETABLES	28
Clean Cultural Practices	28
Vigorous Plants Resist Disease	28
Bordeaux as a Preventive	28
Kinds of Sprayers Used	29
VARIETIES OF VEGETABLES FOR THE HOME GARDEN	30-31
Dates for Planting Vegetable Seeds	31-32
Planting and Seed Table	33-34

