

Let's produce more

CORN

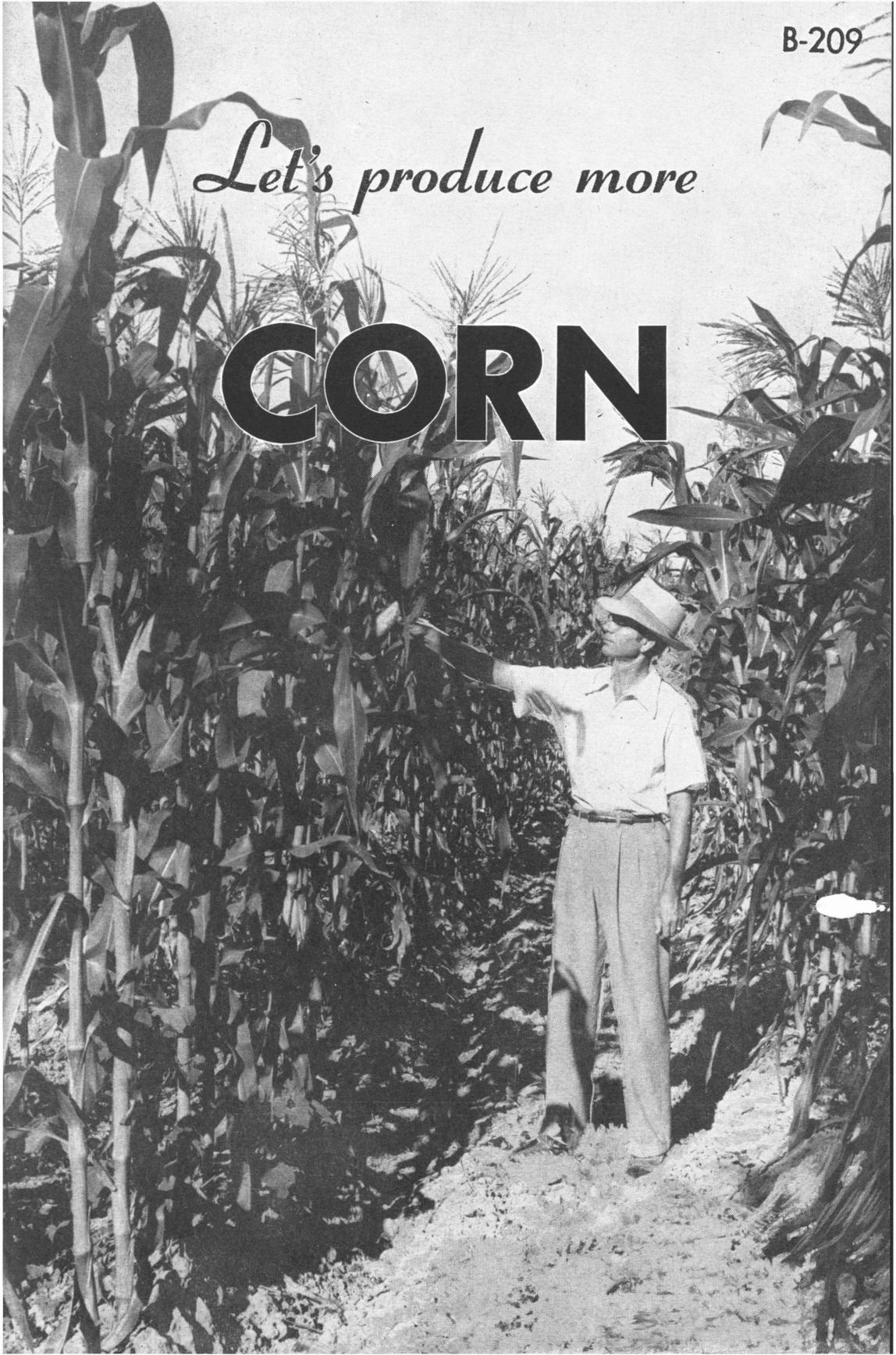


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LET'S PRODUCE MORE CORN

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INTRODUCTION

Corn is one of the most important crops grown in Texas. Cotton, grain sorghum and wheat are the only crops that have been planted on larger acreages in recent years.

