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GROWING

# *Cabbage*

IN THE LOWER  
RIO GRANDE VALLEY

TEXAS AGRICULTURAL EXTENSION SERVICE

G. G. Gibson, Director, College Station, Texas

## CONTENTS

	Page
Climatic requirements .....	4
Soil requirements .....	4
Place in the rotation .....	4
Varieties .....	5
Preparation of land .....	6
Planting .....	7
Irrigation .....	8
Cultivation and weeding .....	8
Thinning and transplanting .....	9
Fertilizers .....	9
Insects .....	10
Diseases .....	10
Harvesting .....	12
Marketing .....	12

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# *Growing Cabbage . . .*

## IN THE LOWER RIO GRANDE VALLEY

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**F**RESH, GREEN CABBAGE, to supply consumers in the North, is produced in commercial quantities in Texas during the cool season of the year.

Annual production of cabbage in the entire United States amounts to more than a million tons, and the winter crop accounts for more than one-third of the total, or 346,500 tons (average for 1949-53 incl.). Of this total Texas produces about 120,000 tons per year while our principal competitor, Florida, averages about 181,000 tons per year. More than 90 percent of the winter cabbage produced in Texas is grown in the Lower Rio Grande Valley. Florida cabbage moves to market at the same time South Texas cabbage is for sale. Florida ships less cabbage to market during December than Texas, but the shipment during March is considerably heavier from Florida than from Texas.

Commercial acreage planted to cabbage in Texas approaches 25,000 acres. Average yields for the State are low (4.4 tons per acre)—about half the average yields reported for Florida. The average annual value of the winter cabbage crop is almost 3 million dollars. The farm price of cabbage has varied from almost nothing to a high of \$175 per ton in January 1952. The acreage planted to winter cabbage is influenced largely by the farm price of cabbage during the preceding season. A year when prices are sensationally high for a short period, or even moderately good for most of the season, is invariably followed by overproduction the following year. However, unfavorable growth conditions and disaster may drastically curtail production locally and in competitive areas.

Texas farmers spend less than half as much in growing cabbage as their competitors in Florida and yields are correspondingly lower. Intensively farmed, irrigated, delta land is capable of producing yields

of marketable heads ranging around 20 tons per acre. Yields of 20 tons per acre and better have been produced at Substation No. 15, Weslaco, Texas. Many Valley farmers have produced average yields that are three times as great as the State average.

The consumer demand is for fresh, green, solid, round heads that weigh 2 to 3 pounds.

The dietetic value of fresh green cabbage is superior to white cold-storage cabbage. The mild-flavored crisp cabbage grown in Texas is far superior to the strong-flavored Danish type cabbage out of cold storage. Texas winter cabbage is primarily a salad crop because of its sweet flavor and crisp texture, but is used also as a boiled vegetable.

The cost of producing cabbage for sale during December and March is higher than for January and February markets because more water and labor for hand weeding are required for starting cabbage in August than during the cooler seasons. Insect control is the most difficult and costly part of growing "late" (March) cabbage, and frequent irrigation is required.

## *Climatic Requirements*

Cabbage is a cool-weather crop, but the heads may be damaged by temperatures in the low twenties if thawing is rapid. Cabbage requires an abundance of moisture, and 98 percent of the Texas commercial crop is grown under irrigation. Rainfall from December 1 through March averages less than 1 $\frac{1}{4}$  inches per month in most of the Lower Rio Grande Valley.

## *Soil Requirements*

Cabbage is grown on a variety of soils in Texas—from deep sandy loams to tight silty clays. The well-drained sandy loams have some advantages because they will support heavy machinery within a short time after rain or irrigation. The light soils are easier to manage, but they retain less moisture and are less fertile than the clay-loam and clay soils. Cabbage is a lime-loving plant and is more tolerant of saline-alkaline soils than most vegetable crops. Soils that are well supplied with composted organic matter are preferred for cabbage production.

## *Place in the Rotation*

Cabbage can successfully follow most farm crops except itself or its near relatives—broccoli, cauliflower and collards. Much trans-

planted cabbage is grown on cotton land, and most of the direct seeded crop is grown on land that produced spring crops such as beans, peas, sweet corn, tomatoes or vine crops. Cabbage grown during the colder months is not as subject to nematode damage as other crops, but yields are sometimes reduced by these soil-inhabiting worms. Plowing the land at successively greater depths during the summer months reduces the nematode population in the light friable types of soil but is not so effective on hard cloddy land.

When cabbage follows a crop that leaves large amounts of woody material in the soil, special treatment is required. A concentrate that will supply at least 60 pounds of nitrogen per acre should be broadcast over the residue after it has been shredded, but before it is disked and irrigated. A redisking and a second irrigation may be required to complete the "composting" process of the crude organic material to the point where it does not interfere with the planting and growing of cabbage.

