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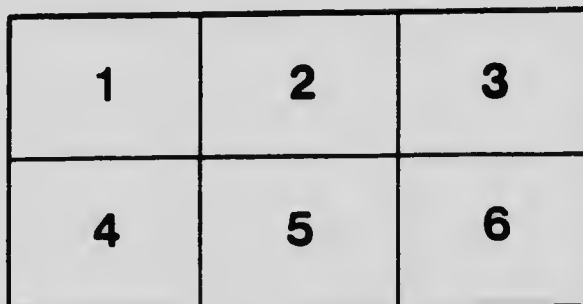
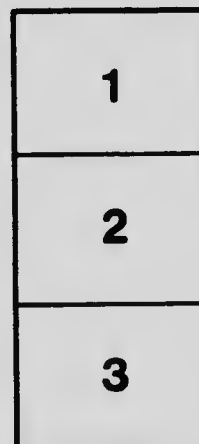
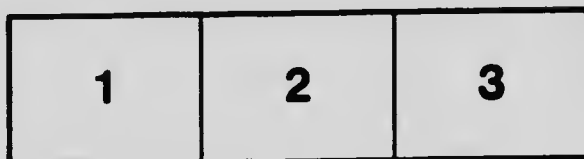
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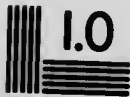
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VEGETABLE GARDENING

BY
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1915

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DEPARTMENT OF AGRICULTURE

VEGETABLE GARDENING

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INTRODUCTION

THE breaking of the land, the growing of crops and the introduction of live stock have so far been given first place by the farmer; and rightly so, as his bread and butter has depended upon their success. It is, therefore, not unnatural that the making of a garden has been neglected for a time.

The ease with which garden produce can be grown and the important place such produce occupies in the economy of the farm home, however, makes the garden a problem which should not be allowed to remain unsettled one day longer than is necessary. Every farmer should have a garden, for he can grow in it a great variety of vegetables and fruits needed on the table.

Many men have not had a garden because they do not know anything about the making of one. They seem to think there is some mystery about it beyond the average man and only meant for the fortunate one under whose magic touch every plant seems to thrive. Such is not the case. With a little care and thoughtfulness any one can have a nice garden. This bulletin has been prepared with the idea of supplying general information on the subject, which coupled with the instructions given on every packet of seeds, should enable every one to have a garden.

I.—LOCATION OF THE GARDEN

The location of the garden is an important consideration. Suitability of soil, good natural or artificial drainage, convenience of access, suitability of exposure, should all receive consideration in the location of the site for the vegetable garden.

The garden should be located as close to the house as possible. This makes the caring and harvesting of it easy. All land should be well drained, since crops on well drained land suffer less from drought as well as from excess of water.

Land with a gently rolling or undulating surface with a southern to a south eastern exposure is the most desirable for general gardening operations. It can be worked much earlier in the spring than that having a northern exposure. Such crops as tomatoes that require a long season and a warm location to mature could do so on a southern slope, while on a northern slope maturity would likely be impossible.

Particularly in the region of the chinook winds the garden should be protected on the north, west and south-west by wind-breaks. Buildings can serve this purpose, but the most effective shelter is that afforded by belts of trees.

THE BEST SOIL

A good garden soil should contain a liberal amount of sand. The best soils for most vegetables is a rich black loam or a sandy loam. The quality of vegetables depends largely on the quality of the soil on which they are grown. Vegetables of much finer texture are produced on sandy soils than on those of a clayey nature. Heavy clay soils are cold, late and hard to work, while very sandy soils do not retain sufficient moisture.

PREPARATION OF THE LAND

Plowing.—The farmer often wonders what is the proper depth to plow. This is a hard question to answer without some precise knowledge of the local conditions and the nature of the soil; but as a general rule it may be said to plow deep. Seven to ten inches is about the right depth especially on the better soils. On the plains it is not always possible to plow deep. The ground may be too hard or perhaps adequate horse-power is lacking. On extremely light soils shallower plowing is advisable, unless it has been heavily fertilized with stable manure thoroughly mixed with the soil. Deep plowing is undesirable also where the subsoil consists of a cold and heavy clay. Turning up this sort of sub-surface soil may greatly retard germination of the seed. This seldom occurs in dry farming districts.

If the land is plowed year after year at the same depth, the sole of the furrow becomes packed by the soothing action of the bottom of the plow. A hard pan or plow-sole is frequently formed especially in districts of limited rainfall. This hard pan is extremely detrimental to the growth of all kinds of plants. Therefore a good plan is to vary the depth of plowing every two or three years.

