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Planting and Growing the Family Food Supply

L. L. Davis

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By L. L. Davis

Acting Head Department of Horticulture
and Forestry

South Dakota State College
Brookings, South Dakota

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Locating And Planting The Family Garden

Importance.—A good vegetable garden used to be a luxury in part of our state. The development of small dams and impounding of water for stock and for irrigating small areas have led to a greater interest in vegetable gardening. We know that the garden is important because it furnishes fresh vegetables for summer needs, and by canning, drying and storing extend their use through the winter. The vegetables furnish minerals and vitamins that are essential in our diet. Many people have found that a garden supplements employment and incomes by using spare time and energy to produce food and thus reduces the food bill. Many city and town residents have found that a garden improves the health of the individual through work in cultivating the garden.

Location.—If we are to get the most out of a garden it should be properly located. Avoid heavy clay soil where gravel subsoil is near the surface. Soil infested with noxious weeds such as leafy spurge, quack grass or creeping jenny is difficult to cultivate in a vegetable garden. Fence the garden from poultry or locate at some distance from the buildings.

It is best to select a garden spot that does not dry out early in the season. A sandy loam makes the best soil. Bottom land is best if drainage is adequate. Low ground or land near irrigation water, even if some distance from the house, will be best if there is a sandy loam soil. Some artesian water is toxic to plants. For a further discussion refer to Part 4.

Fertilizers.—We can make good soil unproductive by fallowing year after year. We approach this condition in a well cultivated garden, but the good gardener replaces the organic matter every year by applying one-year old barnyard manure. A light application of well rotted manure every year is better than a heavy application every third year. Eight to 15 tons per acre may be used depending upon the type of soil and available water supply. Too heavy applications of manure in semi-arid regions will cause gardens to "burn out" quickly during dry weather. More strawy manure may be used on heavy soils than on light soils. Unrotted manure may contain weed seeds. Poultry, pigeon and sheep manures

should be used sparingly as it may burn the plants if free of litter. Two tons per acre is usually sufficient.

Green manure is a valuable substitute for animal manure. Early crops such as peas, lettuce, beets, and bush beans may be planted together so that later in the season the area can be seeded to soybeans, rye, barley or oats. This green manure is plowed under the following spring.

Leaves and straw are good fertilizers if stored in a pit and kept moist until decomposed. Decomposition will be hastened by adding 50 to 60 pounds ammonium sulphate and 30 to 40 pounds phosphate per ton of organic matter.

Coal ashes have little value as fertilizers, but do lighten the soil. Sift before using. Wood ashes, not leached, are beneficial.

Arrangement.—Plant drouth resistant vegetables on the high side of the garden as it always dries out first. The most drouth resistant perennial vegetables are rhubarb, asparagus and multiplier onions. The most drouth resistant biennial vegetables are late maturing root crops, as carrots, turnips, and parsnips. Avoid shading of crops by high crops, as for example, do not plant a row of sweet corn south or west of a row of carrots, as the corn will shade the carrots and greatly reduce the yield.

It is best to space the rows in farm gardens for horse cultivation if irrigation is not possible. If possible to irrigate, it may be desirable to have a small but highly productive garden. Do not plant potatoes in a few long rows beside the corn where it is so difficult to control insects. Plant in a block of shorter rows.

Size.—(For a family of five for a year) A half-acre garden spaced for horse cultivation, exclusive of potatoes will supply sufficient vegetables. A fourth-acre garden spaced for hand cultivation is large enough. There is no use in planting a larger garden than can be tended.

Cost of Garden Seed.—Seed costs differ from year to year, but as a rule the seed for the average garden will cost less than $5.00. If only a limited amount of seed can be bought, buy tomatoes, green string beans, Swiss chard, or New Zealand spinach, parsnips, carrots and certified seed potatoes because they are easily grown, canned or stored, and furnish roughage, vitamins and minerals in the diet.

Time of Planting.—The hardy vegetables, such as onions, peas, spinach, Swiss chard, lettuce, parsnips, turnips, and radishes are sowed about April 15 in the southern part and May 1st in the northern part of South Dakota, or as soon as the weather and soil conditions will permit.

The half hardy vegetables, beets, carrots, New Zealand spinach and celery are planted about two weeks later. The frost tender vegetables, beans, sweet corn, pumpkins, squash, cucumbers, tomatoes, peppers, and egg plant are planted the last of May after the frost danger is past.

Planting and Rate of Seeding.—Plant small seeded vegetables shallowly and large seeded vegetables (peas and beans) 2½ to 3 inches deep. In light soils, sow seed deeper than in heavy soils. If the soil is dry at planting time it should be sown deeper. Late vegetables are sown deeper for the same reason. If the garden is irrigated to germinate seed, sow shallowly.

Very small seeds are sown more evenly if mixed with three or four parts of sand. Garden seeds do not germinate 100 percent. Sow the seed a little thick and be sure and thin later if necessary. If moisture is a limiting factor do not plant seed too thick.

Hotbed Construction, Planting, Management and Transplanting

Hotbeds for tomato, cabbage and other long season plants can be constructed at home with very little labor. The permanent hotbed may be built by digging a pit and filling it with manure and setting the frame into the pit about half way.

Site.—A gentle south-easterly slope allows drainage and sunlight. Hotbeds should be protected on the west and north by buildings, trees and shrubs.

Time.—Hotbeds may be started from March 15 to April 15. The frame slopes six inches toward the south and is constructed to accommodate the size and number of window sash available.