## *Varieties*

Yellows disease in many Texas cabbage fields has caused a shift of interest to the wilt or yellows resistant varieties such as Globe, Marion Market and Resistant Copenhagen.

Globe is a high-yielding, round-headed, solid cabbage of the Glory of Enkhuizen type but should be grown under crowded conditions to keep head sizes to the desirable 3-pound level. Glory has been grown in the Valley for more than 30 years and is still popular for use on land that is free of the fungus causing yellows.

Marion Market is a yellows-resistant strain of the Copenhagen Market variety. It is not as uniform as the parent variety, but is less subject to splitting and bolting and is more vigorous than Copenhagen Market. Heads of the Marion Market variety are not as solid as those of Globe, but they are smaller and mature about 10 days earlier.

Round Dutch is an old variety that has many desirable characteristics, but the plants lack vigor which makes the heads too small when grown in dense stands. Acre yields of this variety are relatively low when grown under average conditions.

Round Red Dutch is a round-headed red variety that matures late. Red Acre is a small-headed red cabbage of the Copenhagen type that requires more time to mature than Glory.

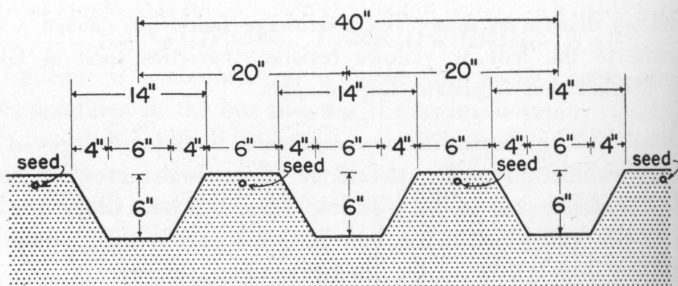
Savoy Chieftain is a late-maturing variety of the crinkle-leafed type. It produces relatively large round-topped heads which are flat at the base.

Selection of the right variety is a most important step toward winning consumer acceptance, and it may greatly affect yields of marketable heads.

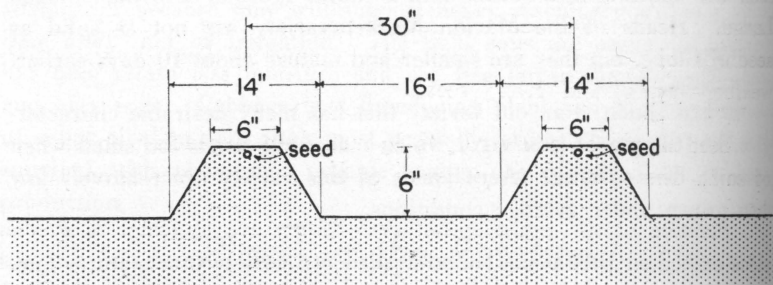
## Preparation of the Land

Plowing, disking, irrigation and redisking should work up a good seedbed for planting. Land to be used as a seedbed for growing transplants should be free of soil-borne diseases and soil-inhabiting pests. If such land is not available, the only recourse is to use soil fumigation. Several volatile soil fumigants are available on the market.

The grading of land to a uniform gentle slope is important. Properly graded land can be irrigated more efficiently, and excess water will drain off the land without damaging the crops.



Flat-type beds for single-rowed planting. Drills of seed or plants are 20 inches apart and in center of beds 6 inches high, 6 inches wide on top and 14 inches wide at the base.



Single-rowed planting with rows 30 inches apart, 6 inches high, 6 top and 14 inches wide at the base.

After the grading and floating operations, the next step is to list the land into rough beds spaced 20, 30 or 40 inches apart from center to center. The 20 and 30-inch beds are used for single-rowed cabbage and the 40-inch beds are flattened and used for pair-rowed cabbage. The rough beds are compacted and shaped with heavy floats or sleds having short 6" × 6" runners, or they may be shaped with the planter sled at the time the seeds are planted.

Irrigation prior to planting is recommended where the early fall crop is planted during hot (August) weather. Main crop cabbage usually is planted dry and watered.

The phosphate fertilizer (60 pounds of  $P_2O_5$  per acre) should be applied deep in the beds before the crop is planted. This can be done with ordinary cotton planters, using *wingless* middlebreakers run 12 inches down from the top of the rough beds. Phosphate balances the high amounts of nitrogen used on cabbage and develops solid heads.

## Planting

Seed treatment, either hot-water dip or bichloride-of-mercury soak and rinse treatment, should be given to all cabbage seed, except those grown in areas free of black rot.

