

TEXAS DEPARTMENT OF AGRICULTURE BULLETIN

Published by the Texas Department of Agriculture, Austin, Texas.

August, 1927

No. 88

GROWING AND MARKETING TEXAS VEGETABLES

By

L. A. SEYMOUR, Director of Markets
J. AUSTEN HUNTER, Market News Specialist



GEO. B. TERRELL
Commissioner of Agriculture

Entered as second-class matter, May 8, 1909, at the Post Office
at Austin, Texas, under the Act of June 6, 1900



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PREFACE.

The title of this Bulletin indicates its purpose. It has been prepared to meet a constantly increasing demand for information of this kind.

It treats of the growing and marketing of the most important vegetable crops raised in this State, in such a manner as to be easily understood by the average reader.

The process of growing and marketing each particular crop is so condensed as to require very little time on the part of the beginner to secure the information necessary to enable him to engage in the production of these crops.

The rapid development of Texas in an agricultural way and the influx of population from other states to engage in truck farming in our rich soils and mild climate, have created such a demand for correct methods of cultivating and marketing vegetable crops that this Bulletin was prepared especially to meet this growing demand.

Mr. L. A. Seymour, Chief of the Division of Markets of the Department of Agriculture, and Mr. J. Austen Hunter, Market News Specialist of this Department, are the authors of this Bulletin. Special credit is due Mr. Hunter for the preparation of the manuscript. Their experience in supervising the inspection of vegetables for the markets, and in collecting and disseminating market news information has given them an insight into this work that enables them to treat the subject intelligently from a practical standpoint.

They have received valuable assistance from various parties in the preparation of this Bulletin which assistance is gratefully acknowledged. A splendid article on the growing of onions, prepared by a successful grower, is included in this Bulletin and valuable information from other growers is used without naming them, for the reason that competition is keen among growers, and we do not desire to be placed in the embarrassing attitude of mentioning the names of some growers to the exclusion of others who are competitors and successful growers.

We trust that this Bulletin will fully meet the demand for its publication, and that those who receive it will find the information necessary to enable them to successfully grow and market the truck crops which grow so profusely in this State, and which are now advertising Texas throughout the United States as one of the greatest producers of early fruits and vegetables.

GEORGE B. TERRELL,
Commissioner of Agriculture.

BERMUDA ONIONS.

In the growing and marketing of onions, Texas occupies a unique position. The first Bermudas of the entire United States come each year from Southern Texas. They are available for a spring consumption that is active, until late in the Texas season when California and Louisiana compete. Of recent years, imports of onions from Egypt and Spain have offered troublesome competition and growers and marketers of the Texas Bermudas should study annually growing conditions in that country and prospective competitive tonnage as well as the carry-over in storage of the crops of late producing states. All of this information is published at the opening of the season by the cooperative State-Federal market news service.

Planting and Growing.

The Yellow Bermuda and the Crystal White Wax are the two most recognized types of Bermuda onions grown in South Texas, and, as a general thing, the bulk of the plantings is of the Yellow type. In North Texas, both of these types are also grown, but there is a tendency to show considerable favor to the Prizetaker variety and an appreciable share of the Collin County tonnage each year will be found to be of that kind.

The growing of plants commercially on a large scale has somewhat discouraged the individual planting of seed beds, particularly so since this method of starting the crop gives the commercial onion grower a safeguard against possible inferior seed and consequent unsatisfactory germination; and furthermore gives him an eighty to ninety day later planting date in which to study the market outlook and decide on the size of the acreage to be set. Most large growers still raise their own plants, however.

The Seed Bed.

Those who do plant their own seed beds should first float the onion seed in water, throwing aside the light seed and drying the heavier seed carefully so that handling through the drill will be facilitated. This floating should be done the day the seed is sown since the moisture tends to start germination. Approximately thirty pounds of seed should be planted to the acre of seed bed. Where the beds are grown under irrigation, the rows should be 12 inches apart, but if irrigation is not to be employed in the handling of seed beds, the rows should be fully 15 and preferably 18 inches apart and eighteen to twenty pounds of seed will be found sufficient to plant the acre. Whether irrigated or dry farmed, frequent cultivation of seed beds will be found essential.

Transplanting.

The plants should be ready for transplanting to the field in from eighty to ninety days, occasionally, under ideal conditions,

slightly earlier. Only strong healthy plants should be used and these only when they have reached approximately the size of a slate pencil.

At transplanting, top the plants at least half of their growth and trim the roots to not more than a half inch. If the crop is to be grown under irrigation, and by far the greater portion of the Texas crop is so grown, set the plants in 12-inch rows and from $3\frac{1}{2}$ to 4 inches apart. Rows of 15-inch width are occasionally used, particularly if cultivation is to be carried on by horse or mule. In the dry farming areas rows should be not less than $2\frac{1}{2}$ to 3 feet apart and there should be a full 4 inches between plants in the row. If the season prior to the transplanting has been especially dry and the grower fears a continuation of the drouth, an even greater separation of rows and plants may occasionally prove profitable.

Cultivation.

The cultivation of onions requires a great deal of intelligent consideration on the part of the grower. Two things are paramount—frequent cultivation to prevent the forming of a crust and packing of soil, and active attention to the elimination of weeds. The first few cultivations after transplanting, may be deep, but after that time an examination should be made of the roots to determine any tendency toward the development of roots close to the surface, and as soon as this growth is noted, cultivation should be shallower and done with great care to avoid cutting the surface root system.

Irrigation.

No set rule can be laid down for the handling of irrigation waters during the growing of the crop. At no time should the plants be allowed to suffer for moisture, but sufficient care must be employed to avoid over-irrigation, particularly so at the early bulbing stage when too much water has a tendency to encourage the development of bottle necks and the growth of tops. Inopportune rainfall will occasionally have this effect, but for the most part, the Texas crop is grown in a section where rains at the bulbing season are the exception rather than the rule. When bulbing becomes general in the field, irrigation should be employed to finish the crop off, but care should be exercised to see that this last watering is done well before the harvesting date, since otherwise hot sunshine will cause sunscald and also affect the carrying quality of the onions.

Harvesting.

The bent or broken stems or tops indicate maturity and when thirty to forty per cent of the tops in the field are thus turned down and the necks close to the ground are soft, the crop should



Fig. 1.—Field of Matured Onions. Note Broken Stems.

be plowed out or pulled. The onions should be allowed to lie in the windrows exposed to the sun for one or two days during which the tops are clipped to a half inch stump and the roots are cut close to the bulb. Sheep shears are generally used for this purpose. The onions should then be gathered, graded carefully for size and condition, packed in slatted bushel containers which permit generous ventilation, and loaded into ventilated railroad cars. The standard bushel crate is used almost exclusively for the handling of Bermuda onions, but some of the North Texas Prizetakers and other varieties are packed in 100-pound sacks. This represents a minor share of the crop at present, however. The commercial production of onions varies from 200 to 250 bushels to the acre.

Marketing.

A normal season in Texas will see the movement from the Southern portion of the State of from four to five thousand cars. In 1926, 5,335 cars were rolled from all points in the State, including, however, 489 cars from Collin County, much of which was Prizetaker stock. These cars represent loadings of approximately 530 bushels each, or 250 hundred-pound sacks. A very large share of the Texas crop moves to the far Northeast with New York, Boston, Philadelphia, among the outstanding markets. Kansas City, St. Louis and Chicago in the middle West, of course, draw their share from the Texas producing areas and when storage stocks of Mountain Danvers in Colorado and the West clean-up early, there is some movement in that direction. The main sources of competition are from old-crop onions carried over in storage and competition from Egypt—both of these in the early stages of the season. The closing days of the Texas movement sometimes meet severe competition from the Bermudas of the Coachella Valley of California and the Bermudas and Creoles of Louisiana. It frequently happens that in the marketing and distribution of her crop, Texas is her own worst enemy, in that there is a tendency to peak shipments and break the price level, rather than move the stock more evenly throughout the season. To overcome this, growers and shippers of recent years have cooperated to the extent of limiting the car-lot movement to a definite maximum and the success of this effort is one of the most important developments in marketing of recent times. While there is some slight storage required in terminal markets in the handling of Texas Bermudas, the crop as a rule is moved into direct consumption, its chief value lying in its availability as a spring vegetable at a time when such are none too plentiful. Various types of selling are employed in marketing the crop. Some growers plant acreage on contract with money advanced for seed; some sell in the field at so much per bushel, the crop to be harvested by the purchaser. Those capable of loading cars most frequently sell either to cash buyers or on telegraphic order, subject to terminal inspection, and during certain seasons the cars are moved on consignment to terminal

markets for handling to best possible advantage. Like most Texas shipments that seek Eastern markets as their outlet, St. Louis is the clearance gateway and many cars are sold f. o. b. that point, or rollers passing through there are sold f. o. b. loading station. The major season is a short-lived one, opening as it does in April and closing in June.

ONIONS.

(The following article was prepared by a successful onion grower.)

The growing of Bermuda onions in a commercial way in Southwest Texas reached large proportions about 1904. There were a few small commercial crops prior to this time but the industry did not get under headway before approximately that year.

Only two varieties of the Bermuda—the Yellow and Crystal Wax—are grown in South Texas and these are sufficient to fully take care of all market requirements. Many seedmen and plant growers have been listing their Yellow Bermuda seed and plants as White Bermudas and very frequently buyers securing their seed and plants from the lesser responsible agencies have been disappointed in their purchases when they raised their crop of presumably White Bermudas and found they had produced the yellow variety.

Seed From Canary Islands.

Our commercial supply of reliable Bermuda seed is purchased from the Canary Islands (Spanish provinces). The seed there are all harvested and shipped us during the months of July and August, moving, for the most part from Puerta Cruz, located on the Island of Teneriffe which grows a large percentage of these seed. The Isles of Las Palmas and Gumar also grow these seed in commercial quantities but custom accepts them as Teneriffe grown.

From all seed which we receive from this source, we have but little trouble as to variety, although sometimes we get them mixed wax and yellow. As a usual thing, however, they run true to type. Occasionally seed runs very low in germination, this trouble being due either to the mixing of old seed with the new crop or from faulty methods employed in harvesting and curing. Commercial growers are very particular in the purchase of their seed and demand them in the original containers as packed in the Islands, showing all import and export marks to assure their being genuine Teneriffe grown seed. These seed are always put up in tin lined boxes containing from 20 to 100 pounds net per box, which makes it convenient for every class of grower. There are reliable seedmen in the United States who handle Teneriffe grown seed and sell them in small



Fig. 2.—Loading a Ventilator with the Texas Standard Bushel Crates.

