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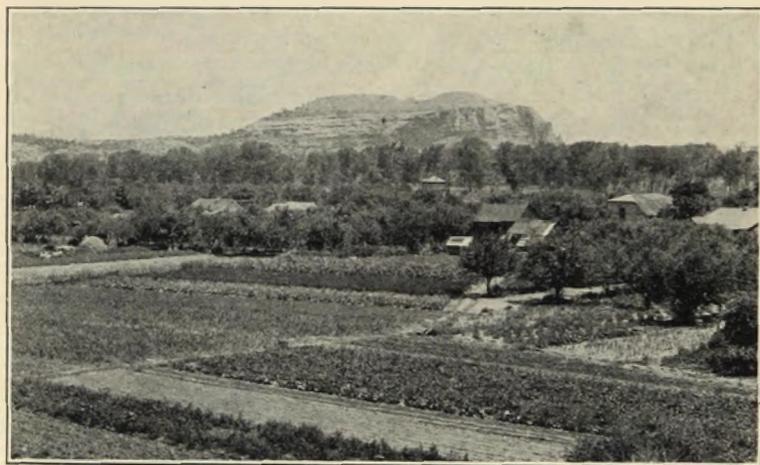
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## THE HOME VEGETABLE GARDEN

A. M. BINKLEY



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COLORADO AGRICULTURAL COLLEGE  
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# The Colorado Agricultural College

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# THE HOME VEGETABLE GARDEN

By A. M. BINKLEY

The problem in every home is to provide sufficient quantities of healthful, palatable and wholesome food for family use. The food value of vegetables in a diversified diet is now quite generally recognized as of fundamental importance to health. This recognition is measured by the increase in consumption of vegetables during the past few years and a still further increase is noted in the number of inquiries received by the Department of Horticulture for information on vegetable gardening. In view of these facts this publication is deemed advisable to furnish the inexperienced gardener with such information as will be of material benefit to him in the growing of vegetables for family use.

The soils and climate of Colorado are especially favorable to the production of high-quality vegetables. The growing of vegetables has developed in the state the past few years to quite an extensive commercial scale in the high-altitude sections, which is further evidence that the state is favorably adapted to the growing of vegetables of high quality and high yields per acre. The length of the growing season in the state varies considerably according to altitude and latitude, and the annual amount and distribution of rainfall varies, however there is not one section of the state which cannot grow a supply of some of the more common fresh vegetables for family use.

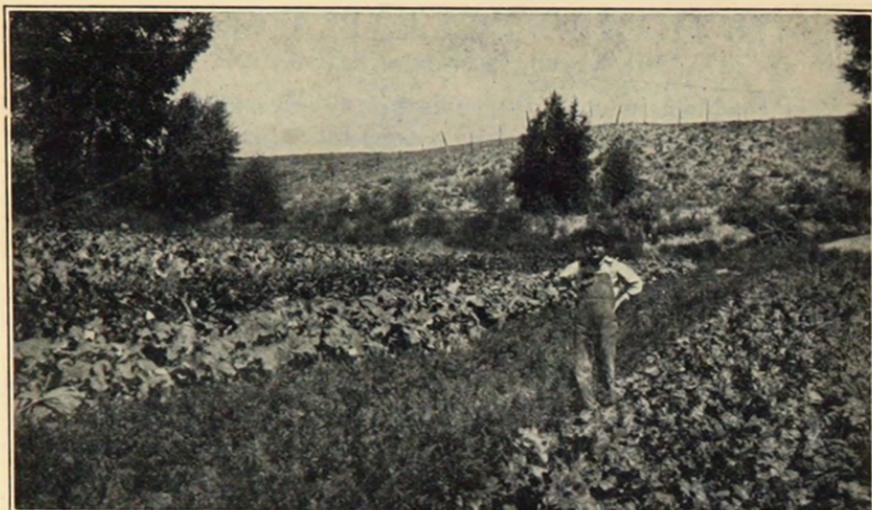
Every family should have a vegetable garden for the following reasons: (1) It will reduce the family food bill. (2) It provides an abundant supply of fresh, high-quality vegetables in season. (3) It will supply the family with vegetables for canning, drying and for winter storage. (4) It will permit a substitution of vegetables in some cases for the more expensive foods. (5) It provides a more healthful diet. (6) It will permit the opportunity to grow prize vegetables for the community fairs.

The most important reason for maintaining a vegetable garden is that of economy, a point that cannot be over-emphasized, and should be measured in net returns in yields above costs of labor and materials. The city gardener often finds the vegetable garden a place for pleasant exercise in the form of outdoor recreation. On the other hand, the garden on the farm is considered necessary and should be arranged so that it can be taken care of for the most part by horse-drawn implements.

## Location of the Garden

In selecting the site for the garden, care should be taken in the matter of location, and the following points considered:

(1) It should be near the house for convenience and because it is oftentimes a spare-hour proposition.



A mountain vegetable garden grown at an elevation of 7000 feet above sea level.

(2) A south slope is desirable as the soil usually warms up earlier in the spring and permits earlier planting.

(3) It should have good drainage, both for water and air.

(4) Vegetables require plenty of sunshine and the vicinity of large shade trees should be avoided.

The city lot gardener usually has little choice in the matter of location, and must use whatever space is available, while the farm gardener has more selection.

A good fence around the garden is an important item to protect the crops from livestock and more especially poultry.

### **Garden Soils and Preparation for Planting**

With the proper understanding of soils, almost any soil can be fitted into a good garden type by supplying organic matter and plant food in the proper amounts. It is often impossible to select the soil type, but this should not prevent one from having a good garden. A sandy-loam type with plenty of plant food is desirable. This type warms up earlier in the spring and permits the planting and growing of earlier crops. It drains readily, can be worked shortly after a rain, and does not bake or crust.

Plowing or spading the garden plot in the fall is preferable as it will permit earlier spring preparation and planting. Manure turned under in the fall will decompose more rapidly and be more available for early crops than if turned under in the spring. It is

better to leave the soil rough, as plowed or spaded, to hold the winter snows and permit the storage of soil moisture. The alternate thawing and freezing winter weather produces an action which breaks up the clods and mellows the surface soil. Insects are exposed to the weather and are usually destroyed. The soil should be broken to a depth of 10 to 12 inches, which will be sufficient for the development of root crops. Spring plowing can be done, provided conditions are such that fall preparation could not be taken care of. Soil worked in the spring oftentimes leaves openings that dry out rapidly.

After plowing or spading the garden, the soil should be pulverized thoroly and worked down to a smooth, fine, firm condition. In case of the small garden this can be accomplished by raking, while on the larger farm gardens, the soil should be disced in the spring, when fall plowed, and then harrowed alternately and leveled with a drag for the smoothing touches. If seeds are planted in coarse, lumpy soil they will be covered at different depths, and the result will be a poor stand and a poor yield. A careful final preparation of the seedbed is essentially important and cannot be over-emphasized.

### Fertilizers

There is a wide variation in soil types, usually determined by the stage of decomposition and the relationship to the parent material. It is generally known that Colorado soils are lacking in humus or organic matter and rich in mineral matter, so the need for manure is readily understood. Well-decomposed manure applied in the fall of the year, disced in and plowed under, gives much better results than spring manuring. Stable manure is undoubtedly the most desirable for the garden, as it supplies the much-needed humus, as well as additional plant food. An application of 20 tons of such manure per acre will produce satisfactory results on most soil types. Manuring will loosen up the soil, enable the soil to take in more water to be stored in the subsoil, render it more drouth resistant during the hotter part of the summer, and will, as a rule, make it work easier. Cow manure is heavier than horse manure and can be used on the lighter soil types. Poultry manure is one of the richest and most concentrated of farm manures and should be used sparingly as a heavy application is likely to burn the more tender crops.

Green-manure crops such as sweet clover or rye, if plowed under in the fall, promote quicker rotting. Not only does the soil become richer and produce better yields, but there is a noticeable difference in the easier handling of most soils. The legumes such as the clovers, cowpeas, and soybeans add considerable nitrogen to the soil. Green-manure crops readily fit into the garden plan, and as soon as the early crops, such as radishes, are harvested, the area can

be planted to a rapid-growing green-manure crop and turned under in the fall. Space in the garden that becomes idle in July can be profitably planted to green-manure crops and turned under in the fall. Rye can be planted from the middle of August to the first of September and where area is not needed for early spring vegetables, can be turned under in the spring.

Commercial fertilizer can be used to advantage where manure is not available. However, in no case should commercial fertilizers be used continuously without adding humus to the soil in the form of green manure or barnyard manure. From results of a preliminary nature it has been found that a complete fertilizer (one containing all of the three important plant food elements), such as a 3-12-4 combination, will produce good increases in yields on the lighter soil types. The growth response is also good when a straight phosphoric acid fertilizer is applied on the heavy-type soils. The commercial fertilizer should be applied at the rate of 200 to 400 pounds per acre. It will burn the germinating sprout if the seed is planted directly with it; this is especially true of the more tender crops. It may be applied by broadcasting over the seedbed before planting and harrowing or raking it in, or it may be sown in a shallow furrow from 2 to 4 inches from the plants and the furrow covered.

### Planning the Garden

The plans for the family garden should be made on paper early in the year to show the arrangement of crops. The rows should be laid out to give long rows for planting, then the number of rows, location of the crops, planting distances, and vegetables to be grown should be put down on the plan. The vegetables should be arranged according to the number of days required for maturing. The early maturing groups such as lettuce, and radishes should be planted together and such space can be used for a second planting. The late-maturing crops, such as cabbage and cauliflower, also are planted in the same area, which will permit the growing of companion crops in between the rows, such as green onions or radishes.

Perennials, such as asparagus, rhubarb, small fruits and herbs, should be planted on an outer side of the garden where they will not be disturbed by cultural operations required by the other crops. In doing this, if the garden is plowed with a team of horses, such crops will not be run over or injured.



The growing of companion crops, for example the growing of early bush beans between rows of tomatoes, is an economical practice. Squashes and pumpkins can be grown along with sweet corn, and early maturing cabbage may be set in between wide rows of corn or tomatoes. The gardener, after some experience, can determine what crops to grow as companion crops and can then get the most out of a limited space. Where gardens are cared for by horse-drawn implements, companion crops of course are not practical. However, to obtain the best results from a small garden, the soil should be kept producing as long as the season permits. Lettuce and radish crops may be grown one crop following another. The root crops, when planted early, often become hard and woody and lose quality by the time they are ready for winter storage. For winter storage of root crops it is better to make a second planting about the first week in July. This practice will produce roots that carry quality for winter storage.

### Garden Seed

In buying seed, demand high quality and be ready to pay for the extra value, because in the long run such seed will be found to be the cheapest. The yield and quality secured at harvest time will more than pay the extra cost. After the amount and kind of seed is definitely determined for the garden according to the plan, it can then be ordered early, much in advance of the planting season. By using a definite plan to order from, the exact amount of seed can be secured, and the waste from surplus thus reduced to a minimum. Reliable local dealers who observe the performances of seed sold to gardeners, can supply seed that will meet the growers' requirements. Where the garden is so situated that purchases cannot be made direct from seed dealers, such seed can be ordered from a reliable seed company, thru mail order. In ordering from the seed catalogs, it is generally better to select the standard varieties rather than the highly featured new varieties.

