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MICHIGAN GARDEN GUIDE

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EAST LANSING

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GARDEN FACTS

1. Nutrition experts state that the yearly food supply for a family of five should include 3,000 pounds of vegetables, including that used fresh and stored, and the quantities required for canning.

2. A year-around supply of vegetables for a family of two adults and two children can be grown in a garden 50 by 100 feet.

3. A garden of that size can be cared for by hand in 130 hours distributed over a five-month season, or an average of less than an hour a day.

4. A garden of that size should produce crops with a wartime retail value of at least $130.

5. Such a garden will produce enough vegetables to can 220 quarts, plus enough to store 20 bushels in addition to that used fresh.

6. On 1/3 of an acre you can, if you do a good job, grow enough tasty, vitamin-rich vegetables to feed a family of five adults for an entire year.

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MICHIGAN GARDEN GUIDE

WHAT TO GROW

Grow the proper quantity and variety of vegetables to provide your family with a year-around supply of fresh, canned, frozen and stored products. (See Table 1.)

TABLE I

Grow and Can This Amount
For Each Member of Your Family

Crop	This Amount	Should Produce*	Of Which, Can
Snap Beans	75 feet	3 pecks	10 pints
Corn	100 feet	72 ears	12 pints
Tomatoes	60 feet	3 bushels	30 quarts**
Greens	35 feet	3 pecks	5 pints
Broccoli	15 feet	3 pecks	8 pints
Lima Beans	50 feet	3 pecks	6 pints
Peas	100 feet	1 bushel	6 pints

Grow and Store This Amount
For Each Member of Your Family

Crop	This Amount	Should Produce*	Of Which, Store
Beets	25 feet	½ bushel	¼ bushel
Cabbage	35 feet	18 heads	12 heads
Carrots	35 feet	¾ bushel	⅔ bushel
Onions	35 feet	½ bushel	¼ bushel
Potatoes	175 feet	3⅓ bushels	2½ bushels
Turnips	20 feet	⅓ bushel	¼ bushel

Include lettuce, radishes and other crops that may be desired for summer consumption.

*This includes the quantity used fresh as well as that canned or stored.

**Includes juice and canned tomatoes. This quantity is recommended where citrus fruits may be unavailable. If plenty of oranges and grapefruit are available, this quantity could be reduced.

Grow things your family likes. Personal likes and dislikes will play a prominent part in deciding what to include in your garden and in determining the amount of each crop grown.

Consider the nutritive value of each crop. The amount of carbo-

hydrates, proteins, fats, minerals, and vitamins present in different vegetables varies. Some are high in all, others are low in one or more or perhaps all of these constituents. In general, carbohydrates can be obtained more economically from cereals than from vegetables. Potatoes are an exception to this rule. Meat, fish, milk and eggs are especially rich in proteins. Vegetables as a group (along with milk) provide one of the best and most economical sources of minerals

Fig. 1. Plan your garden to provide enough to can and store for winter use.

and vitamins. Some vegetables are more valuable than others in this respect.

Grow the vegetables that will produce the greatest return in terms of nutrients per pound, production per square foot and the number of hours of labor required to produce the crop. In the small garden where space is limited, it is more profitable to grow only the more efficient crops. The following list is suggested for the small garden:

Beans	Carrots	Peppers
Beets	Chard	Winter Squash
Broccoli	Lettuce	Tomatoes
Cabbage	Onions	Turnips

Peas (if planted before May 1, and followed by later crops)

Although many other crops including potatoes, corn, lima beans, cucumbers, and squash, are highly desirable, they require a considerable amount of space and, therefore, are usually limited to larger gardens.

SELECT THE SITE WITH CARE

1. If you live on a farm, locate the garden conveniently near the house but never overlook the value of good soil and proper exposure.

2. If you live in town and haven't a suitable location at home with good soil and satisfactory exposure, arrange for the use of a vacant lot or arrange to plant your garden in a community plot.

3. Be sure that the soil is well drained.

4. The garden should be in full sunlight for at least half of the day.

5. Avoid heavy clay soils that are too hard to work or extremely sandy soils that may dry out too rapidly.

MAKE A GARDEN PLAN

A carefully made plan is the first essential step in developing a successful garden. It will help to utilize time, money and space to the best possible advantage. Decide first what vegetables to grow and the quantity necessary to supply your family's needs. Then, depending upon the amount of land available, draw a plan, showing the number of lineal feet of each crop to be planted, the varieties, succession crops, companion crops, and the time for planting each crop.

When making your garden plan, follow these simple suggestions:

1. Arrange the crops that are to be planted first along one end of the garden.

2. Group together crops that will be harvested early so that after harvest the space may be used for later plantings.

3. Include a variety of vegetables — at least 15 — but choose them carefully.

4. Plant enough of each crop for freezing, canning, drying and storing as well as for fresh use during the summer.

5. Allow ample space between rows for cultivation, especially if horse-drawn or power tools are to be used.

6. Don't plant too much of any one crop at one time, particularly radish, lettuce, kohlrabi, spinach and chard. Study the production records in Tables 1 and 2.

THREE PRACTICAL PLANS

Plan I is for the city backyard garden, small but efficient. This 25-by-50-foot garden should produce all of the vegetables for canning, storing and fresh use, exclusive of potatoes and corn, necessary for two people. It will require an average of one-half hour's work a day to obtain maximum production. To increase the production of this small garden, plant cucumbers and pole beans along the back fence or on the trellis against the garage. Plant three or four summer squash vines in the flower bed or in the shrubbery adjacent to the garden. Plan succession plantings carefully to assure crops in late summer and fall.