Fall plowing for the garden is to be preferred, though good results can be obtained if spring-plowed land is thoroughly prepared. If the land is plowed in the fall it becomes disintegrated and packed by settling, and from the action of the weather, and when the upper surface is cultivated and put in good condition early in the spring, a better seed bed is secured than is commonly the case with plowing. A safe rule to follow is to fall plow if there is sufficient moisture to enable proper plowing to be done. In the semi-arid districts harrow and pack immediately after plowing. If fall moisture is lacking plow in the spring when the land is in a fit condition and harrow and pack as before.

Summerfallow.— Experience has taught that, in Southern Alberta particularly, where irrigation is not practised, that one half of the garden should be summer-fallowed thoroughly each year. This assures an abundant supply of moisture, plenty of available plant food for the next year's garden crop, and freedom from weeds. Harrow the first thing in the spring with the drag harrow to conserve moisture and prepare the seed bed.

Sub-soiling.— Sub-soil plows are intended to loosen the sub-soil without bringing it to the surface. In dry-farming practice they are seldom used. Nevertheless, such plows are sometimes used to good purpose. For example, heavy clays that require under drainage are generally benefited by sub-soiling, or they may be used for breaking up a hard pan or plow-sole. When the hard pan comes close to the surface it is often impossible to grow successfully, plants such as sugar beets. Being deep-rooted, they may be forced out of the ground. In the semi-arid regions, sub-soiling should be done at the commencement of summer-fallowing and never at any other time. This deepening of the soil materially increases the water-holding capacity.

CULTIVATION

The objects sought in cultivation of garden crops are:

First,—to keep the soil in the seed-bed readily penetrable to and retentive of moisture for the crops.

Second,—to keep down the weeds, which, if allowed to grow, not only rob the vegetables of moisture but also of available fertility; and

Third,—to liberate plant food.

It is cheaper to do as much of the cultivation as possible before the crop is planted. If this is done the labour of keeping the garden in good condition during the growth of the crop is greatly reduced.

The soil for vegetables should be well prepared. Many garden seeds are very small and require a finely prepared seed-bed to assure good germination. Hence, it is better to use the same land, enriched from time to time, for a number of years. Continued cultivation from year to year brings the land into excellent condition for gardening.

The success of a garden crop that has been planted properly and under proper conditions is just about in proportion to the amount of cultivation it is given while growing. As soon as the plants are set, or are above ground, cultivation should be com-

menced. A wheel-hoe is one of the most satisfactory implements that can be used for this work. It works the ground close to the plants and does away with much hand labour. When garden seeds that require a long time to germinate are sown, it is a good plan to rake over the land very lightly with a fine toothed rake even before the crop appears above the ground, providing the work is so carefully done as not to disturb the seed. This is an easy matter with the larger garden seeds, but it may be impossible with the finer seeds, which are usually planted quite shallow.

When the rows of plants become plainly visible a "Planet Jr." combined hill and drill seeder, double wheel-hoe, cultivator and plow, No. 25 inch may be used by hand to cultivate during most of the season.

Where the area is large enough, the one-horse cultivator may be used successfully on crops such as corn, potatoes and turnips. Cultivation should be given at least once a week during the greater part of the growing season.

Corn may very properly be harrowed with a lever drag from the time it is through the ground till it is 4 to 6 inches high.

Potatoes, too, should be harrowed several times even before they make their first appearance through the ground till they are 4 to 6 inches high, after which the harrow would likely do damage. Set the teeth at about 45 degrees slant.

IRRIGATION

The following rules apply to the irrigation of a vegetable garden:

1. Water should not be applied unless the crop is suffering for it, but the soil should be cultivated thoroughly and frequently to save waste by evaporation.
2. Cultivate at once after irrigating, if the land will permit of it, to keep the soil from baking and to prevent evaporation.
3. Never water-soak the land. Just nicely moisten the soil.
4. Wet the roots of the plants and not the stems or leaves.
5. Irrigation will not take the place of cultivation, since without cultivation irrigation is seldom successful.

MANURES AND COMMERCIAL FERTILIZERS

Stable manure is the best fertilizer for the vegetable garden. Well-rotted manure should be applied in the fall before plowing. In the humid, but not the semi-arid, districts, it may be applied in the early spring and worked thoroughly into the soil. Stable manure has a tendency to lighten a heavy soil and make it more suitable for plant growth. It has a binding effect on the particles of a sandy soil and prevents loss of plant food by leaching.