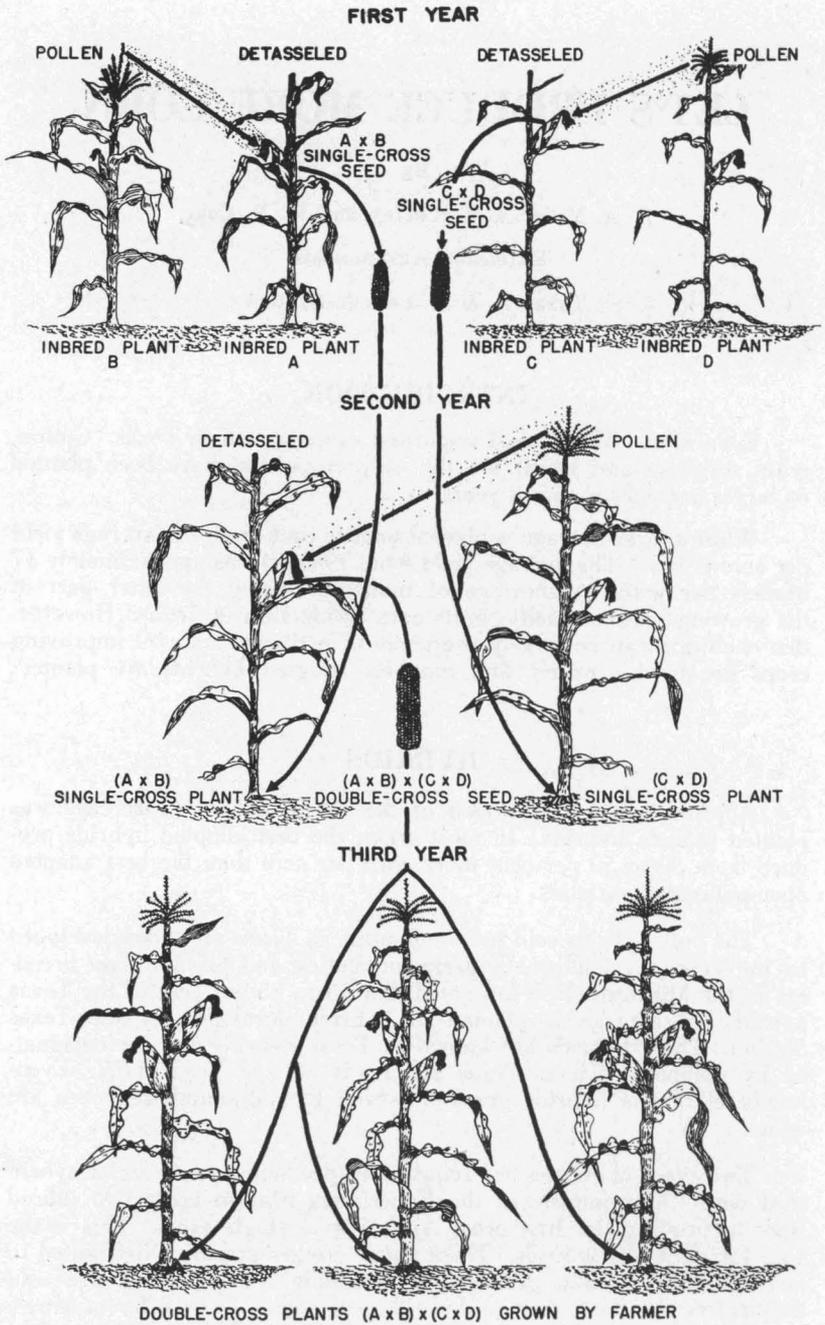
While a large acreage is planted to corn each year, the average yield per acre is low. The average yield from 1941-50 was approximately 17 bushels per acre. A shortage of moisture during the latter part of the growing season usually limits corn production in Texas. However, this condition can be largely overcome if fertilizers and soil improving crops are used properly and the best adapted hybrids are planted.

HYBRIDS

Approximately 65 per cent of the 1951 Texas corn acreage was planted to corn hybrids. In most areas, the best adapted hybrids produce from 30 to 50 per cent more corn per acre than the best adapted open-pollinated varieties.

The only hybrids sold in any quantity in Texas are those developed by the Texas Agricultural Experiment Station and private plant breeders in the Midwest. It is estimated that 75 to 85 per cent of the Texas hybrid-corn acreage is planted to hybrids developed by the Texas Station. These hybrids are known as Texas hybrids and are designated by numbers such as Texas 28, Texas 30 and Texas 11W. Even-numbered Texas hybrids are yellow and the odd-numbered ones are white.