In case old seed is left over it is especially important that a germination test be made. This can be accomplished by counting out 50 to 100 seeds and placing them between moist blotting paper in a shallow dish and covering them with another dish. After 4 or 5 days at ordinary room temperature the viable seeds will sprout if the paper is kept moist and the percentage germination can thus be determined. A sample of seed can also be sent to the Colorado Seed Laboratory at Fort Collins, where a purity count and germination test will be run free of charge.

In growing seed for your own use it is desirable to select plants for seed production that are especially vigorous and high yielders.

This can be accomplished with very little additional work with the common annuals, especially where the fruit is the edible part. Any of the root crops or biennials which must be stored thru the winter and set out the second year for seed production do not prove to be economical crops to secure seed from for the home garden. Seeds should be stored in a cool, dry room, preferably in sealed jars, so that their germination will not be readily lost. High air humidity is especially destructive to the germination of seeds. In many instances new growers have difficulty in estimating the amount of seed required to plant the garden, and accordingly the accompanying table has been prepared. The amount of seed required, depth of planting, time of planting and distance to plant are tabulated for information to beginners.

### Planting Table

There is considerable range in the climatic conditions of the state and the length of growing season varies, so that in consideration of these factors, only the approximate dates for planting are given in the above table. Where it is necessary to plant seeds in a hotbed in order to grow plants, it is noted in the time-of-planting column.

## VEGETABLE PLANTING TABLE

Vegetables	Per 100-Ft. Row		One Acre	Rows Apart		Plants Apart In Row, Inches	Depth of Planting, Inches	Time of Planting In Open Ground	Ready for Use After Planting
	Seeds	Plant		Horse Cult. Inches	Hand Cult. Inches				
Asparagus		50		36-60	24	10-18	10-12	Early Spring	2 years
Dwarf Beans	1 pt.	300-600	40 lbs.	20-36	15-18	2-4	1	May and June	50-75 days
Pole Beans	½ pt.	30-50	30 lbs.	48	48	40	1	June	75-80 days
Lima Beans	½ pt.		40 lbs.	36	24	6-10	1	June	60-75 days
Beets	1 ½ oz.	600	10 lbs.	20-24	12-18	2	¾	April-August	45-50 days
Broccoli	¼ oz.	65	4 oz.	30-36	20-24	18-24	½	April and May	100-130 days
Brussels Sprouts	¼ oz.	70-100	2 ½ oz.	30-36	24-30	16-24	½	May and June	100-120 days
Early Cabbage	¼ oz.	60-100	¼ lb.	30-36	24-30	12-18	½	Apr. Start in hotbed in March	130-140 days
Carrot	½ oz.	600	2 lbs.	30-36	18-24	2	¼	April, May, June	55-80 days
Cauliflower	¼ oz.	80-100	1 oz.	30-36	24-30	14-18	½	April to June	175 days
Early Celery	¼ oz.	300	¼ lb.	24-36	18-24	4	½	May and June. Start in hotbed in early March	120-150 days
Late Celery	¼ oz.	300	¼ lb.	36-72	18-36	4	½	June and July. Start in hotbed in May	120-150 days
Witloof Chicory	½ oz.			24-30	18-20	4-6	½	June	125 days
Sweet Corn	½ pt.		6 qt.	36-40	30-36	4 every 3 feet	1-2	May-July	60-90 days
Cucumber	½ oz.		2 lbs.	48-72	48-72	4 every 3 feet	1	April and May	50-100 days
Egg Plant	⅓ oz.	70	¼ lb.	30-36	24-30	18	½	April and May. Start in hotbed during March	125-140 days
Kohl Rabi	½ oz.			24-30	18-24	6	½	April and May	65-75 days
Lettuce	½ oz.	120	2 ½ lb.	24-30	12-18	10-12	¼	March-July	70-90 days

Vegetables	Per 100-Ft. Row		One Acre	Rows Apart		Plants Apart In Row, Inches	Depth of Planting, Inches	Time of Planting In Open Ground	Ready for Use After Planting
	Seeds	Plant		Horse Cult. Inches	Hand Cult. Inches				
Muskmelon	½ oz.		2 lb.	60-84	60-84	4 every 4 feet	1	April-June	85-150 days
Watermelon	½ oz.		2 lb.	84-144	84-144	4 every 6 feet	1	May and June	100-130 days
Onion Sets	2 qts.	600		20-36	12-18	6-12	1	March-May	130 days
Onion Seed	1 oz.	600	2 ½ lb.	20-24	18	2-4	½-1	March and April	100-180 days
Onion Seed for Sets	1 lb.	2400	50-60 lbs.	20-36	12-18	Crowded	½	March	95 days
Onion Plants—Trans-planting	½ oz.	350	8 oz.	20-36	14-18	3 ½-4	¾	April-May	130-140 days
Parsnip	½ oz.	300	3 ½ lb.	20-36	18-24	4	½	April and May	140 days
Peas	1 pt.	1200	40-50 lbs.	36	30-36	1	1	March-May	65-80 days
Pepper	⅛ oz.	80	2 oz.	20-36	18-24	15	½	May and June. Start in hotbed in March	130-150 days
Irish Potatoes-Dryland	5 lbs.	60	10 bu.	42	42	17-20	5-6	April-June	130 days
Irish Potatoes-Irrigated	12 lbs.	100	20-25 bu.	32-36	24-30	12	4	March-June	90-150 days
Pumpkin	½ oz.	64	3 ½ lbs.	84-96	84-96	4 every 6 feet	1	May and June	75-110 days
Radish	1 oz.	1200	8 lbs.	20-36	12-20	1	½	March-September	25-75 days
Rhubarb roots	30 roots	30		36-60	36-60	42	3-4	April	2 years
Spinach	1 oz.	400	10 lbs.	20-36	12-20	3	½	April-July	50-70 days
Summer Squash	½ oz.	80	3 ½ lb.	36-48	36-48	4 every 4 feet	1	May-June	65-70 days
Winter Squash	½ oz.	64	2 lb.	84-108	84-108	4 every 6 feet	1	May and June	120 days
Tomato	⅛ oz.	33	2 oz.	36-48	36-48	36x36	½	May and June. Start in hotbeds	100-150 days
Turnip	½ oz.	600	1 lb.	20-36	18-24	2	½	April and August	45-90 days

### Setting Plants in the Field

Hotbed plants are often transplanted once before they are set out in the field, and it is a distinct advantage to do so as it gives plants a chance to develop better root systems. It produces better plants, secures earlier crops and provides more space. In many cases, gardeners feel that transplanting from the hotbed to the field is all that they can afford, and select only the strong vigorous plants in the seedbed for setting out in the field. It is difficult to transplant sweet corn, cucumbers, melons and beans. These crops may be transplanted by sowing the seed in paper pots or small baskets and after the plants are 4 weeks old they may be set out without disturbing the root system. Cabbage, cauliflower, broccoli, head lettuce, onions, tomatoes, celery, peppers and eggplant are easy to transplant. However, the following precautions should be observed, to reduce losses:

1. The soil should be well watered before disturbing the plants in the seedbed.
2. Do not allow the plants to become dry after removal from the bed until they are set out.
3. Do not pull plants from the seedbed without loosening the soil. Leave as many roots as possible on the plants.
4. Water the soil before and after setting the plant.
5. Press the soil firmly about the roots after setting.
6. Shading the plants a few days after transplanting can be done on a small scale.

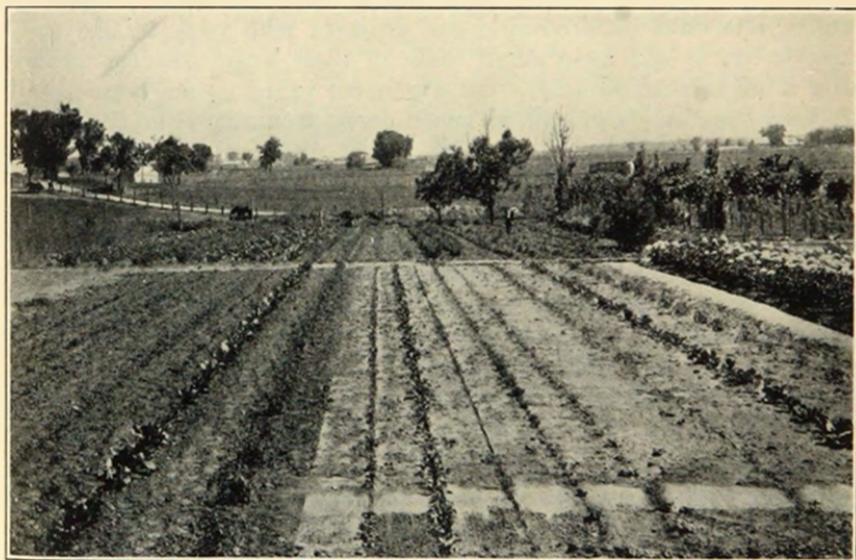
### Hotbeds and Coldframes

Detailed information concerning the making and handling of hotbeds and coldframes may be secured in Bulletin 328, Horticultural Department, Colorado Experiment Station, Fort Collins, Colorado. This publication will be sent to all those who request it, free of charge. It is important that the gardens have some sort of structure to start plants in and to grow them for transplanting. They can also be used for growing early crops of cucumbers, radishes or lettuce. Any information desired on handling plants in the hotbeds, transplanting to the field, hotbed diseases and management in general, can be found in this publication.

### Sowing the Seed

It is very necessary in planting garden seeds that the soil be in a very finely pulverized condition that can be readily worked. In order to secure the best stand the soil must have the proper moisture and the soil particles must be compact, free from clods, and not too dry to insure a good germination. In many instances it is a good plan in dry springs to irrigate the garden ground before planting.

As far as the small garden is concerned it is often of advantage to sow the seed by hand rather than with a seed drill. Smaller seeds should be planted considerably thicker than the large seed to insure a good stand. The depth of planting varies also with the nature of the soil, the kind of seed used, and whether or not the season is dry or wet. The planting table will be of value in determining the proper depth to plant the seeds. In making rows in the garden it is often advisable to stretch a string along the row so that the rows can be made straight and the seed sown without moving the line. This can be accomplished by the use of an ordinary garden hoe. In a good many instances where the spring is especially dry it would be an advantage to irrigate the crops after planting. This can be accomplished by making a furrow along side of the row and the water run down it. It is also a good practice to slightly tamp the soil above the seed so that there is much better capillary action in the soil moisture and a quicker germination brought about.



Paper mulch experiment.

### Mulching

During the past few years there has been considerable publicity given to the use of paper mulch as a means of increasing yields. According to the work the department is doing with paper mulch, it has been found that it hastens germination, and practically eliminates cultivation and weeding. The heavy-type paper prevents the growth of weeds thru it and prevents the evaporation of moisture

from the surface of the soil. One should investigate the type of paper which he wishes to use before buying. There are several undesirable papers on the market which are not satisfactory for use. Investigations with paper on the Experiment Station plots have shown that the lighter-type papers will shrink after laying, so that they will break apart and leave wide spaces uncovered.