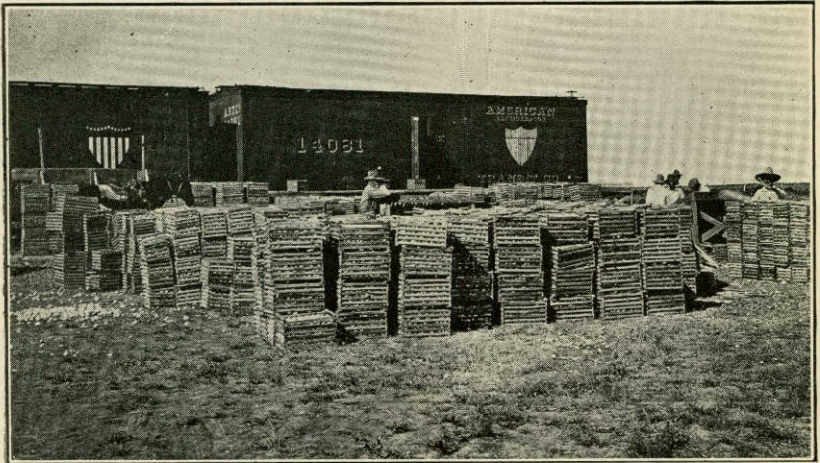


Fig. 3.—Grading Texas Onions to Meet Requirements for Shipping Point Inspection Certificate.

quantities to their trade, the prices ranging from \$2.50 to \$4 per pound for the Yellow variety and from \$4 to \$7.50 for the Crystal Wax variety. The price to commercial growers in large quantities where they have been contracted months ahead for the coming season is around \$2.50 per pound for the Yellow and \$4 for the Crystal Wax. Frequently the Islands, claiming a seed shortage, advance their prices just as much as the traffic will bear, which, of course, depends on the outlook for the market.

Preparation of the Soil.

The preparation of the soil for future crops begins almost as soon as the crops are harvested in April and May, and by the time planting time comes around again a well prepared seed bed is ready. This bed should be well and deeply broken not later than June, kept clean of weeds and other growth by frequent discing in order to have a well formed bed and well mulched to aid in the germination of seed.

After we have kept the seed bed plat conditioned during July and August, the latter part of August or the first days of September, we put up borders about 12 feet from center to center and about two hundred feet in length, disc and level each bed with from two to four inches of fall to each bed so that the water will move over it. We then put in the irrigation laterals and last plant the beds in rows of about twelve inches width with seed at the rate of about thirty pounds per acre. We want the seed beds to be in best possible tilth and plant the seed just as shallow as possible and have them covered. We then irrigate them and on the third days follow with another irrigation, and as they begin to show through, or the ground crusts, we continue to irrigate them as necessary to bring them up. After they are up, irrigation is only applied as necessary to keep them growing rapidly which will have to be determined by the character of the soil and prevailing weather conditions.

To have the greatest success, it is necessary to cultivate the plants shallow and frequently between each watering and not to allow weeds or grass to get any start over them. To beat grass and weeds, always select ground that has been kept clean for nothing destroys a stand of onion plants so much as having to pull out of them a heavy crop of grass or weeds. About 55 or 60 days after planting, they should be about the size of slate pencils and ready for transplanting to the field. An aged seed bed plant is inclined to split, double or bottle neck and to avoid as many of these as possible we try to do our planting from September 15 to 25th in this (Laredo) section, and begin transplanting to the field around November 10.

Transplanting.

After the plants have reached the size and age for transplanting, they are pulled and the tops cut back to about three inches.

They are transplanted either in beds prepared similar to the seed beds or in rows about twelve inches apart and three and a half to five inches in the drill. As soon as transplanting is complete, irrigation is employed to firm the ground around them and start the growth. A few days later when the ground cracks open from the first watering they are irrigated again and from then on frequent and shallow cultivation is given the plants. A grower must watch his soil closely in order that he may cultivate before it hardens and breaks up in clods. Many growers use hand cultivators, others use three-row plows to which they hitch a small mule and in cultivating three rows at a time are enabled to handle a much greater acreage at a small cost.

In the preparation of seed beds and land for planting, some growers put down fertilizer ahead. In the seed beds they use from 800 to 1200 pounds per acre and in their field plantings some growers use more.

Harvesting.

The harvesting period normally begins in the Laredo section around April first. When the tops begin falling and show one-half down and the balance with limber necks, we begin digging.

These onions are plowed up and placed on the borders for one or two days sunning and are then clipped of tops and roots and cleaned and graded and loaded for shipment. The past few seasons state-federal inspection has been had and the shipper gets a grade certificate showing condition and grade and on these certificates we make our track sales. I consider that this inspection has done more for the good of the industry than any one step we have taken for now it is possible to sell everything that bears a certificate at loading station for the market price on the day of loading and it is only going to be a very few more seasons until a certificate will be absolutely necessary to make a track sale.

Causes of Crop Failures.

Bermuda onion crop failures are caused by weather conditions which cannot be controlled by man, or by Thrips (onion lice). Lice seem to affect us most when we have had a dry cold winter. Many growers have found that by cleaning their fields during the summer of all volunteer onions, thrips are not so damaging. Others use Nicotine dust on their seed beds which also keeps them down. Should the crop show many thrips, the lice can be controlled by dusting with this dust every eight days for three or four dustings. Since the Nicotine dust is rather expensive, many growers prefer taking a chance rather than incur the expense.

Pink root is another cause of crop failure. I have never fully decided the cause of this trouble. Some claim it gets in the ground and it takes several seasons and a change of crops to eradicate it. Others claim it is caused by heavy and continuous

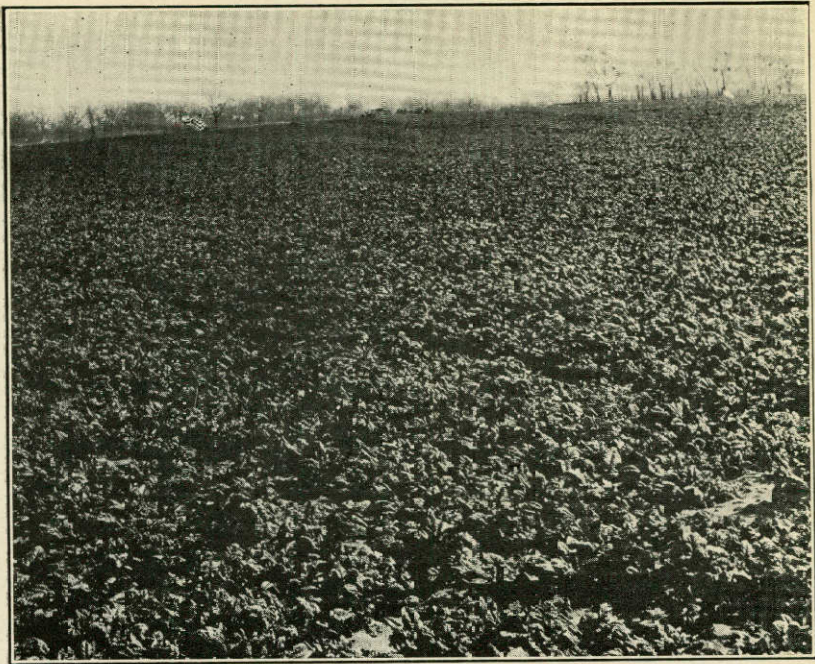


Fig. 4.—A Field of Dry Land Savoy Spinach at Austin.



Fig. 5.—Cutting the Tap Root. This Is the Second Cutting Over of This Field.

growing of onions on the same soil, but while this may encourage it, I have seen new ground that never had been planted to onions, infected with this trouble and I have also seen onions grown on a piece of land absolutely free of pink root where the year previous the crop was practically a failure from this trouble. So the definite cause of this trouble is still a matter of considerable doubt.

Soil Types Suitable for Onions.

Onions are heavy feeders and require rich soil to produce heavy tonnage. A well drained plot that is rich will make them and apparently it makes little difference whether it is loose or tight soil. As a matter of fact some of the best onions I personally ever grew were produced on tight natured land rich in humus and with good under drainage.

Dry Farming.

This experience is from irrigated farming and for dry land the methods may be changed to some extent but I believe the basic principles are the same. Cultivation will be practically the same and in transplanting for dry land, more care will have to be exercised in putting the plants in the ground and firming the soil around each one before leaving it. Under irrigation this is not so necessary for the reason that the water does this part of the work to complete satisfaction.

SPINACH.

There is something of romance in the fact that the development of Southwest Texas from cattle ranches to irrigated truck farms is best shown in the development of the spinach industry in Texas. In 1920, less than a thousand cars of spinach were moved from the State of Texas and in 1927 over five thousand cars were rolled. Crystal City in the heart of the newly developed South Texas area shipped not a car in 1920; but six years later rolled 2,565 cars and by 1927 the growing of spinach for market had extended from comparatively small plantings at Austin (in Travis County) to 10,000 acres, over three-fourths of which was in the section immediately below San Antonio, in what is known as the Winter Garden Area, or in the parlance of some years back "The Upper Counties." Production is noted now even as far northeast as Texarkana and as far west as the El Paso Valley (the movement from which, however, is billed Mesilla Park, N. M.). Since production in Texas is chiefly to meet a certain timeliness of demand, the important commercial production may be said to be confined to the southern portion of the State, bordered by Austin in Travis County on the north, Wharton and Sugarland on the southeast, Laredo on the south-

west and the Rio Grande River. It is this section which ships actively in the dead of winter time.

Planting and Growing.

Since a very appreciable quantity of spinach is grown as a dry land crop and in the irrigated sections, two distinctly different systems of growing the crop are utilized, it might be well to give particular consideration to the preparation of the soil.

First of all it is essential that the land be thoroughly broken and deeply plowed. The theory that shallow plowing makes for an early stopping of the tap root and a prompter development of the leaf system is discounted by the more successful growers, who insist on deep plowing to conserve all possible soil moisture.

