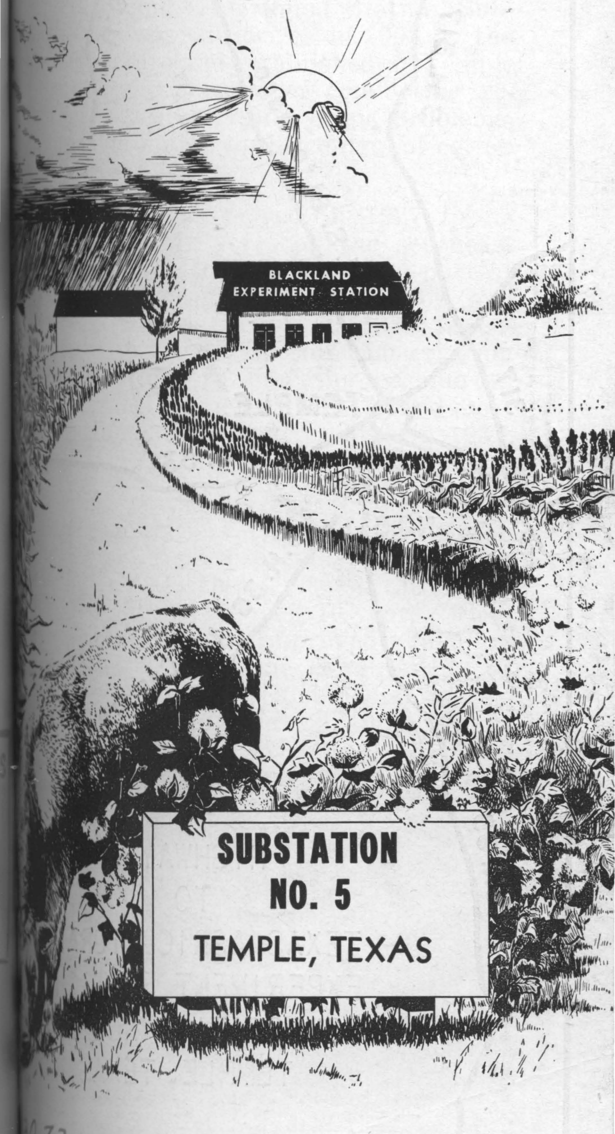
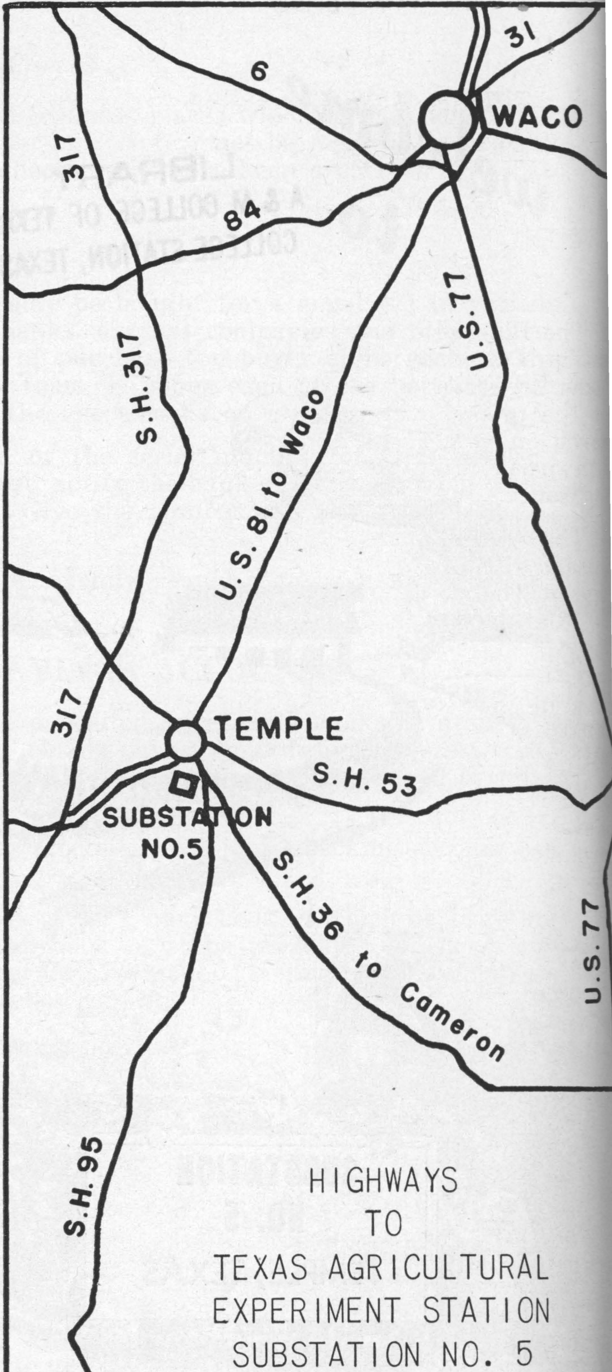
P-205