Manure.—Fresh, grain fed horse manure is the best for hotbeds. Two loads of this manure piled on the south side of a building will begin to heat and steam in a few days. It is forked over in order that it may heat evenly. White patches are wet down with warm water. For a permanent hotbed, tramp about 18 inches of this hot manure into the bottom of the pit and place the frame, sash, and soil on top. Four or five inches of sandy, moderately fertile loam containing little humus is spread evenly over the manure, leveled, firmed and watered. The bed will get very hot at first. The seed is sown when the **temperature drops** to 85° to 90° F.

Ventilation.—The hotbed is ventilated daily except on windy, cold or cloudy days by raising one edge of the sash. The wind must not blow directly on the plants. The amount and duration of ventilation varies with the weather. Ventilation should be started usually at 9 a.m. and discontinued by 3 p.m. Later in the season longer ventilation may be given.

Seedage and Transplanting from Hotbed

Soil.—Seedage soil should be of a sandy loam texture, not very fertile, containing no humus or manure, and free from lumps . The soil should be moist. Form a handful of soil into a ball; if it crumbles upon loosening the fingers it is too dry. If water oozes out between the fingers, it is too wet. The ball should break apart readily. As an aid in controlling damping-off fungus diseases, the soil should be sterilized before it is placed in the hotbed with a solution of 1 ounce formaldehyde to 1 quart of water. The treated soil is kept covered with blankets for 2 or 3 days and then aired out for 2 or 3 days before using.

Flats.—Seed is sown directly in the hotbed or in flats 3½ to 4 inches in depth which are provided with holes in the bottom. A ½ inch layer of coarse soil is placed in the bottom of the flat and it is then filled with ordinary soil. The soil is packed firmly at the edges and corners, levelled off and firmed with a trowel or board.

Seeding.—Seed is sown broadcast or in rows 1½ inches apart. A shallow furrow is made with the edge of the trowel and the seed scattered thinly in the row. The rows will extend from left to right and labels are placed at the top of each row. When only 3 or 4 different kinds of seed are sown in a flat they may be broadcast in strips and separated by a small stick. The seed should be firmed into the bed with the trowel.

Covering.—Cover seeds with a thin layer of sifted soil made up of 50 per cent fine sand to a depth of approximately 4 times the diameter of the seed or frim ⅛ to ¼ inch. Level and firm with a trowel. Cover

with cheese cloth and thoroughly water with a small sprinkling can. Remove the cheese cloth and cover flats with glass and shade with newspapers. If seed is sown directly into hotbed, shade with newspaper.

Watering.—No water is needed until after the seeds have germinated and the glass removed from the flats, usually 4 to 6 days after seeding. The flats or beds are watered moderately when needed, usually about 10 a.m. They are not watered on cold, cloudy days and only when the temperature is rising so that a little ventilation will dry off the plants.

Transplanting.—Seedlings are transplanted in 18 to 21 days after they have developed their first true leaves. They are planted two inches apart. The soil is the same type as for seedage and is firmed with the trowel. Holes to receive the seedlings are made. The seedlings are lifted out of their seed beds with some soil by running a knife underneath the roots. Handle carefully and place roots in the hole made with pointed sticks. Firm the soil about the roots. The soil about the plants should be leveled, sprinkled with sand, THOROUGHLY watered and shaded with newspapers for three days and then given full sunlight.

Culture.—The plants are grown in this bed about 3 weeks before they are transplanted to hotbeds or the field. Seedlings are not allowed to crowd each other because they will grow spindling. If they become crowded before they are planted in the field, they should be transplanted again 3 inches apart.

Transplanting, Cultivating and Culture of Common Vegetables

Transplanting to Garden.—Success in transplanting hotbed grown plants to the garden depends upon the character of the plants, the condition of the soil, and the manner of doing the work. The plant should be well-grown, stalky and hardened to withstand the changed conditions. Soft stemmed, leggy plants are not desirable. Properly hardened plants will withstand lower temperatures and drier and hotter weather. Plants should be set in properly prepared soil. Otherwise, the plants are likely to be stunted, weak, and die out because of improper moisture and poor soil conditions. Transplanting is more successfully done just before or after a rain or in cloudy, cool weather since evaporation and transpiration are less under these conditions. Otherwise, transplanting should be done late in the afternoon. A few larger and older leaves should be removed. Less wilting will occur if earth is left on the roots. Plants are set a little deeper than they stood in hotbed. The hole is filled with water before setting the plant. The surface of the soil is left loose and dry to prevent crusting.

Objects and Benefits of Cultivation.—The main object of cultivation is to control weeds and to maintain a dust mulch. The early checking of weed growth lightens the cultivation work. Weeds rob vegetables of moisture and nutrients and crowd and shade the vegetables. A dust mulch checks the evaporation of water fom the soil surface, has a beneficial action on soil organisms and hastens the decomposition of substances in the soil. Rainfall is more readily absorbed if the surface soil is loose.

Time and Nature of Cultivation.—Timeliness and thoroughness are the keys to successful cultivation. The best gardeners cultivate very soon after every rain in order to destroy weeds, break up the surface crust and maintain a dust mulch. The frequency of cultivation depends upon weather conditions. When no weeds are growing and a dust mulch

exists, cultivation is not necessary. There is no rule as to the time and duration of cultivation of vegetables. It varies with climatic and soil conditions. Shallow cultivation is more beneficial than deep cultivation because it retains the moisture and does not injure shallow rooted plants. Vegetables may be "laid by" after they have gained their growth. With some crops this is fairly early in the season, with others it is midsummer.