Two types of crosses are required in producing commercial hybrid seed corn. Agronomists of the Experiment Station cross two inbred lines to produce the first cross, known as a single cross. This is the case for all Texas hybrids. These single crosses are then distributed to seed growers for the production of double crosses which are sold to farmers the next year as hybrid seed corn. Two different single crosses are used in producing any one particular hybrid. The method



This drawing shows how hybrid seed corn is produced. Farmers plant double cross hybrid seed.

used in producing hybrid seed corn is illustrated in Figure 1. Six rows of one single cross are detasselled, while two rows of another single cross are left as a pollinator. Hybrid seed is produced on the detasselled rows.

Recommended Hybrids

Corn yield tests are conducted by the Experiment Station each year at many locations over the State. Practically all hybrids sold in Texas are included in these tests. The newer Texas hybrids—Texas 30, 28, 26 and 24—are superior to the out-of-state hybrids and the older Texas hybrids in their ability to produce high yields and to stand until harvest.

Texas 30, the newest yellow hybrid, has given outstanding results where it has been compared with the older hybrids. It has produced yields either as high or higher than any hybrid now grown in the State. *Texas 30* is highly resistant to both root lodging and stalk breaking, and is superior to the other hybrids in resistance to insects and diseases. According to results obtained so far, *Texas 30* is the best “all-around” hybrid that has yet been developed for the corn-growing regions of Texas. *Texas 30* ordinarily produces one large ear with a tight-shuck cover, which makes it resistant to ear worms and ear rots. It has large stalks which may be expected to stand up well until harvest time.

Texas 28, which has been tested over a longer period of time than *30*, has produced yields as high as 165 bushels per acre in Texas, and even higher yields have been reported in Arkansas. In tests conducted by the Experiment Station it has produced at least 10 per cent higher yields than older (lower-numbered) Texas hybrids and those tested

Note straight stalks and very little lodging in *Texas 30* on the left compared with *Texas 20*, an older hybrid, on the right.



from other States. This hybrid will make two ears per stalk under favorable conditions, but the ears are usually not as large as those produced by Texas 30. Texas 28 produces large, soft grain with a good yellow color. While it is resistant to stalk breakage, the roots sometimes break and a few of the stalks fall over. Texas 28 is recommended for all of Texas, except the Gulf Coast Prairie and the Rio Grande Plain.

Texas 26, matures slightly earlier than Texas 28 and 30. It is widely grown and produces high yields in the Blackland Prairie region and farther west, especially on drouthy soils. This hybrid matures slightly earlier than Texas 28 and 30. Under favorable conditions Texas 26 produces two good ears per stalk, but the ears are somewhat susceptible to ear worms and ear rots. Most plants stand until harvest, but not quite as well as Texas 28.

Texas 24, usually will have more plants stand until harvest than any other hybrid grown in Texas. It definitely does not produce as high yields in the Blackland Prairie region as Texas 30, 28 and 26 but it does produce high yields in the East Texas Timber Region, the Gulf Coast Prairie and the Rio Grande Plain. Like Texas 30, it usually has one large ear per stalk. The ears of Texas 24 are moderately resistant to insects and diseases. Very little seed of this hybrid was produced in 1951 as most farmers seem to prefer the newer Texas hybrids.

White hybrids seldom produce as high yields as yellow hybrids. However, white corn often is used in making edible foods such as white corn meal and grits, and it usually sells for higher prices than yellow corn. Texas 11W probably is planted on a larger acreage than all of the other white hybrids. It usually produces one large ear per stalk but the grain is small. This hybrid is resistant to ear worms and rots and has a tight shuck cover. A new white Texas hybrid recently has been released by the Experiment Station. In 19 experimental tests during 1950 and 1951, this new hybrid, Texas 15W, produced an average yield of five bushels more per acre than Texas 11W. It is also superior to Texas 11W in standing ability, but does not have so tight a shuck cover. Farmers should be able to buy seed of 15W in large quantities for 1953 planting. TRF 3, also a white hybrid, was developed by the Texas Research Foundation primarily for milling purposes. It has a large kernel and produces yields comparable to Texas 11W.

Certified Seed

Farmers are advised to plant only certified seed of corn hybrids. Buying certified seed is the best assurance of getting good hybrid corn. For corn seed to be certified in Texas it must be approved by inspectors from the State Department of Agriculture. If farmers plant certified seed, they have the assurance of unbiased inspectors that the seed has been produced on properly detasselled plants and in fields that are well-isolated from other corn. Hybrid seed produced on plants not properly detasselled or well-isolated will not be truly representative

of the hybrid in question and will be mixed. Certified seed can be identified by a blue tag attached to each bag.