MAY 1957

welcome to



TEXAS AGRICULTURAL EXPERIMENT STATION



HIGHWAYS
TO
TEXAS AGRICULTURAL
EXPERIMENT STATION
SUBSTATION NO. 5
TEMPLE, TEXAS

Welcome

to the

TEXAS AGRICULTURAL EXPERIMENT STATION

Substation No. 5

Temple, Texas

The Blackland Experiment Station, Substation No. 5, was authorized in 1909 by the Texas Legislature and established at Temple for the primary purpose of conducting research on varied soils and crops problems, with special attention to the control of cotton root rot.

The station was moved in 1927 to its present site of 542 acres on the southeast edge of Temple in the south central part of the Blackland Prairie of Texas. Soil and water research was begun in 1931 in cooperation with the U. S. Soil Conservation Service. Hybrid corn breeding became an important function here in 1927, and beef cattle grazing and feeding research in 1937.

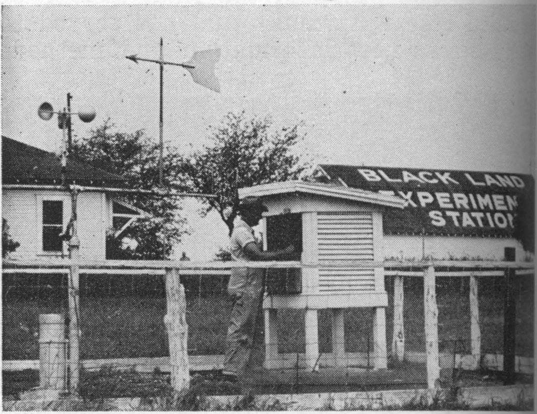
Increasing attention has been given here to evaluating weather in relation to crop performance and conservation. Mechanization for all major crops, especially cotton, has been a major research activity on the Blackland Station during the past 10 years. Field scale application of improved farming practices has provided the final testing of detailed research results and has served to demonstrate new information and methods

The Blackland Experiment Station headquarters area from the air.

to farmers and to representatives of other groups or agencies.

The Blackland Prairie is a rather clearly defined agricultural area of deep, fertile, heavy textured soils. It includes about 10,000,000 acres extending southward from the Red River bottomland on the north through Central Texas and joining the Rio Grande Plain in the San Antonio area. It is bounded on the east by brown, sandy, forested Coastal Plain soils and on the west by shallow clay prairie soils over hard limestone. The distance from north to south is slightly more than 300 miles. An additional 2,000,000 acres of Blackland lies on the southeast, separated by forested Coastal Plain soils.

Elevation on this station varies from 582 to 660 feet with slopes ranging from zero to 6 percent. The average annual rainfall for 44 years is 33.7 inches. The average frost-free season is 249 days, extending from March 26 to November 21. The average temperature is 67.2 degrees F., with the minimum daily average 55.3 degrees F. and the maximum average 79.1 degrees F. The most dependable rainfall occurs from April 15 through May 30, and the minimum rainfall corresponds with maximum temperatures in July and August. Thus severe summer drouths are expected. Variability in spring rainfall and summer drouth have a great influence on crops grown and on cropping practices. Temperature, humidity and wind often determine rainfall effectiveness.