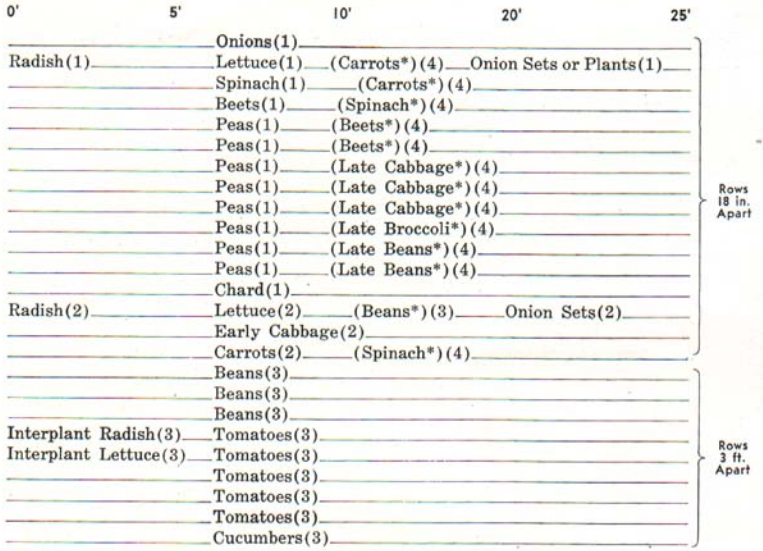
Since it is designed to produce the greatest variety and quantity of food per square foot, corn and potatoes are not included. To produce a year's supply of potatoes would require 14 more rows and to produce corn for fresh use and canning would require 6 to 8 rows. Winter squash, pumpkins and melons have not been included because of the relatively large amount of space these vegetables would require.

If you like fresh-picked sweet corn, you may want to sacrifice some of the other crops to grow enough corn for summer use.

Despite the fact that they do not produce as much food in a small area as many other vegetables, peas are included because in this plan they occupy the space only during the early part of the season and the entire area is devoted to later crops. Unless planted no later than the first week in May, however, peas cannot be included in this plan because they will not be harvested in time for you to plant the later crops. Only early-maturing varieties should be used.

PLAN I

A 25-by-50-foot Garden



*Those crops listed in parentheses would be planted after the other crops had matured. To make this succession possible, peas must be planted before May 1.

The figures in parentheses indicate planting dates as follow:

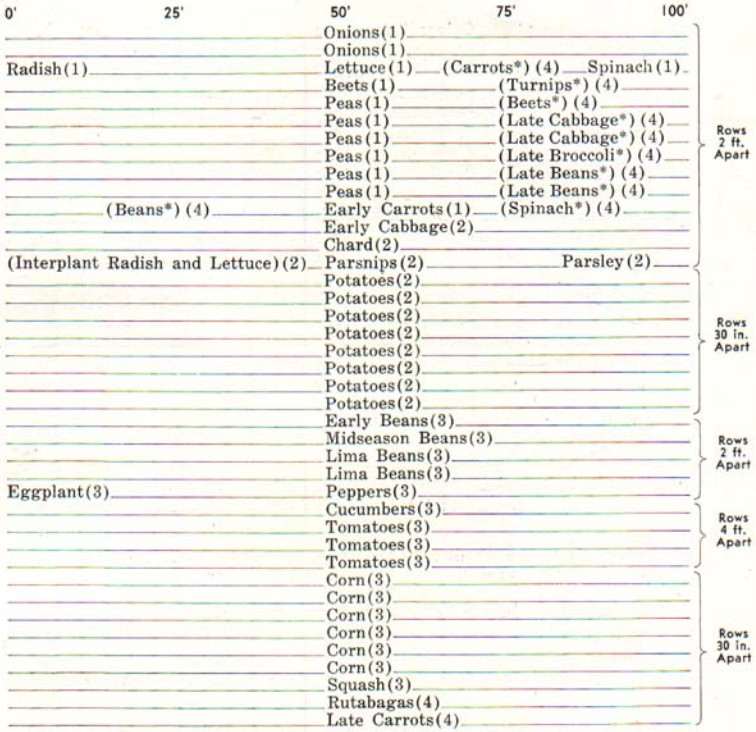
(1) Very early — as soon as the soil can be worked.
(2) 10 days after No. 1 planting.
(3) As soon as danger of frost is past.
(4) Late June planting — for fall.

PLAN II

Plan II is for the vacant lot gardener. It requires a 50-by-100-foot garden with rows spaced 2 feet apart for small vegetables and 3 feet apart for the larger crops. If peas can be sown early they may be followed with late plantings of cabbage, beets, spinach, turnips, beans or other late crops as indicated. Such a garden should supply a family of three adults or two adults and two children with most essential vegetables including corn and potatoes for the entire year.

An average of less than an hour a day should take care of it.

A 50-by-100-foot Garden



*Crops listed in parentheses would be planted after the other crop has matured. Peas must be planted by May 1 to make this succession possible.

The figures in parentheses indicate planting dates as follow:

(1) Very early — as soon as the soil can be worked.

(2) 10 days after No. 1 planting.

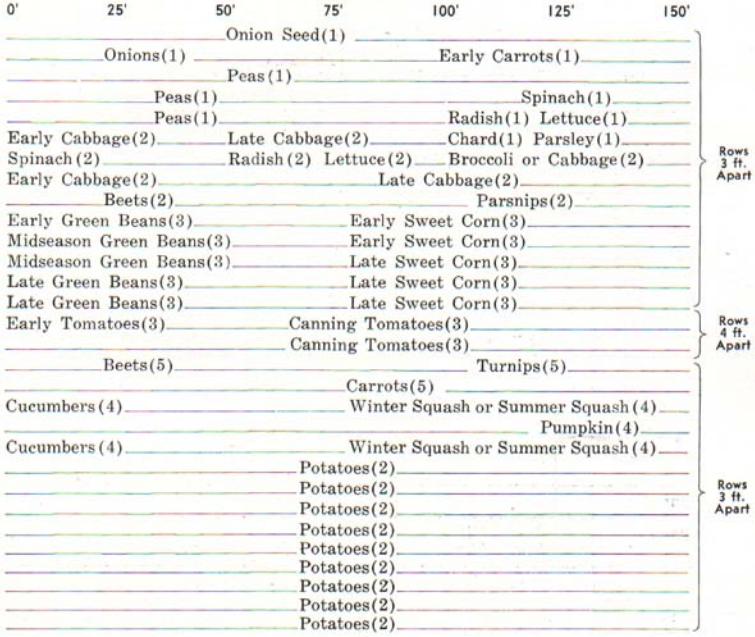
(3) As soon as danger of frost is past.

(4) Late June planting — for fall.