Horse manure is loose and light; and ferments quickly. It is therefore valuable for early spring crops, as by its fermenting action the land becomes heated, and the early vegetables are forced. It is also used in hotbeds because of its heating power.

Hen manure is a highly concentrating manure. It heats quickly and violently, and should be used with caution. When a crop of cabbage or cauliflower comes to a standstill, a small quantity of hen manure around each plant lightly incorporated into the

soil so as not to touch the roots or stems, or it will burn them, will produce wonderful results in presence of a little moisture. It should never be mixed with other manures, but be applied separately.

Cow and hog manures are cold and slow in action. Hence they are more valuable for late crops of vegetables than for early crops. They ferment rapidly when mixed with horse manure.

Sheep manure is very concentrated and heats rapidly. It is one of our best farm manures, and is valuable for early vegetables.

The compost heap may consist of old straw, leaves, rotten vegetables, heating manure, etc., placed on unrotted sod one foot deep. It may be worked over by the hogs in the hog yard or turned by hand. The resulting fertilizer is very valuable in vegetable gardening, both in the cold and hot beds, and in the open land.

Commercial fertilizers seldom need to be used for vegetables in this province. They should never be used until the source of manure has been exhausted or the crop comes to a halt in its growth. They are generally expensive, and there is danger of using too much, instead of too little, with bad results to the crop. Among our most valuable commercial fertilizers are:

Sodium nitrate, which is perfectly soluble and available for plants, and should be applied in very small quantities at a time. If cabbage, cauliflower, lettuce or spinach come to a standstill in hot, dry, windy weather, a small quantity of nitrate placed around each plant without touching it will produce marvellous results in the presence of rain or applied moisture.

Lime at times is very beneficial and should be applied during the winter at the rate of one thousand pounds per acre.

Potash, one hundred and fifty pounds, and acid phosphate fifty pounds per acre, may be applied. Two-thirds of an ounce to the square yard is about right. It should be applied during the winter months.

Land plaster or gypsum applied to land at the rate of two hundred to six hundred pounds per acre often improves such garden crops as beans and peas.

II.—PLANTING OF VEGETABLES

TIME TO PLANT

The best practice is to plant as soon as the ground is sufficiently warm to secure a strong growth. It is true that by early planting there is danger from late spring frosts and there seems to be a tendency on the part of most amateur gardeners to attempt to escape frost injury by planting too late, but there is a greater margin of loss from late planting. If the seed is sown early and the young crop is destroyed by frost, it is probably not too late for a second seeding. One may lose by frost; one will surely lose, if, year after year, planting is delayed until all danger of frost is past.

METHOD OF PLANTING

Planting may include two distinct operations:—(a) Transplanting from hot bed or cold frame; and, (b) Out door seeding.

Elsewhere in this article information will be given as to the building of the hot bed and cold frame, and as to methods of growing young plants therein.

Owing to the comparatively short growing season and late spring frosts, it is very desirable to have the young plants started, either indoors or by the artificial means just mentioned.

Transplanting.—The operation of planting then becomes rather one of transplanting in which the young plants, started under cover, are placed in their new home. Needless to say, great care should be taken in handling the young plants while they are being transplanted. If at all possible the soil remaining on the rootlets should not be allowed to dry out, and the plants should be kept out of the soil for the shortest time possible. If the soil is in good condition as to tilth and moisture there will be need of little water. A hole is made a little deeper than the plant grew in its original location, the young plant is then placed in this hole and the earth pressed evenly and firmly about the roots.

It is not the best practice to pour a lot of water on the surface around the plant to soak in as best it may, particularly if the surface is going to be left alone for some days. A better plan is to put the water in the hole first, allowing it to soak away, and then place the soil in as before. After transplanting, there should be a soil mulch about the young plants to retain moisture. Almost any of our garden vegetables may be artificially started, but the foregoing methods will govern practically all cases. Where the young plants have been brought some distance after being dug up, it may be well to soak the roots for a short time in tepid water immediately before planting.

Outdoor Seeding.—However much one may advocate the starting of vegetables under cover, there are, and always will be, gardeners who will take a chance on seeding immediately in the garden, and for these certain rules should be given:

(1) Have the seed-bed well worked up and at a reasonable temperature; there is nothing gained in seeding before the ground is warm enough to produce growth.