Size and Shape of Planting Seed

Kernels of many different sizes are present on each ear of corn. After harvest, all hybrid seed corn is run through grading machines which group all of the kernels of one size together. The various sizes of round and flat grades may then be offered for sale as individual grades. Most farmers prefer to plant the large flat grains. However, the large and medium-round grades and the medium-flat grades produce about the same stands and yields. The price of round grades usually is 60 to 70 per cent of the price of the flat grades. A bushel of medium-size seed generally will plant 40 per cent more area than a bushel of seed of the larger sizes. Thus good quality seed of medium grades, especially medium round, generally are economical to plant. The size of hybrid planting seed definitely is not a good indication of the size of kernel that will be produced from it.

New Seed Each Year

Farmers should purchase new hybrid seed each year, since plants grown from second-generation seed lose some of the hybrid vigor and therefore produce about 20 per cent less than plants from first generation seed. The cost per acre of hybrid seed for planting is small, and the increased yields from new seed will more than justify their purchase each year.

SOILS AND SOIL MANAGEMENT

A distinction is made between a so-called fertile soil and a productive soil. A fertile soil is one that contains enough of plant nutrients to grow good crops, *but it will not be productive unless the plant roots get the proper amounts of air and water* throughout the growing season. This is what is meant when it is said that a soil must be in good tilth or must be in good physical condition (have good structure) to produce good crops. Air circulation into the soil and the water-holding capacity of the soil can be improved or maintained on most farms with a good soil-management program. A soil that drains well and has the capacity to absorb and hold large amounts of water is important in producing a good crop of corn.

Air Circulation In Soil

Internal drainage is necessary because corn roots must have air and very little air can get into a soil that is water logged or that is "run together." Corn roots will not penetrate a soil that is not porous enough for air circulation. Air in the soil is absolutely necessary for

maximum absorption of plant nutrients and water and for normal root growth.

Soil Moisture and Water Conservation

Most of the corn crop is grown during the five-month period from March 1 to July 31. During this period the average rainfall varies from about 18 to 20 inches in the East Texas Timber Country, Gulf Coast Prairie and Northeast portion of the Blackland Prairie to about 14 to 15 inches in the Rio Grande Plain and West Cross Timbers. However, rainfall in these areas varies from year to year and is below or above normal about half of the time.

Approximately 23 to 24 acre-inches of water are required for high production of corn in Central Texas. This requirement will vary somewhat among areas of the State. But, when the water requirement of corn is compared with the amount of rainfall in any area, it obviously is important to hold some of the rainfall that is received during the late fall and winter. This applies to years during which a normal amount of rainfall is received, and is even more important in years when the rainfall is below normal.

Organic Matter

Deep soils that are high in organic matter have the ability to take in large amounts of water and hold it. Thus, long-time soil management programs should include deep-rooted legumes and grasses in the cropping system.

Organic matter affects most of the important factors determining soil productivity. Long time soil-management programs should therefore include cropping systems that provide as much organic matter of good quality as possible. Some of the ways organic matter helps to increase or maintain the productivity of soils are

- (1) to increase the rate of water penetration and water holding capacity of the soil
- (2) to provide food for bacteria and other forms of soil life
- (3) to serve as a storehouse of nitrogen and also phosphorus
- (4) to make mineral constituents of the soil more available
- (5) to make the soil mellow and easier to cultivate, i. e., to improve soil structure.

The chief sources of organic matter are crop residues, green manure crops, deep-rooted legumes and grasses and barnyard manure.

Barnyard Manure

When barnyard manure is available it should be used to improve the physical condition of the soil and for the plant nutrients it contains. When manure is applied it should be broadcast and plowed under well in advance of planting so that it can become well rotted.

Soil Building Crops

One of the best ways to add organic matter and plant food to the soil is by growing properly inoculated and fertilized legumes that are adapted to the soil and climatic conditions of the area. Legumes take up plant food from the fertilizer and, if inoculated, utilize nitrogen from the air by means of bacteria in the nodules on the roots. This nitrogen is carried to all parts of the legume plant after it has been made available by the bacteria. A large part of it is stored in the tops of the plants. When legumes are plowed under the plant food that is taken up from the fertilizer as well as the nitrogen taken from the air is added to the soil. Whole plants, therefore, should be plowed under for the soil to obtain maximum benefit. However, the roots of deep-rooted grasses and of legumes, such as sweetclovers and alfalfa, will do much to improve the physical condition of the soil and allow faster, deeper and greater water penetration.