If the crop is to be grown without irrigation, land with a good subsoil should be selected, deeply plowed and thoroughly pulverized. The seed is then either sown broadcast or drilled in rows, using as high as 16 pounds to the acre in the former case and around ten pounds to the acre in the latter. Some large growers, who plant broadcast, make it a practice to seed 14 to 16 pounds at first planting and 10 pounds at second planting or after the first crop is removed from the land. Certain marketing practices to meet peculiar demand conditions and which will be explained later are responsible for this. If it is decided to cultivate the broadcast-sown spinach, gang plows, such as are used in setting up onion rows are run over the field, throwing most of the seed into ridges and permitting cultivation later. However, in a number of sections where broadcast planting is employed the crop is given no further attention until harvesting time and for the first three or four years of successive planting on new land fairly good crops with, however, a gradually dangerous increase of winter weed, will be secured. In cultivating the dry land spinach which has been thrown up in rows, only very shallow plowing should be employed, although in the black land area somewhat deeper plowing may be essential to keep the plants from yellowing.

If the crop is to be grown under irrigation, the land should be prepared in beds. In one type of growing, where furrow irrigation is employed, the seed is sown in double rows on these beds. In the other the seed is sown broadcast and borders are then thrown up so as to permit flooding. Under this latter system the plants are even grown on the borders themselves.

Two types of spinach are grown commercially in Texas—the Bloomsdale Savoy or Curly spinach and the Viroflay or flat leaf spinach. The first type is becoming more and more universal in the State on account of its general acceptability on the market. However, since Chicago, Denver and Detroit pay certain premiums for a moderate quantity of the flat leaved variety, there is an appreciable quantity of this grown in certain sections of the State.

The frequency of irrigation is a matter of purely local determination. Different soils require different degrees of mois-

ture, and, of course, rainfall during the growing season must be considered. Cultivation should follow each irrigation so as to prevent the baking of the soil around the plants.

As a general rule the first seed are sown in the opening days of October. The more experienced growers generally wait for the first cold snap of the fall season since otherwise insect life may cause a poor stand to develop. The market outlook, particularly the progress of the Virginia season, is however, an even greater determinant in setting the starting date for the planting of the crop.

Harvesting.

On an average, eighty days after the seed go into the ground, the crop is ready for harvest, but quite frequently, particularly in the early season or during periods of active demand, the plants are cut sixty to sixty-five days after sowing the seed, and it sometimes happens that due to blight or freezing weather, it takes as long as 100 days to mature a crop. This latter is an extreme, however.

While various practices are employed, the most generally accepted method of harvesting is for the individual to grasp the plant with his left hand, severing the tap root with a butcher knife held in the right. Approximately an inch of tap root should be left attached to the plant to insure the leaves not being torn apart in the handling process. As the plant is brought up to be placed in the field container, dead leaves and clinging soil are removed, so that only good edible leaves are left attached to the severed root. Where early in the season heavy seedings are made, it is generally the practice to "cut over" the field two or three times, taking only the larger plants each time and thus permitting the remainder more growing room. As the season progresses and the crop develops seed stems, care should be taken to remove these from the pack as they lower the grade and are generally unacceptable on the market except in very brief periods of excessive demand.

The bushel basket is used almost exclusively in Texas for spinach, although in other states the barrel is employed quite frequently. So as to make for a minimum of handling, which is always desirable in the processing of vegetables, much of the crop is packed in the field as it is gathered, the baskets being loaded on special trucks, hauled to the railroad platform, where a scoopful of crushed ice is placed in the middle of each basket. Thus a minimum of the plants are bruised, and decay in transit is held low. However, in the older producing sections, the practice of washing is still employed. In these communities, field baskets are employed for handling the harvesting, each cutter dumping his bushel load into a high slatted truck which when loaded is driven to the packing shed, onto a platform of which the spinach is pitchforked, later to be dumped into vats of water, and forked through to a lower level accessible to the packers, who fill a bushel basket half full with the freshly

washed spinach, then drop in a scoopful of crushed ice, then fill the container with spinach and place the top on. From 18 to 20 pounds of spinach are placed in the basket. Some successful shippers make it a policy to weigh a minimum of 20 pounds of dry spinach to the basket in the field, since this eliminates difficulties of slack pack, the usual result of a too generous application of crushed ice which, of course, is melted in transit. As a general rule 10 to 12 pounds of ice are placed in the middle of the basket.

In loading the cars, it will be found that on an average 828 bushels will make a carload. This makes a load six rows wide and six tiers high and 23 baskets long. Express cars hold somewhat more than the freight refrigerators, but except for emergency market demands the tendency is away from express handling. Each alternate basket in the row is placed upside down.

As a general thing, particularly in those sections that do not wash the spinach (washing has somewhat the same effect as precooling), from one to two tons of "slab" ice are placed over the top of the load in the cars. This insures better carriage, the melting ice dripping down through the baskets supplementing the bunker icing of the car in refrigerating the shipment.

Marketing.

The marketing of spinach affords many complexities. Its distribution range is wide, extending as it does from Denver on the west to New York and Boston on the east and Canadian points on the north. The crop has for competition the production of Virginia and the Carolinas and, as an exceptionally large portion of the Texas production goes to markets to which Virginia and the Carolinas have material advantages from a freight rate standpoint, the success of the Texas season is largely dependent on severe weather in those competitive producing areas.

Practically the entire commercial movement goes to market by way of St. Louis gateway. It is quite frequently sold fob that city; in fact, of recent years, nearly as frequently as it is sold fob the loading station. A generous share of the movement is also sold rolling since spinach demand is very sensitive and it requires quite a bit of "jockeying" to locate the best outlets. A price of 40 to 50c per bushel fob the shipping point will pay all expenses and a slight profit, the amount of profit, of course, depending on the yield per acre, harvesting expenses, etc. An estimate of normal expense on a 350-400 bushel yield shows a distribution as follows: Raising and handling 5c, cutting 5c, basket 13½c, ice 5c, hauling 2½c. This omits many upkeep expenses in conjunction with packing equipment which should be counted.

Once in terminal markets and the seal broken, the car is sold to jobbers who take 50, 100 or more baskets each. Care has to be exercised in transporting the spinach from the cars to the distributing houses to see that the spinach is protected from

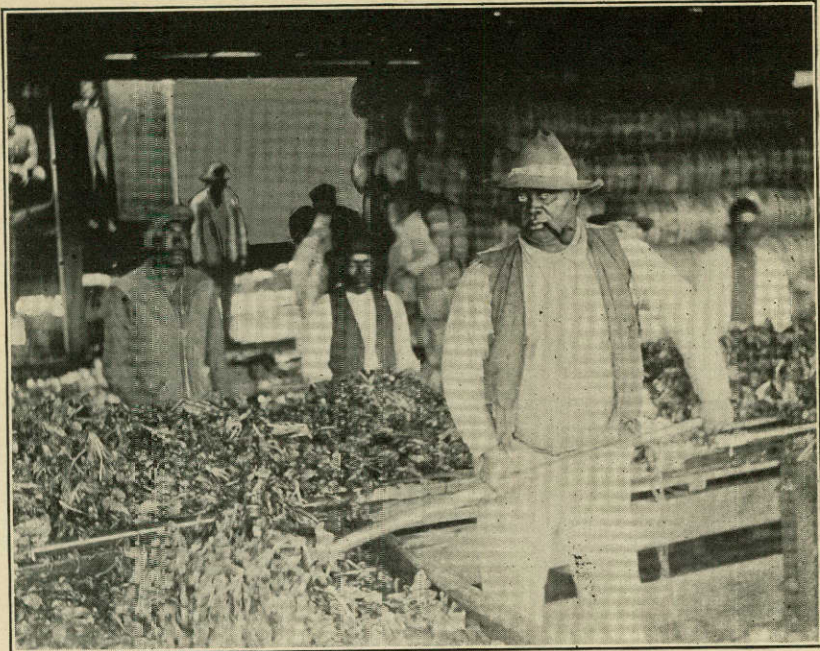


Fig. 6.—Washing Spinach Is a Form of Pre-cooling. Note Packing Hands in Foreground and the Loading Car in the Back.



Fig. 7.—Field Stack Waiting for Truck or Wagon to Pick Up and Haul to Car. Watermelons Should Never Be Stacked on End, Always on Side as Grown.

freezing for the Texas crop is marketed in the winter months chiefly, when vegetables in northern markets are extremely limited. Sometimes it happens that blizzards will prevent the unloading of cars for a few days resulting in the accumulation of shipments and the breaking of a market when weather does permit unloading.

WATERMELONS.

In the growing and marketing of watermelons, Texas ranks second in the United States and for earliness of production is preceded normally by only Florida, the competition of which is never severe in middle Western markets. So it will be seen that both in the State and out, Texas' watermelon crop is of great importance.

Planting and Growing.

In preparation for the planting of the seed, the soil should be well broken to a depth of five or six inches, depending on the depth to the subsoil. It will be found that a deep sandy loam, with a red clay subsoil is particularly desirable for the growing of watermelons for such a soil has a tendency to hold moisture for longer periods and to prevent the development of white heart which is caused by a resumption of growing later in the season when a droughty soil has forced the melons to a degree of maturity. The rows should be laid off eight, ten or twelve feet apart, then cross-plowed at right angles, so as to make approximately square hills in which to plant the seed. If stable manure is used for fertilizer, and where available this is very desirable, it should be thoroughly mixed in the soil where the melon seed are to be placed. It is essential that this be done some weeks before the actual planting so that the plant food may be thoroughly assimilated by the soil. Frequently a post-hole digger is used for this purpose. Occasionally the fertilizer is broadcast over the entire field and this is to be desired if there is sufficient fertilizer to permit. Some growers place the commercial fertilizer in deep furrows, then bed the soil back onto it, at least two weeks before planting date. In the event commercial fertilizer is used, it may be supplied at the time of planting or soon after the plants are up and growing. The kind and proportion of such fertilizer depends, of course, on the plant food requirements of the soil which should be studied.

In the selection of seed, the greatest care should be taken to insure the use of seed from melons that the previous season had all the desirable characteristics of weight, shape, color and texture of fruit. If the grower has no seed saved himself, he should make sure of the reliability of the seed house from which he purchases his requirements and should bear in mind that poor seed are always expensive, regardless of the price. Of the com-

mercial varieties produced, the Tom Watson leads in its marketability and this is the variety chiefly grown in the State. The Irish Grey is becoming increasingly popular, but since it carries less satisfactorily than the Watson, commercial handlers prefer the Watson. A large variety of other melons are produced for nearby markets, but not to any appreciable commercial extent.