(2) Sow the seed, if at all possible, in rows. A small trench may be made with the handle of the garden implement deep enough but not too deep. If the seed-bed is in good condition, large seeds need not be under more than their own depth of soil, provided there is sufficient moisture for germination. On the other hand, deep seeding may entirely prevent germination. After the seed is covered the soil may be pressed, even to the extent of the weight of the person doing the planting, but this will depend very much upon the condition of the soil as to moisture. If extra pressure is applied to the covered seed, care must be taken that the surface is loosened up to provide a soil mulch.

(3) Put in plenty of seed. Some of the seed of our garden vegetables is apt to be short of germination; possibly some of the seed sown may be older than is desired. Onion seed, for example, falls off rapidly in vitality after the first year. It is easier to do a little thinning than to fill the blank spaces with transplants later on.

(4) If the gardener prefers to use the old-fashioned bed, it should be raised but very little, if at all, from the plane of the path. It should not be wider than about four feet, so that work may be done from both sides without tramping on the bed, and its rows should run crosswise.

(5) The rows, whether long or short, should run from east to west to secure full advantage of sunlight.

(6) The surface of the seed plot may not be disturbed until the appearance of the young plants indicates the location of the rows.

GOOD SEED

Good seed is fundamental to good gardening both from the point of yield and also of interest. Purchase seed from reputable seed houses and do not pay attention to travelling salesmen or to representation, not backed by proof. With good seed, fair results may be achieved with indifferent culture, but the best cultivation cannot achieve even a fair amount of success if the seed is poor.

The leading seed houses sell their garden seeds now under a report of germination test, and it is well that the growers should demand this report in purchasing. When it comes to soundness of stock in our garden seeds, much is left to be desired. A certain variety of garden vegetable should call for a certain definite type, for instance, when one sows alleged Chantenay carrot, he should expect the seed to produce that particular type of carrot. Unfortunately, he may very often get carrot seed that will produce some carrots of an entirely different shape, or in other words, which will produce only a percentage of the Chantenay type. This should not be; and as gardening becomes more common, and as people get to know more about varieties, they will demand of the seedsmen uniformity of type; but they should be willing to pay the seedsmen a little more to get just what they want.

Tests have been made of stock purchased from old reliable seed houses in England, planted beside stock sold by Canadian firms under the same name, and the difference in percentage of germination and in uniformity of type is sometimes striking. Canadian firms should be willing to purchase for the growers the seed they demand. It should not be necessary for so many of our old country home-makers in Alberta to send home for their little packets of garden vegetable seeds. Surely it is not all sentiment on their part. The grower has a perfect right to demand the source of the seed for which he pays.

CULTIVATION

It has been said that it is desirable to grow the vegetables in rows. The reason for this is to facilitate cultivation and also to allow the sunlight to become more available, also, the gardener is enabled to fight the weed enemy to much greater advantage. As has already been shown, cultivation has two important purposes and one is weed eradication. It is impossible to exclude this phase of gardening. The best time to kill weed seeds is just as they are showing through the ground and for this purpose the rake is an excellent implement.

THINNING

The question of thinning is rather a debatable one. The operation of thinning is performed to allow opportunity for maximum production. If the general rules for thinning are followed, it will be found that plants should have room dependent upon the extent of their maximum root and top development, to allow soil space to secure plenty of plant food; and air space to secure plenty of sunlight and ventilation. By giving the rows these favourable conditions, maximum production may be looked for. The common practice so far has erred on the side of too little thinning, rather than too much. It may be due to a feeling of economy or of timidity, or a combination of both, but the young gardener is apt to thin with a sparing hand. However, all should not be said on one side.

The demand for thinning should depend altogether on the product desired; for instance, catalogues may tell you to thin beets out to 6, 8, 10 or even 12 inches apart, but who wants a beet grown where the interspaces are 12 inches? What is wanted on the table is a small beet which cooks up tender, is not unwieldy to handle and which is a nice size for pickling. Why then thin? The seed catalogues will tell you to sow some beets early and some a little later, when practically the same results can be secured by restricted thinning. The same is true of carrots. What demand is there for a carrot which has had 8 to 12 inches space on each side of it, that it may attain its maximum growth? Everyone knows that the smaller carrot is much more desirable. This may not seem altogether orthodox, but it is a good practice within reason.