PLAN III

Plan III is a complete farm garden, with rows spaced far enough apart for farm equipment. Since the farmer usually has more land to use than time to spare, succession cropping and interplanting are not recommended. Late plantings for fall crops should not be overlooked, however. This 1/3-acre plot should produce enough vegetables for a family of five for one year. The care of it would require approximately 92 hours or an average of about one hour per day with horse-drawn equipment during the growing season.

A 100-by-150-foot Garden



Numbers in parentheses indicate planting dates as follow:

(1) Very early — as soon as the soil can be worked.
(2) 10 days after No. 1 planting.
(3) As soon as danger of frost is past.
(4) Late June planting — for fall.
(5) July planting — for fall and winter storage.

VARIETIES TO PLANT

The selection of good varieties that are adapted to Michigan's climatic conditions is important. In the northern part of the state, varieties that mature early must be used. There are many new varieties which are distinct improvements, but some may not be adapted to your soil or climatic conditions. Usually it is better to grow varieties of established worth than to devote too much space and time to novelties. You will have a better selection of varieties if you buy your seed early.

The varieties listed in Table 2 have given good results in home gardens throughout the state, although there are many others that are excellent.

TABLE 2

Recommended Varieties for the Home Garden

Crops	Recommended Varieties	Amount of Seed per 50-foot Row	Will Produce (Pounds)	Planting Time*	Space Plants in Row
Asparagus	Mary Washington	25 plants	18	1	18-24″
Early Green Beans	Tendergreen, Stringless Green Pod, Plentiful	¼ lb.	15	3-4	4-6″
Late Green Beans	Stringless Refugee; Kentucky Wonder (pole)	¼ lb.	15	3-4	4-6″ Pole 12-15″
Wax Beans	Pencil Pod; Kidney Wax; Golden Wax	¼ lb.	20	3-4	4-6″
Lima Beans	Henderson's Bush; Fordhook	¼ lb.	12	3	4-8″
Soybeans	Banse; Giant Green	¼ lb.	20	2	4-6″
Beets	Detroit Dark Red; Early Wonder; Crosby Egyptian	½ oz.	50	1-4	2-3″
Peppers	Oakview Wonder; Calif. Wonder; King of North	1 pkt.	30	3	14-18″
Pumpkin	Sugar Pie	1 pkt.	200	3	6-10′
Radish	Scarlet Globe; Icicle Scarlet Turnip White Tip	½ oz.	12	1-3-5	1-2″
Rhubarb	McDonald; Victoria	20 plants	50	1	3′
Rutabaga	American Purple Top	1 pkt.	50	4	6-10″
Salsify	Mammoth Sandwich Island	1 pkt.	50	2	3-4″

*1. Very early — as soon as the soil can be worked.
2. 10 days after No. 1 planting.
3. As soon as danger of frost is past.
4. Late June planting — for fall.
5. July planting — for fall and winter storage.

TABLE 2 — Continued

Crops	Recommended Varieties	Amount of Seed per 50-foot Row	Will Produce (Pounds)	Planting Time*	Space Plants in Row
Broccoli	Italian Green Sprouting	1 pkt.	25	1-4	24″
Brussels Sprouts	Catskill; Long Island Improved	1 pkt.	25	2	18-24″
Early Cabbage	Copenhagen Market; Golden Acre; Early Jersey Wakefield	1 pkt.	75	1-4	15-24″
Late Cabbage	Hollander; Penn State Ballhead	1 pkt.	100	1-4	15-24″
Cauliflower	Snowdrift; Early Snowball	1 pkt.	50	2-4	18-24″
Carrots	Chantenay; Danvers Half Long, Imperator and Nantes	¼ oz.	50	1-4	1-3″
Celery	Summer Pascal; Utah; Easy Blanching	1 pkt.	50	2	4-8″
Chard	Lucullus; Large Ribbed Green; Rhubarb Chard	1 pkt.	40	2	6″
Chinese Cabbage	Chihili	1 pkt.	50	4-5	8-12″
Early Sweet Corn	Marcross; Erlibird; Seneca 60; Surprise; Golden Early Market	¼ lb.	175	3	8-12″
Mid-season Sweet Corn	Bancross; Golden Bantam; Lincoln	¼ lb.	175	3	8-12″
Late Sweet Corn	Golden Cross Bantam; Charlevoix; Ioana	¼ lb.	175	3-4	8-12″
Cucumber	A & C; Straight Eight; National Pickling	¼ oz.	35	3	3-5′
Eggplant	Black Beauty; New Hampshire Hybrid	1 pkt.	50	3	24-30″
Endive	Green Curled; Full Heart Batavian	1 pkt.	25	1-4	8-12″
Kale	Dwarf Blue-Curled	1 pkt.	25	5	8-15″
Kohlrabi	Early White Vienna	1 pkt.	30	1-4	4-8″
Head Lettuce	Great Lakes; Imperial 44; Imperial 847	1 pkt.	50	1-2-4	8-10″
Leaf Lettuce	Grand Rapids; Simpson	2 pkt.	25-40	1-3-5	2-4″

*1. Very early — as soon as the soil can be worked.
2. 10 days after No. 1 planting.
3. As soon as danger of frost is past.
4. Late June planting — for fall.
5. July planting — for fall and winter storage.

TABLE 2 — Continued

Crops	Recommended Varieties	Amount of Seed per 50-foot Row	Will Produce (Pounds)	Planting Time*	Space Plants in Row
Muskmelon	Honey Rock; Hearts O' Gold	1 pkt.	75	3	3-6′
Mustard Greens	Giant Southern Curled; Tendergreen	1 pkt.	25	3	4-8″
New Zealand Spinach	There are no separate Varieties	1 pkt.	30	3	4-6″
Onions	Seeds: Yellow Globe; Sweet Spanish Sets: Yellow-White	¼ oz. 2 qts.	50 50	1 1	4-6″ 2-3″
Parsnip	Hollow Crown; Model	1 pkt.	50	2	3-4″
Early Peas	Thomas Laxton; World's Record	½ lb.	30	1	2-6″
Mid-season Peas	Laxton's Progress; Little Marvel	½ lb.	30	1	2-6″
Late Peas	Alderman; Morse Mkt.; Dwarf Telephone	½ lb.	30	1	2-6″
Spinach	Long Standing Bloomsdale; Giant Thick Leaved (Noble)	½ oz.	25	1-3-5	3-6″
Summer Squash	Prolific Straight Neck; Zucchini (Green Italian Type)	1 pkt.	50	3	2-4′
Winter Squash	Table Queen; Buttercup; Hubbard or Delicious	½ oz.	50	3	3-5′
Tomato (early)	Victory; Early Chatham	1 pkt. (12 pl.)	75	3	3-6′
Tomato (midseason)	Stokesdale; John Baer or Bonnie Best	1 pkt. (12 pl.)	100	3	3-6′
Tomato (late)	Rutgers; Jubilee (Yellow)	1 pkt. (12 pl.)	100	3	3-6′
Turnip	Purple Top White Globe	1 pkt.	50	5	3-5″
Watermelon	Harris Earliest; Honey Cream (Yellow); Northern Sweet	1 pkt.	200	3	6-10′
Raspberry	Taylor; Chief; Latham				
Strawberry	Premier; Dunlap				