Implements and Tools.—Cultivators may be of three types—horse, tractor, and hand. Each has numerous attachments such as shovels, scrapers, teeth, discs, and rakes. The small shovel and teeth attachments are generally used for hand cultivation. The scraper or hoe attachments are used where the weeds have gained headway. These attachements cut the weeds off just below the surface of the soil. The scrapers or hoes do not maintain as good a dust mulch as the other types of attachments. Small teeth are preferable to shovels since they permit more shallow cultivation and bring less moisture to the surface. Hand tools such as hoes and weeders are necessary to cultivate between hills in the rows.

Successive Plantings.—The vegetable season may be prolonged by making successive plantings or by using early, mid-season, and late varieties. Gardeners may prefer Golden Bantam sweet corn or one of its hybrids to other varieties. If plantings are made every two weeks, the season will be prolonged until frost, if water is available. If space is a factor, the early crops may be planted together so that later, quick maturing fall crops can be sown in their place. Turnips, radishes, lettuce, beets, carrots, peas and beans may be sown in July for fall gardens. Companion cropping will save space also. Tomatoes and peppers may be planted between rows of peas and beets, and squash and pumpkins between rows of sweet corn.

Beans are very tender to frost and seldom germinate in cold soil. May 15th is early enough to plant beans in average years. They are planted about two inches deep, spacing the seed from three to six inches apart in the row. They are never cultivated or picked when the plants are wet since this practice will spread a serious bean rust disease. Cultivation of more than one inch deep is discontinued after the beans flower, as it will cause the flowers to fall. String beans planted about July 15th, if watered, will ordinarily produce a good crop for canning before frost.

Beets are safely planted as early as the last week in April in normal years since they will stand considerable frost. It is best to make two plantings of beets as those planted early may become tough before fall. One planting is made the last week in April for summer use and a second planting the first of June for winter storage. The seed is planted about an inch deep, two inches apart and thicker than the plants are to grow because it has a low germination percentage. Since each beet seed may produce several plants, they are thinned leaving the plants four inches apart in a row.

Early Cabbage is started in the house or hotbed. The seeds are planted early in April and the plants transplanted to the garden early in May. Late cabbage is successfully grown by planting the seed in the garden about the second week in May, placing three or four seeds in a hill about 18 inches apart in the row. Later the weak plants are pulled.

Carrot seed is sown from ¼ to ½ inch deep, scattering the seed thinly along the row. Summer carrots are sown about May 1. Since the early carrots often become large and woody, a second planting is made about

June 1 for storage. Since the seed is slow in germinating and the seedlings are very tiny and weak, a few radish seeds are planted with the carrots to mark the row and make early cultivation possible. The radishes are out of the way before carrots need the room.

Cucumbers are not planted before May 20th because they cannot stand frost. They are planted in hills, ten seeds to the hill, five to six feet apart both ways and between ½ to one inch deep. The plants are thinned out, leaving four or five of the strongest and most vigorous in each hill. If cucumbers are well fertilized during the growing season and watered during dry weather they will produce very large yields.

If the striped beetle appears, the cucumber hills are tented with cheesecloth when they first come up. The tents are left on until the plants are crowded. Later the beetles are held in check by dusting with lead or calcium arsenate and gypsum.

Onions are planted as early in the spring as the ground can be put in shape. The seeds are planted ½ inch deep, and 10-15 to the foot. The onions are thinned, allowing two or three inches between plants.

The plants mature late in August when the tops are thoroughly dry. The bulbs are pulled, left to dry in the sun for several days, sacked and stored. Onions are not left in the ground late in the fall because they will sprout if moisture is present and they will not store well. They are stored in a **cool dry place.** They will stand freezing but not alternate freezing and thawing.

Smooth seeded peas are very frost hardy and are planted just as soon in the spring as the ground can be put in shape. The wrinkled seed varieties are not as frost hardy and are not planted until the last week in April. Where there is sufficient moisture the seed is planted two inches deep and ten seeds to the foot. Where drought is a factor, the peas are planted in the bottom of a trench four to six inches deep and covered with an inch of soil. When the plants come up the soil is worked around them until the trench is level. Peas planted this way will stand the drought very well. The fresh pea season will be lengthened if two or three plantings are made two weeks apart.

Certified seed potatoes are recommended since they will more than repay their cost in increased yields. The average sized seed potato is cut in four pieces, once lengthwise and again crosswise. The pieces are planted four or five inches deep, a foot to 15 inches apart. A few potatoes are planted in the middle of April in order to get early potatoes. The main crop is not planted until the middle of May.

Pumpkins and Squash are not planted until around May 20th since they are very tender to frost. Five or six seeds are planted to each hill eight feet apart both ways. Pumpkins are planted in corn if there is sufficient moisture. This practice is not followed in dry localities.

Radishes are planted as soon as the ground can be put in condition. The seeds are planted about ½ inch deep, 20 to 25 seeds to the foot. Several plantings of radishes, 10 days or two weeks apart will give a long fresh radish season.

Rutabagas do better on light sandy soils than on heavy clay and gumbo soils. They are frost hardy and can be planted as early as April 15th. A second planting is made about the middle of June for winter storage. Large plantings of rutabagas are not recommended as they are uncertain and get very tough during hot weather.

Spinach is planted in late April. The seed is planted not more than ½ to one inch deep. New Zealand spinach succeeds better in late plantings and will produce abundantly during the hot summer and fall.

Sweet Corn is planted in rows three feet apart with four or five kernels in each hill about 2½ feet apart in the row. It will be available the whole season if the weather is not too dry and two successive plantings are made ten days to two weeks apart starting about May 10th.

Swiss Chard is planted April 20 to May 1 about 1½ inches deep. A 25 foot row will supply an abundance of greens. The stems can be served like asparagus.