The cost of the paper used in the paper-mulch experiments varies widely with the type used. However, a fairly good type of paper can be purchased at around \$2.50 for 5400 square feet. So far the use of paper mulch under Colorado conditions is still in the experimental stage and there are many problems connected with its use which must be worked out before it can be recommended for general use.

One of the factors which gives considerable trouble is the laying of the paper over irrigation furrows. During the growing season the rainfall is often not sufficient to properly mature the crop, even under paper mulch, without the use of supplementary irrigation water. It would be advisable for growers who wish to use such paper to try it out on a small scale in their home gardens before using it on any large scale. As a general thing it has been found that warm-season crops such as sweet corn, cucumbers and tomatoes, have given considerably increased yields under paper mulch, and the cool-season crops, such as head lettuce and potatoes have not shown very large increase in yields over the unmulched plots. For the small home garden, paper mulch can be used to an advantage where only a very small amount of time is available for work in the garden. It will tend to keep weeds down while one is away for a week or two and it will save the necessity of weeding and cultivating. As a rule one weeding is all that is required during the growing season. This can be accomplished at the same time the row vegetables are thinned.

### **Thinning**

In planting vegetables having small seed, generally the seed is too thick and the plants will grow in a very crowded condition. This is especially true of the root crops and thinning should be started just as soon as the third or fourth pair of true leaves have developed. Thinning at this stage will prevent the growth of weak spindly plants. In thinning, the plants should be left at the proper spacing, usually 2 to 6 inches apart in the row and the largest plant in each bunch left in the soil. By leaving the large and most vigorous plant in each bunch, a larger and earlier yield may be secured.

### **Irrigation**

In Colorado there must be a good supply of water available to profitably grow vegetable crops, as there are but few localities in

the state that can grow such crops without supplementing rainfall with irrigation during the growing season. This is largely due to the irregular distribution of rainfall, most of which falls during the winter and is unevenly spread over the summer months. There is, however, a wide range in the amounts of distribution of rainfall over different sections of the state, and no definite rule can be followed in the application of irrigation water. The soil type, character of the sub-soil, slope of land, the crop being grown, all determine the amount and frequency of irrigation. Irrigation should be heavy and often enough to keep the plants growing uninterruptedly during the growing season. Plants should not be allowed to become wilted or checked.

In this state there are three methods of applying irrigation water: Surface, sub-surface and semi-sub-irrigation. Surface irrigation is by far the most satisfactory method to use, especially where the furrow method of applying the water is used. This method is accomplished by running water in furrows along by the side of and close to the plants. The water should be applied when needed and the soil thoroly soaked, rather than frequent light irrigations. Excessive irrigation, however, is detrimental and should be avoided. The soil should be cultivated as soon as it is sufficiently dry after each irrigation. Irrigation may be done at any time during the day; however, early morning irrigation is preferred by many.

In using the lawn sprinkler, better results may be secured on most soil types by watering thoroly once a week rather than by sprinkling lightly every day. The general tendency in sprinkling is to apply too little water, and more economical use of water can be secured by running the water in furrows along the rows. Flooding the surface of the soil is not recommended in applying irrigation water.

In certain parts of the state natural sub-irrigation methods are in use in the production of vegetable crops, especially in the San Luis Valley. The water table is close to the surface of the soil and by running water in a large ditch surrounding or thru the field the water table is raised so that it comes in contact with the roots of the crop. The ditch is usually filled with water and allowed to stand until sufficiently irrigated. Semi-sub-irrigation is also used to a limited extent and in this case the water table is raised as far as possible by sub-irrigation and the irrigation completed by furrow surface watering. The above methods are used generally on the lighter-type soils and there is little cost in applying water.

In the dryland sections of the state it is often possible to produce good gardens without the use of irrigation water. By shaping the farming methods to store the soil moisture, such as summer fall-

lowing, the furrow method of planting and listing, such crops as sweet corn, tomatoes, peppers, cabbage, squash, pumpkins and beans are grown. In many cases good gardens are grown by using the excess water pumped by the farm windmill.

### Cultivation

Garden soils should be cultivated at frequent intervals and for the most part shallow. This operation will keep the surface soil well stirred, thereby forming mulch which will keep down moisture losses as well as destroy weed growth. The soil should be cultivated after each irrigation or rain as soon as the soil is dry enough to work. This will prevent the formation of crust and surface baking. As a general thing the gardener irrigates too often and heavily and neglects cultivation. Do not substitute irrigation for cultivation. It is better to cultivate at regular intervals and by so doing less watering will be found necessary for healthy growth of plants. Cultivation may be accomplished by the use of horse-drawn implements on large gardens, while on the small gardens, with narrow rows, a wheel or hand hoe may be used.

### Insects and Diseases

There are usually quite a number of insects and diseases which attack garden crops and cause some loss. As a rule the gardener does not notice the injury until too late, and careful inspections should be made from time to time. Preventive measures are important and if disease is not known, write to the Colorado Experiment Station for Bulletin No. 323, "Common Diseases of Truck Crops."

The table on the next page has been prepared on garden insects and methods recommended for control.

### Cultural Directions for Vegetable Crops

**Asparagus** is a crop which should be in every garden and is of special importance because of the high quality of the product. It is one of the earliest crops to produce in the spring and once it is planted and properly cared for, will produce for many years. It will do well on almost any well-drained soil, especially a well-fertilized deep loam; if earliness is desired a deep sandy loam is an advantage.

While asparagus plants can be grown from seed, it is as a rule more satisfactory to purchase plants from a reliable seedsman. This is especially true for the home gardener. In most cases it is better

## Garden Insect Pests and Methods of Control

By GEORGE M. LIST, *Department of Entomology, C.A.C.*

Crop	Insect	Stage Which Does Damage	Type of Injury	Control Method Given Under Numbers At Foot Of Table
Asparagus	Asparagus beetle	Adult, larva	Feed upon new growth and mature stalks	1, 2
Beans	Mexican bean beetle	Adult, larva	Feed upon leaves & pods	3
Cabbage Cauliflower and Kohl-rabi	Cabbage aphid	All stages	Suck juice from leaves	4
	Cabbage worm	Larva	Eat foliage	1, 2
	Cabbage maggot	Larva	Tunnel in base of stem and roots	5
	Cutworms	Larva	Cut off young plants	6, 7
Cucumbers	Cucumber beetle	Adult	Eat leaves and stem	8
	Aphid	Adult	Suck juices from stem and leaves	4, 12
	Squash bug	Adult, nymph	Suck juice from stem	4, 9
Eggplant	Flea beetle	Adult	Eat leaves of young plants	10, 11
Lettuce	Cutworms	Larva	Cut off young plants	7
	Grasshopper	Adult, nymph	Eat leaves of young plants	7
Melon	Same as cucumber			
Onion	Maggot	Larva	Burrow in the bulb	No satisfactory method
	Thrip	Adult, nymph	Suck juice from foliage	12
Potato	Colorado potato beetle	Adult, larva	Eat foliage	3, 13
	Flea beetles	Adult, larva	Adults eat foliage, larva feeds on tubers	10, 11
Peas	Aphid	Adult, nymph	Suck juice from plant	4, 12
Squash	Same as cucumber			
Tomatoes	Horned tobacco worm	Larva	Eat leaves and fruit	1, 2, 9
Tomato	Tomato psyllid	Adult, nymph	Suck juice from plant	12, 14
	Cutworms	Larva	Cut off plants	6, 7
Corn	Corn earworm	Larva	Eat into corn ear	No satisfactory method
	Corn-root worm	Larva	Tunnel into base of stalks and roots	15

### Methods of Control

1. Dust mature plants with a mixture of air-slaked lime (5 parts) and lead arsenate (1 part).
2. Spray with a solution made of 2 ounces of lead arsenate, 2 ounces of laundry soap and 3 gallons of water.
3. Spray with magnesium arsenate or zinc arsenite (1 ounce) and water (3 gallons).
4. Dust with a mixture containing 5 percent nicotine sulphate.
5. Protect plant with tarred paper disc placed at base of plant at time of transplanting.
6. Wrap stem of plant, from roots to first leaves, with paper at time of transplanting.

7. Mix two-thirds ounce of white arsenic or Paris Green with 1 pound bran. Dilute one-sixth pint of molasses with a small amount of water and with this moisten the bran into a crumbly mass. Scatter along the rows of plants at night. For grasshoppers scatter broadcast before 10 a.m.
  8. Dust with gypsum or hydrated lime (19 parts) and calcium arsenate (1 part).
  9. Hand pick.
  10. Dust with hydrated lime (5 parts) and calcium arsenate (1 part).
  11. Spray with Eordeaux Mixture, 4-4-50 formula. This mixture can be purchased in the dry form from druggists or seedmen.
  12. Spray with a solution containing 2 tablespoonsful of nicotine sulphate, 1 ounce soap, and 3 gallons of water, about every 10 days after insects appear.
  13. Spray with Paris Green (1 ounce) water (3 gallons).
  14. Spray with lime-sulphur solution (1 part) water (40 parts).
  15. Rotate crops. Never plant corn following corn.
- 

to purchase 1-year-old plants for transplanting and where it is possible, select only the strong healthy plants. Many gardeners order a good many more plants than are needed in order to select the most vigorous, and with a cost of 1 to 2 dollars per 100 it is not expensive. For the average family 100 roots are all that are needed.

In planting, select a place in the garden that will not be disturbed by the plowing or preparation of the garden usually near a fence on the outside of the plot. The plants should be set out in furrow rows 3 to 5 feet apart, and about 10 to 18 inches between plants. The furrows should be 10 to 14 inches deep to permit proper covering of the roots. At first a shallow covering of 2 to 3 inches is desirable and as the plants grow, more soil can be worked in the furrow by cultivation so that by the end of the season the furrow is filled. Deep furrows can be made by running a hand plow in the same row 4 times. Planting should be made early in the spring of the year. Asparagus should not be cut for use until the third year after planting and then only for a short time.

A short-growing crop such as beans or early cabbage may be planted with the asparagus the first season, and cultivation of such a crop will also suffice for asparagus. After the first season cultivation should be shallow and frequent, all during the growing season.

It is a good practice to allow the tops to stand until spring, especially where the winter is severe. If the tops are cut green a good bit of the reserve food material is lost which should be stored in the roots. It is better to disc the tops into the soil in the spring rather than to burn them off. The crop is a comparatively heavy soil feeder and needs plenty of fertilizer, and from 10 to 12 tons of barnyard manure per acre each year may be applied when producing full yields.

The shoots are harvested by cutting with a knife after they have attained a length of 4 to 5 inches. The cutting should not be deep but just underneath the surface as there is danger of injuring the crown. If bleached asparagus is desired, the rows may be hilled up

with soil and when the tips appear thru the surface they are ready to cut.

**Beans** are an important crop in this state and are grown on a wide range of soil types. The heavier types are less desirable than light sandy loams. Beans will not stand light frosts and being tender should not be planted until all danger of frost is over.