*1. Very early — as soon as the soil can be worked.
2. 10 days after No. 1 planting.
3. As soon as danger of frost is past.
4. Late June planting — for fall.
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SUCCESSION PLANTING

Fig. 2. One should plan a succession of crops.

To be assured of a continuous supply of garden-fresh vegetables throughout the entire season, successive plantings must be made. Small plantings of radishes and leaf lettuce should be made in the spring, and another in late summer for fall, to assure a continuous supply. At least three plantings of corn and green beans should be made. Cool-season crops like head lettuce, spinach and peas may be planted very early and again later for a fall crop. At least two plantings of carrots, beets and cabbage should be made, one for summer use and a later one for storage. Many important garden crops arrive at their peak quality in the cool moist days of fall. They are extremely valuable and should be included in every garden.

Table 3 suggests the approximate planting dates for successive plantings. Climatic conditions in the community in which you live should be taken into consideration. If you live in the northern part of the state, planting dates for fall crops should be advanced considerably, and the plantings suggested in the second and third columns may be combined into one.

Through careful planning, production from a small garden can be greatly increased by planting later crops in spaces left vacant by those crops that are harvested early.

For example, early lettuce, spinach and radishes may be followed by beans, beets and corn. Early peas may be followed by late storage carrots, beets, late cabbage or turnips. Beans, carrots, peas or beets may be followed by late turnips.

TABLE 3

Plan a Year-around Garden — Make Several Plantings

Very Early	After Frost	10 Days Later	June 25	August 1
Radish	Radish			Radish
L. Lettuce	L. Lettuce			L. Lettuce
Cabbage		Cabbage (s)	Cabbage (pl)	
Broccoli		Broccoli (s)	Broccoli (pl)	
Peas	Corn	Corn	Corn	
Onions	Beans	Beans	Beans	
Cauliflower		Cauliflower (s)	Cauliflower (pl)	
		Brussel sprouts (s)	Brussel sprouts (pl)	
H. Lettuce			H. Lettuce	
Kohlrabi				Kohlrabi
Spinach				Spinach
Carrots			Carrots	
Beets			Beets	
Potatoes	Tomatoes	Pumpkin	Rutabagas	Turnips
Chard	Peppers	Melons	Kale	
Parsnips	Eggplant	Squash	Chinese cabbage	
Salsify	N.Z. Spinach	Limas	Endive	
	Celery	Soybeans		
		Cucumbers		
		Pole beans		
		Late potatoes		

COMPANION CROPPING

Where space is limited, the crops that mature quickly can be planted between the rows or in the rows with crops that occupy the space during the entire season. Head lettuce and cabbage are often set alternately in the row with radishes planted between the rows. The radishes and lettuce are out of the way before the cabbage needs the space.

Squash or pumpkins can be planted in early corn if the corn is spaced at least 3 feet between rows and single plants 18 inches or more apart in the row. The stalks should be removed as soon as the corn matures to make way for the squash.

Early beans, lettuce, radishes, or spinach may be planted between tomatoes, eggplant, late cabbage and melons respectively.

While succession and companion cropping are recommended for the small garden, the practice makes heavy demands on the soil. Two crops cannot be successfully grown on the same land unless plenty of water is available, liberal amounts of fertilizer used and the best cultural practices employed.

PLANTING DATES

Several counties in southern Michigan rarely have a killing frost after the first week in May. In northern Michigan, the "frost-free"

date does not ordinarily come until a full month later. Such climatic variations make it necessary to establish planting dates in a particular area on the basis of the time at which the last killing frost is likely to occur. The accompanying map shows the average dates at more than 80 Michigan stations.

AVERAGE DATES OF LAST KILLING SPRING FROST

(Based on data supplied by U. S. Weather Bureau Station at East Lansing)

GARDEN SOILS — Lime

Vegetables grow best on soils that are only slightly acid or neutral in reaction. Proper applications of lime made to acid soils will increase very materially the production of most vegetables. Too much lime in the soil may be just as bad as too little. You should apply liming materials only if the soil test indicates a reaction below pH-6. A pH or

hydrogen ion reading of 7 indicates a neutral soil. The lower the pH, the more acid the soil. If you think your soil is acid, take a sample to your county agricultural agent or agricultural teacher to be tested before applying lime. You can purchase a Soiltex outfit from your county agricultural agent and test your own soil.

The kind of liming materials to be used depends upon the location of your garden and the materials available in your community.

The amount to apply depends upon the reaction of the soil and the kind of liming material used. The usual rate of application is 35 to 50 pounds of hydrated lime or 50 to 75 pounds of ground limestone per 1000 square feet.

ORGANIC MATTER

Applications of manure to garden soils having low supplies of organic matter materially increase vegetable production.

Barnyard or stable manure is the best source of organic matter for gardens. For best results, it should be spread at the rate of ½ ton per 1000 square feet before the soil is plowed or spaded, whether it is spring or fall. Where the garden is large enough to use tractor or horse-drawn equipment, manure may be spread after the garden has been plowed and then disked in.

Artificial manure can be made from straw, leaves, grass clippings and waste plant material from the garden provided it is free from disease organisms or insects. Spread a layer of this material 1 foot thick over an area 6 by 10 feet. Sprinkle over this 2 pounds of fine lime, 1 pound of superphosphate and 2 pounds of soybean meal, Milorganite or similar organic nitrogenous fertilizer, or ½ pound of ammonium nitrate. Wet the layer down with water. Add successive layers in the same manner until the pile is about 5 feet high, wetting each layer as it is added. The pile will decompose into manure equal to good stable manure in about 2 or 3 months.