On the other hand, in the case of onions, a fair distance between the plants is a decided advantage, because, while some of the onions may be used when young, ultimately a good-sized and well-developed plant is required. This simply goes to show that the gardener must be guided by what he wants, rather than by what some one else thinks he wants. As far as possible the thinning should be so conducted that what is pulled out may be partly utilized. Lettuce is very apt to be sown thickly; begin to use before the leaves are anywhere nearly full grown, and the lettuce will catch up to you. The same is true of radish; begin pulling as soon as the first large one is ready, and as the rows are thinned out new radishes attain their growth. In the case of vegetables planted in hills, such as melons, cucumbers, etc., where a large growth is looked for, it is a good practice to remove the weaker plants as early as possible, leaving two or three strong plants to the hill. This may be made a general rule for the thinning of plants in hills.

HARVESTING

The question of harvesting is a relative one. Probably the term could be applied to all operations of gathering the vegetables, from the time the first lettuce leaves are plucked until the last parsnip is dug. Where vegetables are taken up and immediately used, the question of any specific method of harvesting is scarcely necessary, but where vegetables are removed from the garden for market purposes, and for winter storage, a few helpful hints might come in handy.

With onions it is a good thing to pull by hand, and leaving the tops on, pile them in thin rows and leave them to dry out. Later the tops may be twisted off.

With beets, carrots, turnips and such vegetables, it is a better plan to twist the top; cutting may not be done in the right way. However, the majority of people will probably use the knife, and in this case it might be well to note that it is not advisable to cut too close to the crown.

STORING

The question of storing is very important. It is particularly important in Alberta because root houses and cellars are not as plentiful as they might be. A root house may be dug from the side of a hill, and covered with alternate layers of straw and earth, sufficiently deep to repel frost and snow. Bins may be built along the side for the reception of vegetables for winter use.

Beets, carrots, turnips, parsnips, etc., may be stored in boxes full of sand as a means to retain moisture and an even temperature. The sand should not be too damp and the rooms should be as cool as possible, while remaining above freezing point. In the case of onions, dry shelves made of slats upon which the onions are spread, one layer deep, is best. Onions piled together in sacks or bins are almost sure to decay. Of course, many of our better houses have good cellars or basements. If the basement contains a furnace, the furnace room should be partitioned off. It is not possible to keep vegetables in the same room as the furnace.

VARIETIES

Many people ask what is the best variety. It is a very difficult question to answer, and it has been thought best to give a list of a few of the leading varieties which have been successful, and to leave the reader a latitude of choice, because the great majority of the varieties advertised by any seedsman will give good results. It is not always so much a question of variety as it is a question of securing a good strain of that variety, and, as before indicated, the growers should be, not only willing, but anxious to pay the dealers a premium for first-class stock.

The following varieties are worthy of a place in any garden. This list should be understood to represent types rather than an arbitrary recommendation of mere varieties:

Beets.—Egyptian, Early Blood, Meteor, Early Model, Eclipse.

Beans.—Almost any strain of a golden wax, of the green type: —Refugee, Stringless Green Pod; Mammoth Long Pod, Express, Long Pod, Early Red Valentine. Green: Giant Green Windsor, Broad Windsor.

Cabbage.—Express, Kildonan, Autumn King, Early Wonder, Early Favourite, Red Drum Head, Red Dutch, Paris Market, Early Jersey, Wakefield, Copenhagen Market, Danish Ballhead, Drumhead Savoy (late).

Carrots.—Chantenay, Ox-Heart, Danvers, Early Scarlet Horn, Long Red Intermediate, Improved Long Red, Surrey.