Tomatoes: A—Tomatoes have a prominent place in all home gardens because they are: 1. Fairly easy to grow. 2. Large yield producers. 3. High in Vitamin C. 4. One of the easiest vegetables to can. 5. Very inexpensive. B—Best varieties of tomatoes for South Dakota: (Use only the earliest varieties because the season is short.) 1. Penn State, Bonny Best, Bison, Red River Special, Earliana and John Baer are the best early varieties. The Bison is self-pruning, does not run to vines and sets well in hot weather. 3. The Penn State is as productive at the Bison but does not seem to set fruit as well in hot weather.

C—Starting tomato plants in window boxes: 1. Do not use heavy soil for seed boxes but sandy loam soil. 2. Do not put manure with soil. 3. Screen out all lumps. 4. Sterilize the soil before planting the seed to avoid the extremely serious seedling disease known as damping off. 5. Sterilize window box soil as follows: Dilute one ounce of ordinary formaldehyde with one quart of water. Use a gallon of this formaldehyde solution to half bushel of soil. Place the soil in a clean box or on a concrete floor and thoroughly wet it down with the formaldehyde solution.

Cover the soil with a wet blanket and leave it for three days. Remove the covering and allow the soil to aerate for three days, shoveling it over twice a day. **The germination of the seed will be killed by the formaldehyde if the soil is not thoroughly ventilated.** Plant the seeds after the soil is aerated for three days. This soil treatment will help control damping off of all vegetables or flowers started in the house. Other disinfectants as Ansul dust, Ceresan, Semesan, should be used according to the manufacturer's directions. Sterilize soil by baking in an oven. Include a potato and when it is baked the soil will be sterilized.

Planting seed boxes. Tomatoes should be started in the house or hotbed the second or third week in March. Make seed boxes 3½ to 4 inches deep with holes in the bottom for drainage. Fill the box with soil and settle it by jarring. Pack the soil around the edges with the hand or a block of wood to prevent the soil shrinking away from the edges of the box. Sow the seeds broadcast or in rows. Mix soil and fine sand 50-50 and cover the seeds not over ¼ inch deep by sifting this soil mixture over them. Firm gently with a block of wood. Cover with cheesecloth and water through the cloth to prevent washing out the seed. Use cheesecloth for each watering until the plants are up. Seed boxes covered with glass and shaded from the hot sun by newspapers will force the plants up quicker than if they are left uncovered. Water tomato seedlings in boxes always about 10 a.m. Never water on cold, cloudy days. Transplant the seedlings, with two to three inches of space both ways, to other boxes in about 21 days when they have developed their first true leaves. Shade

with newspaper for three days after transplanting and then give the plants full sunlight.

"Harden off" the plants in the boxes by allowing them to become somewhat dry and setting them out doors for several hours three or four days before transplanting to open ground.

Setting out tomato plants. Pick a cloudy day to set out plants if possible. Use ½ bucket of water with each plant if the soil is dry at transplanting time. Allow the water to seep away and firm the soil solidly around the roots. Leave the surface soil loosely mulched to conserve moisture. Shade the plants on the southwest side for several days after transplanting if weather is sunny and warm. Protect spindly plants by tying them to a stake with cloth or use a box or a couple of shingles as a windbreak. Grow tomatoes from seed planted in open ground only after the danger of spring frosts is over.

Planting tomato seed in the ground is not as reliable as starting the plants in the house or hotbed. It gives fair success when early fall frosts do not occur. Only the very earliest varieties are grown by this method. Bison, Penn State, and Earliana belong in this group. To plant tomato seed in open ground, the following method is recommended: Plant the seeds in hills about five feet apart each way, putting six or eight seeds in the hill. After the plants are about two inches high pull up the weak plants leaving only the strongest and most thrifty plants in each hill. This method also eliminates danger of poor stands due to low germinating seed.

Irrigating The Vegetable Garden

I wonder if I'm venturing too much if I say that probably every one is insured. Some of you have life insurance, a few have old age insurance, many have privately owned automobiles that are insured against accident or theft. Your home and farm buildings are insured for fire and tornado; perhaps you have insurance against hail damage to your crops, but how many have insurance against drouth? Insurance against the drying heat of summer is as important as insurance against life or your houses. Probably in a few places in our state, insurance against drouth would be very costly. The greenhouse operator, nursery man or truck gardener has insurance against drouth. It is costly, but his product will sell for enough to pay the cost.

No, the gardener doesn't buy an insurance policy. He buys equipment to pump water on the soil when necessary. There have been years when irrigation wasn't of any value to some parts of our state, because our rainfall was sufficient for good growth. In other years, irrigation water was necessary only once or twice to carry the garden material over a short dry period. In recent years, drouth conditions have been all too frequent, and irrigation water has been absolutely necessary if truck crops were to be grown to their best.

In subsequent years the moist cycle will doubtlessly return and irrigation will not be necessary.

In India, portions of the United States, and elsewhere in the world, areas have been irrigated that are worthless now. At first these areas produced a good crop. Then a general decline followed. The irrigation waters contained salts that prohibited growth if present in large quantities; in other cases salts were present throughout the soil and as the irrigation water evaporated, these salts were accumulated near the surface.

In time the concentrations became so great that plant growth was prevented.

In South Dakota we have soils and water that contain large quantities of salts, which if allowed to accumulate in the surface soil will also prevent plant growth. A few of our deep artesian wells contain large quantities of ordinary table salt and sodium carbonate. This latter material produces that dreaded soil called "black alkali" which, if present in large enough quantities, will prevent plant growth. Table salt has been used to check weed growth in asparagus beds. It is not a fertilizer. Asparagus is more tolerant than weeds of salt, but many vegetables are not as tolerant as asparagus.