Records and evaluation of rainfall, temperature, wind, humidity and evaporation are essential in agricultural research.

These factors also exert many direct effects on crops.

Most of the research here is conducted in cooperation with the Soil and Water Conservation Division of the Agricultural Research Service, USDA, and with other substations and departments of the Texas A. and M. College System.

Results are made available immediately to county agricultural agents of the Texas Agricultural Extension Service, personnel of the Soil Conservation Service, farmers and allied groups through field days and the press, radio and television.

Visitors are welcome at the Blackland Station. The address is Box 414, Temple, and the telephone number is PR 3-2552.

R. M. SMITH, *Superintendent and Soil Conservationist (TAES-USDA)*

J. W. COLLIER, *Agronomist and Plant Breeder (TAES)*

E. D. COOK, *Agronomist (TAES)*

R. J. HERVEY, *Pathologist and Microbiologist (TAES)*

J. E. ADAMS, *Soil Scientist (USDA)*

R. C. HENDERSON, *Farm Supervisor (USDA)*

L. D. DOLAN, *Administrative Officer (USDA)*

Foreign agriculturalists study our research results and exchange ideas.

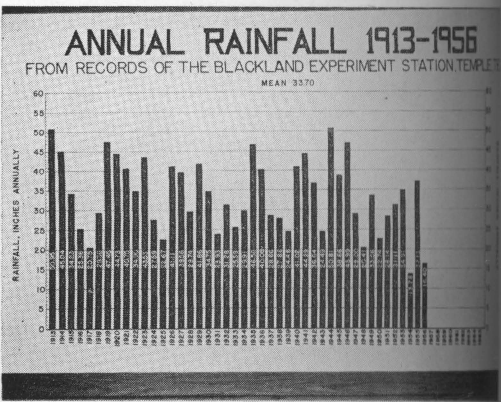
Agricultural Research Projects at Substation No. 5

CLIMATIC INFLUENCES

Weather records collected for almost a half century on this station provide many clues to farming progress. Research is directed toward lessening weather hazards and taking advantage of desirable weather characteristics. Early-maturing, spring-planted crops are benefitted by dependable moisture in May. Severe summer drouth must be avoided or tolerated by any crop.

Summer rainfall increases cotton root rot. Inconsistent rainfall in the fall requires feed reserves for wintering livestock. Johnsongrass and weeds are controlled by proper timing of operations in relation to weather. The use of water by winter cover crops creates hazards for succeeding warm-season crops to be planted in the spring. Control of weeds and crop regrowth is essential for maximum storage of subsoil moisture.

Erosion control usually is adequate only when land is protected during May storms. Soil shrinkage and cracking because of drying is a primary factor in the control of runoff. Blackland soil puddles or packs easily when wet, and becomes difficult to



Rainfall and other weather varies widely from year to year. Research is planned to avoid weather hazards and to take maximum advantage of favorable influences.

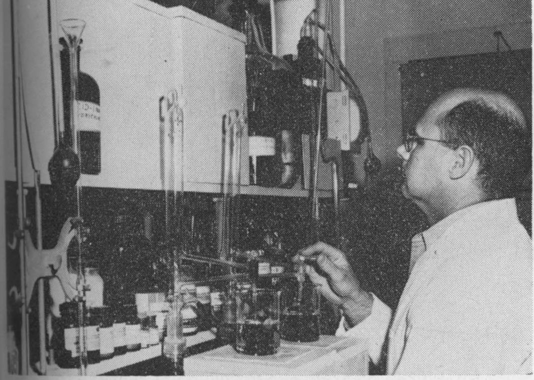
work. A fuller understanding of the complex interactions among weather factors, soils and crops is essential to continued agricultural progress.

SOILS

Fertilization and Management

Experiments have shown that phosphorus and nitrogen are the primary fertilizer needs in the Blackland. Total phosphorus content of Blackland soils is high, but the rate of availability often is inadequate for maximum crop production. Banded applications of 30 to 60 pounds of phosphoric acid (P_2O_5) per acre, as superphosphate, have increased yields in many tests. The need for nitrogen is closely related to moisture and temperature. Greatest responses to nitrogen are in vegetative growth. Where phosphated small grain-clover is grown in rotation with row crops, extra fertilizer is not needed.