Shredded peat, granulated muck and sewage sludge may be used as substitutes for manure. Apply at least twice as much per 1000 square feet of garden area and increase the commercial fertilizer application at least 50 per cent since peat, muck and sewage sludge do not contain as much of the available plant nutrients as manure.

The organic matter content of garden soils can also be built up by growing green manure crops. Rye or oats may be planted in the garden area in late summer or fall wherever there is any bare ground or where the vegetables have been harvested and between the rows of late crops. Oats will winter kill and may be plowed under whenever the soil is fit to be worked in the spring.

On the farm where sufficient room is available, two garden areas might be set aside and one planted to vegetables and one to green manure cover crops each year alternately. The use of buckwheat with Sudan grass and soybeans, mixed oats and field peas, sweet clover and other cover crops may well be worked into a two-year garden rotation.

COMMERCIAL FERTILIZERS

Garden soils must contain a generous supply of available mineral nutrients to produce large, crisp, succulent vegetables. Mineral nutrients added in the form of commercial fertilizers help the soil to increase production.

The minerals most likely to be lacking in garden soils that have been limed are nitrogen, phosphoric acid, and potash. These are the "big three" that are supplied in manure and commercial fertilizer. Manure is a good source of nitrogen and potash but should be supplemented by the use of phosphoric acid at the rate of 10-20 pounds per 1000 square feet.

The 1944 Victory Garden fertilizer having a 4-12-4 analysis is available in 5-, 10-, 25-, 50- and 100-pound packages and, along with ammonium nitrate, may be used on Victory Gardens. The 4-12-4 fertilizer should be broadcast evenly at the rate of 15 to 25 pounds per 1000 square feet of garden area. Half of the fertilizer may be broadcast before plowing or spading, and the other half either broadcast immediately afterwards, or saved and placed in bands 2 inches from the plant row at a depth of 2 to 3 inches below the surface. In 1944 other grades of complete fertilizer such as 4-10-6, 2-16-8 or 3-12-12 may be purchased for Victory Gardens in packages larger than 80 pounds if desired.

Superphosphate, either 0-20-0 or 0-18-0 fertilizer, may be substituted for the Victory Garden fertilizer of 4-12-4 analysis on silt loam and clay loam soils which have been heavily manured; 0-14-7 fertilizer can be used on sandy, sandy loam and loam soils which have been heavily manured.

THE SEEDBED

Fit the soil carefully.

In successful gardening, the preparation of the seedbed is of great importance.

In the large garden this work is done with a plow, disk and harrow; in the small one it can be done better with a spade or fork and garden rake.

All available garden refuse such as the remains of previous crops, should be worked into the soil. Next plow or spade to a depth of 6 to 8 inches. In doing so be careful not to turn up more than an inch of subsoil. Work the ground in the fall or as early in the spring as the condition of the soil will permit.

Determine this by squeezing some dirt in your hand. If it forms a compact, muddy ball, the soil is still too wet. If the mass crumbles readily under slight pressure when the hand is opened the ground is ready to be worked.

When once started, the work of preparing the seedbed should be completed as quickly as possible. Harrow or rake the soil several times. The surface should be thoroughly pulverized to a depth of at least 3 inches. When planted in such a bed, the seeds are sure to be surrounded by the moist soil particles so essential to quick germination and rapid development.

PLANTING — Sowing the Seed

It is desirable to plant in a freshly prepared seedbed; otherwise, the weeds are likely to come up before your plants. Keep the ground worked where late sowings are to be made to prevent weeds from starting.

Plant in straight rows — This will increase the attractiveness of your garden and make cultivation, insect control and harvesting easier. Use stakes, string and a yardstick. Follow your previously prepared plan. Shallow furrows, suitable for small seed, can be made by drawing the hoe handle along the line. For deeper furrows, use a wheel-hoe or the corner of the hoe-blade.

Plant at the proper depth — In moist soil, cover small seeds such as spinach and lettuce with ¼ inch of soil. Medium-sized seeds such as those of carrots and parsnips are covered to a depth of ½ inch. Large seeds such as those of peas, beans and corn should be covered with about an inch of soil. In light soils or when moisture is deficient, as it is likely to be in mid-summer, plant somewhat deeper.

Space the seeds properly in the row — Plants that crowd do not develop properly. They also require more labor in thinning which may, unless carefully done when still small, damage the plants that are left. Follow the planting directions on most seed packages. Mix some dry pulverized soil with small seeds, then spread them in the row with your fingers.

Mark the rows—Some gardeners plant radishes in rows with onions, parsnips, beets and salsify. The radishes germinate quickly and mark the rows. They mature early and are harvested before competing seriously with the companion crops.

Firm the soil after planting — This practice packs the soil particles around the seed and hastens germination. It may be easily and quickly done with your hands or by light tamping with rake held upright.

STARTING EARLY PLANTS

Certain tender long-season crops such as eggplant, tomatoes and peppers must be started early indoors if they are to be grown successfully in this climate. Such plants can usually be procured from a professional gardener or florist. In most cases the strictly amateur gardener will do well to obtain his plants in this way. If, however, you decide to grow your own, ask for Extension Bulletin E-20 which contains instructions. Broccoli, cauliflower and late cabbage may be sown in a seedbed, then transplanted to the desired row when they have achieved proper size, or even directly in the garden row where the soil has been well prepared.

TRANSPLANTING

If tomato, cabbage, and pepper plants or those of related crops are grown or purchased, they should be transplanted with care. The gardener who takes the following precautions will be well repaid for his trouble:

1. Harden the plants by withholding the water supply and exposing them to outdoor conditions for a few days before transplanting.

2. Move them in the afternoon or evening — transplant on a cool, cloudy day if possible.

3. Water the plants just before moving them — damp soil clings to the roots much better than does dry soil.

4. Do not allow the roots to dry out — remove plants with as much soil adhering to the roots as possible.

5. Set the plants moderately deep, and be sure to firm the soil around the roots.

6. Water the plants after setting. If the sun comes out bright, rake in some dry soil around the plants to keep that which has been soaked down from baking.