The actual planting date depends on the progress of the season and the possibilities of escaping killing freezes. Most growers plant their seed just as soon as the soil is warm enough to insure germination, and in the event of low temperatures, occasional growers cover the tender vines with paper caps, which, incidentally, also serve to prevent aphid infestation from spreading in the field. As soon as the plants are well up, cultivation should commence and it will be found that the vines react well to thorough and frequent cultivation by section harrow or other pulverizing implements which stir the soil not only immediately adjacent to the plant but in the entire acreage, thus releasing all possible plant food to the vines. As the vines take on growth, constant pruning of sucker runners will be found advisable and as the fruit sets, it will be found essential to remove all but three or four of the healthiest melons to avoid the production of inferior and small sized stock which is difficult to market.

Harvesting.

When melons approach the condition of complete ripeness, they should be clipped, not pulled, from the vines. A sharp knife should be used for this purpose and the cut should be made so as to leave a good length of stem attached. It is desirable as soon after clipping as possible that the melons be transported from the field to the cars, or else be placed in the shade. In hauling the melons, care should be exercised to avoid bruising by having wagon or truck bedded with hay, and internal injury to the fruit may be avoided by laying the melons down on their sides (just as they grew), rather than by stacking them on end as is so often done. Upon arriving at the car and before being placed, the stem of the watermelon should be reclipped to about an inch and then treated with a bluestone solution to prevent stem-end rot or any other infestation while in transit. It frequently happens, however, that this clipping and treating is done after the placing of each row in the car and this latter method may be somewhat more expeditious. The solution which is used is prepared as follows

Stem-end Treatment Solution.

Use an enamelware kettle and place therein $3\frac{1}{2}$ quarts of water and 8 ounces of bluestone and bring mixture to a boil over a good fire. While water is heating mix 8 ounces of starch with one pint of cold water, stirring until the milky solution is free from lumps. Just as soon as the bluestone is dissolved and the solution in the kettle is boiling, add the starch mixture,



Fig. 8.—Hauling Melons to Railroad Tracks for Loading.



Fig. 9.—A Field of Cabbage in South Texas.

pouring in a slow steady stream, stirring vigorously so as to prevent the formation of lumps. Continue to stir the entire solution for one or two minutes until the mixture thickens evenly. It is then ready to be placed on the stem-end of the melons with a small paint brush.

Loading.

Stock cars with ventilated openings slatted up to the top of the watermelon load are used for hauling watermelons, and these should be well bedded with hay or straw to absorb all possible shock in transit. Four inches of this padding will not be found excessive. The loading is started at end of car, placing end of melons to end of car, so that from eleven to thirteen melons (depending on size) are parallel to one another and to the sides of the car. Another row is then placed in front of the first one, with end of melon to end of melon. Then a row is placed on top of these first two rows, the melons resting in this instance half on the first row and half on the second and in such a way as to take advantage of the curvature between the melons for secure seating—in other words, resting on four melons. The half melon space in the back is usually filled with melons laid lengthwise or parallel to the end of the car and sufficiently packed in with hay to prevent bruising, but many prefer to pack this end entirely with hay or straw since much of the shock of switching and handling the cars is better absorbed in the complete hay cushion than when additional melons are placed at the end. This process of loading should be continued to the door of the car where the melons are placed in such a tight manner as to prevent the load from shifting, and with sufficient hay or straw to eliminate bruising. Where four layers are placed in the car, in some sections it is the custom to start the bottom layer of melons away from the end of the car about half the length of the melon, filling the intervening space with tightly packed hay. The layer on top of this is placed flush with the end of the car and so alternately to the top, thus giving a smooth appearance to the top tier. The heavier averages are usually packed three and four tiers high and the lighter averages five tiers high. As a result the car-lot watermelon markets of the North indicate the number of tiers as well as the average and price in quoting.

Marketing.

In a number of the larger producing sections of Texas, the farmers have grouped themselves together for the purpose of loading and marketing their melons and this is desirable since it is essential that each car be loaded as nearly as possible with uniform weight melons. Cash buyers operating in the shipping points may purchase the car immediately on its loading being completed, thus taking all the risk of marketing off the hands of the producer. Shippers, who grow no melons themselves, may purchase wagon lots from the farmers and distribute the

load among several cars according to weight. Some of the associations appoint their own marketing agents who direct the loading, shipping, selling and make returns less costs and a stipulated commission, and still others market through brokers who make it their business to find market outlets, charging a definite commission for their services. In a number of cases, the cars are consigned to a terminal marketing agent for selling to the best possible advantage and quite occasionally they are "rolled" with no market in sight, other than some diversion point such as Fort Worth, Kansas City or St. Louis, from which cities they are diverted to their final destination.

On arriving in the terminal market, if the city is a large one like Chicago, the cars are sent to the "watermelon tracks" where they are examined by the trade and purchased, later to be unloaded and distributed by jobbers, wholesalers and retailers to slicing parlors and consumers. If in a diversion market, such as Kansas City, the cars may be purchased on arrival and sent through to other markets, but if destined for local consumption, the jobber-wholesalers usually purchase only lots from the car, such as 100 melons, or more, which they take to their sales houses and later distribute to the trade that serves the consumers. In some of the still smaller markets the trading is right from the car door to the huckster's wagon, and in some instances cold storage warehouses take the entire carload and place it on ice to take care of stores and individuals of the territory they serve. Occasionally the auction type of selling is employed but not as frequently as in other commodities.

The early competition to the marketing of Texas watermelons comes from Florida and later competition from Georgia. By the time the season gets well under way the Carolinas are also shipping heavily and toward the close of the season at Weatherford, Oklahoma, and even Missouri may be active shippers. The normal distribution of the Texas crop is to the middle West and as far West as Denver. Shipments have been noted traveling as far West as Seattle, Washington, however, and as far Northeast as Philadelphia, but distribution in either of these sections is precarious for the California crop cares for the far West and big advantages of freight rates place Florida in a position to control the Eastern and Northeastern portions of the United States. Two hundred to two hundred and twenty-five melons is an average yield per acre for the State as a whole. In certain areas production is much greater than this.

SWEET POTATOES.

Sweet potato growing in Texas is an extensive industry and one that offers considerable possibilities because of its wide range of adaptable soils in the State and the long period of the year during which marketing is feasible. Caution should be exercised in too frequent successive plantings, however, for the sweet potato is a gross feeder and hard on the soil. The same land

if planted once in three years to sweet potatoes and built up in the interim with soil improvement crops should show no ill effects from the production of this commodity.

While a considerable variety of soils are adaptable to the growing of sweet potatoes, a rich, well-drained sandy loam will be found most desirable. The soil should be plowed deeply and worked to a bed of six to eight inches in depth, and this bed should be well fertilized either with a limited amount of well rotted barnyard manure, or if a sufficient quantity of this is not available, with cottonseed meal.

Since the sweet potato is grown from slips which may be purchased from commercial growers, unless one prefers growing them himself, preparations should be made sufficiently early to procure the slips in time to plant the field when danger of frost is over. These slips are procured by bedding the seed stock in good rich well drained soil, by placing the potatoes side by side, but sufficiently apart so that they will not touch each other. Some growers make the practice of putting poultry wire over the potatoes and over this wire some two inches of soil. The wire prevents the potatoes from moving when the slips are drawn out. Since the potato is subject to weevil infestation, it will be well to soak the seed stock in a solution of corrosive sublimate, two ounces to 16 gallons of water before bedding, or if plants are to be purchased instead of grown, care should be exercised to specify certified plants or plants free from possible disease. It may be figured that two bushels of seed will produce plants ample to care for an acre of land, but it will, of course, require several drawings to get enough slips to care for the acre.

Transplanting.

The field having been laid off in bedded rows three and one-half to four feet apart and fertilized as previously described should be ready to receive the slips as soon as the danger of frost is past. These slips are placed on the beds 12 to 18 inches apart, pushed down to a depth of about four or five inches. Many growers use a stick having a "V" cut in one end for this purpose. Where the acreage to be transplanted is considerable, regular planting machinery may be employed. Depending on the extent of recent rains and the moisture content of the soil, it may or may not be desirable to follow up the planting with a dipperful of water to each plant. The planting machines are prepared to take care of this watering and in the drier sections it will be found very desirable.

Cultivation.

As in other of the truck crops, the frequency of cultivation is largely a matter which each individual grower must work out for himself. Frequency of rains, the growth of grass and weeds, and the general requirements of the soil are all determining factors. The first plowing after the setting of the slips should

be deep to insure a well pulverized soil and permit the proper growth of the tubercles. During the cultivation, the vines should be turned into alternate middles to insure that every other middle may be cleared of vines. Thus half of the field is plowed at a time, cultivation of the other half following in a week or ten days.

Irrigation.

In East Texas, where the bulk of the commercial crop is grown, irrigation is not employed. In South Texas, where the industry is developing, the vines are allowed to go as long as possible without watering, but once the irrigation is started, great care is exercised to see that the tubers are kept continually moist as the alternate watering and drying will otherwise result in the development of second growth which make the potatoes largely unmarketable. No irrigation is given the crop for an appreciable time before harvesting commences.

Harvesting.

When most of the potatoes in the field are mature, the crop should be harvested. Maturity may be determined by the yellowing of the vines as well as by cutting an occasional potato and watching for the whitish tinge that develops on the cut portion of a matured potato when exposed to the air. It frequently happens that at the harvesting season of the year heavy rains will interrupt the harvest and start the second growth. If this occurs to any extent it will probably be found more profitable to "hog off" the crop than to harvest it for human consumption, for the second growth and misshapen potatoes find a poor market outlet and frequently serve to materially reduce the market price for good stock.

The harvesting is accomplished by pulling off the vines with a turning plow or some similar device, and plowing out the potatoes either with the regular potato digger, or, if this is not available, with the aid of a common middle buster. In some sections, it is the practice to clear the field of vines by taking a young sapling, either pointing or forking one end which is to run down the row. With a good team hitched to this sapling and someone at the far end to hold it at a slight elevation, the vines are gradually accumulated and may be cleared at the end of each row. Others adopt the policy of cutting the vines which are thrown into the middles and later covered with soil when the potatoes are plowed out.

The potatoes, as soon as dry, should be gathered in bushel baskets and then sorted. Like most truck crops a minimum of handling from harvesting to final consumption will be found to be profitable. The crop is now ready either for marketing, or for handling through the curing plant in the event it is desired to extend the marketing season.