Fertilizers such as phosphate and potash aid the legume plants in producing large yields of green material for hay, grazing or green-manure crops. Since use and management of the various crops require individual comment, only a few of the more general management practices will be discussed.

East Texas Timber Country and West Cross Timbers. Hairy vetch, fertilized with both phosphate and potash at the time of seeding in the fall, has proved beneficial as a soil-building crop on sandy soils of the East Texas Timber Country and the West Cross Timbers. Other annual winter green-manure crops for these two areas include Singletary peas and Austrian Winter peas. The annual lespedezas and reseeding crimson clover are also important in the East Texas Timber Country for soil building purposes, and for hay, grazing or seed.

Other Areas. Soil-building crops for the calcareous clay soils of the Blackland and Grand Prairies, and most other heavy soils of the State, center around the sweetclovers. These clovers, due to their extensive root systems, open up the soil to give greater penetration and storage of water and circulation of air. Either the annual types such as Hubam and *Melilotus indica* or the biennial types such as Madrid and Evergreen may be used, depending on the kind of farming system being practiced. Where adapted, the deep-rooted biennials produce a larger amount of organic matter as roots and provide longer seasons of grazing than the annuals. They are especially desirable in forage-grain-livestock systems of farming. The sweetclovers are well adapted for either interplanting with or overseeding on small grain crops. Some of the most promising possibilities involve the use of the small grain-sweet clover mixtures in various cropping systems.

The use of soil-building crops in the Rolling and High Plains is not a common practice because of low rainfall. However, alfalfa, hairy vetch and the sweetclovers are recommended for these areas when soil-

improving legumes are planted. They are well adapted on the High Plains under irrigation for soil improvement.

USE OF FERTILIZERS

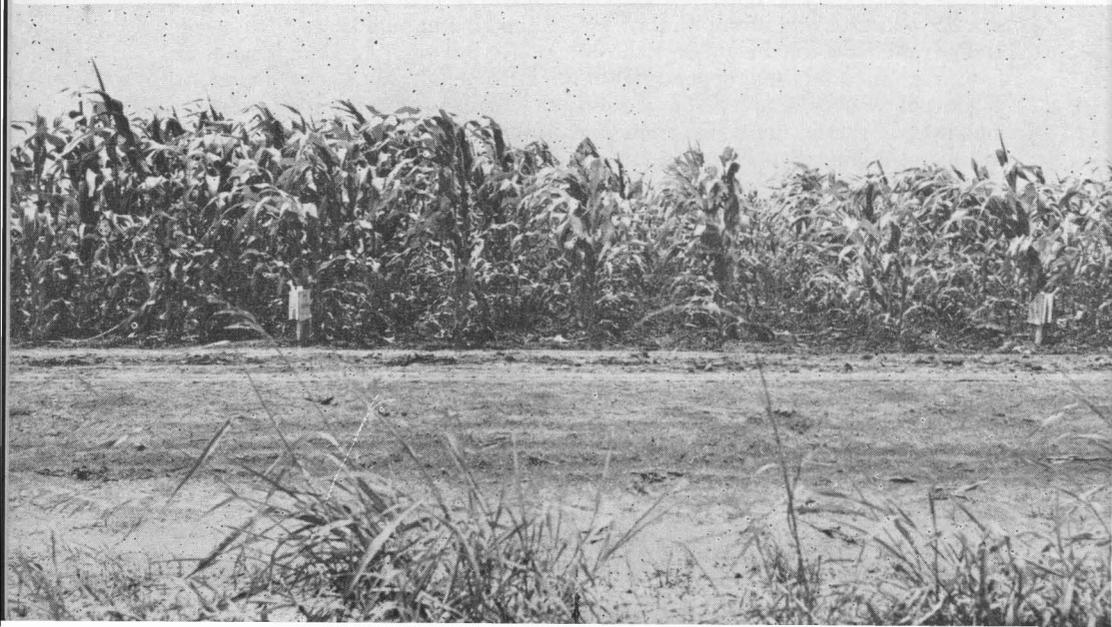
The use of commercial fertilizers has increased greatly during the past few years. Maximum yields cannot be obtained, however, unless fertilizers are used in combination with good soil management practices. This combination has been responsible for the higher corn yields that recently have been obtained over the State. Farmers should be certain that their soil does not have a "plowpan" and that it is in good tilth!