The planting distance varies according to the method of cultivation used. For the small home garden, 15 to 18 inches between rows is satisfactory, while on the larger farm gardens, the rows may be 20 to 36 inches apart. The depth of planting should be from an inch to an inch and a half. Many gardeners plant beans thickly, around 2 beans per inch, in which case thinning is important. Garden beans should be thinned so that there will be a plant every 2 to 4 inches. Frequent shallow cultivation should be given up to the time the crop is in full bloom. Beans should not be cultivated when the vines are wet from rain or dew in order to prevent spread of diseases.

Lima beans require especially long, warm, growing seasons to do well and it is better to plant later than the snap beans. The seed are sensitive to proper conditions for germination and will not do well if the soil temperature is too low. With too much soil moisture they will rot. Any condition such as soil crust, due to rain after planting, will cause a heavy loss in stand. It is important that lima beans be planted on the lighter, sandier, soil types in this state, so they can mature earlier. This is especially true in sections of the state where the growing season is short. Care and cultivation are practically the same as for snap beans.

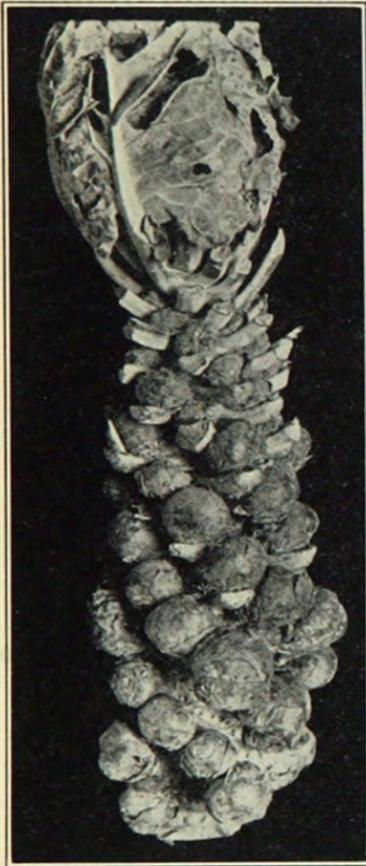
Pole beans are fast becoming more popular as a green shelled bean and may be planted in hills 3 to 5 feet apart. From 3 to 4 plants left in each hill are sufficient. The lima bean may also be used as a green shelled bean. See variety list for special varieties.

**Beets.**—Garden beets may be planted early in the spring before all danger of light freezes is over, since the crop is somewhat hardy. Beets will do well on a wide range of soil types. However, where bunch beets are desired, earliness is more important than heavy yield, and the lighter sandy soils are more desirable.

The seed may be sown with seed drills or by hand in rows 12 to 18 inches apart for hand cultivation or 20 to 24 inches apart when the horse-drawn drills are used. The seed should be planted to a depth of three-fourths of an inch to 1 inch under the soil, and where the crop is to be harvested all at one time, the plants should be thinned to from 3 to 4 inches apart in the row.

Thinning while small is very important since the beet seed is of a compound nature and several plants usually develop from one seed.

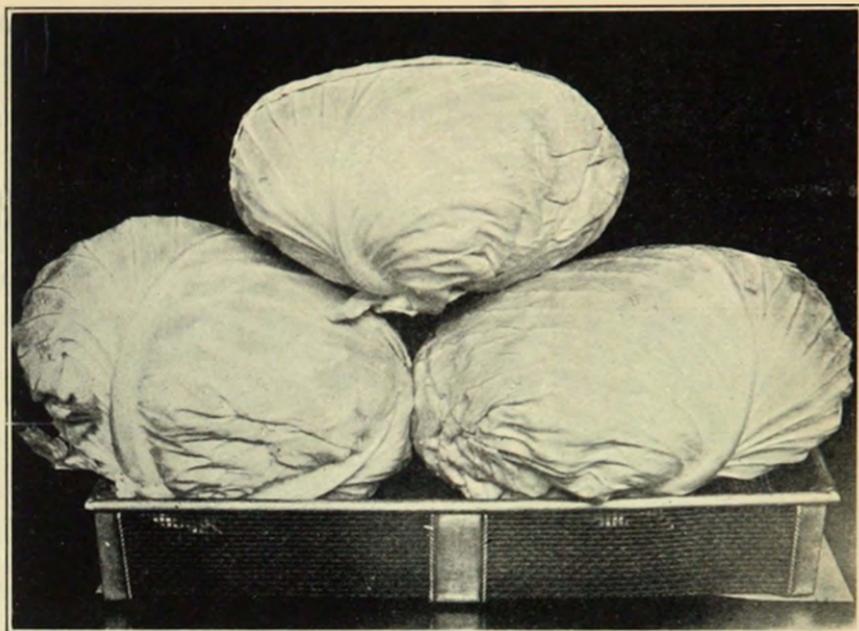
In leaving the largest beet in each bunch, quite an advantage is obtained in earliness. Successive plantings for winter storage may be made as late as the middle of July. Early planted beets usually are too large and woody to use for pit or cellar storage. Poor quality in the garden beet is usually determined by the light color or white ring zones in the interior of the root. A cross-section of the root should be dark red thruout. One of the desirable varieties is the Early Wonder, a round, early, dark red variety.



Brussels sprouts.

**Brussels sprouts** are very closely related to cabbage and require about the same cultural treatment. The sprouts or miniature heads are formed in the axils of the leaves and are cut off and cooked like cabbage. The crop is more hardy than cabbage, and usually reaches the best stage of edibility during late fall. The leaves should be broken off as the buds develop, and only a few left on the top of the plant. Plant lice are apt to feed in the young buds and a careful inspection should be made from time to time, so that spraying can be resorted to before the buds become large and act as protection for the insects.

**Broccoli**, closely related to cauliflower, is becoming better known, and the market is showing a promising development, especially in the eastern states. Test plantings over the state show that the crop is not well adapted to all sections because of the long season required for proper development. Broccoli requires about the same cultural treatment as cauliflower, except that the plants should be set farther apart and the wide space between rows. It has two advantages over cauliflower in that it is not as sensitive to high temperatures and it is more certain. Tying of the leaves is unnecessary, and a partial second crop is often cut. Broccoli should be cut before there are any signs of separation of the curd. At the present time it is difficult to secure seed of good strains, and many gardeners have been disappointed in the yields of the crop.



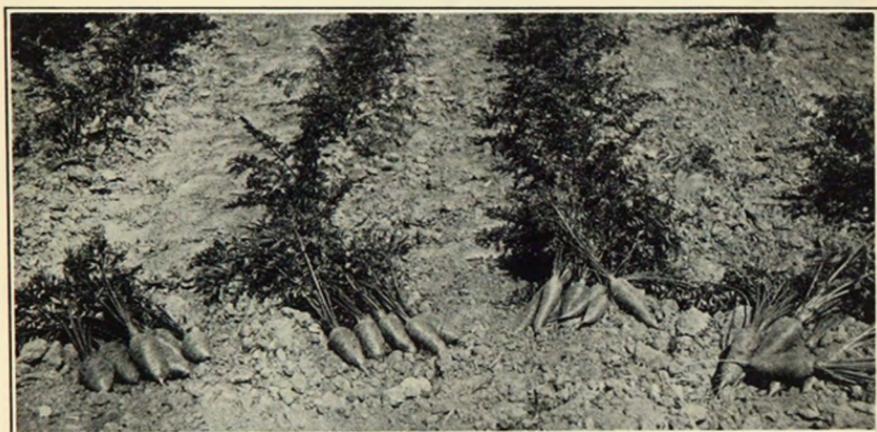
The flat Dutch variety of cabbage. A good type for winter storage.

**Cabbage.**—For the early crop, the seed should be sown in the hotbed in March and by proper hardening of the plants they may be set out in the field in April. The early varieties will mature in July and August. For the late crop the seed may be planted in an outdoor seedbed the latter part of May or first of June, and set out in the field as soon as they are of proper size. Late-planted cabbage should mature in October, and is usually ready for winter storage. The early crop is usually set 18 inches apart in the row and the rows 2 to 3 feet apart. Late cabbage is set at the wider spacing of 24 to 26 inches apart in the row and the rows are 3 feet apart.

The cabbage crop requires frequent cultivation, plenty of moisture and good fertilization for heavy yields. The crop will do well under a wide range of conditions, and is not sensitive to extremes of temperature.

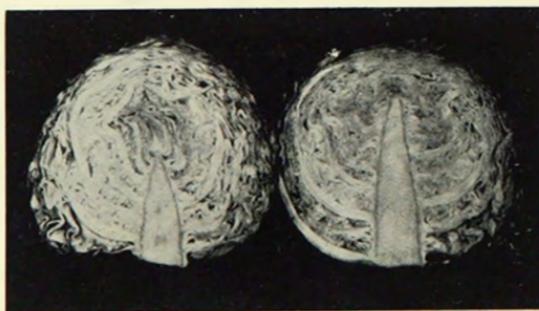
**Carrots.**—The popularity of carrots has increased considerably during the past few years because their value in the diet is much better understood. They are included in most gardens, and usually planted at successive intervals of 2 or 3 weeks, so that a supply of fresh tender roots is available all during the growing season, and for winter storage.

The crop is grown in about the same manner as garden beets. The seed is sown in rows 18 to 24 inches apart for the small garden and covered one-half inch deep. The plants should be thinned after they are well started, to a distance of 2 to 4 inches between plants. Thinning may be handled in the small garden by pulling the larger roots when of sufficient size to use, and allowing the smaller ones to develop. The smaller-sized carrots are tender and more desirable for table use.



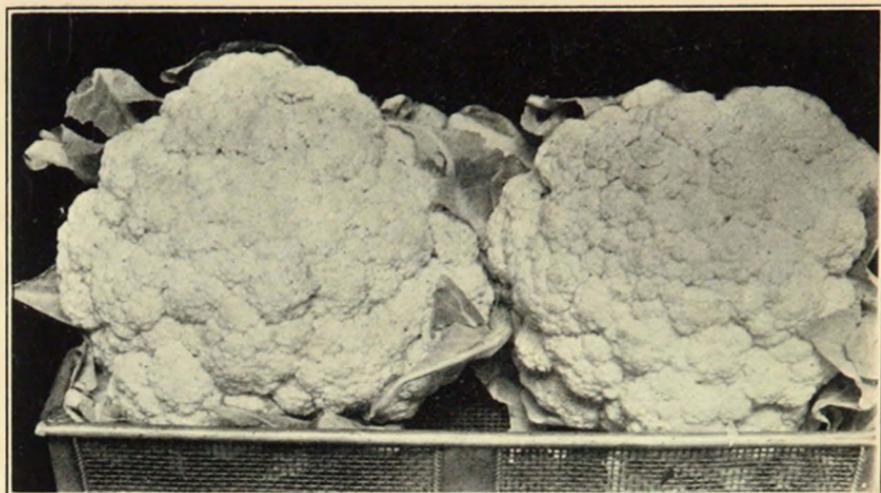
Carrot varieties—Oxheart, Chantenay, Coreless and Danver's Half Long.

The most popular varieties are the Danver's Half-long and Chantenay. The Nantes or Coreless is a variety of very fine quality, altho it does not yield as heavily as the other two varieties.



Copenhagen market variety of cabbage. Cross section of two different heads, same age, showing undesirable core.