- Corn.**—Malakoff, Cory, Golden Bantam, Early Adams, Squaw.
- Cucumbers.**—Long Green, Medium Green, White Spine, Success, Prolific, Davis Perfect, Peerless White Spine.
- Lettuce.**—Boston, Drum Head, Simpson, Early Perfection, Express, Nonsuch, Grand Rapids, Iceberg, Giant Crystal Head, Crisp as Ice, Improved Hanson, Trianon, Paris.
- Onions.**—Early Flat Red, Danvers, Barletta, White Queen, White Pearl, Wetherfield, Prize Taker, White Globe.
- Peas.**—Nott's Excelsior, King Edward, Tremendous, Telephone, Telegraph, Satisfaction, Duke of York, Gold Finder, No Plus Ultra, Gregory's Surprise, Thos. Laxton, Sutton's Early Giant, Strata-gem, McLean's Advancer, Heroine.
- Tomatoes.**—Earliana, Ponderosa, Challis Early Jewel, Bonny Best.
- Turnips.**—Golden Ball, White Snowball, Red Globe, Yellow Garden, Hartley's Bronze Top, White Garden, Extra Early Milan.
- Celery.**—Suburb. Pink, Solid White, Giant Pascal, White Plume, Golden Self Blanching, Paris Golden Yellow.
- Vegetable Marrow.**—Long White, Long Green, White Bush.
- Pumpkins.**—Ohio.
- Squash.**—Yellow Netted, Mammoth, Kohl Rabi.
- Leek.**—Colossal, London, British Flag, Prize Taker.
- Parsley.**—Double Curled, Triple Moss Curled, Myatt's Garnishing.
- Parsnips.**—Hollow Crown, Tender and True.
- Radish.**—Scarlet White Tipped, Triumph, Long White, White Tipped Turnip, Rosy Gem, French Breakfast, Scarlet, Icicle.
- Spinach.**—Round Selected, Perpetual.
- Asparagus.**—Conover's Colossal, Palmeto, Argenteuil.
- Rhubarb.**—Myatt's Victoria, Royal, Victoria, Strawberry, Lin-nacus.
- Salsify or Vegetable Oyster.**—Mammoth.
- Cauliflower.**—Knight of Malta, Masterpiece, Snow Man, Early Wonder, Early Dwarf Erfurt, Early Snowball, Extra Early White-head.
- Swedes.**—Champion Purple Top, Skirving's Improved, Gumbo, Bangholm.
- Potatoes.**—Early varieties: Irish Cobbler, Rochester Rose, Early Ohio, Early Boyee, Vick's Extra Early.
- General crop: Wee MacGregor, Gold Coin, Table Talk, American Wonder, Country Gentleman, Burbank, Holbron's Abundance, Early Moonlight, Sutton's Satisfaction, Beauty of Hebron, Windsor Castle, Twentieth Century, Early White Prize, Carman No. 1.

III.—HOTBEDS

Hotbeds and cold frames are used for forcing plants. The term "forcing," as used in horticulture, means growing plants out of season. The hotbed is the simplest forcing structure, and is used for lengthening the season, for bringing on a crop in advance of its normal season, or for growing a very short season crop, like lettuce or radishes. Cabbage, cauliflower, celery and tomatoes are the crops that are usually started in the hotbed.

As the name implies, cold frames are sash-covered frames without heat. The application of heat transforms them into hotbeds.

MAKING THE HOTBED

The Site.—The first step is to choose a suitable situation on the south side of a building, wall or close fence where the cold winds from the north will be broken and all the sunshine possible will be obtained. The hotbed should also be situated on well-drained soil and convenient to an adequate water supply.

Hotbeds may be made either above or below ground. The one below ground is usually preferable, because it furnishes a more uniform and lasting heat for the plants. To make it, the soil should be taken out to a depth of about 18 inches and about 3 feet wider than the frame, so that there will be room for banking. The *banking* is a very important part of the construction of a hotbed, as the conservation of heat in the bed depends very much upon it. It will be readily seen that much labor will be saved by doing the necessary excavation for the bed in the autumn, when there is no frost in the ground. Failing to have the ground excavated for spring use, it would be better to construct a hotbed for that season on the surface of the soil.

Manure.—The best manure for a hotbed is produced by grain-fed work animals. Horse manure is the best to use, and it should be quite fresh and not old and rotten. It should be made up of at least one-half straw. A sufficient quantity to meet the needs of the work must first be accumulated (about five waggon loads), and then piled in a broad flat heap, properly moistened and well packed. When it begins to heat, it should be re-piled and left for three or four days to make sure that all the manure is of uniform consistency. Five or six days after turning, it should be quite hot, and is now ready for use. The duration of heat will depend on the freshness of the manure, the quantity of litter, and the compactness and depth of the heap. Fresh manure well composted and thoroughly packed and moistened in a deep heap, will give maximum heat. In placing the manure in the bed, it is advisable to start from one end shaking the manure from a fork so that the long and short manure will be well mixed; in this way make a layer 8 or 9 inches in depth the full length of the bed. It should then be tramped well and moistened. Another layer is then started, and so on, tramping each layer well until the manure is the depth required. This depth will depend on when the bed is made. If made early, the manure should be from 2½ to 3 feet in depth, but if made during the early part of April, when the weather is not very cold about 1½ to 2 feet of manure will suffice.

After the manure has been put in, the frame should be placed on and then about four to six inches more manure put in and banked well around the sides of the frame. Outside, the manure should be banked to the top of the frame and from 12 to 15 inches in width.