Corn is grown under a wide range of soil and climatic conditions in Texas. Soils vary in their need for fertilizer and in the management required for maximum production. Therefore, any discussion of corn fertilization must be on a soil-area basis. However, recommendations on the use of fertilizers are uniform for all areas where corn fertilization is profitable. In general it has been found that the most profitable returns from fertilizers are in areas where good soil management has been practiced but where the amounts of plant nutrients—nitrogen, phosphate and potash, especially nitrogen—are not adequate. Many of these areas receive enough rainfall to give efficient returns from the use of fertilizers, if the soils have been kept in good tilth so rain can penetrate and be stored. But in other areas, where rainfall is the first limiting factor, fertilizers cannot generally be expected to give big increases in corn yields.

Nutrients Required by Corn

Sometimes farmers are afraid to use enough fertilizer for high yields because they think it will burn the corn. As a result they often

Corn on left followed fall planted Madrid sweetclover in the rotation. Corn on the right had no soil building legume in the rotation.



use only enough to get the plants started and the leaves then turn yellow from plant food starvation—not from lack of moisture.

In connection with plant food needs, *the yellowing and firing of the corn leaves in most cases is due to nitrogen starvation and not to dry weather*, as has been the general opinion. Drouth causes corn leaves to roll or twist without losing the green color, whereas lack of nitrogen causes them to turn yellow along the midrib, and then shrivel and fire. The belief that common yellowing of corn is caused by dry weather rather than lack of nitrogen has cost farmers a great deal in reduced corn yields. In phosphorus starvation, young plants often have a purplish cast and the tips may die, while in potash starvation the leaves turn brown along margins and the edges appear scorched.

Approximately 130 pounds of nitrogen, 50 pounds of phosphoric acid and 130 pounds of potash are used in producing a 100-bushel crop of corn. The amounts of nutrients that are actually removed by the harvested crop are somewhat less than these figures, but the requirements of the crop must be supplied if maximum yields are to be obtained.

Fertilizer Application

Fertilizer materials should be applied at the proper time and by the best known methods for a particular area to allow corn plants to make the most efficient use of them during the growing season. Mixed fertilizers should be applied at the time of planting, or about two weeks before planting, and should not touch the seed. It is best placed in a

Corn on the left, at College Station, was not fertilized. Corn on the right received 60 lbs. nitrogen, 40 lbs. phosphoric acid, and 40 lbs. potash. One-half of the nitrogen was applied as a side-dressing.



band two or three inches on one side of the seed and two or three inches below the seed with a fertilizer distributor on the planter. For best results fertilizers for side dressings should be placed in the ground. Weed and grass growth is greatly increased when they are spread on top of the ground.

Nitrogen Side-Dressing. In most areas of the State a nitrogen side-dressing should be applied. It is profitable on some soils, particularly sandy soils, even though a green-manure crop has been turned. It should be applied when corn is from 12 to 18 inches high, or about 35 to 40 days after planting. The side-dressing should be applied 10 to 12 inches to the side of the plants and two to three inches deep in order to place it in moist soil. If the corn is in three-foot rows the fertilizer for side-dressing may be placed half-way between the rows. A good way to apply it is with an attachment on the cultivator which drops it behind the first shovel. However, an ordinary distributor, a tractor planter or a horse drawn planter also can be used for side-dressing.



Highest officially recorded corn yield ever produced in Texas. This was Texas 28 which followed Austrian Winter peas in rotation. This is an outstanding example of a good hybrid following a legume with plenty of fertilizer. Harold Watkins, 4-H Club boy in Red River County, grew the corn. The AN AM in picture stands for anhydrous ammonia.

Fertilizer Recommendations

A general fertilizer recommendation for each soil area is given in the table on the last page. Although it is impossible to make one general fertilizer recommendation for an area that will fit equally well on every farm, good results will be obtained from using these recommendations. The best way to get information on how much and what kind of fertilizer to use for corn is from the results of a soil test. This can be done by contacting the local County Agricultural Agent for information on taking a soil sample and how soil samples may be sent to the Soil Testing Laboratory at College Station. Soil tests mean better fertilizer usage and better yields.