**Cauliflower** is a member of the cabbage family which has become an important crop, principally in the high-altitude sections of

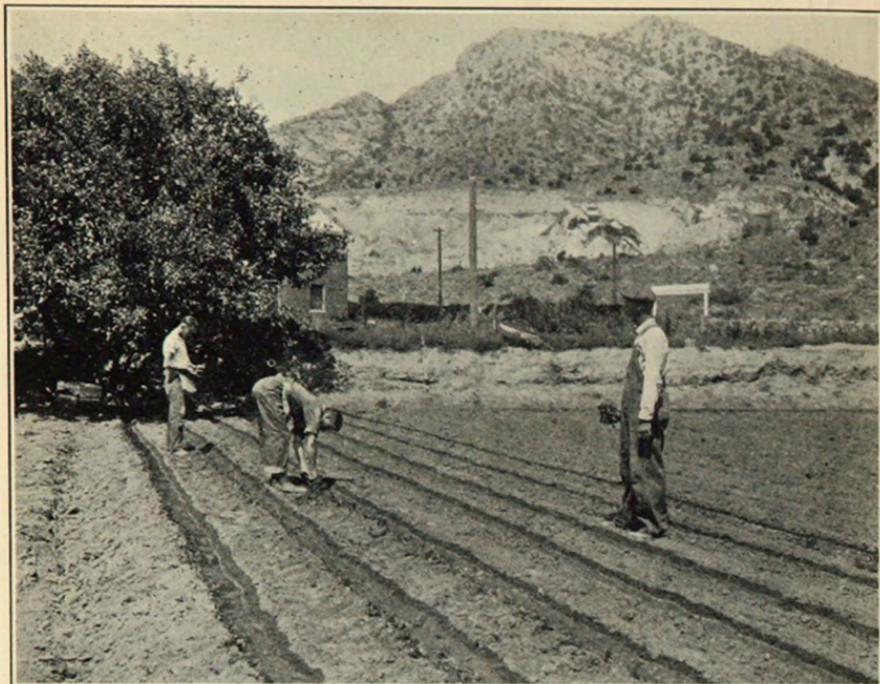


Well-developed heads of cauliflower.

the state. It does not thrive well in dry or hot weather and for the sections with long growing seasons, it should be planted either as an early spring or late fall crop. For the early crop the seed should be planted in hotbeds in March and as soon as severe freezes are over the plants should be set in the field. Cauliflower will not stand as much frost as cabbage. The spacing and distance between rows varies according to the variety, as a rule, 18 inches between plants and 3 feet apart in the rows, being the common planting distance. The late crop may be started by planting the seed in the open during May and by July the plants should be large enough to set in the field.

As soon as the head or curd has started to form, the leaves should be tied over the top, in order to properly bleach the curd. Many gardeners use different colored string in tying heads so that all of the first-matured plants are tied with one color and can then be harvested without any difficulty or loss of time. The most common variety for the main crop is the Early Snowball. Another new, promising, early variety is the Matchless Spring.

**Celery** will do well on a deep, rich, well-drained soil. The heavier-type soils are more often used to produce celery. However, where there is plenty of moisture available during the growing season, good crops may be produced on the well-fertilized lighter-soil types. Plenty of fertilizer should be applied to the soil for celery growing



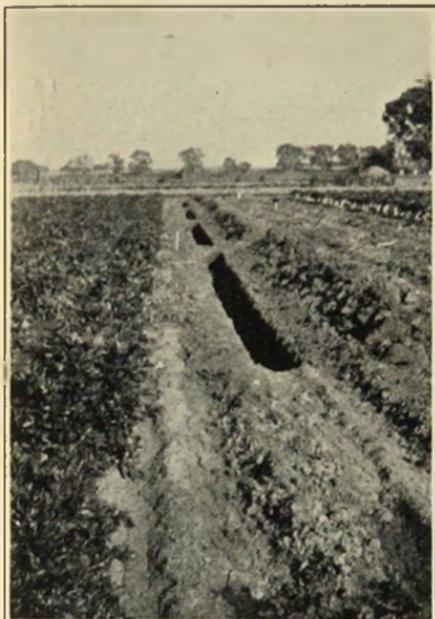
Transplanting celery. Notice the method used in irrigating before and after setting.

and where available, barnyard manure is the most satisfactory. It is better to turn manure under by spading or plowing in the fall of the year.

Growing celery plants is rather an exacting operation and it is better for the home gardener to buy plants rather than attempt to raise the necessary number. It is important in sowing celery seed that the soil be very fine and well pulverized because of the small size of the seed, and the slow germination. The seeds should be covered lightly with soil after sowing and the seedbed shaded until the sprouts are well thru the surface. Planting for the early crop should be done about March 1 and the plants should be ready to set out in the field during the first half of May. Late celery plants are often started out of doors and set out in the field in early July.

In setting the plants in the garden, it is important to set them at the proper depth along the edge of the furrow so that the heart of the plant is not covered. The rows should be made at the proper distance and the water run thru the furrow considerably ahead of setting. The plants may then be set along the side of the furrow and the water again run thru the row. A dibble or a trowel may be

used in making an opening in the soil for the plants. Frequent and shallow cultivation is important where a manure mulch is not used, in cutting down moisture losses.



A winter storage trench for late celery.

The early varieties are blanched by wrapping each individual plant with paper or by placing boards along each side of the row close to the plants. Time required for blanching depends upon the variety and weather conditions; it usually takes about 2 weeks for proper blanching. The late celery is bleached by gradually banking up earth in the row. For storing, best results are secured by placing the celery in outdoor trenches. The depth of the trench depends on the height of the celery, usually about 18 to 24 inches deep, so that some of the top of the plant is left above the trench. The crop should not be stored until continuous cold

weather sets in. The plants should be dry, free from disease, and the roots must not be removed when stored, so that the plants will continue to grow slowly. The top of the trench may be covered either with boards or with strawy manure. Cellar storage is not generally satisfactory.

There are several new early varieties that are being used to some extent, the Easy Blanching and Golden Plume, altho the commercial acreage is still planted to the Golden Self Blanching.

**The cucumber** is a tender vegetable which cannot be planted until after all danger of frost is over. As a rule the rows are laid out, on all the larger acreages, 6 feet apart and the seed planted in hills 18 inches apart. A good many gardeners follow the practice of sowing the cucumber seed in the row in a small drill or by hand and thinning out, after the stand is thru the ground, to a distance of 2 to 3 feet apart, leaving 3 to 4 plants in each hill.

The crop will do well on well-fertilized, light, sandy loam. It is important that the soil be rich and have plenty of available plant food. In planting in the small garden, a small fork full of manure

may be placed under each hill and mixed in with the soil. The seed should be covered to a depth of about one-half inch. Clean cultivation should be kept up until the vines run across the rows.

Cucumbers are picked for slicing as soon as they have reached the proper size. This lengthens the bearing period and considerably increases the yield of cucumbers. In case the cucumbers are to be used for small pickles, they should also be picked when they reach the proper size. Usually, the smaller the fruit the more desirable for the small pickle.

**The egg plant** requires a long, warm growing season with a rather light loamy soil to develop properly. In most sections of Colorado the season is too short for the egg plant to properly mature without transplanting. The seed should be planted in the hotbed or greenhouse around the middle of March and they may be either transplanted to small pots when they develop to two small leaves, or they can be set directly out in the field, provided weather conditions will permit. Egg plants are very susceptible to frost injury and they should be properly hardened off in the coldframe before setting out in the field. In setting out, they should be planted in rows 3 feet apart and about 20 inches between plants. Closer spacing may be given if space is limited. It is important to keep crops growing uninterruptedly during the season, and the soil should be rich and well fertilized for good yields.

The most common variety is the Black Beauty. For the small,



Kohl-Rabi. A vegetable deserving more attention by gardeners.

home garden, better results will be secured by purchasing plants from a seed house or nursery company. The plant is only adapted to the sections of the state where the growing season is long.

**Kohl Rabi** is a member of the cruciferae family and is closely related to the cabbage group. It produces a thickened stem or bulb just above the ground and has a flavor very similar to cauliflower. The plant is hardy and can be grown under practically the same conditions as cauliflower. The seed may be sown directly in the field for the late fall crop or for the early spring crop it may be planted in the hotbed and transplanted to the field as early as April. The plants should be thinned out when the seed is sown in the field, to a distance of 6 to 8 inches apart.

This crop only remains in an edible condition for a short time and it should be used when the bulb reaches a diameter of  $2\frac{1}{2}$  to 3 inches. After that time it becomes woody and strong and is unfit for table use.

**Head Lettuce.**—Head lettuce is one of the most important commercial salad crops grown in the state and can be grown under a wide range of soil conditions. It can be grown on a rich, moist soil and is especially well adapted to the high-altitude sections of the state. It is also an ideal crop to grow early in the spring or late in the fall in the sections of the state with a long growing season. Good results have been secured by planting the seed in the hotbed in March and transplanting the lettuce to the field in April. However,



Head lettuce grows to perfection in the high-altitude sections of the state.

the majority of the acreage is planted by seeding directly in the field. Plantings may be made in July and August for the fall crop as lettuce will stand considerable low temperature.

Lettuce should be grown without any checking in the field to be of high quality. Rapid growth is especially important and the soil should be rather rich for good results. The seed is usually sown in rows about 18 inches apart and thinned out at a distance of 12 to 14 inches in the row. The seed is very small and should not be planted deeper than half an inch. It is important to cultivate frequently and at a shallow depth.

The crop is sensitive to weather conditions and especially so during the period that it is heading. Frequent light rainfall during the heading stage will produce soft mushy heads, whereas unusually dry hot weather will favor the development of seed stocks. For that reason it is important that the crop be matured as rapidly as possible before there is danger of extremely hot weather starting in.

For head-lettuce varieties, the more common one now being used in the large commercial acreages in the state is New York or Wonderful. It is also known as the Los Angeles Market and Mountain Iceberg. The gardener should emphasize the variety that he wants to plant and should not ask for the common Iceberg type. This variety has a pink tinge on the margin of the leaf and is undesirable for planting.

**Leaf Lettuce.**—Leaf lettuce is often grown in home gardens for use in salads. This type of lettuce is almost a sure producer and will yield an ample supply of greens for the average family. When it is grown in the small garden it is usually not thinned, but cut or thinned out as it is used. The culture is practically the same otherwise as for the growing of head lettuce.

For more details concerning the culture of lettuce, write to the Colorado Experiment Station and ask for Bulletin No. 309, entitled "Head Lettuce, Cauliflower and Peas."

**Muskmelons.**—The term 'muskmelon' as used by the grower refers to the melons that are characterized by large seed cavities, distinct ribbing and a surface that has a rather light netting, whereas the cantaloupe usually has a small seed cavity and is heavily netted on the surface. The muskmelon is an important commercial crop in this state and is grown principally in the sections which have a long, warm, growing season.

In order to produce it profitably in the sections with short growing seasons, it is important that it be planted on a light, sandy, loam, soil type, preferably with a southern slope. The soil should be well prepared, free from cloddiness, and not too heavily fertilized.