The amount of seed planted depends on the method used in growing the crop. Where the crop is to be transplanted, 1 pound of good viable seed should produce about 20,000 plants. This quantity of plants would set about 1 acre of dense stand (closely spaced cabbage) or 2 acres of conventionally spaced cabbage (36-inch rows and 14 to 16 inches apart in the rows). Direct-seeded cabbage planted in paired rows spaced 20 inches apart and plants 14 inches apart in the rows requires 2 to 3 pounds of seed per acre. From 1½ to 2 pounds of seed are required for direct-seeded, single-rowed (36-inch) cabbage. Larger quantities of seed (15 pounds per acre) are used for starting seedbeds of the early fall crop which must be planted during hot weather—using "old crop" seed.

Seed should be planted ¼ to ½-inch deep, depending on the type of soil. The coverage is shallower on the heavier types of soil.

Planters of the multiple-unit type which are attached to special sleds or bed shapers place the seed in the ground, cover it and compact the soil over the drills of seed. Openers may be of the double-disk type, shoe type or minute middlebreaker type. An opener of the

middlebreaker type with a splatter-plate attachment is preferred for seedbed planting. Such an arrangement scatters the seed in bands about 2 inches wide, which allows the seedlings more room to develop than where the seed are planted in drills.

## *Irrigation*

The use of irrigation water to germinate the seed and start the young seedlings is an important part of seedbed management. Frequent light applications of water may be needed to keep the surface soil at a favorable temperature for the growth and development of cabbage. This is especially important in the case of August plantings of cabbage. Water-logging the soil should be avoided, but heavier applications of water will be needed as the plants grow. A 1-inch irrigation may be sufficient on small ( $\frac{1}{4}$ -inch) plants, but the rate should be increased to about 3 inches during the latter half of the crop year.

Good yields of cabbage have been produced with as little as 8 inches of water, but most growers use twice that much. In fields where the irrigation efficiency is as low as 50 percent, relatively heavy (4 to 5-inch) irrigations may be necessary. This avoids the development of dry areas before all parts of the field need water.

Rough-bedded land may be irrigated before transplanting is done. This cools the soil, settles the beds, and leaves high waterlines on the sides of the beds to guide the setters in dibbling in the transplants. Another irrigation should follow transplanting immediately to settle the soil about the roots.

Water should be applied as often as necessary to keep the plants in a succulent growing condition. Since cabbage has an extensive root system, heavy irrigation may be used toward the latter part of the season.

## *Cultivation and Weeding*

Weed control is important in early (August and September) seedbed plantings because frequent use of water encourages weed growth. Considerable hoe work and the use of push-type cultivators may be needed to keep weeds under control while the soil is too wet to support power equipment.



## Thinning and Transplanting

Thinning of the seedlings in the seedbed is unnecessary if the seed are planted in broad bands. It may be necessary to hand-thin plantings where excessive amounts of seed were planted in narrow drills.

Blocking out and precision thinning to *only one* plant per hill are essential parts of the direct-seeding method. Where doubles are left, neither plant makes a marketable head. The first thinning may be done when the plants are about 3 inches tall and before serious damage from crowding has occurred. The final thinning may be delayed until the plants are about 6 inches tall and danger from cut-worms and "bud" worms is over.

Seedbed plantings of cabbage should be irrigated and dusted or sprayed for the control of insects and diseases about 10 days before the plants are pulled and transplanted. Since the first pulling of cabbage plants from the seedbed is really a plant-thinning operation, the soil should be fairly moist. The plants should be pulled carefully to retain as much of the root system as possible. If the soil is hard, the plants should be spaded or plowed out. The cull plants should be discarded and the good seedlings packed in field boxes or rolled up on wet sacks. The roots should point inward with the tops along the margins of the sacks. The rolls or bundles of plants are transported to the field, and the plants are pulled out one at a time and dropped along the rough beds or handed to the plant setter. Overexposure of the bare roots to sun and wind should be avoided. Narrow trowels, spades or dibbles are used for opening the holes to receive the plants. Each seedling should be set so that the bud is at or slightly above the waterline on the beds or about the general level of the soil. The soil should be firmed about the roots of the newly set plant, and water applied promptly.

Stand has a marked effect on yield and on the size of individual heads. Dense stands of 20 to 25 thousand plants per acre make it possible to obtain 20 to 25 tons per acre yield of cabbage which averages about 2½ pounds per head.

## Fertilizers

Cabbage removes large quantities of nitrogen and minerals from the soil. Plowing under a heavy green manure crop and broadcasting at least 60 pounds of nitrogen per acre on the residue supply part of

the nitrogen needed for a 20-ton crop. About 60 pounds of  $P_2O_5$  per acre applied deep in the beds will balance off the large amounts of nitrogen which may be used and supply available phosphorous and calcium for the cabbage plants. The additional 40 to 60 pounds of nitrogen may be applied as a water-furrow application after the heads have attained a diameter of about 3 inches.

Heavy applications of nitrogen alone may result in the formation of loose, puffy heads.