Field and laboratory studies of depth of moisture and nitrates in the soil and on various dates show complex and varied relations to soil, season and cropping systems. Well-managed Blackland soil has good nitrogen-supplying capacity. Available moisture often is lacking for maximum use of soil nitrogen. Downward movement of nitrates with spring rains largely overshadows original depth placement by



Soil is studied thoroughly in the laboratory as well as in the field.

machine, but nitrate-leaching losses below root depth are believed to be small. Emphasis is being placed on increasing efficiency and on correlations between laboratory results and field response in relation to cropping practices.

Structural Influences

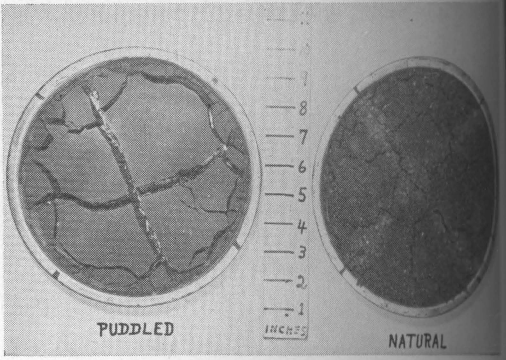
Natural soil structure varies with original soil characteristics and with management. Shrinkage, swelling, cracking and stickiness are outstanding in the structure of Blackland soils.

Many of the farming methods developed in other soil areas are unsatisfactory in the Blackland because of the extreme physical properties of its heavy clay soils.

A variety of old methods of characterizing soil structure have been tested or modified and new methods are being developed with emphasis on the importance of moisture content and volume changes.

Field experiments have indicated that working or grazing Blackland soil when it is wet causes major temporary changes in soil structure. These changes have been evaluated by newly-developed methods. Succeeding reductions in yields of cotton and corn also have been noted.

More information is needed on the kinds of structure desired for maximum crop yields and for conservation. Methods to create the desired structure must then be developed and perfected.



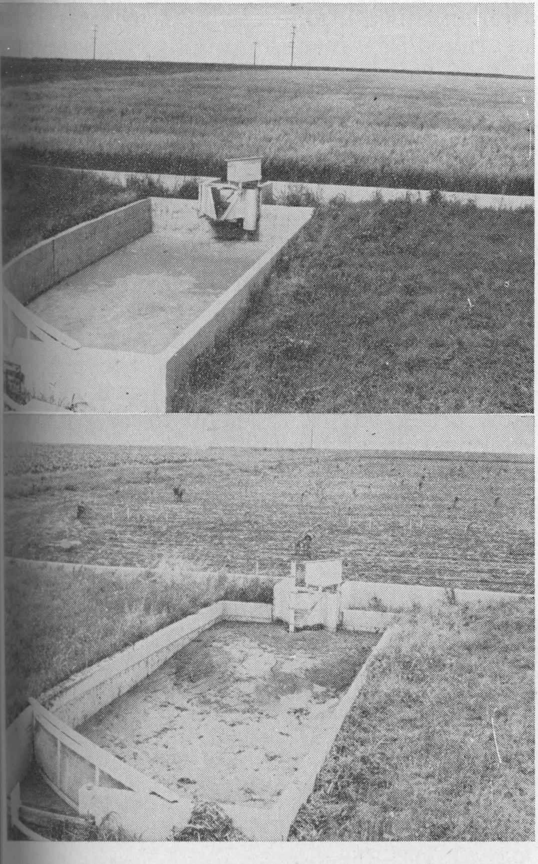
Blackland soil structure varies by puddling and is evaluated in relation to shrinkage and swelling.

SOIL AND WATER CONSERVATION

Runoff and Erosion in Cropping Systems

Research on this station since 1931 has provided factual results which have served for many principles and practices in soil and water conservation. Present studies are conducted on field scale plots, 1½ acres each, and on gauged terraces. Results from these field plots are more applicable to farmers fields than results from smaller plots.