The fertilizer recommendations in this bulletin (see table) are expressed in pounds of plant nutrients to be applied per acre. These nutrients cannot be purchased as such, but must be obtained from materials or mixed fertilizers on the market. For example, 30-60-30 is recommended for sandy loams in "The East Texas Timber Country", for applying before or at time of planting. This means 30 pounds of nitrogen, 60 pounds of phosphoric acid and 30 pounds of potash. Six hundred pounds of a 5-10-5 mixed fertilizer will furnish this amount of nutrients. The recommended 60 pounds of nitrogen for side-dressing may be obtained from approximately 200 pounds of ammonium nitrate (33½% N) or 300 pounds of ammonium sulphate (20% N) or 400 pounds of sodium nitrate (16% N) or 75 pounds of anhydrous ammonia (82% N).

CULTURAL PRACTICES

Seedbed Preparation

The yield of corn is determined before and at the time of planting to a much greater extent than most farmers realize. This means that the land should be well prepared. Seedbed preparation usually consists of plowing with a disc or moldboard plow in the fall or winter, followed by harrowing and bedding and sometimes by rebedding. If the land is plowed early it should be left rough to reduce erosion, and to enable it to store up as much rainfall as possible during the winter.

When corn is grown following a winter legume crop, the legume should be plowed under about two weeks before planting the corn. In cases where the legume makes a late growth it is usually better to follow the legume with cotton or some other late crop and then the next year with corn. Regardless of the method used in seedbed preparation, corn requires a seedbed that is deep, well pulverized, in good physical condition, and free of weeds at planting time.

Planting Dates

It is the last thirty days of growth that usually determine the success of a corn crop in Texas, provided good cultural practices have

been used in growing the crop. Corn should be grown during the period when there is the least injury possible from summer drouths. Early-planted corn is practically always more productive than late-planted corn; so the best planting dates are usually as soon as the soil is warm enough in the spring. These dates are subject to both regional and seasonal variations, but in most areas of the State planting is begun near the average date of the last frost. For approximate planting dates by areas see table on last page.

Corn should be planted as early as weather conditions will permit but planting too early while the soil is too cold will cause poor stands and slow growth. Maximum yields cannot be made without good stands. The upper 6 or 8 inches of the soil should have an average daily temperature of about 50 degrees Fahrenheit before planting. The soil temperature can be obtained with a good thermometer.

Planting

On well-drained soils, seed should be planted on the level or slightly below the level, but on poorly drained soils they definitely should be planted above the ground level. In the Blackland Prairie Region and in river bottoms it is a common practice to plant on medium beds. The recommended planting depth for seed is 1 to 1½ inches. Contrary to popular opinion, deep planting of the seed does



Planting corn on a well prepared seed-bed with a two-row planter.

not help in obtaining a deep root system. Rolling the soil after planting helps in securing a good stand. Chemically treated seed also helps in obtaining a good stand by reducing losses from seed rots, seedling blights and other diseases. Practically all hybrid seed sold in Texas are treated before being sold to the farmer.

Spacing

Corn should be spaced according to the rainfall of the area, fertility of the soil and capacity of the soil to store and hold water. Spacing recommendations by soil areas are given on the last page. Slightly closer spacings than are recommended there may be profitable on especially fertile soils which take in large amounts of water and hold it. On the other hand, corn should be spaced farther apart than recommended if the correct kind and amount of fertilizer is not applied or if the soil is low in organic matter.

The correct spacing of corn for producing maximum yields usually can be determined by the size of ears produced. Maximum yields of Texas hybrids in general are obtained when the ears weigh one-half pound each. If the ears are larger than this, the stand of corn is not adequate for the moisture and fertility conditions. If the ears are smaller than one-half pound, the stand is too thick for the available moisture and fertility conditions.

A uniform stand of the proper spacing should partially shade out weeds. In addition, soil water evaporation should be less.

Cultivation

Proper cultivation is important. Many good prospective yields of corn have been ruined by cutting feeder roots by cultivating too deep and too late in the season.

The main object of cultivation is to kill grass and weeds. This is most easily done just as the first crop of weeds and grass are coming through the soil. The first cultivation also increases the circulation of air in the soil around the corn roots. For later cultivations the sweeps or shovels on a cultivator should be set flat so as to run shallow. If the land is well prepared before planting, only about two cultivations are necessary after the corn is up. However, one or possibly two additional cultivations sometimes may be required to control grass and weeds.

When corn is about three feet high, the soil is filled so completely with roots that even shallow cultivation will cut many of the feeder roots. Late cultivation after corn is waist high does more harm than good. And laying by corn with a turning plow can ruin a corn crop. This practice cuts many feeder roots just at the time the plants need nutrients and water the most to develop the ears.