It is only by actual test that anyone can tell if the water is satisfactory for irrigation.

Let us assume that a water analysis does show the presence of more salts than we would like. Does this mean that the water can not be used for irrigation? It does not; it merely means, that if the salts are allowed to accumulate year after year in the soil a time will come when plants will not grow. In many parts of Dakota where water from wells streams, ponds or lakes is available, it is not necessary to irrigate frequently year after year. Many years would elapse before some salts could accumulate in sufficient quantities to prevent plant growth.

There are always exceptions to any rule. There are a few spots in South Dakota where alkali occurs in such large quantities that irrigation with the best water would probably be useless. As the water evaporates the salts accumulate on or near the surface. These salts appear as white incrustations. In some borderline cases, irrigation may or may not be of value, depending upon the chemical condition of the soil, amounts of organic matter in the soil, type of soil, climatic conditions and amount of salts in the water. In many gardens particularly in the eastern portion of the state irrigation will be profitable and it should be practiced more extensively in the western part of the state by impounding waters.

Before discussing ways and means of irrigating the farm or city garden, it might be well to point out the nature of the salts found in irrigation water and point out the cultural methods for their control as far as possible.

Sodium chloride—This salt which we know as ordinary table salt is beneficial to soils where there is a deficiency. Our soils are not deficient in sodium chloride. If present in too large quantities, it diminishes the yields of all vegetables. Potato tubers in too salty soil are more waxy and smaller than normal. On too rich ground it tends to check rank growth of stalks and straw.

An overdose of salt is fatal to all vegetation. For this reason it is applied to barberry plants in barberry eradication work. Sodium chloride is more destructive to young plants than to old plants. Its presence slows and even stops bacterial action as in the brining of meat.

It is present in our well water and in rather large amounts in some of our deep artesian wells.

Since common salt checks bacterial action that is necessary in liberating nitrogen to the plants, the application of commercial fertilizers or manure which contain nitrogen is beneficial. Efficient and thorough drainage will aid in washing the salts away.

Sodium Sulphate.—This salt, if present in too large quantities, checks plant growth. It occurs as white incrustations on low places in various

parts of this state and is present in our water. The addition of coarse manure and adequate drainage is beneficial.

Sodium Carbonate.—When this salt is present in large quantities, it is called "black alkali." It occurs in undrained places, and puddles clayey soils. This salt as well as all the sodium salts, has a tendency to creep upward through evaporation and is left on the surface as a white incrustation. The humus of fertile soils is dissolved and left as black rings or patches after the water is evaporated. From this action it derives its name.

Some, not all of our deep artesian wells contain relatively large amounts of this salt, and the water is exceedingly dangerous to use in large amounts. It is almost impossible to say how much sodium carbonate can be present in water and be safe for any particular section. Climatic and soil conditions in one area make an amount safe which would not be safe in another. A chemical test will reveal its presence. Perhaps the best test is to **use the prospective water on plants potted in garden soil, or on a small portion of the garden.** Applications of gypsum and good drainage are helpful in improving soils that contain large quantities of sodium carbonate.

Calcium Carbonate.—The amount of lime found in artesian waters would not be harmful for years to come if the organic matter is maintained. If the organic matter is not maintained, lime aids in the rapid exhaution of soils. In acid soils, lime is often of benefit and is considered as a fertilizer.

Magnesium Sulphate, Magnesium Carbonate, Calcium Sulphate—commonly known as gypsum and several other compounds are found in our water, but act as fertilizers or occur in such small quantities that they are not harmful.

From this discussion it appears that two things are particularly necessary if we are to use some doubtful artesian water for irrigation. Manure and drainage are essential in every garden, and especially necessary in the irrigated garden. An application of manure every four or five years is not enough for the vegetable garden. Apply from eight to 12 tons stable manure per acre every year, and less water will be needed for irrigation. Organic matter retains water and supplies nutrients necessary for plant growth.

A. E. Hutchins* of Minnesota gives us the following reasons for irrigating vegetable crops:

1. "It may hasten and increase the percentage of germination. Seeds require moist soil for germination.
2. It assures a better stand of transplanted plants and reduces the check in growth resulting from transplanting, particularly when the soil is dry during or following transplanting.
3. It serves to carry the plants through periods of drouth that may kill them, or at least reduce the yields greatly.
4. It insures the continuous growth of the plant, which is necessary for high quality.
5. It makes possible more intensive cropping.
6. If often hastens maturity.
7. By proper moisture control yields can often be increased.

* Hutchins, A. E. "The Home Vegetable Garden in Dry Weather." Minnesota Extension Circular 47.

8. Overhead irrigation is sometimes used to prevent injury from light frosts.

9. Water is sometimes applied to a very dry soil, previous to plowing, to bring it into a better physical condition for the preparation of the seedbed."

When and how much to irrigate are questions that are frequently asked. The usual mistake is failure to apply enough water because the supply is limited or because one does not realize how much it takes to soak the soil six or seven inches. The following suggestions will serve as a guide for applying water:

1. "Water often enough to keep the plants growing continuously throughout the season.

2. A check in the growth of plants during dry periods often indicates that water is needed.

3. Water when the plants show indications of wilting.

4. A garden loam that can be compacted into a ball when pressed in the hand contains moisture enough for most crops under normal conditions.

5. Water in the late afternoon, evening, or early morning to conserve moisture, but do not hesitate to water any time during the day if the plants show need of moisture. Some plants such as squash, wilt in the day time due to the intense heat and revive at night. Additional water is not always necessary.