Soil and water losses are held to a minimum by grass alone or with sweetclovers. Small grains alone or small grains-sweetclover are outstanding for the protection of sloping land during April and May when the most serious losses occur on



Broadcast crops such as oats and sweetclover offer excellent land protection during the April-May heavy rainfall season compared with heavy runoff and erosion from row crops.

cultivated land. Soil cracks have proved effective in preventing runoff during a season. Soil drying by small grains or other crops has a great influence on water intake because space is provided in the soil for additional rainfall.

Studies of the interrelationships of weather, soil characteristics, cropping sequences, management and yield are providing basic information necessary to meet variable kinds of weather, and changes in crop acreages, quality and price relationships.

Water Losses by Evaporation

Evaporation removes an estimated 3 percent of the soil moisture in Texas, and from 70 to 75 percent of the total precipitation on the Great Plains. Open pan evaporation on this station over a 39-year period has averaged 57.9 inches annually compared with annual rainfall of 33.7 inches. High summer temperatures and soil cracking probably cause soil moisture losses by evaporation to be higher for this area than is generally realized.

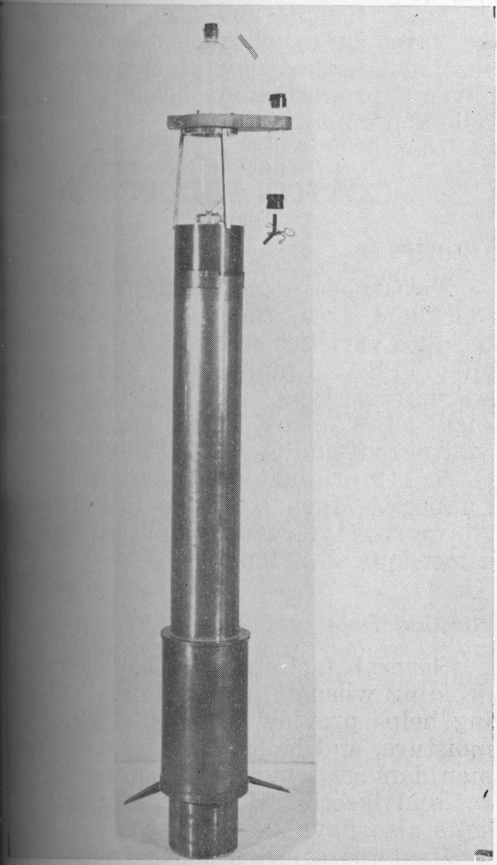
Studies here have shown a lowering of soil moisture content 3 inches on each side of shrinkage cracks to a depth of 12 inches and a lowering of soil moisture near the crack to a depth of 24 inches. Measurements also have shown that the maximum potential evaporation at a depth of 2 feet in a crack varies from 50 to 70 percent of evaporation at the surface.

Evaporation losses from shrinkage cracks are being studied to make more efficient use of water.

Evaporation losses from both the soil surface and cracks of Blackland soils are being analyzed. The use of mulches, physical treatments and chemical amendments are being tested for reducing soil moisture losses by evaporation.

Infiltration

Farming practices which increase the water intake ability of soil also reduce soil and runoff losses. Water intake and soil and water losses from natural rainfall are being studied for three cropping systems on 12 field-scale runoff plots. The cropping systems include: (1) continuous row crop (corn); (2) 2-year rotation of corn, oats-Madrid sweetclover; (3) 3-year rotation of corn, fescue-sweetclover, fescue-sweetclover.



A new type portable rainfall simulator infiltrometer helps research workers understand and improve water conservation.

A small portable rainfall simulator infiltrometer is being used in a study of the effect of various cropping systems on the water intake rate and erodibility of Blackland soils and relative erodibility of other soils in Central Texas.

Residue Management

Machines and methods of residue management from other areas have been adapted to Blackland conditions. Some procedures are promising, including soil and water conservation benefits. Under some conditions, deep furrow drilling of small grain and phosphate appears practical for eliminating one or more steps in land preparation. Summer plowing with subsurface sweeps, followed by conventional bedding appears more promising than a complete change to subsurface methods. Runoff and crop yields are being compared by using trash mulch versus conventional methods, and their relations to soil physical properties are being studied in the field and laboratory.