Topping

A few farmers top corn and use the tassels for hay. This practice will definitely decrease the yield of corn if it is done *before* the silks are 5-6 weeks old. Approximately 15 per cent reduction in yield may be expected when corn is topped two weeks after silking and a 6 per cent reduction if topped four weeks after silking.

HARVESTING AND STORING

Corn should be harvested as soon as it is dry enough for safe storage. Early harvesting is important to prevent as much damage as possible in the field from insects, ear rots and rodents. The use of machinery for harvesting corn has increased rapidly in the last few years, and a large part of the crop is harvested in August and early September. This allows early land preparation for fall-seeded small grains or legume crops.

In order to control weevils, rats and other rodents, corn should be stored in a crib or bin that is tight enough for effective fumigation. It may be necessary to tack heavy building paper on the floor and walls to make the crib as air tight as possible.

Every year a large amount of corn in storage is ruined by weevils. This big loss could be prevented by proper fumigation. Where the corn crib has been made tight, 1,000 bushels of corn may be treated with 6 to 8 gallons of a mixture of three parts of ethylene dichloride and one part carbon tetrachloride, or four parts carbon tetrachloride and one part carbon bisulfide. These mixtures are on the market under various trade names.



Harvesting corn with a mechanical picker.

Caution: The fumigants should be applied from the outside with a bucket pump or other type sprayer, and should be distributed evenly over the surface of the grain. It is unwise to apply the chemical with a sprinkling can because the vapors are dangerous to inhale. It is a good precaution to use a gas mask. If any of it gets on the skin it should be washed off with soap and water to prevent blistering. Under some conditions fumigation

GENERAL RECOMMENDATIONS BY SOIL AREAS FOR CORN PRODUCTION IN TEXAS

Soil Areas	Planting dates	Plants per acre	Spacing, inches in row	Fertilizer at planting time ¹	Side-dressing of nitrogen ²	Soil-improving legumes	Hybrids
East-Tex. Timber Country Loams and sandy loams Sandy soils	Mar. 5-30	6,500-9,000	18-24	30-60-30 30-60-60	60 60	Hairy vetch, Single-tary peas, Austrian winter peas, Lespedeza	28, 26, 24, 30
Gulf Coast Prairie Blackland Loams and sandy loams	Mar. 15- Apr. 15	9,000	18	40-40-0 40-40-20	40 60	Melilotus indica, Hubam and Madrid sweet clovers	11W, 24, 30
Blackland Prairie Blackland Mixed land	Mar. 1-20	6,500-9,000	18-24	40-40-0 40-40-20	30 30	Hubam, Madrid and Evergreen sweet clovers	28, 26, 30
Grand Prairie Blackland Mixed land	Mar. 1-20	6,500	24	40-40-0 40-40-20	30 30	Hubam, Madrid and Evergreen sweet clovers	28, 26
West Cross Timbers	Mar. 15-30	6,500	24	15-30-15	30	Hairy vetch, Hubam and Madrid sweet clovers	28, 26
Rio Grande Plain Blackland Sands and sandy loams	Feb. 15- Mar. 1	6,500	24	20-0-0 20-40-0	30 30	Hubam clover and Melilotus indica	24, 26
Lower Rio Grande Valley and Winter Garden Dist. (under irrigation) Clays and loams Sands and sandy loams	Feb. 1- Mar. 1	13,000	12	40-40-0 40-80-0	90 90	Hubam clover and Melilotus indica	24
Rolling Plains Clay loams Sandy and sandy loams	Mar. 25- Apr. 10	6,500	24	20-20-0 30-30-0	30 30	Alfalfa, Hairy vetch, Hubam and Madrid sweet clovers	26, 28
High Plains (irrigated) Clay loams Sands and sandy loams	Apr. 10- May 1	9,000	18	30-0-0 30-30-0	60 60	Alfalfa, Hairy vetch, Hubam and Madrid sweet clovers	28

¹Shown as pounds per acre of nitrogen (N), phosphoric acid (P₂O₅) and potash (K₂O), respectively.

²Shown as pounds per acre of nitrogen (N).

may lower the germination per cent of corn for planting purposes unless adequate ventilation is provided after fumigation.

Monthly inspections during warm weather should be made to see whether or not re-fumigation is necessary. Another precaution is to clean out the crib thoroughly and then spray the floor and walls with DDT or Chlordane before storing the corn to kill any weevils which may be present in the cracks and crevices.

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