Marketing.

The curing plant is a link in the marketing machinery for sweet potatoes that offers great possibilities to Texas growers for it extends the distributing season over the best part of the year, rather than restricting it to a very brief period when the crop just comes to maturity. The curing plant removes by slow evaporation the surplus moisture from the potato and thus enhances its carrying quality. Inexperience of some operators in over-heating, or in placing diseased stock into the warm storage has occasionally caused great loss in some of these plants in Texas and those contemplating the erection of curing plants or the storage of their potatoes in such plants will find it profitable to give mature study to the difficulties to be avoided as well as a consideration of the advantages which the system affords.

Field storage and curing is frequently and very successfully employed in many sections of East Texas. This bank type of storage is accomplished by heaping the potatoes at the desired place and building over them a conical shaped tent of corn stalks, over which in turn is placed crap grass and soil. An opening is left at the top and over this a shed-like structure is built to protect the potatoes from rain. In many such banks another ventilating opening on the South side is made at the base of the bank so that a steady circulation of air may be assured through the pile of potatoes.

The bushel basket is the most generally used package for the marketing of sweet potatoes and the average carload consists of approximately 400 of these. The use of the bushel crate is becoming more and more popular and this container has many features to recommend it to a more serious consideration on the part of shippers.

The distribution range of Texas sweet potatoes is not great. The bulk of shipments move to State markets, although a few shipments stretch as far North as Kansas City and Chicago and some Texas cars have travelled as far as Seattle, Washington. There is considerable competition in the growing and marketing of sweet potatoes from Arkansas and Louisiana and it is this competition in addition to the fact that freight rates to distant markets are excessive for such a low priced commodity that goes to restrain the range of territory in which Texas sweet potatoes are consumed. Since the Porto Rican is the more generally accepted sweet potato in the immediate territory in which the Texas crop is marketed, it is the variety which should be most consistently grown. There is also, however, a fair demand for the Nancy Hall, and as a rule in the more distant markets this is the recognized variety. The average production of sweet potatoes in Texas is 95 to 100 bushels to the acre. Occasionally the yield runs as high as 150 bushels and not infrequently as low as 75 to 80 bushels.

CABBAGE.

Growing cabbage in Texas is an increasingly important industry, not only in the Lower Rio Grande Valley, but in the Corpus Christi Section, and to a very appreciable extent all over South Texas. Commercially the crop is grown chiefly for winter and early spring marketing since the adaptability of this plant to various soils and growing conditions permits its production in homegardens practically all over the State and nation as soon as mildness of weather allows.

Planting and Cultivating.

Developments in recent years to the growing of plants has caused a number of growers to rely on the commercial plant producing companies for their needs. However, if it is desired to grow the plants, seed should be sown in beds, drilled into rows from 12 to 14 inches apart and sufficiently early to permit transplanting to the field in late September or early October, or before severe weather develops. In some sections, of course, growers plant much later than this.

The usual care in the preparation of the field for a garden vegetable is required. If the soil is heavy and strong and well drained, little fertilizing may be required, but on light soils, plenty of manure well mixed into the soil will be found advantageous and some use generously of nitrate of soda or other commercial fertilizer containing nitrogen to give impetus to the growth of the cabbage plant and later to the heading of the cabbage.

At transplanting time, the land should be bedded up in rows two and a half to three feet apart. Some even prefer to set the rows as far apart as four feet, particularly for the Flat Dutch, which is still the most recognized type for this section of the State, although Glory of Enkhuisen and some Danish are also grown. The plants are set as a rule on the east side of the ridge sufficiently low to protect them from strong winds and from 12 to 18 inches apart. This calls for about eight to ten thousand plants to the acre. The plants should be set down in water, but irrigation should be sparingly employed until the winter season is well developed less too rapid growth be stimulated leaving the plants susceptible to freeze injury. Once under good growth, however, and properly hardened, cultivation, followed by irrigation, should proceed as regularly in two weeks' periods as conditions will permit. Plants reach maturity from 90 to 120 days according to the variety.

Harvesting and Marketing.

The heads are cut in the field, loaded in wagons and hauled either direct to the cars where they are sorted and loaded in bulk, or else are delivered to packing sheds where they are put up in crates. The former is by far the most recognized method of handling. A "V" shaped frame, inverted, is placed in the



Fig. 10.—Examining and Culling Heads in the Field Prior to Hauling to Loading Station.

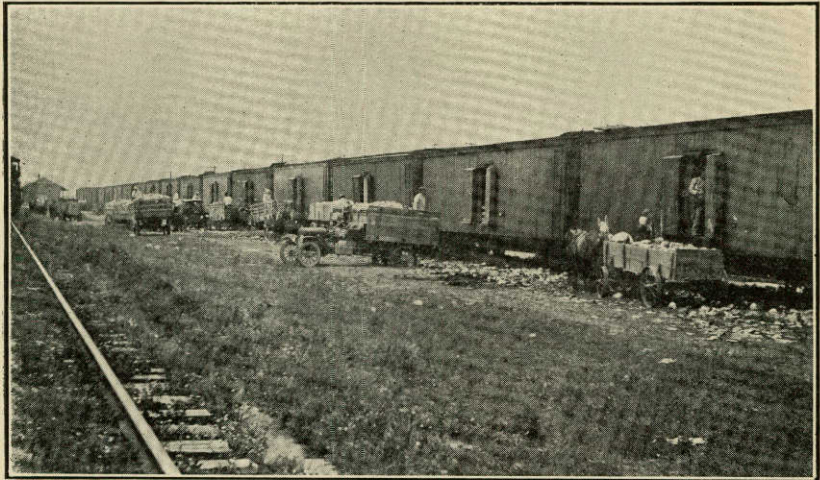


Fig. 11.—Loading the Cars with Bulk Cabbage.

middle of the car to insure ventilation and the cabbage is piled on top of this. Shipments go out under bunker icing and are iced frequently in transit to prevent spoilage or heating.

The crop is marketed in various ways. Some cabbage is grown under contract. In other cases the growers sell their wagonlots to the shippers on a delivered basis, or at a fixed price per ton or per acre in the field. This depends on the state of the market and the activity of the demand. Carlot operators who travel from one section to another frequently purchase the cars for cash immediately on their loading, but by far the bulk of the shipments is moved on what is known as wire order sales, that is, sales on telegraphic orders, subject to terminal inspection. It quite occasionally happens, during the greatest activity of the shipping that demand is slack and it is necessary to roll much of the movement either for transit or terminal sale. In this event the cars are sent either to Baton Rouge, La., Fort Worth, Kansas City or St. Louis and from these points further directed to the best markets. State-federal inspection service at shipping point aids materially in holding up the quality of the stock going forward and in protecting the demand, and terminal inspection is also available in a number of markets to insure an unbiased report on possible decay in transit.

The winter carry-over of late cabbage in New York and Wisconsin is the major factor that affects the success of the Texas marketing season in its early phases, while the cabbage crop of Florida, Alabama, Louisiana and other southern states is an influencing factor in the later days of the shipping season. Within the State, there is considerable competition between sections and years of over production occasionally make this crop difficult to move at a profit. Weather conditions from start to finish are governing influences not only in the earliness of the movement but in the activity of the demand. In a normal year, Texas will ship from five to six thousand cars. In 1926 the State's tonnage of straight cars was 6,256 and there was also a large movement in mixed cars with other commodities. The yield per acre of cabbage varies greatly in Texas. In 1926 it was 5.8 tons.

POTATOES.

There are two distinct potato seasons in Texas—the Fall Season and the Spring Season. It is the latter which is most important from a commercial standpoint as the Fall yield, as a general thing, is not so great as the Spring yield. There is generally a very acceptable demand, however, for the Fall turnout, since by the time that crop is ready to harvest, only potatoes shipped in from long distant producing areas, principally Colorado and Idaho are available in State markets.

For the Fall crop, seed should be planted about August 15 to September 1. The land should be well bedded in rows three feet apart and the seed stock planted 12 to 15 inches apart. Many use whole small tubers in this planting, rather than cut the eyes

from fancy seed stock as for the Spring Crop. Occasionally the maturity date for the Fall crop is moved up by sprouting the seed stock in a damp cool place before planting to the field. Quite occasionally potatoes of the Fall crop are carried forward as seed stock for the Spring crop.

Planting and Cultivating Spring Crop.

The bulk of the Triumph seed stock used to plant the spring potato crop of Texas comes from Nebraska, Wisconsin, Minnesota, Maine, Idaho and North Dakota. The more western states also furnish a considerable share of the Cobbler seed stock, which, however, is less extensively planted. Because of the expense involved in delivering this seed from such distant producing areas, it is usually quite expensive. This makes for a tendency among growers to be too sparing on their seed when planting and it not infrequently happens that poor stands and unsatisfactory yields result, particularly to new growers who attempt too great economy.

It is well to treat the seed potatoes with a disinfectant consisting of corrosive sublimate or bichloride of mercury by tying the potatoes in burlap bags and soaking for around three quarters of an hour, if only slightly infected, or for as much as one and a half to two hours if showing considerable evidence of the Black Scab. In preparing the solution about four ounces of the corrosive sublimate should be dissolved in two or three gallons of hot water and this mixture diluted in thirty gallons of cold water. The corrosive sublimate dissolves poorly in cold water.

The seed should be cut in thick pieces and it would be well to cut two eyes to the piece, rather than just one. It will be found desirable not to cut the seed too far ahead of planting, but in the event it is necessary, it should be spread out and permitted to dry before being stored in bulk and preferably sprinkled with air slacked lime. Small potatoes should be planted without cutting.

Some ten days or two weeks before planting date, the field should be prepared for the seed by opening up a furrow with a middle buster or large turning plow, spreading within the furrow barnyard manure to the extent of several tons to the acre or else commercial fertilizer. If commercial fertilizer is used anywhere from 600 to 1000 pounds should be applied to the acre, depending on the requirements of the soil. The fertilizer having been permitted to become thoroughly mixed with and assimilated by the soil, the land should be bedded in three foot beds in which the seed is planted to a depth of four to six inches (slightly less in some sections) and from 10 to 15 inches apart. The planting will leave a ridge which should be knocked off with a plank drag just before the plants make their appearance. The soil should be kept loose on the surface so as to permit the plants to break through easily. A section harrow is generally used for the first cultivation. The teeth should be turned

backward and the field harrowed lightly so as to avoid possible damage to the young plants under the surface.