6. Soak the soil thoroughly to a depth of several inches at each application. Apply once or twice a week during dry periods.

7. One-fourth inch of water at each application is sufficient for seed beds and small vegetables, one-half inch to one inch for larger and maturing vegetables. While this quantity is most desirable, smaller amounts will aid the plant in surviving dry periods, particularly if the water is applied slowly and in close proximity to the plant.

8. Shallow-rooted plants require more frequent applications than deep-rooted plants."

"Water can be used from any available source.

1. Wells probably provide the commonest source for the home garden on the farm. Water from artesian wells and the excess water pumped by windmills form a cheap source. Where the water is pumped by hand, it is fairly expensive if the labor involved is considered.

2. Streams provide a good source, particularly when the garden can be planted nearby and the fall is such that the water can be ditched to it or only a short lift is necessary.

3. City water must be used in many cases by the town gardener. This is usually a fairly expensive source, but it would often prove practical and profitable, particularly in tiding crops over short periods of drouth."

4. Small storage dams will frequently provide irrigation water.

One of the many methods of irrigation is applicable to your garden. The method will be dependent upon the available water supply and the amount of money you will spend. In some gardens, one method may have advantages that another method does not have. In the farm garden a slow stream of water is often run through furrows between the rows. The rows closest to the supply should be closed and the water directed to the farther rows first. In this way a portion of the garden is not over watered. However, it is necessary that the garden be level or uniformly sloped. Some gardeners are successful in irrigating the garden with a

porous canvas hose through which the water slowly oozes. A garden hose conducts the water from the source of supply to the garden. Irrigation water should never be allowed to run continuously into a garden.

Where water pressure can be obtained, overhead sprinkling systems are practical, but their cost is more than surface irrigation. The water is applied as a mist from spray nozzles spaced at intervals along a pipe or the water is applied from revolving apparatus of many forms.

Control of Garden Insects

Garden Insect Control—There are biting or chewing insects, and sucking insects. All chewing and sucking insects can not be effectively controlled by the same poison. An insect that eats holes in the leaves, or the edges into a ragged condition, or entirely devours the leaves, is a chewing insect. To control these insects use arsenate of lead as spray or dust. Sucking insects draw the moisture out of the leaves. They are easily controlled by spraying with Black Leaf 40.

Lead Arsenate or Calcium Arsenate as a Spray For Chewing Insects.—Use a half ounce of the powdered arsenate, three to four level tablespoonsful of the powder to one gallon of water. For cabbage, use soft water with a little laundry soap, or corn syrup to make it spread and stick on the waxy leaves. When spraying potatoes, use a mixture of 8 lb., Bordeaux mixture and 2 lb., Calcium Arsenate in 50 gallons of water. Paris Green may be substituted for arsenate. Use 75 to 100 gallons spray per acre of potatoes. Apply spray before blister beetles appear.

Lead Arsenate Dust for Chewing Insects.—Mix the powdered arsenate with six to eight parts of a filler, such as air-slaked lime, land plaster, cheap flour, fine sieved wood ashes or fine road dust. Apply to infested plants while dew is still on, by shaking it through a cheesecloth bag or perforated can.

Calcium Arsenate Dust for Cucumber Beetles.—Mix one part of powdered calcium arsenate with 12 to 15 parts of land plaster or flour. Dust on to the infested plants through a cheescloth bag or perforated can.

Poisoned Bait for Cutworm Control in the Garden.—Make poisoned bran mash according to the following formula:

Wheat Bran	25 lbs.	Water	3 gal.
Paris Green	1 lb.	Molasses	1 qt.

Note—White arsenate can be used in place of Paris Green in this formula using 1¼ lbs. of white arsenic in place of one pound of Paris Green.

Mix the bran and poison together while dry by shoveling it over and over. **Do not breathe this dust as it is poisonous.** Dilute the molasses in the water in a separate container. Then slowly moisten the dry poisoned bran with this sweetened solution. Late in the evening broadcast this bait thinly over the infested garden. Gardens heavily infested with cutworms should be treated two or three times several days apart, early in the season. Cutworms can also be controlled by soaking the soil down one inch with Pyrethrum extract.

Sucking Insects Controlled with Black Leaf 40.—The sucking insects cannot be controlled with arsenate of lead because they do not eat the leaves. They have a sharp beak with which they puncture the surface of the plant and suck the juices. The principal South Dakota sucking insects are aphids or plant lice. They can be controlled by using a spray that

comes in contact with the outer surface of the body. Use Black Leaf 40 or Pyrethrum for plant lice. Black Leaf 40 is a tobacco by-product and can be obtained at any drug store. Pyrethrum is obtained from a flower and is poisonous to plant lice when fresh.

Black Leaf 40 For Plant Lice.—Dilute three teaspoonsful of Black Leaf 40 or nicotine sulfate in each gallon of soft water, containing enough laundry soap to form suds in the solution. Use the spray thoroughly since it must hit the insects in order to be most effective.

Home Storage of Vegetables

Economy.—The storage of vegetables is an economical practice, especially for those who have grown them in larger quantities than the family needs for immediate consumption. The caring of the surplus vegetables in many cases will not require the outlay of money. Existing facilities in the basement of the home may often be used to store the late maturing vegetables. If no other facilities are available, the crops may be stored for several weeks in outdoor pits or banks which require no cash outlay other than labor. Many vegetables may be stored more economically than they can be preserevd by canning or drying.