7. In hot, dry weather, shade the plants for a few days, if possible.

PROTECTING YOUNG PLANTS

Tender young plants set in the early spring may require some sort of protection for a few days. This is especially true when they are exposed to chill winds or unseasonable cool nights. Commercial devices afford protection, but are relatively expensive. In the home garden, two shingles or thin boards placed in the ground close to the plant affords a measure of protection from prevailing winds. Cones made from old newspapers and held in place by a little dirt, will shield plants during cool nights.

THINNING

Thinning the seedlings in the row is one of the most important of garden operations. It is difficult to sow small seeds thinly enough to permit the plants to make their best development. Table 2 gives the proper distances for plants to stand in the row.

Thinning should be done while plants are small and when the soil is moist so that they can be pulled out easily without injuring those that are left. Turnips, rutabagas and other root crops should be thinned before their taproots begin to become fleshy. Onions from seeds and radishes can be left in the ground until those that are thinned out are large enough to eat.

Pull surplus beet plants when they are 4 to 5 inches tall and use them for greens. Plants thinned from the turnip row may also be used for greens.

Carrots should be thinned first when they are 2 to 3 inches tall so as to stand about 1 inch apart. They can then be left to develop until large enough to be eaten, when alternate plants can be pulled and used, leaving more room for those that are left.

Some gardeners use the outer leaves of lettuce as they grow, leaving the center to develop. If you plan to use the entire plant, thin to 1 inch, then use alternate plants as they develop.

CULTIVATION

Once the seed is in the ground, cultivation (weed control) is the most important garden problem.

Proper cultivation loosens the top soil and permits the rain to soak in so that none of it is lost. It preserves the moisture by killing weeds which, if allowed to grow, rob the crops of both moisture and plant food.

Fig. 3. Shallow cultivation conserves moisture by eliminating weeds. Loose surface soil permits all of the rainwater to soak in.

Unless the soil is too wet to be worked, begin as soon as the rows of plants can be recognized even though weeds have not yet appeared. If it is necessary to thin any of the plants, the work should be done at this time. Remove the weak plants, leaving the strong ones.

In the farm garden, the work can best be done with either horse-drawn or power tools; in the medium-sized garden, with a wheel-hoe (most home gardeners prefer the single-wheel rather than the double-wheel type); in the small garden, with a hoe, hand-rake or weeder. Between-the-row cultivation should be supplemented by hand-weeding in the rows. Cultivate only the surface soil (as shallow as possible and still control weeds). Deep cultivation is harder work, injures plant roots, and dries out the soil.

Cultivate at least once a week, as soon after every rain as the soil is dry enough to work, or more often if necessary to keep weeds under control. Weeds are easily killed while they are small. If allowed to grow, they not only damage the plants but their control becomes a tiresome back-breaking job.

WATERING THE GARDEN

Growing plants must have water. There are "dry spells" almost every year when supplemental irrigation is very desirable. Many plants wilt somewhat on hot dry days even though the soil is not deficient in moisture. If they do not completely recover during the night they need water.

The gardener should learn at the outset that water deficiency cannot be overcome by waving a hose about in the garden. This sort of watering washes the soil, promotes leaf disease, and encourages plant roots to grow near the surface where they are sure to be damaged by cultivation or dry weather.

The gardener who sows seed in hot dry weather may have to hand-sprinkle the surface soil several times daily in order to insure germination and give the seedlings a good start. Hand-sprinkling at other times almost invariably does more harm than good.

Water may be applied by an automatic sprinkler or by removing the nozzle and allowing the water to run from the hose onto a flat board or stone, thus preventing washing. Shallow furrows running along the plant rows will carry the water for some distance and help to cover large areas at one setting.

When water is applied, the soil should be thoroughly soaked to a depth of 5 or 6 inches. The ground should not dry out after such a wetting for at least a week. When it does, give it another thorough soaking.

During the early part of the season, rain and artificial irrigation should be followed by cultivation as soon as the soil is dry enough to work. Stirring the soil will kill the weeds that would otherwise start to grow after the application of water. Cultivation also prevents baking and on some soils helps conserve moisture.

EFFICIENT INSECT CONTROL

It is more economical and easier to control insects if you check them before they become numerous. Have a supply of necessary insecticides on hand so that you can spray or dust the minute you find evidence of an infestation.

You Will Need:

For a 25-by-50-foot garden

1 pound poison bait (dry)
3 pounds calcium arsenate-gypsum dust
1 pound nicotine dust
1 pound rotenone dust (do not mix with lime)

Buy these materials ready mixed if possible. If only a few plants

are infested, or if only a few large insects are present, hand-picking is the most practical method of control.

For ⅓-acre garden

20 pounds calcium arsenate-gypsum dust
10 pounds poison bait
2 pounds nicotine dust
(5 ounces nicotine sulfate, 5 pounds of lime)
3 pounds rotenone dust (do not mix with lime)

How to Prepare Bait and Dusts:

1. Poison bait for cutworms, grasshoppers and crickets:
   2 pounds of dandelions cut up fine
   1 ounce white arsenic, paris green or sodium fluosilicate
   Prepare this bait in the morning to permit wilting.
2. Calcium arsenate-gypsum dust for worms and beetles eating plant leaves:
   1 part calcium arsenate to 19 parts gypsum
3. Nicotine dust for plant lice and other sucking insects:
   ½ teaspoon nicotine sulfate plus ½ pound lime
   or three parts fixed nicotine — 1 part lime
   (Mix by shaking in tight can)

Clean culture and rotation will help solve many garden pest problems. Pull and destroy all plant refuse as soon as each row is harvested. Commercial combination arsenate and fixed copper sprays and dusts are available and effective for general use in the home garden. Use as manufacturer recommends.

How To Do It:

1. If white grubs are present and too numerous for hand picking, other land should be selected and prepared.

2. For cutworms, grasshoppers and crickets, which appear nearly every year, scatter poison bait on a warm **evening** soon after the first plants appear above ground and **just before** "set plants" are put in the ground or when insects appear.

3. Cucumbers and melons present special problems because beetles and aphids carry disease in addition to eating the plants. Watch for and combat these from the time plants appear.