The Frame.—The simplest frame is made out of 2 inch planks. It should be so constructed that it may be raised, as this may be necessary if the plants get too close to the glass. The frame should be at least six inches higher at the back than at the front, in order that the rain will run off readily and the plants get more sunshine. For ordinary use a frame 6 feet by 12 feet will be found convenient and sufficiently large for the ordinary farm. As above stated it should be made of 2 inch material. The back side of the frame, which should always be placed towards the north, is made 15 inches high, while the front should be 9 inches high.

The Sashes.—The sashes generally used are 3 by 6 feet. Very often storm windows from the house may be used to advantage in covering the hotbed. The shape and size of the frame in this case is constructed to suit sashes. Having the manure in and the frame on, the bed is now ready for the sashes. The bed should be so constructed that they fit snugly.

Shelters made of one inch lumber, the same size as the sashes, are useful for covering them as they help to conserve the heat in cold weather.

The Soil.—In two or three days the sash should be removed, the manure given a tramp all over, making it level where necessary, and then the soil put on. To get the best results, the soil should be prepared the previous autumn and left in a pile over winter. It should be rich and of such a character that it will not bake. Any good garden soil mixed with compost will answer the purpose.

The soil should be from 5 to 6 inches deep over the manure, and it is better to have it a little deeper than too shallow. The soil when it is put in should come near the top of the frame at the lower side, as the manure will sink considerably, and the nearer the plants are to the glass later on the stockier they will be.

Getting Ready for the Seed.—In five or six days the hotbed will be ready for the seed, but it is necessary to wait until the manure has cooled a little, and the temperature has fallen to between 80 and 90 degrees Fahrenheit. During the time when it is hottest some of the heat may be allowed to escape by raising the sashes a little every day. One should not be in a hurry to sow the seed, as, if the temperature is too high, the results will not be satisfactory. When the bed has reached the right temperature, the soil should be spaded over a couple of inches, and the surface levelled and made fine with the rake. The bed is now ready for sowing.

Seeding.—The seed is usually sown in rows 4 inches apart and about the same depth as outside. The frame should be kept sufficiently aired after the plants come up by raising the back of the sash to prevent the plants from becoming spindly or weakly, when

they are apt to damp off. Care should be taken, on the other hand, to prevent their being chilled or frozen.

Protection.—Provision should be made for the protection of the hotbed during severe weather and cold nights. This can be done by means of board shutters, old rugs or clean straw. The board shutters may be placed snugly down over the sashes and fastened in place. The rugs are spread over the sashes and secured in case of winds or storms, and the straw is piled over the surface to a depth of a foot, in a way that it cannot blow away.

Watering.—The soil in the hotbed must be watered when necessary, care being taken not to overdo this, as the plants would then be likely to damp off. No single operation connected with the maintenance of a hotbed is of more importance than watering. The time and method of watering determine the growth of the plants, their freedom from disease and the effectiveness of the hotbed. Watering should be done in the morning and on bright days only. The use of water in the evening lowers the temperature of the hotbed at the most critical time of day. A moist atmosphere at night also stimulates the development of disease, and has a tendency to weaken the plants.

Picking Out.—After the plants have developed to a height of an inch or an inch and a half, they should be picked out into another sash or cold frame, or into another part of the same bed. The transplanting of the little plants at this early stage encourages the development of sturdy, healthy plants with better root systems. Plants in the hotbed should be picked out at least twice before transplanting to the garden. In picking out the first time, the aim should be to allow each plant a space of an inch and a half or two inches each way. The second transplanting in the hotbed should come two or three weeks after the first, and the distance between the plants increased to six inches each way. They should be left in this way for ten days to two weeks. The cabbage may be transplanted to the garden any time after May 15th, and the tomatoes in early June.

Hardening Off.—To have success with transplanting hotbed plants to the garden, it is necessary to have the plants properly hardened off. The term hardening off as applied to vegetable gardening means the acclimatizing of the plants to outside conditions. This is done by removing the sashes from the hotbed for a number of days prior to setting the plants into the garden. For the first few days in this period the sashes are removed for only a few hours during the warm part of the day. The length of time is gradually increased until the sashes are left off pretty much all the time for a day or two before setting out.