Storage Room.—A cool, well ventilated corner of the cellar offers good conditions for storage. The room should be well insulated and equipped with ventilators so that the temperature can be controlled. If only one window is present in the room, a ventilating chute for the intake of cold air may be brought down from a single pane in the window to the floor. The outlet chute may also be inserted in the window but the opening should be approximately five feet from the floor, while the intake chute should extend to within a few inches of the floor. Natural earth makes the best floor for the storage room, for it retains moisture better. The vegetable room should be darkened. The windows may be covered with curtains in order to protect the vegetables from too much light. Care should be taken to prevent mice, rats and other rodents from entering the storage room.

Storage Pit.—The conical pit is sometimes used for temporary storage of potatoes, carrots, beets and parsnips. It is not satisfactory for winter storage in South Dakota because it is difficult to keep the vegetables from freezing. A well drained location should be chosen. A shallow excavation is made and lined with leaves, straw, or similar litter; the vegetables are placed upon this in a conical pile which is covered with straw and soil. The depth of the soil covering is determined by the severity of the weather existing during the time the vegetables are stored in these temporary pits. If vegetables are to be stored in the pits late in the fall, it is desirable to cover them with corn fodder. Ventilation is provided by keeping an opening from the top of the vegetable pile through the soil to the air above.

Underground pits may also be dug for storage of vegetables. The roof is covered with poles that extend far enough over the edge to keep water from draining into the hole. Alternate layers of straw and soil are placed on top.

A cave may also be constructed in the side of a hill along the same general plan.

Peas and Beans mature until a maximum number of pods are ripe. The plant is then pulled, stacked to cure and dry when the peas or beans

are threshed, dried and stored in cloth bags, in a dry, well ventilated place such as an attic. String beans also make excellent dry beans.

Beets and Carrots and other root crops are pulled late in the fall and the tops cut. The most satisfactory method of handling root crops for winter is storing them in bins and mixing with sand. Temporary storage may be given them in a pit, but as severe freezing occurs, they should be removed to the storage room. The sand covering the root crops should be kept moderately moist to prevent withering of the roots.

Parsnips and Salsify may be allowed to remain in the ground all winter. Since it is difficult to dig them out of frozen ground, it is advisable to store a small quantity in the storage room in the same manner as beets and carrots.

Cabbage heads are cut and stored in pits. The plants may be pulled and placed in a shallow pit or trench in a single layer and covered with alternate layers of straw and soil. More straw and soil is added as the weather becomes more severe. Cabbage may also be stored by cutting the heads and laying them in single layers on shelves in the storage room. A large quantity of cabbage should not be stored in the basement of the dwelling, as the odor is likely to penetrate throughout the house especially if they decay.

Celery may be kept in the garden until very late by merely banking soil up along the row. As freezing weather approaches, the bank is extended over the top of the row and further protection given by covering this ridge with coarse manure, straw or corn fodder. The celery may be removed from one end of the row as needed. This method of storing is objectionable because it is hard to get at the celery when the ground is frozen. Celery may be stored on the floor of the storage room. The plants are dug with some soil adhering to the roots and set upright with their roots packed closely together in moist soil or sand. They should not be stored in the same cellar with cabbage or turnips as they will absorb the odor of these vegetables.

Onions require a dry, well ventilated place. The storage room does not provide the best conditions for onion storage. An attic furnishes good storage space. Slight freezing of the bulbs will not injure them provided they are not handled while frozen. They are usually stored when matured and thoroughly dry, in well ventilated barrels, baskets or crates. Several rows of onions are pulled, thrown into a windrow and left for several days to ripen and cure before being topped and stored.

Squash and Pumpkin may be stored in the basement in a separate room which is dry and well ventilated. A storage building above ground, dry and frost-proof, is considered best for storing these crops. They are placed on shelves, in single layers, so that no two squash touch each other.

The recommended temperature of the storage room is from 40° to 45° F. The winter varieties may be kept until late in the winter under these conditions, but in a damp atmosphere they will soon start decaying. Some are successful in storing these crops in the attic of the house, providing it does not freeze. Others have stored them in the furnace room of the basement or in a room adjoining the furnace room, which is kept dry and well ventilated. The stems of these crops should not be removed, because rots are apt to enter at this point.

TABLE 1
Vegetable Varieties, Amount and Time of Planting For A Family of Five

Kind	Amount of Seed	Approximate Planting Date	Lineal Foot Row	Expected yield & Amt. Req. Yrly. For Family of 5
Bean	4 lb.	May 10	400 ft.	200 lbs.
Beet	3 oz.	May 1	200 ft.	125 lbs.
Cabbage (early)	1 pkt. 50 plants ½ oz.	May 10	100 ft.	80 lbs.
Cabbage (late)	100 plants	May 10	200 ft.	100 lbs.
Carrot	1 oz.	May 1	125 ft.	150 lbs.
Cucumber	½ oz.	May 20	100 ft.	100 lbs.
Lettuce	½ oz.	April 15	100 ft.	25 lbs.
Onion	¼ lb.	April 15	200 ft.	125 lbs.
Parsnip	½ oz.	May 1	100 ft.	90 lbs.
Peas	2 lbs.	April 15	200 ft.	75 lbs. in pods
Pepper	1 pkt.	May 20	50 ft.	3 doz.
Pop Corn	½ lb.	May 10	200 ft.	20 doz.
Pumpkin	1 oz.	May 20	100 ft.	125 lbs.
Radish	1 oz.	April 15	100 ft.	60-70 bunches
Rutabaga	1 oz.	April 15	200 ft.	50 lbs.
Spinach	½ oz.	May 1	50 ft.	25 lbs.
Squash	1 oz.	May 20	100 ft.	80 fruits
Sweet Corn	3 lbs.	May 15 June 1 June 20	1200 ft.	40 dozen
Swiss Chard	1 oz.	April 15	50 ft.	70 lbs.
Tomato	2 pkt. 100 plants	May 20	400 ft.	8 bu.
Turnip	½ oz.	April 15 August 1	100 ft.	50 lbs.
Potato	2 bu.	April 15	1400 ft.	14 bu.