4. For slugs and sow bugs, you may also apply poison bait. Use it under pieces of board or low dense vegetation.

5. For worms and beetles eating plant leaves, use calcium arsenate dust. Apply with small dust gun, or shake through cloth sack. Start soon after plants appear above ground. Make four or five applications at night, once each week, or whenever insects appear later in the

season. This will control tomato worms. For Mexican bean beetles, rotenone is the best control. Do not use on leaf vegetables or beans.

6. For plant lice use nicotine dust. Make home-mixed dust fresh each time used. Use dust gun to reach under leaves.

To Control Root Maggots:

Radishes — Plant several short rows, 5 to 7 days apart.

Cabbage — Protect plants with squares or circles of tarpaper.

Note: An attempt has been made to suggest control methods using materials likely to be available under wartime conditions.

Caution: Do not eat leaves of plants which have been treated with a compound containing arsenic, such as calcium or lead arsenate.

For further information on controlling garden insects, consult your county agricultural agent.

KEEP YOUR PLANTS HEALTHY

It is better to prevent diseases than to try to cure them. The following simple suggestions will help materially to avoid the more common plant diseases.

1. Rotate the crops within your garden
2. Grow disease-resistant varieties
3. Provide good drainage
4. Sow thinly — thin properly
5. Stay out of the garden when the plants are wet. (This particularly applies to beans.)
6. Use treated seed if possible
7. Keep insects under control
8. Commercial copper fungicides control many leaf diseases

Seed Treatments to Prevent Seed Decay and Damping-off

Spergon, Semesan and red copper oxide are commonly used to prevent seed-borne diseases, such as damping-off or seedling rot. Follow the manufacturer's recommendations as printed on the container.

Sprays and Dusts for Fungous Diseases of the Leaves

Fixed Copper Fungicides — Fixed copper fungicides may be used in place of bordeaux mixture and copper-lime dusts. They do not require the addition of lime. These materials can be purchased from dealers in spray materials, already mixed and ready for application. Follow the manufacturer's directions.

Such materials commonly sold in Michigan are Yellow Cuprocide, Bordow, Basicop, Tri-basic Copper Sulphate, Copper Compound A, COCS, OXO-Bordo, Copper Hydro 40 and others.

Commercially Prepared Copper Dusts—Commercially prepared copper dusts also may be used instead of sprays. These should be used according to the manufacturer's directions.

To Make 3 Gallons of Bordeaux Mixture for Potatoes, Celery and Tomatoes* — To make 3 gallons of bordeaux mixture dissolve required amount of powdered copper sulphate in 1½ gallons of water. In a second 1½ gallons of water, dissolve required amount of hydrated spraying lime. Pour the two solutions into the sprayer. Shake well while using. For tomatoes use an 8-4-100 analysis, and for potatoes and celery, use an 8-12-100 analysis.

Bordeaux Mixture

Amount of Powdered Copper Sulfate and Lime to Add to Separate 1½ Gallons of Water:		Strength of bordeaux mixture
Powdered copper sulfate	Hydrated lime	
4 ounces	2 ounces	8-4-100
4 ounces	6 ounces	8-12-100

*Bordeaux mixture should be used immediately after making. Calcium arsenate may be added to bordeaux mixture or fixed copper sprays and dusts to control chewing insects. Do not spray or dust cabbage or related plants with copper fungicides.

A CHECK LIST OF GARDEN INSECTS AND DISEASES

Vegetable	Disease Control		Insect Control	
	Disease	Seed and Field Treatment	Insect	Control
Beans, snap	Bacterial Blights	Use blight tolerant strains as: Giant stringless; Improved Kidney Wax; Round Pod Kidney Wax; Tendergreen; Refugee	Mexican Bean Beetle	Rotenone dust
Beans, lima	Anthracnose	Do not cultivate or pick them when plants are wet	Aphids Leaf Hoppers Beetles	Nicotine Nicotine Rotenone dust
	Seed Decay	Dust seed with Spergon		
Beets	Damping-off	Dust seed with red copper oxide		Ordinarily insect free
Broccoli Brussels Sprouts Cabbage Cauliflower	Damping-off	Dust dry seed with Semesan	Aphids	Nicotine
	Yellows	Use yellows resistant strains of Cabbage (Golden Acre, Wis. Hollander, Marion Market, Detroit) Do not use copper fungicides on this group of plants.	Cabbage worms	Rotenone dust Never use arsenicals on cauliflower or broccoli, use calcium arsenate and gypsum on cabbage only.
			Flea Beetles	
			Maggots	Tar paper discs
Carrots	Damping-off	Dust seed with red copper oxide or Semesan	Carrot rust fly	Mid-season crop avoids fly
Corn, sweet	Seedling root rot	Dust seed with Semesan, Jr., or Barbak	Corn Borer Corn ear worm	Rotenone dust Snip off tips of ears after pollination
			White grubs Wire worms	Avoid infested land
Cucumber	Damping-off Wilt	Dust seed with red copper oxide. Control beetles and aphids		
	Mosaic	Keep down milkweed and ground cherry	Aphids Cucumber beetles	Rotenone dust Calcium arsenate-gypsum
Eggplant	Damping-off Fruit spot	Dust dry seed with red copper oxide	Flea Beetles	Bordeaux or fixed copper fungicides + calcium arsenate, or gypsum — calcium arsenate
		Spray with fixed copper fungicide if necessary		

A CHECK LIST OF GARDEN INSECTS AND DISEASES

Vegetable	Disease Control		Insect Control	
	Disease	Seed and Field Treatment	Insect	Control
Lettuce	Tip burn Drop	Use adapted resistant Imperial strains. Three or four years rotation on well drained soil		Few insect troubles
Onions	Downy mildew Smudge	Good air and soil drainage Yellow and red varieties are resistant	Onion Maggot	¼ pint Dormant oil in 1 gal. water. Pour along row. Do not get on plant.
Peas, green	Damping-off	Dust seed with red copper oxide Semesan, or Spergon	Aphids Weevils	Rotenone dust
Potatoes	Scurf Scab Early Blight Late Blight	Treat uncut tubers in Semesan Bel at manufacturer's directions Spray when plants are 4 inches high and repeat at intervals of 10 days with Bordeaux mixture 8-12-100 or fixed copper of Equivalent strength (12 lbs. of lime to 100 gals.) Fixed copper dust may be used at manufacturer's directions	Potato Beetle Flea Beetles Leaf hopper	Bordeaux mixture or fixed copper fungicide — calcium arsenate and gypsum 8-12-100 Bordeaux or fixed copper + lime will control leaf hoppers
Rutabagas	Few diseases in Home Garden		Maggots Cabbage worms	1 pt. dormant oil in one gal. water. Pour along row. Do not get on plants Rotenone dust
Spinach	Damping-off	Dust seed with red copper oxide	Aphids	Rotenone dust
Squash	Few diseases in Home Garden		Cucumber beetles Squash bugs	Gypsum + calcium arsenate Trap adult bugs under shingles and hand pick. Destroy eggs. Nicotine kills young bugs. Cover bugs 1 inch deep with soil