The first plowing should be reasonably deep, and just as soon as the plants appear definitely in the row. Frequent plowing should follow but as the plant develops it should be shallower and further away from the plant. As soon as there is danger of injuring the tubers, plowing should be discontinued.

Harvesting.

Yellowing of the vines is generally an indication of maturity. The potatoes are then dug, usually with a regular potato digger which throws the potatoes on the surface where they are accessible to the harvest hands who should immediately follow, sack the stock and remove it from the bright sunlight, for more careful grading and handling. Taking the State as a whole the yield will average 60 to 65 bushels to the acre.

Ventilated cars are used mostly for handling the crop which is semiperishable and during certain seasons iced refrigerators are required, particularly for long distance hauls.

Marketing.

The Texas crop of potatoes has a fairly extensive distribution range from the far west to Detroit. Not much of the crop goes to the far east. As a rule a premium is paid for the Red or Triumph potatoes which are the ones chiefly grown in the Lower Rio Grande Valley, the Wharton-Eagle Lake section and in Northeast Texas. Cobblers which are grown extensively in the San Antonio territory and lightly in the Wharton-Eagle Lake section are apparently better yielders, however, and in very satisfactory demand. They are usually later in their maturity than the Triumphs.

Potatoes are sold like other vegetables, previously discussed. However, because of the extensive demand and the tremendous volume, there are more produce houses specializing in potatoes as a commodity than any one other item that is grown for market. The Chicago potato market is the keynote for the entire United States and operators both in shipping point and in other terminal markets govern their operations very closely in sympathy with trading on the Chicago potato tracks.

While major commercial production of tomatoes in Texas continues to lie in Smith and Cherokee Counties in the East Texas section, centering at Jacksonville, of recent years the growing of Fall and early Spring tomatoes in South Texas and the Rio Grande Valley has reached such proportions that it deserves mention. As growing, and to a less extent, marketing of the tomato crop in each of these sections is distinctly different, they will be treated separately.

Northeast Texas Section.

The growing of tomatoes in northeast Texas calls for a great deal of painstaking effort and intelligent care, and growers will do well not to plan their operations too extensively until experience with local conditions of soil and climate sufficiently modify the following outline of procedure as to permit the grower to take advantage of his own peculiar opportunities and overcome the difficulties of his particular location which only experience can demonstrate.

The Hotbed.

Seed is planted in hotbeds usually between January 10 and February 1. The hotbed as it is constructed in East Texas consists of a pit, preferably with south exposure. This pit should be at least $3\frac{1}{2}$ feet deep at the back and 2 feet deep at the front. Under the pit, somewhat toward its deeper end and running lengthwise of it is an 18-inch flue, attached at the far end of the pit to a chimney to permit complete circulation of the warm air. Quite frequently instead of a regular pipe flue, growers merely dig a trench in the hard soil and this serves the same purpose. The opening of the flue in which the slow fire is built should be not less than 18 inches from the top of the bed and the pipe should be so laid that it inclines upward as it proceeds toward the smokestack or chimney, that end of the flue being only about six or eight inches from the top. Over this flue there is laid sheet iron and over this, good rich soil to the depth of not less than a foot and a half. The back, front and sides of the hotbed should be walled up with lumber, leaving the front of the bed $1\frac{1}{2}$ feet lower than the back. Small rafters should be placed across the frame from three to four feet apart and the entire top covered with heavy sheeting or duck. One side of this sheeting or duck should be fastened permanently to the upper edge of the frame and the other end fastened between two strips of 1x2 which thus serve as a roller when it is desired to roll up this covering to permit exposure to sunlight and air. If the hotbed is required to be of a greater size than six feet wide, two flues will be found more desirable than one large one. The average hotbed is made six to eight feet wide and 14 to 16 feet long, occasionally slightly longer.

After the hotbed is constructed, the soil should be well watered; then the slow fire started in the furnace and the ground permitted to warm up for about two days. Seed should then either be drilled in or sown broadcast and covered to 1 inch of depth. It may well be figured that a pound of seed will produce enough plants, under normal conditions, to set five or six acres in the field and the unit hotbed described above should care for three to five acres of plants.

Once plants are up, it is not necessary to continue the heat in the flue, although on occasional days of extremely low temperature, it may occasionally be advisable to renew it. On

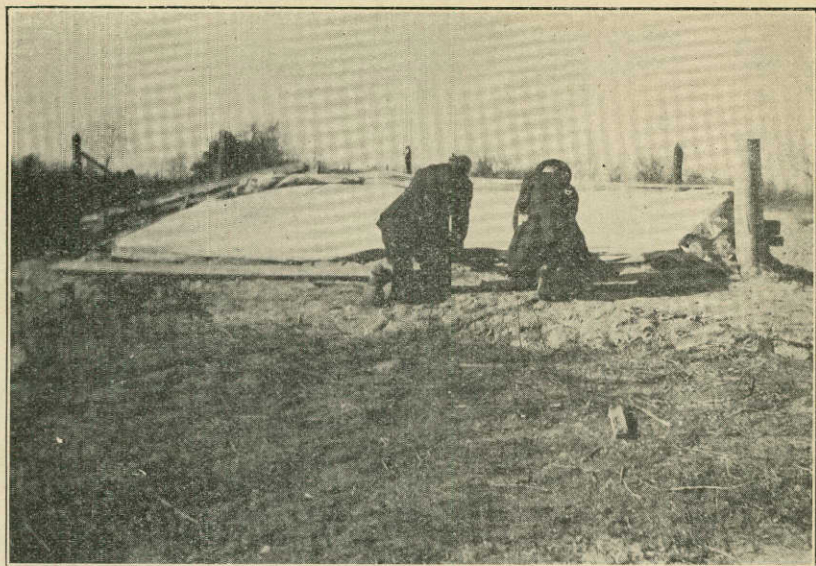


Fig. 12.—The Hotbed. Note the Chimney and Canvas Covering to Protect the Tender Plants.

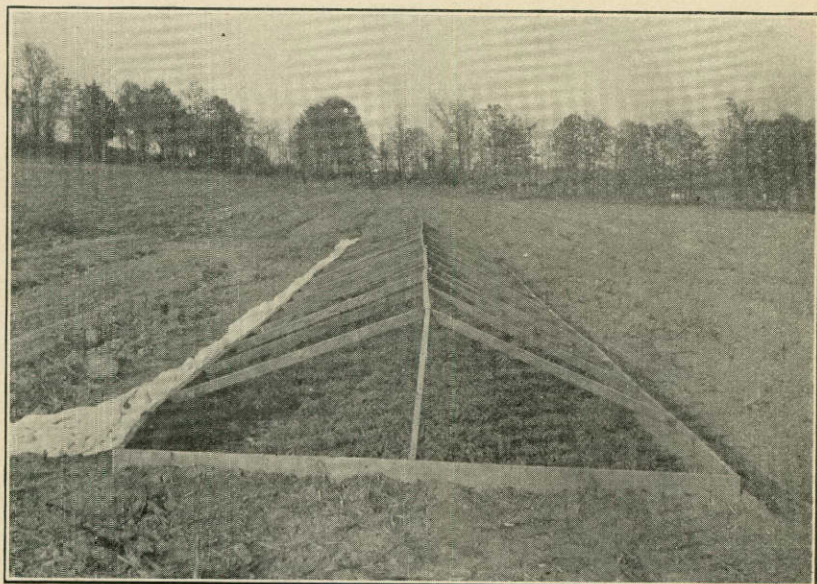


Fig. 13.—Cold Frame with Gable Top. This Hardens the Plants Before Setting to Field.

pleasant days the sheeting should be rolled up to permit the plants to get the benefit of sunshine and air.

When plants have developed four or more leaves they are ready for transplanting to cold frames where they are hardened before their final transplanting to the field.

Compost Bed.

Sometimes in lieu of the hotbed, the compost bed is employed in starting the plants. The compost bed is constructed very similarly to the hotbed described above with the elimination of the flue through the center of the bed. After the excavation has been made, fresh lot manure should be placed in the bottom of the pit to a depth of from ten to twelve inches. This should be dampened freely. On top of this should then be placed six to eight inches of thoroughly pulverized soil into which has been mixed a liberal supply of well rotted lot manure. It is then ready for the seed to be planted or sown as described above. A great many tomato growers believe that plants grown in this kind of bed are more vigorous than those grown in the hotbed warmed by artificial heat.

Cold Frames.

The location for a cold frame should be selected near the center of the field to be planted at least a month before it will be required for use. This cold frame should be well fertilized either with good compost from the lot or by the use of commercial fertilizer; or both. In constructing the cold frame, it should be made of 12-inch boxing, one foot high on either side. The top may either be gabled or sloping, the rafters in the former case being toe-nailed into the ridgepole and the sides of the cold frame, thus making a support for the sheeting or cheese cloth covering which allows the grower to take advantage of each day's most favorable climatic conditions and to ward off the effects of severe weather. In very bad weather, it is well to cover the sheeting with pine straw or Bermuda hay, which further protects the delicate plants. As in the case of the hotbed, one end of the covering should be attached permanently to the side of the cold frame and the other attached between two strips of thin lumber to form a roller. In the case of the gable type of top, it is also well to temporarily attach the canvas to the ridgepole as it may be desirable frequently to raise only one side of the covering. If the sloping type of top is to be employed, the same handling as described for the hotbed may be used with very good satisfaction. In either case, the rafters or supporters for the covering should not be more than three to four feet apart.

As stated before and repeated for emphasis, the cold frame should be constructed and the compost or heavily fertilized soil placed therein fully a month before it is necessary to transfer the plants from the hotbed. This is to permit the proper disintegration of the highly fertilized materials. The plants taken

from the hotbed are planted in the cold frames in rows with plants either three inches apart on all sides from each other, or three inches one way and four another, or, as occasionally occurs, four inches apart in either direction. To secure regularity in this transplanting a number of successful growers utilize a "pegging board," in length the width of the cold frame and in width, about two such rows as are planted. Small wooden pegs are used at the proper intervals on this pegging board so as to stamp out or impress two sets of small holes for the plants, a small marker on the bottom of the board indicating by a mark in the soil where the board should be placed the next time so as to secure evenly and regularly spaced markings. Plants should be placed in the holes made by the pegging board, carefully covered and watered, then covered with the sheeting until they root, which will be a matter of only a few days. After that they should be watered by spraying, not less frequently than every three to five days, unless it rains, and exposed to sunshine and air where there is no danger of weather injury. It will be well to remember to thoroughly saturate the bed the day before placing plants therein.