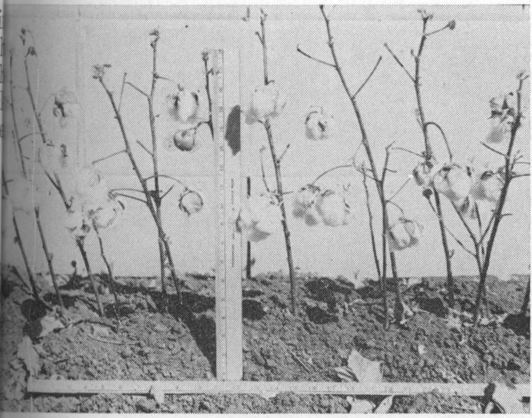
COTTON PRODUCTION

Varieties

Two types of cotton are planted in the Blackland area, the open boll type, which includes varieties such as D&PL Fox, Stoneville TPSA, Empire and Kasch, and the stormproof type, which includes varieties such as Lankart, Blightmaster, Western Stormproof and C. A. 119. Blightmaster and C. A. 119 originated at Substation No. 8 at Lubbock. Much cotton in this area is the stormproof type which can be harvested with a mechanical stripper.

Planting Date and Spacing

Several factors must be considered in deciding when to plant cotton. Early planting helps provide the most efficient use of moisture, and helps avoid some of the summer damage which may be caused by root rot and insects. However, experimental results also have shown that it does not pay to plant too early, when the ground is cold. Cottonseed germinate slowly at temperatures of 65° F. or lower. A good rule in this area is to plant anytime after April 1 when



Cotton plants spaced 2 to 4 inches apart in rows 40 inches apart improve yields and efficiency of stripper harvesting.

the average soil temperature at planting depth is close to 70° F. In 1956 tests, the April 16 planting with average soil temperature of 70° F. gave maximum yields.

For stripper harvesting and highest yields, spacing plants 2 to 4 inches apart in rows 40 inches apart is recommended.

Fertilization

A combination of nitrogen and phosphorus has increased cotton yields. Potash alone or in combination with nitrogen and phosphorus does not result in an additional increase. Commonly recommended rates are 15 to 30 pounds of nitrogen and approximately 30 pounds of phosphorus per acre. In rotations where cotton follows oats fertilized with phosphate, additional fertilizer has not been needed to increase cotton yield.

Weed Control

Cultivation with a rotary hoe is helpful in controlling weeds if rain comes before cotton is up. It controls seedling weeds and breaks surface crusts. After cotton is established, weeds are controlled with a cultivator or by oiling with special shoe attachments. Hoeing or spot-oiling controls weeds later in the season.

Research is in progress to develop improved and more economical chemical and mechanical controls of Johnsongrass and weeds.

Farmers show much interest in new developments in cotton mechanization.

Desiccation and Mechanical Harvesting

Proper drying of cotton leaves with desiccants such as pentachlorophenol has proved dependable for stripper harvesting. Results from true defoliants have not been consistent. Tests show desiccants should not be applied before 90 percent of the bolls are open, and stripping should not be attempted when the leaves are moist. Stripper harvesting saves farmers $15 to $25 per bale over hand harvesting. Research also is being directed toward more efficient chemical defoliation.