SOME SUGGESTED CULTURAL PRACTICES

1. **Mulches** — Straw, leaves, grass clippings or partly decomposed leaf mold placed on the ground in a thin layer 2 to 3 inches thick will help to retain soil moisture. Mulches of grass clippings are especially desirable under tomato vines to keep the fruits clean and prevent rotting.

2. **Hilling** — In poorly drained soil, the practice of hilling or planting on ridges will help to provide better drainage and raise the roots above the water level. In dry soils, however, the plants are more likely to dry out. In dry soils, potatoes should be hilled only enough to keep the tubers covered and to prevent sunburn.

3. **Planting in Hills** — Many gardeners like to plant such crops as cucumbers and melons in hills. For best results, dig a hole a foot deep and 2 feet across and place well-rotted manure in the bottom, then re-fill with pulverized soil, sow the seeds, thin to no more than 3 plants to a hill. In the home garden planting in rows with single plants evenly spread, will produce results as good as planting in hills.

4. **Plant Protection** — If you use paper cones or similar forms of protection for plants that are set out early or seed that has been sown early, be sure that some ventilation is provided to permit the escape of moist air.

5. **Spraying and Dusting** — Be sure to hit the under side of the leaves when spraying or dusting. Many of the insect pests live almost entirely on the lower leaf surface. Dust early in the morning or late in the evening when there is little breeze and the dew is on the plants.

6. **Get Rid of Corn Stalks** — Corn borers live over winter in corn stalks. Plow them under before May 1, to reduce the infestation. Cut corn stalks as soon as crop is harvested.

7. **Supporting Plants** — To support pole beans, tall-growing peas and other similar plants, set posts every 12-15 feet in the row. Stretch wire between the posts at top and bottom and weave string between the top and bottom wire, or use cut brush stuck in the ground along the row.

8. **Cutting Broccoli** — Don't allow the cluster of green buds to open out before cutting. Cut the stems down as far as they are tender. These tender stems cook well, if split lengthwise, and they are delicious.

9. **Picking Brussels Sprouts** — Pick the lowest sprouts first. Pick them before the lower leaves start to turn yellow. Break off the leaf below the sprout, then break it away from the stalk.

10. **To Keep Cabbage from Splitting** — When cabbage is fully developed and you can't use it all as it matures, carefully pull each plant up an inch or so to disturb the roots and splitting will be retarded.

11. **Tying Cauliflower** — To retain the pure white color of the cauliflower, tie the leaves up over the head, when it is two or three inches in diameter, to keep it dark. It will usually be ready to eat a week or 10 days after this stage. Cauliflower should be kept growing rapidly.

12. **Blanching Celery** — When the plants are half to two-thirds mature the stalks can be blanched by placing 12-inch boards along both sides of the row and fastening them together to exclude light. Some gardeners wrap each stalk with paper or cardboard. Allow the top 6 inches of the leaves to stick out the top. It should be ready to eat in about 2 weeks.

13. **Endive** — For early winter meals. Endive is really at its best after cold weather sets in. Cover it in late fall with straw or leaves, and leave it in the garden for early winter use.

14. **Try Onion Plants** — Most greenhouses and seed stores now offer onion plants, usually of the sweet Spanish type. They give excellent results.

15. **Shall I Stake Tomatoes?** — This question is asked more frequently than any other. Generally speaking, it is not necessary in Michigan, if you mulch the soil under the plants with straw or grass clippings. Staking means more work, more plants per square foot. Normally the production per square foot is not increased enough to offset the extra cost of plants and labor. The average quality may be a little better on staked plants.

16. **Cutting Potato Seed** — Cut seed potatoes about a week before planting to allow the cut surface to cure. Each piece when cut must contain at least one eye. Usually 3 to 6 pieces can be cut from a potato. For early potatoes some of the seed can be sprouted indoors before planting. Each seed piece should weigh between 1 and 2 ounces.

17. **Shell Beans** — After you've eaten and canned all the green or wax beans you need, allow the rest to mature on the plants. When they have completely matured, pick them and spread them out in a warm place to dry, then place them in a cloth sack and crush the pods. Next place them in a tub of water. The dried pods will float and the beans will sink It's an easy way to shell them and these dry beans make a delicious dish.

18. **Forcing Rhubarb for Winter** — Dig a few plants of rhubarb before the ground freezes. Leave the soil on them but allow them to lay outside until after a hard freeze, then later put them in a dark basement. Pile sand around them and keep it moist. The temperature should be between 45 and 60° F. Stems which develop are delicious and tender.

19. How many quarts will a given quantity of given vegetables make when canned?

	Fresh Vegetables	Canned Produce
Asparagus	2 pounds	1 quart
Sweet Corn	4 ears	1 pint
Snap beans	1 bushel	9 quarts
Lima beans	1 bushel	11 quarts
Beets	1 bushel	14 quarts
Chard	1 bushel	4 quarts
Peas	1 bushel	5 quarts
Tomatoes	1 bushel	12 quarts

20. **Head Lettuce in Michigan** — Thin head lettuce plants 12 to 15 inches apart. It doesn't have to be tied up, but success depends on cool weather. Cut and refrigerate as soon as head is ready. Plant very early in spring—or in late summer for fall.

STORAGE

For information on winter storage of garden vegetables, write to the Michigan State College, Bulletin Room, East Lansing, for Extension Folder F-47.

GARDEN MEMORANDA