NOTES

1. All seeds of string beans, corn, lettuce, peas, and radishes are not planted at one time, but successive plantings 10 days or two weeks apart should be made to insure fresh vegetables throughout the season.
2. The number of feet may be modified to family needs.
3. Rows should be far enough apart to allow horse cultivation if garden is located in the country.

TABLE 2
Vegetable Varieties for South Dakota

(Named in order of their preference for growing at home.)

Asparagus—Mary Washington, Palmetto

Beans, Bush, Dry Shell—Navy, Great Northern, Red Kidney
Beans, Bush, Green Pod—Stringless Green Pod, Stringless Black Valentine, Bountiful, Tendergreen, Giant Stringless Green Pod
Beans, Bush, Wax Pod—Improved Golden Wax, Wonder Wax, Pencil Pod Black Wax, Brittle Wax, Davis, White Wax, Kidney Wax, Surecrop
Beans, Bush, Lima—Henderson Bush, Burpee Bush, Fordhook
Beans, Pole, Dry Shell—Horticultural
Beans, Pole, Green Pod—Kentucky Wonder, Oregon Swiss Giant
Beans, Pole, Wax Pod—Golden Cluster Wax, Kentucky Wonder Wax
Beans, Pole, Lima—*Burpee's Best
Beets—Detroit Dark Red, Crosby's Egyptian, Good for All, Improved Blood, Ohio, Canner

Cabbage, Early—Copenhagen Market, Golden Acre, Early Jersey Wakefield, Marion Market
Cabbage, Late—Wisconsin Hollander, Danish Ballhead, Danish Roundhead, Mammoth Red Rock, Drunhead Savoy
Carrots—Chantenay, Danver's Half-long, Imperator, Red Cored Chantenay, Tendersweet, Nantes, Touchon
Cauliflower—Snowball, Dry Weather
Celery*—Golden Plume, Golden Self-Blanching, Utah

Corn, Sweet—Golden Bantam, Golden Cross Bantam, Stowell's Evergreen, Golden Sunshine, Golden Gem, Spanish Gold
Corn, Pop—Japanese Hulless, South American Mammoth, Black Beauty, White Rice, Pinky
Cucumbers, Slicing—Arlington White Spine, Straight 8, Davis Perfect, Longfellows, Early Fortune
Cucumbers, Pickling—Chicago Pickling, National Pickling

Eggplant—Black Beauty, Early Dwarf Purple, Blackie
Endive—Green Curled, Broad Leaved Batavian

Garlic

Kale—Dwarf Green Curled, Dwarf Curled Scotch
Kohlrabi—Early White Vienna

Lettuce Leaf—Grand Rapids, Black Seeded Simpson
Lettuce, Head*—Iceberg, Big Boston, Hanson, Stonehead Riveria

Muskmelon—Hearts of Gold, Early Zepher, Hale's Best, Honey Rock, Milwaukee Market, Golden Osage, Early Tye, Benders Surprise

Onion, Red—Red Globe, Wetherfield
Onion, Yellow—Sweet Spanish, Prizetaker, Early Red Flat, Mountain Danvers
Onion, White—White Globe, Silverskin

Parsley—Moss Curled, Curled Dwarf
Parsnips—Hollow Crown, Guernsey
Peas, Early—Alaska, Little Marvel, American Wonder, Thomas Laxton, Laxton's Progress, Gradus
Peas, Main Crop—Alderman, Telephone, Hundredfold, Lincoln, Potlatch
Peanuts—South Dakota Grown Great Northern
Peppers, Sweet—Ruby King, Early Giant, Sunnybrook
Peppers, Hot—Red Cayenne
Potato, Certified Seed—Warba, Early Ohio, Bliss Triumph, Irish Cobbler, Chippewa
Pumpkins—Small Sugar, Big Tom, Orange Winter Luxury
Radish—New Comet, Crimson Giant, White Icicle, French Breakfast, Scarlet Globe, Sparkler

Radish, Winter—Chinese Rose, White Strasburg, Black Spanish
Rhubarb—Ruby, McDonald, Victoria

Salsify—Sandwich Island
Spinach, Early—Long Standing Bloomsdale, King of Denmark, Julian, Nobel
Spinach, Summer—New Zealand
Squash, Summer—Giant Summer Crookneck, Straightneck, Early White Bush, Cocozelle
Squash, Winter—Buttercup, Banquet, Hubbard, Des Moines (Table Queen), Arikara, Delicious, Boston Marrow
Swiss Chard—Lucullus

Tomatoes—Penn State, Earliana, Allred, Lange's Sparks
Tomatoes, Early—Bison, Progress, Red River, Break O'Day, June Pink, Pink Heart
Tomatoes, Midseason—John Baer, Bonny Best, Pritchard, Early Stone
Tomatoes, Late*—New Globe, Ponderosa, Marglobe, New Stone, Oxheart
Turnips—Purple Top White Globe, Purple Top Strap Leaf, Extra Early Purple Top Milan, Yellow Aberdeen, Skogoin

Watermelon—Cole's Early, Kleckley Sweet, Northern Sweet, Will's Golden Anniversary, Peerless or Ice Cream, Stone Mountain, Pride of Muscatin, Winter Sweet Dixie Belle

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* Uncertain in South Dakota

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