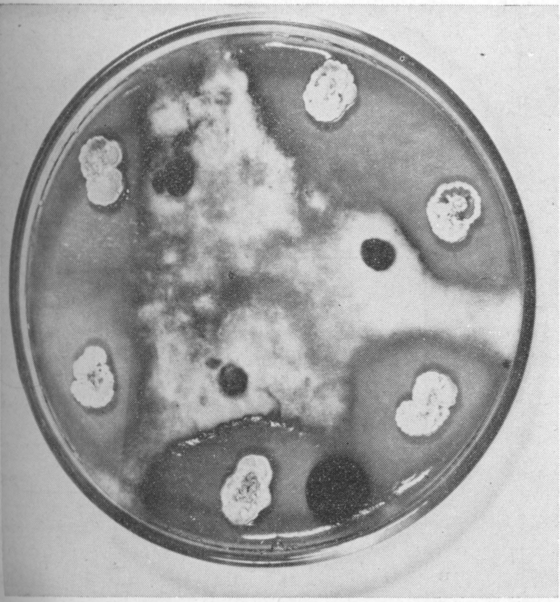
Insect Control

During most years, early-season insect control is necessary to produce high yields of cotton. Insect control is done according to recommendations by entomologists of the Texas Agricultural Experiment Station and the USDA. In 1955 and 1956, systemic-treated cottonseed plus one spraying proved a satisfactory substitute for a complete early season spraying program.

COTTON DISEASES

Cotton Root Rot

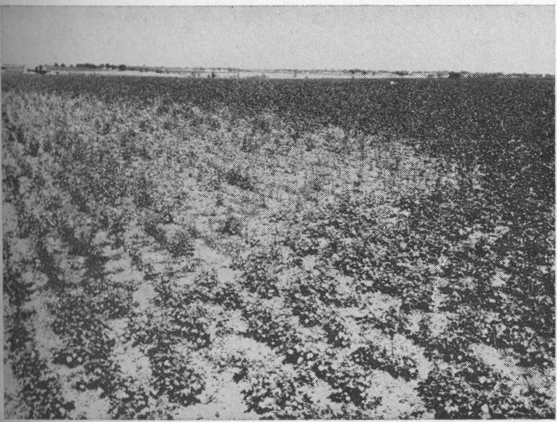
Cotton root rot, caused by the soil fungus, *Phymatotrichum omnivorum,* is one of the most serious diseases of cotton in Texas. Although losses from this plant disease are largely confined to the Blacklands, it causes serious damage in the Lower Rio Grande Valley and El Paso region. Nearly all tap-rooted plants are subject to attack. Most



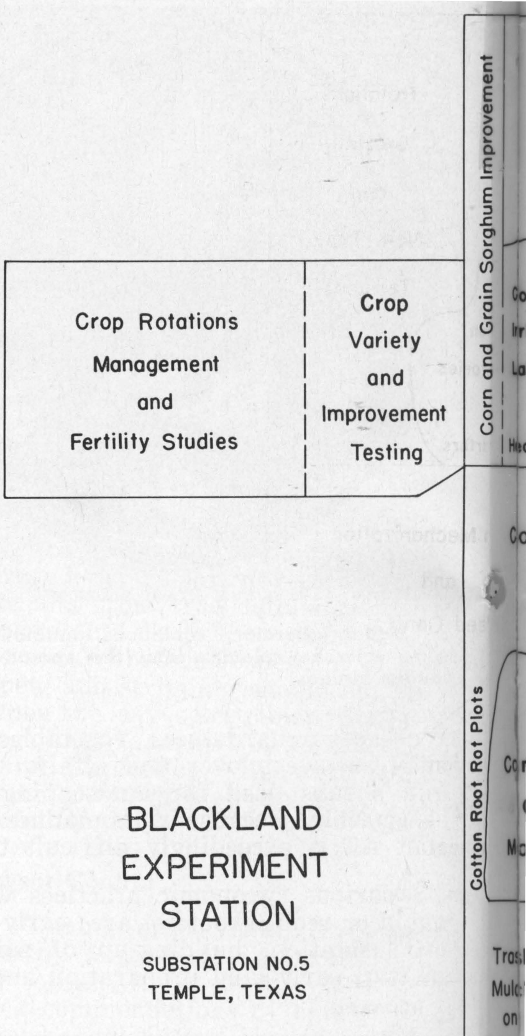
Under laboratory conditions antibiotic effects of some microbe colonies limit the spread of root rot fungus strands.

types of orchard trees, vegetables, legumes such as sweetclover and alfalfa, and trees and shrubs used for landscaping also are susceptible. Because of its manner of attack, root rot is exceedingly difficult to control.