IV.—INSECTS AND INSECTICIDES

It is not possible, in this connection, to enter into the specific differences which distinguish families and groups of insects from one another. For our purpose it is sufficient to know that those insects which, as a rule, are most injurious to crops are of two classes; insects which gain their sustenance by biting or devouring the tissue of the plant, and those which gain their sustenance by

sucking the juices of the plant. The first class of insects have jaws fitted for biting and for masticating the plant tissues, and their work is followed by defoliation or by the destruction of areas of leaf or stem tissue. The mouth parts of sucking insects are not made for biting, so do not admit of the destruction of plant tissue in this way. Such insects have tube-like mouth parts which they insert in the tissue of the plant to suck its juices. It is evident, therefore, the insects of the two classes must be fought from different standpoints and with different insecticides.

We have very troublesome insects belonging to both classes, and they are not difficult to identify. The foliage is eaten in one case and left intact in the other. In the latter case the substance is removed from the leaf; as a result its function is upset, the leaf gradually dies and drops to the ground.

Eating Insects.—The class of insects which obtain their nourishment by eating the tissue of the plants can, of course, be poisoned, and this is usually successfully accomplished by the use of Paris Green or arsenate of lead in suspension in water. Paris Green is used at the rate of 1 pound to 50 gallons of water, while the arsenate of lead is used in somewhat greater strength—2 pounds to 50 gallons of water. These poisonous solutions may be applied to the foliage of cabbage, cauliflower, etc., before using without any danger to the household. The vegetables grow from the inside and not from without, hence the poison remaining on the surface is washed off before cooking. In combating these insects it is important to treat in the initial stage, else the foliage may be injured to such an extent that the functions of the plant be upset and the insects allowed to become too numerous and large for quick and effective extermination.

Sucking Insects.—Those insects which obtain their nourishment by sucking the juices of plants can be destroyed only by the use of insecticides coming in contact with their bodies. The effectiveness of the remedy with this class of insects depends on covering the openings of their breathing spiracles which are situated in the sides of the abdomen, with a thin film of insecticide. The insects in this way are unable to breathe and quickly succumb. For this purpose volatile oils, or oil and soap mixtures are usually employed. Kerosene emulsion and whale-oil soap are two of the standard remedies for this class of insects.

Kerosene emulsion is made as follows:

Hard soap or whale-oil soap	½ lb.
Water (preferably soft)	1 Gal.
Kerosene	2 Gal.

Dissolve the soap in soft water by boiling, add the kerosene and churn with a pump or by hand for 15 minutes. Dilute 5 to 25 times before applying.

Use the stronger emulsion for all scale insects. In using the strong solution care should be taken or the foliage of the plants may be seriously injured. For such insects as plant lice, red spider, mealy bugs, and thrips, the weaker preparations will prove effective. Cabbage worms, currant worms, and all insects which have soft bodies can be successfully treated by the use of contact

insecticides as well as by poisons. It is advisable to make the emulsion shortly before it is used.

Whale-oil soap spray is prepared as follows: Dissolve it in hot water if wanted quickly. For aphids and other common sucking insects use 1 pound of soap to 5 to 8 gallons of water. In using any of the insecticides, especially contact sprays, it is important to apply the solution in as fine a mist as possible. For house plants, a syringe that has a very fine opening may be used. For the garden, use a pump and hose to which is attached a very fine nozzle through which the solution is forced in the form of a mist. The leaves should be sprayed on both surfaces and all other parts of the plants as well, to make sure of hitting all of the insects.

Cutworms.—These have been grouped with the insects with mouth parts formed for biting. Owing to the fact that these insects feed on that portion of the plant which is below or just at the surface of the ground, the usual means of applying poisons are not effective. In poisoning cutworms in the garden the following mixture will be effective:

Bran or middlings	50 lbs.
Paris Green	1 lb.
Corn Syrup	2 lbs.
Water enough to moisten	

The bran or middlings are thoroughly mixed with the Paris Green while dry, then the syrup is dissolved in a gallon of water and the mixture is moistened until, when pressing a handful firmly, a slight amount of water may be squeezed out. Apply the mixture at once to the surface of the ground around the plants in the infested area. Apply it broadcast in the evening, and work it into a half inch of the surface soil with a garden rake. This will give better satisfaction than applying to the surface, because the majority of the cutworms in this province feed just below the surface of the ground, and unless the poison is worked into the surface soil, little or no injury is done them.

Proper cultural methods are very important in combating all insects. A thorough cleaning up of the ground each fall after the crops are removed will be found to be beneficial. All dead leaves, diseased plants, etc., should be raked into piles and burned. Then the ground should be plowed to a depth of six or seven inches and harrowed. Such treatment in the garden when associated with a short rotation of crops will insure to a marked extent freedom from insect pests.