## *Insects*

Cabbage plantings may be attacked by insect pests from the time the seed are planted until the heads are ready for harvest. Fire ants frequently destroy appreciable quantities of seed soon after they are placed in the soil. Cutworms and leaf-eating caterpillars attack cabbage plants at all stages of growth. Cutworms and "bud" worms are likely to cause serious damage in seedbed plantings of cabbage. Loopers, cabbage worms, plutella, aphids and thrips may attack cabbage at any stage but they are most difficult to control after the heads are of considerable size.

The serious consequences which may result from having excessive quantities of pesticide residues on vegetables such as cabbage make it desirable to have all pests under control 4 weeks before the expected harvest date. If control measures must be applied during the last 30-day period, a safe insecticide should be used. Low tolerance limits have been set on most of the commonly used pesticides, and they must be used strictly according to the directions of the manufacturer. Information relating to the safe protection of vegetable crops against insect pests is contained in L-255 "Guide for Controlling Insects on Vegetable Crops in Texas."

## *Diseases*

Black rot, yellows, black spot, damping-off and downy mildew are the diseases most likely to cause serious losses to cabbage growers.

Black rot may be controlled through the use of "clean" seed that were produced in black rot free areas. The alternative is to use the standard bichloride-of-mercury soak and rinse method for the seed, or the hot-water treatment. Seed suspected of being infected with black rot "germs" should be given the hot-water treatment (122 degrees F. for about 20 minutes). The hot water must be agitated continuously

while the seed are being treated. The 122 degree temperature must be maintained through the frequent addition of hot water, but it *must not* be poured directly on the seed. The seed in their cheesecloth containers are removed from the hot bath and dipped in cold water for a few minutes. They should then be spread out thinly on the 24" × 24" cheesecloth squares to dry. The seed should be treated in the evening, left to dry overnight and planted the next morning.

A soil-inhabiting wilt disease which causes yellows in cabbage is controlled best through the planting of yellows-resistant varieties, such as Globe, Marion Market and Resistant Copenhagen. Yellows causes the plants to be stunted and one-sided, somewhat as does black rot, but the diseased areas in the stems are brownish rather than black. The plants have a distinct yellowish cast. The yellows (wilt) organism lives in the soil for several years.

Damping-off or wire stem is caused by a common soil fungus known as Rhizoctonia. It may cause the death or stunting of cabbage seedlings, and sometimes causes bottom rot or head rot as the crop nears maturity. Crop rotation and soil fumigation effectively reduce losses from this disease. Cabbage should not be planted on land where bottom rot, head rot, or root rot of crucifers have occurred.

Black leaf spot is seldom important in cabbage production but may blemish some heads late in the season. It is primarily a storage disease and seldom damages enough heads to warrant the use of control measures. It can be seed-borne.

Downy mildew may be damaging at all stages of growth but is most destructive when the plants are small and during cool, moist weather. It is spread about the fields by blowing rain. It first appears as pale green spots on the leaves; a white mass of mold forms on the undersides of the spots while the plants are wet with dew. Later the spots turn yellow, then brown, and the small leaves may be killed. The older leaves of plants nearing maturity may become severely infected with downy mildew. Several sprayings or dustings with maneb may be needed to control downy mildew. Maneb can be mixed with the insecticides used to control pests, such as caterpillars and aphids.

Transit diseases of cabbage can be controlled partially by careful handling during harvesting and packing. Bruises caused by pitching the heads considerable distances are likely to become infected with decay-producing fungi.

## Harvesting

The cutting operation begins when a considerable portion of the heads are large and firm enough to meet market requirements. Varieties of the Copenhagen Market type mature more uniformly than others, but they also are more likely to split if left too long after they are ready for market. Fields of cabbage may be cut over several times during seasons when prices remain at satisfactory levels.

Cabbage usually is cut and hauled to the packing shed by the owner. Large butcher knives are used to cut the heads from the stalks. At least three loose wrapper leaves are left attached to help protect the head from bruising. Rough handling by the field crews or packers increases losses from transit and storage diseases of cabbage.

## Marketing

Early crop cabbage is ready for harvest during December, but the bulk of the winter crop is shipped during January and February. The late crop from the Valley is shipped during March, but the season may extend through the first week of April. It is difficult to keep late cabbage reasonably free of worms and aphids.

Most Valley cabbage is sold to cash buyers on a pack-out basis. The grower cuts and hauls the crop, and the culls and wrapper leaves (trimmings) are weighed back to him. Prices received for cabbage by farmers may range from only enough to pay the cost of cutting and hauling to almost \$200 a ton during periods of scarcity. Unfavorable weather in competitive production areas may up the prices received by Texas farmers, but bad weather in big market centers may have a depressing effect on demand and prices. Unfortunately, severe weather in northern market centers usually occurs during January and February when the bulk of the Valley crop is ready for harvest.

## Acknowledgments

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