For the small home garden the seed is usually planted in hills 5 to 7 feet apart and 6 to 8 seeds planted in each hill. The seed is planted to a depth of about 1 inch. After the sprouts have appeared thru the surface of the soil they should be thinned out to 3 or 4 plants per hill. The plant will not stand even the very light freezes and seed should not be planted until all danger of frost is over.

Where the growing season is especially short, cantaloupes of the early variety may be grown by starting indoors by planting in small strawberry boxes or flats. After the plants have developed 2 or 3 true leaves they can then be set out in the field and a plant protector placed over the top of them. The use of such protectors has proved to be very profitable in many instances for the small garden.

Cultivation should be frequent and shallow up to the time the vines run across the row. Light frequent irrigations are recommended for this crop; the nature of the vine growth causes the soil to be more or less shaded and it will retain moisture for longer intervals.

Muskmelons or cantaloupes should not be pulled for immediate consumption until the fruit separates from the stem. In commercial fields the picking is accomplished by pulling the melons from which a fourth of the stem is pulled off of the fruit. This is called the quarter-slip stage and is used for long-distance-shipping purposes. For the shorter-distance shipments the half-slip stage is used, and for immediate consumption the full-slip stage is used and that is where the entire stem pulls out of the melon.

There is much confusion among growers as to varieties. However, the larger commercial acreages are planted to Hale's Early and to the Pollock 10-25. The Pollock 10-25 is the main crop variety and is a heavy yielder of high-quality melons. A very good variety of muskmelon is the Greeley Wonder.

**Onions.**—The growing of onions in this state has proved to be an important industry in the sections of the state with long growing seasons. They can be grown in practically all parts of the state, even tho the growing season is short, by using the transplanting method. The crop may be grown from seeds, plants or sets. Where the sets are planted the crop is usually harvested as green onions, whereas, in planting seeds and plants, mature dry onions may be grown for the market. The seed is usually sown during the latter part of March or the first of April, in single rows 20 inches apart. In many cases the rows are planted at a distance of 26 inches apart and a row planted on each side of the furrow. This leaves a pair

of rows about 12 inches apart and 14 inches between rows. A good bit of the commercial acreage is planted, however, in single 20-inch rows.



Onions are ready to harvest when most of the tops drop over from maturity.

In planting seed of good quality it is seldom necessary to thin where the seed is evenly distributed in the row. In some cases it has been necessary to thin and this was caused by too heavy seeding, in which case the plants should be thinned out to a spacing of 4 inches. The seed should not be covered at a depth of over half to three-fourths of an inch.

The root system of the onion crop is usually very shallow and irrigation should be frequent. Where the seed is planted it is often necessary to irrigate after planting. While no definite rule can be laid down for irrigating onions, it is important that they be kept growing without checking.

In sections of the state where the growing season is unusually short, a good yield of onions may be secured by the transplanting method. In using this method the seed is sown in the hotbed or in the small greenhouse bench during February. As a rule there are somewhere around 10,000 seeds per ounce and it will require around 8 ounces to grow the 80,000 plants necessary to set an acre. The plants should be grown to the size of an ordinary lead pencil before

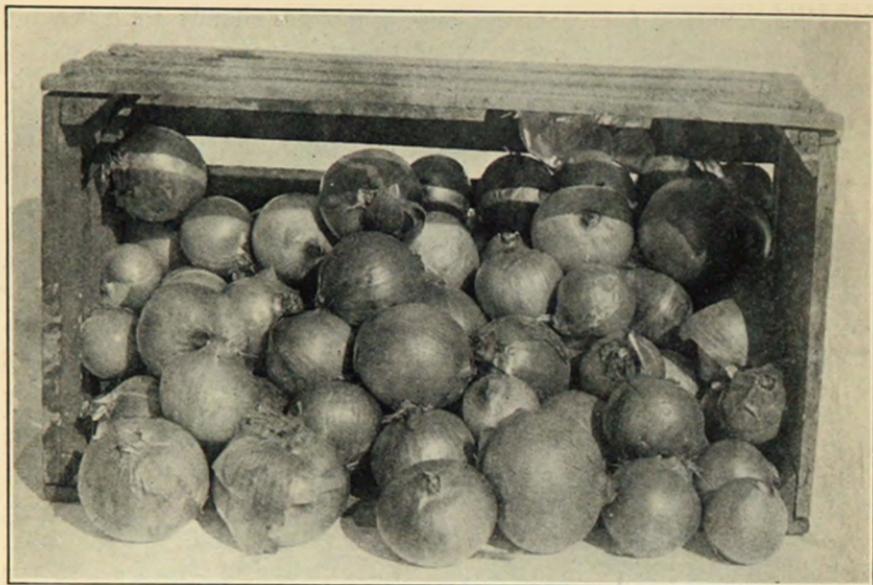
they are removed for transplanting. It is important that the top development be held down so that there is not a soft, succulent growth made. The plants should be hardened off gradually by withholding water and lowering the temperature. Plants set in the field are usually spaced at a distance of 3 to 5 inches in the row and planted in 20-inch rows. There are several advantages of using this method.

It lengthens the growing season, it favors the development of a milder, more mature onion, increases the yield and eliminates the tedious process of weeding. The first hoeing or weeding of onions is usually the most expensive and this can be done by cultivating before the onions are transplanted. The cost of setting plants varies between \$40 and \$65 per acre and at the present time the department is conducting comparative costs on the two methods. There are a good many transplanting machines on the market, which, while they have not been tried out experimentally are supposed to plant from 60,000 to 80,000 in a day. Ordinarily one man can set from 8,000 to 10,000 plants in a day. The transplanting method so far has not proved to be well adapted for extensive commercial use. However, for the small home garden it should be especially profitable in growing the mild Spanish or Bermuda onion.

When the onions are matured properly the tops will fall over naturally and the crop is then ready to pull and cure. The bulbs are pulled from the soil and piled in windrows, usually 6 rows to the windrow, and allowed to cure. The tops are cut off about 1 inch above the bulb and allowed to dry for a period of 10 to 14 days. It is important that the bulbs be well cured so that the necks are not green when they are put into storage. All immature or thick-necked specimens should be sorted out and only the very choice bulbs selected for storing. Onions should be stored preferably in crates in a cool, well-ventilated, dry room.

In growing onions for sets, the gardener sows the seed very thickly so that the onions do not have a chance to develop. A good many gardeners use a small portion of their plot for the growing of sets for the next year. As soon as the small plants have reached the size of one-half to three-fourths inch in diameter, they should be pulled and dried in the sun before topping. The small sets thus procured can be prevented from sprouting by placing in a cool, dry, well-ventilated room and can be kept dormant until ready to set out.

**The parsnip** is a crop that will do well on especially deep, sandy-loam soil. The root development is unusually long and it is important that the soil be deep. This crop requires a long season for



Well-matured onions will keep better when stored in open-slat crates.

full development and the seed should be planted at a depth of not less than one-half of an inch, in rows 18 to 24 inches apart. As soon as the crop is well started it should be thinned to a spacing of 4 inches between plants. The crop is unusually hardy and a portion of the crop may be harvested in the fall of the year and placed in a convenient storage pile or cellar and the balance left in the ground until spring. The portion that is left in the soil should be covered with a mulch manure or the soil thrown over the top of the crowns.

**Potatoes** have an important place in the home garden from two standpoints. They will supply new potatoes as early as June in some sections and not later than August in any part of the state. Second, they will keep well into the winter or even into the following summer under proper storage conditions. They yield more food for a given amount of space than most any other vegetable and can be grown on a small scale anywhere in the state.

Potatoes succeed best on a sandy-loam soil, underlaid with a porous sub-soil, but even the heavier soils produce good crops if they are underlaid with a porous sub-soil. Heavy adobe soils which puddle easily are not suited to potatoes, unless they can be loosened up by the application of well-rotted manure in large quantities.

The preparation of the soil should be thoro and deep, to conserve moisture, provide a large feeding area, and to insure the least resistance to the developing tubers. The worst enemy of the garden



A mountain potato field. Potatoes can be profitably grown in the home garden.

potato is scab. This difficulty is caused and increased by growing the potatoes on the same plot year after year and by the application of fresh manure. Other diseases, such as rhizoctonia and fusarium may also be carried by the soil. Because of these diseases the potato plot should be moved around over the garden and not remain in the same place year after year. In fact, the potatoes should not remain in the same spot 2 years in succession.

For garden purposes the **early varieties** are recommended: Bliss Triumph, Irish Cobbler and Early Ohio. In some cases, under irrigation, a **late variety** may be desired in which case the standard variety for the locality will be best or the Rural New Yorker No. 2 will succeed almost anywhere if the season is long enough.

As a general rule the home gardener does not receive maximum returns from his potatoes because the seed is badly run out or degenerated. He should procure new certified seed at least once in 5 years and in some localities once in 2 years. It is always advisable to treat the seed and for this purpose one of the organic mercury compounds will be found suitable.

**The seed** should be cut into large blocky pieces averaging at least 2 ounces in weight. It is best to cut the potato longitudinally from the bud eye cluster to the stem and then cut straight across if necessary, making sure that there is at least one eye on each piece.

The best plants and the best tubers should always be saved for seed. Do not plant the culls that are left in the spring.

It may be advisable to make **two plantings** in sections with the longer growing seasons, one to supply new potatoes during the latter part of the summer and one for the winter storage supply. In the warmest sections, planting may be done the last week in March or early in April. In the highest altitudes it may not be possible to plant until nearly the first of June. The planting may be done by hand. A furrow or trench is opened up to a depth of 4 or 5 inches depending on the character of the soil. In heavy soil planting should not be over 4 inches deep, while in light soil, 5 or even 6 inches is better. If the garden is irrigated, plants may be 12 or even 9 inches apart and rows 28 inches apart if hand cultivated or 34 inches apart if horse cultivated. On dryland plants should be from 14 to 18 inches apart and rows 42 inches apart.

**Cultivation** should begin soon after planting to keep the weeds down and keep the soil loose and well aerated. After the plants are up, cultivation should be continued between the rows. Thoro cultivation should follow each irrigation and under no conditions should the soil be allowed to crust or bake. As soon as the tubers begin to form, soon after blooming, dirt should be drawn to the plants.

Potatoes should always be **irrigated in furrows** 6 to 8 inches deep between the rows, never by sprinkling. The water should be allowed to run until it has wet thru between furrows, 12 to 48 hours. A small stream of water for a longer time is better than a larger stream. Most gardeners irrigate potatoes too much; 2 to 4 irrigations will generally be sufficient. Keep the plants growing and do not check them by letting them get too dry or by getting them too wet.

Small new potatoes may be dug 8 to 10 weeks after planting.

**Peas.**—The growing of peas is of considerable importance in the state, both in high-altitude sections for the fresh-vegetable market and for canning, in the northern part of the state. The dwarf round-seeded varieties are usually the earliest and most hardy but are not of high quality. For the small home garden the crop is usually planted in double rows 18 to 24 inches apart or in single rows 24 inches apart. The seeds should be planted to a depth of about 1 inch for late seeding and 3 to 4 inches for early planting, which may be done as early as the ground can be worked. The crop requires a cool growing season and best results will be secured by planting so that the crop will mature either early in the spring or late in the fall. The crop responds favorably to fertilization and over-fertil-

ization will produce an unusually heavy fine growth at the expense of pod production. For the home garden successive planting should be made during the early spring and late summer.