Preparation of the Field.

In preparation for the final transplanting from the cold frames to the field, ground should be thoroughly broken at least four to six weeks before transplanting date. This is to give the soil opportunity to aerate completely. There is little danger of plowing too deeply and it is essential that the land should be thoroughly broken at least six inches deep. After breaking and pulverizing, the ground should be laid off in ridges from four to four and a half feet apart. Commercial fertilizer should be scattered in between these ridges and then the ridges bedded over onto the fertilizer. The ground should be allowed to stand in this condition from one to two weeks, then the ridges should be broken open with a small plow to a depth of about six inches from the top of the ridge. As this is the final stage prior to the actual setting of the plants, it is well to see that this plow does not precede the setting hands too fast, as it is desired to hold all possible moisture in the soil.

Transplanting to the Field.

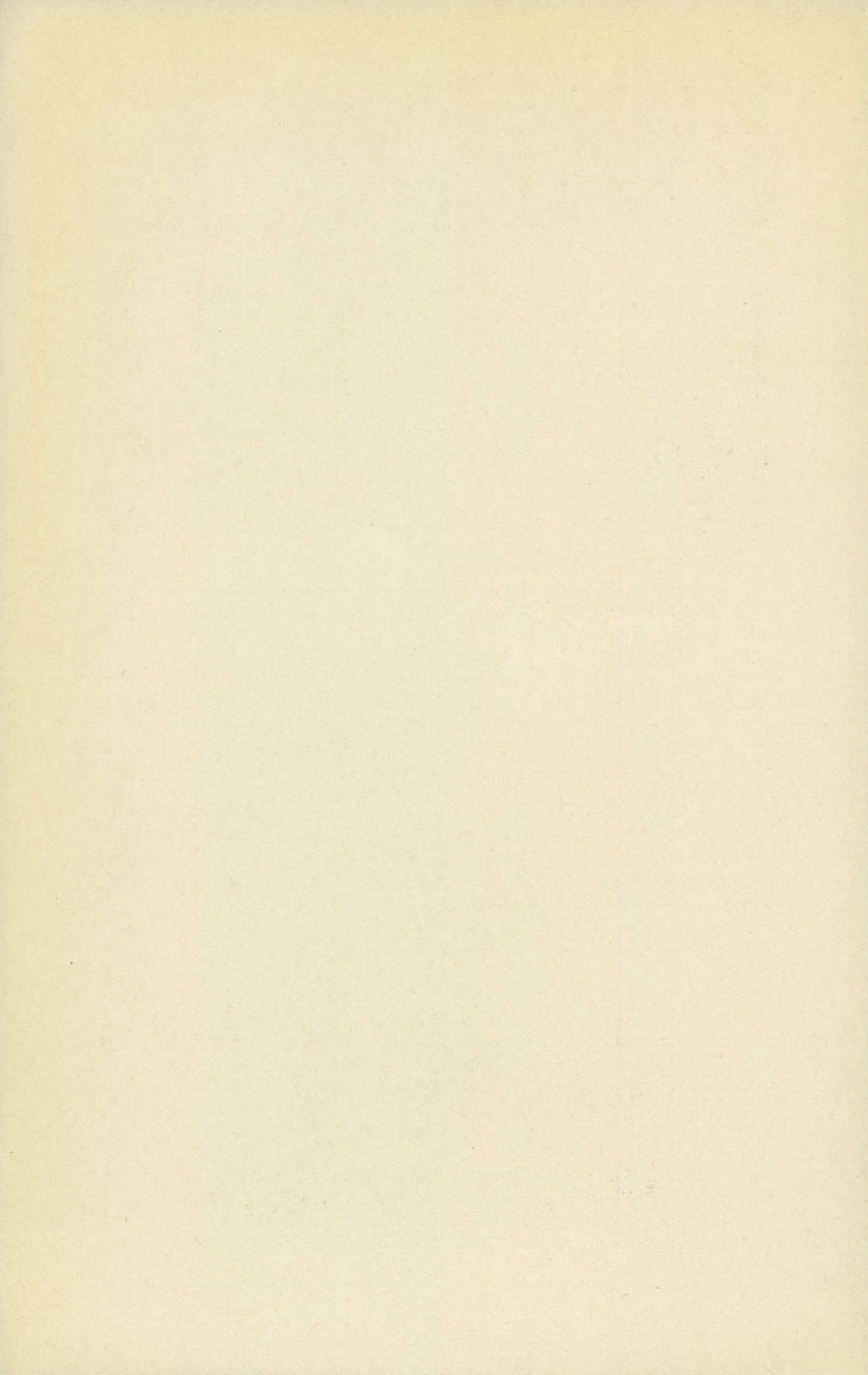
With the field thus prepared and the hardening services of the cold frame performed, final transplanting takes place. This is accomplished first by tearing down the cold frame so that the entire body of plants is exposed. It is well, however, to remember to water the plants thoroughly the day prior to this transplanting and it may be desirable to water while in the actual process of handling, using a hand sprinkler for this purpose. With the frame removed, the grower should run his trowel deeply down the middle of each row of plants. Then with one trowel under the plant and the other on the opposite side, so as to get plenty



Fig. 14.—Plants Loaded on Sled for Hauling to Field.



Fig. 15.—Staking of Vines Speeds Maturity of Tomatoes and Greatly Aids Harvesting.



of soil with the root, the plant should be lifted onto a sled or other apparatus for transporting to the field. Preferably just following the opening plow, the plants should be set in the field from two to two and a half feet apart (some prefer to give as much as three feet growing space), and in rows that are four to four and a half feet apart. The soil is brought around the roots and it is advisable to have the plow follow, throwing the soil up more completely around the plant. Transplanting to the field does not take place until danger of frost is past.

When the tomato plants get from 12 to 18 inches high, a stake about three feet long is placed by each and the vine is fastened thereto with light string, as close to the top as possible. It is essential that the sucker vines that branch from the main stem be pruned at least once and preferably twice a week, and after the vine is well set with bloom buds to the third or fourth cluster, it is best to top the plants so as to throw the strength toward the development of fruit.

The first plowing after transplanting should be to a depth of four to five inches, but afterwards it is well to plow very shallow, in fact only sufficiently to throw a dust mulch around the roots to prevent rapid evaporation of moisture from the soil. This light plowing should be continued almost to actual harvest time.

Harvesting.

In what is known as the pink deal, tomatoes should be gathered as soon as they have a pink color about the size of a quarter on the blossom end of the fruit. In this deal, it is usually necessary to gather the fruit daily and to pack it in market containers in small packing sheds close to the field.

In the marketing of green stock, which of late has been greatly favored, it is usually satisfactory to allow the pickers to make the fields every two or three days. Experience or frequency of handling is the only satisfactory teacher of the proper degree of maturity in tomatoes gathered for green handling, but the cutting of an occasional tomato to determine if the internal lobes have reached the jelly stage will soon make the picker expert in judging the maturity of the fruit. In harvesting green stock, a half bushel field basket with bail, to permit of easy carrying, is employed. These half bushel baskets are dumped into bushel containers on wagons or trucks, which are hauled to loading stations where the tomatoes are graded and usually wrapped and packed in four-basket crates, six-basket carriers or lugs.

South Texas.

The growing of tomatoes in South Texas and the Lower Rio Grande Valley is still very much in the experimental stage as is evidenced by the numerous systems of planting in vogue.

The compost bed and cold frame are quite occasionally employed and also the hotbed, but a number of growers plant their seed direct to the field, filling out gaps with plants thinned from

rows in which the seeds sprouted too generously. In either case, the land is set up in high ridges and the seeds or plants placed on the side of the ridge rather than the top so as to prevent damage by high winds. In South Texas, little staking of the vines is done and the vines are allowed to grow wild over the furrow. Furrow irrigation is given the plants immediately after the setting (or if grown from seed, when they are about ready to bloom), but after this first watering they are given only sparing irrigation as needed. Harvesting is accomplished as described for the East Texas section.

Varieties.

The Early Detroit and Gulf States are grown extensively in the southern tomato deals, while East Texas also grows the Acme and Redfield Beauty in addition to these.

Marketing.

Commercially, the two important crops of tomatoes grown in Texas are the early spring crop of the Lower Rio Grande Valley and the later spring and early summer crop of East Texas. There are a number of lesser important areas that produce between these, and which of recent years have become more and more important commercially. One of these is at Yoakum.

Florida has always been the heavy early producer of tomatoes and of recent years Mexico has materially hampered the market range of Texas with offerings of considerable volume. The bulk of the Texas crop is distributed to middle western markets, but occasional cars go to the far west and to such northeastern markets as New York and Boston as well as Canadian points. Mississippi which ships largely in the same type of container as Texas, affords the greatest competition for the northeast Texas deal and forces a greater restriction to those markets directly north and west of Texas points to which this state has advantage of freight rates. There is usually developed in the season a good cash track selling at loading station market in which cars loaded with approximately 896 flats or 420 six basket crates are sold just when loaded. Other methods of selling are by "wire orders" that is, on the basis of telegraphic description and subject to examination at terminal markets. Quite occasionally it is necessary to roll the shipments unsold, in which event they are frequently sent either to Kansas City or to St. Louis for diversion and the best markets selected after the car's arrival there in the event a buyer has not in the interim shown up to take the car either fob the loading station, or fob St. Louis. Such a car is known as a "roller." Once arrived at consuming market, the car is broken open, the jobbers take large lots from the cars, place them under refrigeration, if they are pinks, or in ripening rooms if green, and distribute to the wholesalers and grocers as needed. Taking the Fall and Spring crops together the average yield of tomatoes in Texas is about 95 bushels to the acre.



Fig. 16.—Loading Cars with Four-Basket Flats—Jacksonville.



Fig. 17.—Graders and Packers at Work. Note the Lug Pack Which Is Becoming Popular.

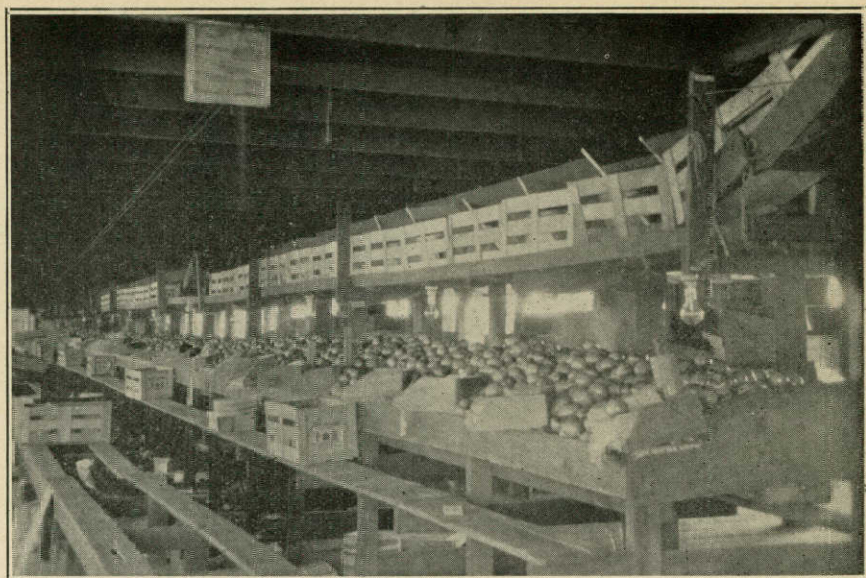
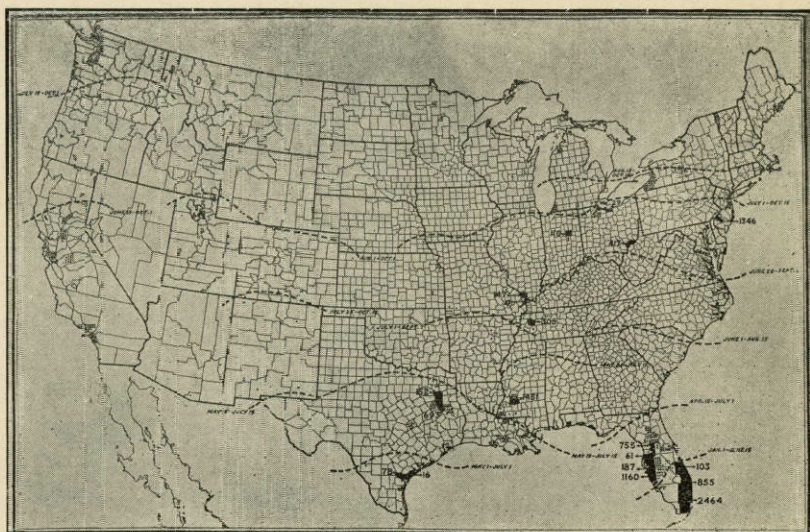


Fig 18.—A Splendidly Arranged Tomato Packing Shed. The Crates Are Assembled Upstairs and Run Down Chute Within Convenient Reach of Packers.



(Courtesy U. S. D. A.)
Fig. 19.—Competitive Tomato Producing Sections of the United States. Figures Represent Approximate Carloads and Areas of Production Are Indicated in Black. Note Approximate Opening Shipping Dates.

BEANS.

String beans are grown throughout South Texas, particularly in the Lower Rio Grande Valley where protection from severe weather is assured during most of the winter. The crop matures as a rule well in advance of other states with the exception of Florida, hence demand is usually active and of recent years price to the grower has been very satisfactory.

Varieties most generally grown and chiefly recognized in markets are the Wax and the Green. Seed should be drilled with the object of securing a three to six inch stand and in rows about three feet apart. Little fertilizing will be required on rich soils and on others the nitrogen proportion should be minimized since the plant is a nitrogen gatherer itself. Cultivation should be shallow but frequent and irrigation applied rather sparingly, especially when the plants are young.

The beans are gathered by hand, usually in half or bushel baskets. The bushel hamper is the recognized Texas market package for snap beans. The crop is moved to market under refrigeration and frequently with express handling since a great deal depends on the freshness of the beans on arrival. The commodity is handled all through in much the same manner as described for other tender vegetables.

BEETS.

The early Blood Turnip beet and the Crosley Egyptian are favorites in the major beet producing sections of Texas, although the Eclipse is also planted extensively. About five or six pounds of seed are sufficient to plant an acre. The soil should be deeply plowed and well fertilized in advance of planting date. The use of generous quantities of acid phosphate will also help. The land should be thrown up in beds just prior to planting seeds which should be sown about an inch in depth and from two to three inches apart. Frequent irrigation to insure steady, active growth will be required.

Harvesting is accomplished by pulling the beets by hand, washing and tying in bunches of from three to half a dozen. Before loading under refrigeration, they are frequently pre-cooled by being run through cold water after the bushels are packed. In the cars they are packed as the other busheled commodities and they are marketed mostly in the middle west with farthest western point of commercial consumption at Denver.

CARROTS.

Carrots are a complementary crop to beets and as a rule are also marketed in conjunction with that crop, although of recent years demand for straight cars of carrots has increased enormously. A thoroughly worked soil and carefully prepared seed bed will be required. Seed should be planted about a half inch deep in the drills. Rows should be about thirty inches apart, although some plant the full three feet. Careful attention will be required on the advent of the plants as to weeding, so as to keep the rather delicate plants from being choked out. Like beets, the crop is hand harvested, packed in bushels, pre-cooled and refrigerated. The same marketing and distribution is given as in the case of beets. The handling of the two in the same car has become a recognized practice, particularly in feeding the smaller markets. The crop is grown chiefly in the Lower Rio Grande Valley, but appreciable acreages are to be found also at Laredo, the Winter Garden section and close to San Antonio.

CUCUMBERS.

Cucumbers have become a crop of very major importance in the list of Texas vegetables. There is a brisk movement in express cars annually and also a considerable acreage is planted under contract for pickling purposes.

The seed is planted in hills, six feet apart, the rows thrown up after deep plowing, being eight feet apart. Eight seeds to the hill will not be too many, but the plants resulting should be thinned to two, when runners start. Some growers, seeking an early crop, start the plants in boxes and transplant to the field but the major share of the Texas acreage is planted directly in the field and as many as two or three replantings may be made in the event frost damages or kills the tender vines.

Until the vines spread and make it impossible, cultivation should be employed to keep the field clean. Harvesting is accomplished with the aid of the half bushel or bushel basket when the cucumbers are not less than five inches in length (lesser, of course, where grown for pickling purposes, in which case size is usually stipulated in the contract). As a rule re-sorting is done at the packing shed and the cucumbers are carefully graded and loaded out in bushel hampers. Corpus Christi at present is the center of the slicing cucumber producing territory, but other points in south Texas are rapidly coming into prominence.



Fig. 20.—Harvesting Beets, South Texas.

EGGPLANT.

The commercial growing of eggplant, particularly for mixed car shipment and less than carlot movement to nearby markets is growing in importance in South Texas. The plant is a very tender one and too early plantings are frequently lost to cold spells. The Black Beauty and Purple Thornless are recognized varieties for this section.

Very much the same care and attention in the preparation of plants for the field as outlined for tomatoes must be given eggplant. When ready for the field, they should be set approximately two feet apart in three to four foot, bedded rows. The fruit when about four or five inches in diameter is cut from the stalk and packed in bushel baskets for the market. Care should be exercised to cull from the vines all over ripe fruit, which has a tendency to sap the energy of the plant.

LETTUCE.

While the commercial growing of lettuce has been subject to considerable fluctuation in recent years, it is still a very important truck crop in the Lower Rio Grande Valley, and one of its types, Romaine, is becoming a recognized market commodity in the Winter Garden section, where it has shown itself more resistant to low temperatures than the Big Boston and Los Angeles or New York Special lettuce which is the chief output of the Lower Valley.

In preparing the soil, the heavy manuring required for cabbage will be found essential as will the applying of generous amounts of nitrate of soda, chiefly before heading time although also to the extent of about 150 pounds to the acre shortly after seed planting.

Quite frequently double row planting is employed in growing lettuce. The plants are set 10 to 12 inches apart each way and the double rows are three feet from each other. If the seed are drilled, thinning will be required. If transplanted, the proper distance can be regulated at that time. Careful irrigation sufficiently frequent to encourage steady growth will be found essential. Set-backs from improper watering or low temperatures seldom fail to reflect in the quality.

The crop may be harvested by cutting the head just above the root. The outer leaves are trimmed and the heads are packed in standard lettuce crates and moved under heavy refrigeration. Romaine is chiefly handled in bushel hampers, but carries and sells better in standard California lettuce crates.

While all middle western markets receive some of their share of lettuce during the Texas marketing season from this State, a surprisingly large proportion of the crop goes to the far eastern markets of Philadelphia, New York and Boston. California and also Arizona tonnage compete for the demand.

PEPPERS.

Peppers, grown chiefly for local consumption and shipment in mixed cars, are especially adaptable to the soils of South Texas. Little fertilizing will be required to produce a crop, but a somewhat richer soil may be found desirable in some sections for the Fall crop. The seeds are put through the hotbed and cold frame process outlined in detail for tomatoes. (This is if an early spring crop is desired.) Transplanting to the field should not be made before danger of frost is past, when the plants should be placed 18 to 24 inches from each other in three foot bedded rows. Irrigation should be sparingly employed, in fact mostly to keep the plant from suffering for moisture. Cultivation required should also be limited to the keeping down of noxious growths and the maintaining of a dust mulch to prevent evaporation from the soil. As in the case of eggplant, mature fruit must be taken from the vine or else it has a tendency to sap the vitality of the plant. The bushel basket and the bushel hamper are both employed in packing the crop, although the best package is the bushel pepper crate. The distribution range is not great, but it encompasses most of the middle west and as far west at Denver, going forward chiefly as a mixed commodity with other vegetables.

Texas growers of vegetables will do well to secure copies of Bulletins No. 167 and 346 and Circular No. 31 of the Texas Agricultural Experiment Station, College Station, Texas. These discuss in detail fertilizers and their proper utilization and will be found of invaluable assistance to the grower in maintaining the productivity of his soil and in finishing off many of the vegetables.

Attention is also called to the fact that during the marketing season, an extensive daily service on shipments, prices and competition is maintained by the State Department of Agriculture with the United States Bureau of Agricultural Economics. Details of this service which is without cost to those interested will be gladly furnished on request to the State Department of Agriculture, Austin, Texas.