The dwarf varieties are becoming more popular and do not need trellis supports. For the tall varieties the trellis is usually needed to support the vines and the successive planting should be made only with the dwarf types. For more detailed information concerning the culture and growth of peas, write to the Colorado Experiment Station for Bulletin No. 309, "Lettuce, Cauliflower and Peas."

**Peppers.**—The pepper crop usually requires a long, warm growing season, slightly more so than the tomato crop. The seed is slow to germinate and it is especially sensitive to too much water while sprouting. Plants should be started in the hotbed or greenhouse in early March in order to have good strong vigorous plants to set out in the field when danger of frost is over. Due to the slow growth made by the plants, they are often transplanted once to pots or flats before setting out in the field. The plants may be set out in the garden in the latter part of May or early June as soon as all danger of frost is over. The distance for setting in the field is usually in rows 18 to 24 inches apart, and about 15 inches between plants.

**Sweet corn** requires an unusually warm growing season for proper development and has more limited use in this state because of the short growing season, especially in the high altitudes. For the small home garden, corn is usually planted in rows 30 to 36 inches apart and the seed planted so that there will be a plant every 10 inches in the row.

Another method often used is planting the hills in rows 3 feet apart and 3 feet apart in the rows. The seed should be planted at a depth of an inch to an inch and a half. It should not, however, be planted until the latter part of May, after danger of frost is over.

Some gardeners follow the practice of making successive plantings during the summer in order to have a fresh supply on hand during the summer season. This can be done profitably in sections of the state where the growing season is long.

In order to have proper quality in sweet corn it should be used a few hours after picking.

There are a few new varieties which will mature in 60 to 65 days. However, varieties like Golden Bantam usually require 70 to 75 days. In the sweet-corn variety trial, results do not warrant the use of the smaller 60-day corn.

It is not necessary in growing sweet corn to sucker the sprouts

that grow up from the base of the old plant. Over a period of years it has been shown that suckering sweet corn does not pay. It is very difficult in planting the later varieties to secure proper maturity and it is better for the home gardener to make successive plantings of varieties like the Golden Bantam rather than to grow the Country Gentlemen or Late Evergreen types.

**Radishes.**—The easiest and quickest vegetable to mature in the garden is the radish. In order to secure quality and flavor in the radish it is important that a rapid growth be made without any check. The seed should be planted at a depth of about half an inch and the crop may be planted in rows 12 to 20 inches apart. Some of the early varieties will mature in 25 days and successive plantings should be made during the cool season. Radishes will not do well if planted in the heat of the summer, and it is much better to make successive early spring plantings and successive late plantings.

This crop is an ideal one for a companion crop with lettuce, or it may be sown between the rows of cabbage, beans and potatoes. Because of the short time required for maturity it is usually out of the way before heavy cultivation is needed by the other crops.

In pulling the larger radishes, thinning is thus accomplished and more room is given for the others. In planting in the hotbed, the seed is usually sown in rows 4 to 5 inches apart early in the spring. When forced in this manner the crop will mature in a short time.

In growing the winter radish, one should sow the seed about the last of July or the first of August. This will permit the root to develop to a sufficient size for storing in pits or in the cellar. The size, shape and color of radishes should determine the one that the grower wishes to plant. Referring to the variety list, a few of the more common types are listed.

**Spinach** is being grown more extensively every year and is used as a greens crop. It is very hardy and can be planted early in the spring in rows 12 to 20 inches apart and thinned out when ready for use. It requires around 50 days for the crop to properly mature. Successive plantings may be made during the growing season and the late crop may be planted in July or in August. Spinach should be planted in a soil that is rich and well fertilized so that a rapid growth can be made. There should be plenty of moisture available during the growing period, as an especially dry period often causes checking and injures the quality of the leaf.

**The turnip** is a hardy vegetable and may be grown as an early spring or late fall crop. The seed may be planted in early April for the spring crop or in August for the fall crop. The rows for the

small garden may be marked off for planting at a distance of 18 to 24 inches apart. The seed should be sown half an inch deep and the stand thinned to a distance of 2 inches apart in the row for harvesting as a bunch vegetable. Turnips are hardy and may not be harvested in the fall until after light frosts. The roots may be stored in outdoor pits or in cellars.



Tomatoes pruned to a single stem will produce earlier tomatoes.

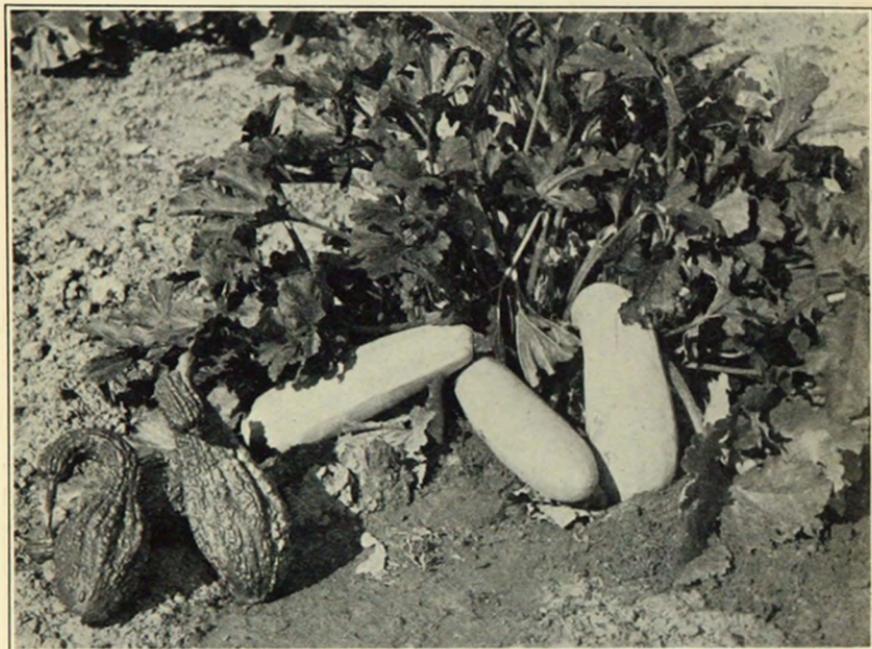
for use in the dryland sections of the state. The pruning is accomplished by the pinching off of all branches or shoots in the axils of the leaves so that the fruit and leaves are produced on a single stem. The yield is usually not as great on pruned plants, altho there is an advantage in earlier ripening, more convenience in picking and in controlling insects and disease by spraying.

The variety to select for planting depends upon the use the gardener plans to make of the fruit. For the family table as a fresh vegetable, quality, type and earliness should be considered. For

**Tomatoes** require from 100 to 150 days to produce fruit and if an early crop is desired, the seed should be planted 6 to 8 weeks before the date of the last killing frost in the spring. For the small home garden this can be accomplished by planting the seed in the house in shallow boxes and as soon as the seedlings reach a height of 2 inches, they should be hardened by gradually withholding water and lowering the temperature for about 2 weeks before setting out in the field. The seed may be planted about the middle of March for the early crop. The plants are usually set out about 3 by 3 feet apart. They should be set deep, the soil firmly pressed around the roots, and watered immediately after setting.

canning a variety such as the Bonny Best, will do well as it has a good red color, is smooth, has but little waste of fruit and is a good yielder. The Marglobe is a disease resistant variety and should be planted if there is a wilt disease prevalent.

**Pumpkins and Squash.**—The cultural treatments for pumpkins and squash are practically the same. The bush varieties may be planted in hills 4 feet apart. These two crops will respond to fer-

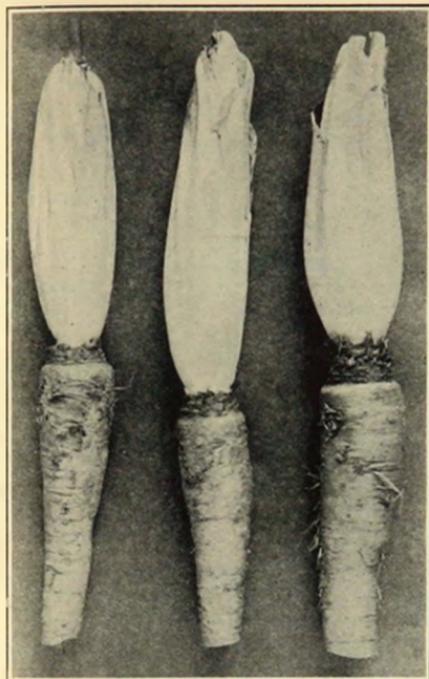


Summer crookneck and white marrow.

tilizer treatment and a fork full of well-rotted manure under each hill will pay well in yield returns. The seed should not be planted until all danger of frost is over, and the soil is warm.

The Table Queen variety of pumpkins, often called Acorn or Des Moines, is one of the new types which is becoming very popular. It can be used during the summer or winter months, and because of its small size may be halved and baked. One pumpkin will do for two individual servings.

The early summer varieties are in prime condition to pick just before the shell begins to harden. If the skin can be broken by a slight pressure it is in an edible condition. A hard shell is undesirable. The later squash as the Hubbard, should, however, have a hard shell when mature and ready to pick for use or storage.



Forced heads on roots of Witloof chicory.

**Witloof Chicory.**—Chicory is often known as French Endive, and is grown mainly for its leaves used in salads and its roots used as an adulterant for coffee. The seed is usually planted in June in 18 to 30-inch rows, and thinned at a distance of 4 to 6 inches apart. In the fall the roots are plowed out and tops cut off to about 3 inches above the crown, and placed in storage until ready to use for forcing. The crop may be forced by placing in a cool cellar or under greenhouse benches. The roots are vertically set in a trench close together and covered with fine soil or sawdust to a depth of 7 to 8 inches, so that light is excluded. This will prevent the leaves of the head from

spreading. Light watering is necessary and under temperatures of 50 to 60 degrees the heads should develop to proper stage in 4 weeks. The heads should be cut before becoming too long, or just before pushing thru the covering.

**Rhubarb** is a perennial plant that is ready for use early in the season. It will do well on a wide range of soils, and requires plenty of fertilizer for good yields. It can be propagated by division of the roots in the spring or fall of the year, and each piece should have one strong bud. The roots should be covered after planting to a depth of 3 to 4 inches. The roots may be spaced 18 to 30 inches apart in rows 3 to 4 feet apart. Harvesting should not start until 2 years after planting. The crop requires plenty of water, and growth should be maintained after the cutting season in order to store food in the roots for the growth the following spring.

**Watermelons.**—The culture of the watermelon is the same as described for cucumbers and muskmelons. The spacing of the plants is wider and the hills should be 8 feet apart each way, with 4 plants left in each hill. The crop is easily injured by frost and should not be planted until after the date of the last frost in the spring.

## Vegetable Varieties for Colorado

Asparagus	Mary Washington—(Rust Resistant) Palmetto Columbia
Dwarf Snap Beans	Giant Stringless (Green) Stringless Refugee (Green) Pencil Pod Wax Refugee Wax Stringless Greenpod
Bush Shell Beans	Dwarf Horticultural
Pole Shell Beans	White Kentucky Wonder
Bush Lima Beans	Henderson Bush
Beets	Crosby's Egyptian Early Wonder Long Season Detroit Dark Red Early Model
Broccoli	Italian Calabrese
Cabbage	Golden Acre—Early Copenhagen Market—Early Enkhinzen—Midseason Danish Ballhead—Late Flat Dutch—Late
Carrots	Nantes—Coreless Chantenay Danver's Half-Long
Cauliflower	Early Snowball Dwarf Erfurt Matchless Spring (Extra Early)
Celery	Golden Self-Blanching (Early) Easy Blanching Giant Pascal
Sweet Corn (Early)	Golden Bantam (Yellow) Gills Early Market (White) Banting (Yellow) Sunshine (Yellow)
Sweet Corn (Midseason)	Howling Mob (White)
Sweet Corn (Late)	Evergreen Bantam (Yellow) Country Gentlemen (Late White) Stowell's Evergreen (Late White)
Cucumbers	Davis Perfect (Slicing) Long Green Boston Pickling (Pickling) White Spine
Egg Plant	Black Beauty
Kohl-Rabi	White Vienna
Lettuce (Heading Type)	New York or Wonderful (Main crop in state—crisp head type) Wayahead (Butterhead) Mignonette—Small crisp heading (early)
Lettuce (Leaf)	Grand Rapids
Cantaloupes and Muskmelons	Hale's Early Hearts of Gold Pollock (10-25) Honey Dew Honey Ball Greeley Wonder
Onions	Ebenezer—for production of sets Danver's Yellow Globe Mountain Danver (Main crop) Prizetaker Sweet Spanish or Valencia (Main crop) Denia Gibraltar
Parsley	Moss Curled
Potatoes	Early Ohio Triumph Cobbler Rural New Yorker
Parsnips	Hollow Crown Guernsey

Peas	Laxton's Blue Bantam Dwarf Perfection Nott's Excelsior Dwarf Telephone
Peppers	Long Red Cayenne (Hot) Harris Earliest Panama (Pimento) Sunnybrook Oshkosh
Pumpkin	Small Sugar Summer Crookneck or Summer Straightneck Table Queen or Des Moines Early White Bush Scallop
Radish	Early Scarlet Globe French Breakfast White Icicle Long Scarlet Black Spanish (Winter radish)
Spinach	Long Standing Bloomsdale (Early) Juliana King of Denmark New Zealand (Late)
Squash	Delicious Hubbard Prolific Marrow Hubbard Kitchenette
Sweet Potatoes	Yellow Jersey Nancy Hall
Swiss Chard	Fordhook Giant
Tomatoes	Earliana (Early) Early Jewel Bonny Best Marglobe (Wilt Resistant) Greater Baltimore Globe Stone Ponderosa
Turnips	Purple Top Milan
Watermelon	Red Top White Globe Kleckley Sweet Tom Watson Fordhook Early

### Harvesting

The time to harvest vegetables in order to secure high quality, is largely determined by the stage of growth. Quality in vegetables is of importance to the home gardener and it varies widely according to the kind of crop grown, weather conditions and cultural care given during the growing of the particular crop

Peas, sweet corn and snap beans lose quality quite rapidly after harvesting and should be used as soon as possible after being removed from the plants. Harvesting should not be delayed until they have reached full size, as there is a considerable lowering of the quality by the delay. There is no definite rule to follow in harvesting for the highest stage of edibility. Experience is of value in this connection.

The root crops, such as radishes, carrots, beets and turnips, should be harvested when small, for quality. There is a definite relationship between size and quality, the smaller the root the higher the quality.

During periods of hot or wet weather, head lettuce will become worthless in a short time and it should be harvested as soon as heads are firm and compact. Cauliflower will also deteriorate rapidly and the heads should be cut as soon as they are of good size and well blanched.

Cabbage and celery will stand some frost but should be harvested before severe weather sets in. Potatoes must be dug before there is danger of tubers freezing. Parsnips may be left in the soil all winter and harvested in the spring, altho it is advisable to have a small quantity in storage for use during the winter.

### Storage of Vegetables

There are many vegetables which can be stored profitably for use during the winter months, and there is less work and expense involved in storing than in canning or drying. It will assure a fresh supply of vegetables during the winter and will reduce the grocery bill.

**Root Crops.**—Root crops that can be stored easily are potatoes, beets, carrots, parsnips, winter radishes, kohlrabi and rutabagas.

In selecting roots for storage, discard (1) immature roots, (2) large overgrown specimens, (3) irregular and sprangly shaped roots, (4) cut and bruised roots. Select the medium-sized mature roots. In cutting the tops off, be careful that the cut is not close to the root. All root crops require about the same storage conditions and can be stored together. The storing should not be done until late fall, so that the vegetables have ceased to grow. Miniature roots will not keep well and the large specimens are apt to be tough and woody.

There are four types of storage that may be used, depending on the quantity to be stored, namely: (1) Outdoor pit, (2) outside cellar, (3) house cellar, (4) commercial storage cellar. The outside pit cellar is a good one for the home gardener to use.

1. **Outdoor Pit.**—Take surface soil off to a depth of 6 to 8 inches, in shape of rectangle. Place a thin layer of straw on inside edges of the excavation. The roots are then placed in a pyramidal form. The width of excavation should be 4 to 6 feet and the length as long as is necessary for quantity to be stored. Cover piled vegetables with straw 12 to 18 inches thick. Cover with 2 or 3 inches of soil at first, then 4 to 6 inches in proportion to the approach of cold weather. For ventilation, after first storing, make an opening at the base, and one at the top to permit circulation of air. When cold weather sets in, cover ventilators. This method is used for storing large quantities, where the grower wishes to keep them until spring.

A large barrel or heavy box may be placed in the ground in such a position as will make it convenient to get into during freezing weather. A pit may be dug so that the barrel or box can be placed in a semi-horizontal position. The box can be covered with a lid or the barrel with the barrel head. The container may be covered with straw and dirt in sufficient layers to protect the roots from freezing. This is a handy method of storing small quantities of root crops, and can be used in any small backyard garden.

2. **Outside Cellar.**—Provide boxes of sufficient size to hold quantity of vegetables desired. In the bottom of the box place a layer of fine moist sand (not wet), 2 inches deep. Place a layer of vegetables and then another layer of sand about 1 inch deep. Continue until the box is filled. Place box in a cool cellar. When the top layer of sand shows signs of drying out, sprinkle it with water to keep it moist.

3. **House Cellar.**—Vegetables may be stored loose in bins in the cellar, when large quantities are stored. Air in the cellar must be kept moist, properly ventilated and the temperature right. Vegetables may be stored in piles and covered with moist sand if there is sufficient room in the cellar and the temperature can be kept low.

**Celery Storage.—Trench Storage.**—Dig a trench about 1 foot wide and as deep as necessary so that the tops of the stalks are close to the surface of the ground. The plants should be pulled with most of the root system left on, and set vertically and close together in the trench. The top of the trench can then be covered with straw or strawy manure. Some gardeners nail two 1-by-12-inch boards together to form a trough and invert this over the trench. The roots of the plants in the trench should be set in moist soil so that there will be some growth made during the storage period. Store the celery that is free from disease.

**Cabbage Storage.—Pit Storage.**—The cabbage plant is pulled with the roots attached, and after removing a few of the outside leaves the head is placed down in the trench. The trench is about 6 to 8 inches deep and wide enough for 3 or 4 heads and as long as necessary. On top of the first row of heads placed in the trench, 2 more rows may be placed between the stems of the first row. A layer of straw is put over the cabbage and a layer of soil placed on top of the straw. More soil may be added as the winter weather becomes more severe. Small quantities may be stored in a cool cellar. It is important that the temperature be kept low.

**Onion Storage.**—1. Store only mature, well-cured, bulbs (very important).

2. Require plenty of ventilation, store in shallow boxes or crates not over 3 or 4 layers per crate.
3. Temperature should be around 32 to 40 degrees F. High temperatures are undesirable.
4. Air should be dry.

**Squash Storage.**—Store well-matured individuals. Test maturity by hardness of the shell. When impossible to dent the shell with thumb nail, they should be all right for storage. They require warm temperature and dry air. Temperature 60 to 80 degrees F. The furnace room is a good place to store squash.

**Pumpkin Storage.**—Pumpkins require cool, medium-moist air, and rot easily if too warm or if the air is too moist. Temperature 40 to 60 degrees F. Too dry air makes pumpkins shrivel. Do not pile in cellar; place on shelves, same as with squash.

### Acknowledgment

The author wishes to acknowledge his indebtedness to Dr. E. P. Sandsten for helpful suggestions, to C. H. Metzger for the portion on potato growing and to G. M. List of the Entomology Department for the "Table of Garden Insects and Methods of Control."

### List of Available Bulletins of Interest to Vegetable Growers

Colorado Experiment Station, Fort Collins, Colorado.

No. 278—Degeneration in Colorado Potatoes.

No. 309—High-Altitude Vegetable Growing (Head Lettuce, Cauliflower and Peas).

No. 311—Tipburn of Lettuce.

No. 312—Harvesting and Marketing Cantaloupes and Honeydews.

No. 314—Potato Growing in Colorado.

No. 321—Soil Sterilization for Seedbeds and Greenhouses.

No. 323—Common Diseases of Colorado Truck Crops.

No. 328—Hotbeds and Coldframes.

No. 331—Some Edible and Poisonous Mushrooms of Colorado.

Colorado Extension Service, Fort Collins, Colorado.

No. 121 —Farm Storage of Apples and Potatoes.

No. 163A—Marketing Colorado Cabbage.

No. 208A—Potato Seed Selection.

No. 300A—Small Fruits, Raspberries, Blackberries Currants and Gooseberries.

No. 303A—Lawns.

Division of Agriculture, U. S. Department of Agriculture, Washington, D. C.

Farmer's Bulletin No. 204—The Cultivation of Mushrooms.

Farmer's Bulletin No. 220—Tomatoes.

Farmer's Bulletin No. 289—Beans.

Farmer's Bulletin No. 345—Onion Culture.

Farmer's Bulletin No. 433—Cabbage.

Farmer's Bulletin No. 829—Asparagus.

Farmer's Bulletin No. 879—Home Storage of Vegetables.

Farmer's Bulletin No. 937—The Farm Garden in the North.

Farmer's Bulletin No. 1044—The City Home Garden.

Farmer's Bulletin No. 1269—Celery Growing.

Farmer's Bulletin No. 1242—Permanent Fruit and Vegetable Gardens.

Farmer's Bulletin No. 1291—Preparation of Fresh Tomatoes for Market.

Farmer's Bulletin No. 1325—Marketing Onions.

Farmer's Bulletin No. 1594—Preparation of Bunched Beets, Carrots and Turnips for Market.

Farmer's Bulletin No. 1563—Cucumber Growing.

Farmer's Bulletin No. 1609—Lettuce Growing.

Department Bulletin No. 1427—Dryland Gardening at the Northern Great Plains Field Station.

Technical Bulletin No. 75—Crop-Plant Stimulation with Paper Muleh.