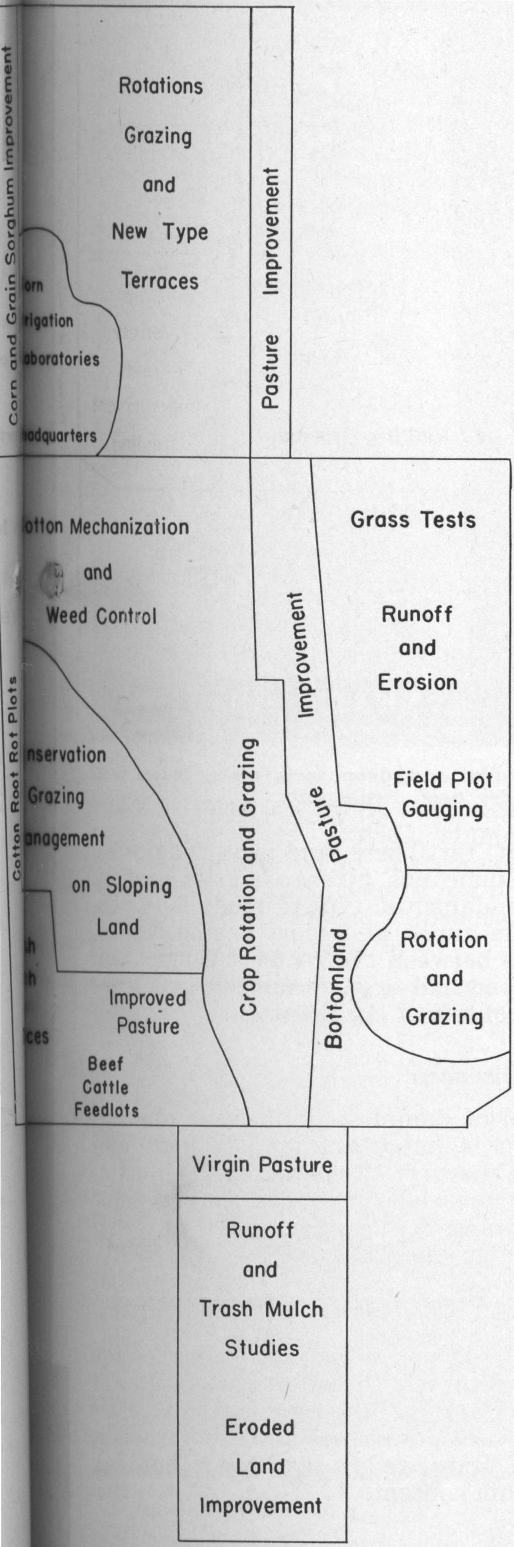
Various agronomic practices which help avoid or reduce root rot are: early maturity, crop rotation, building-up of soil organic matter, early land preparation and the pro-



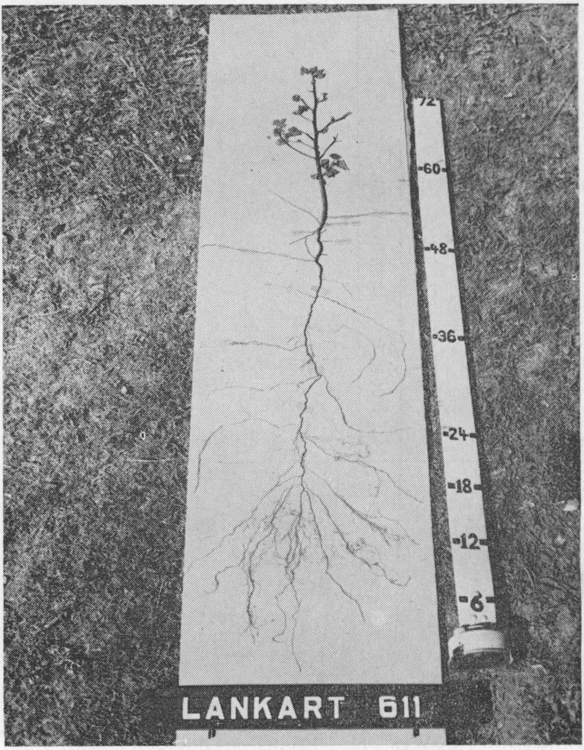
Complete control of cotton root rot is a major problem of research.



Crop Rotations
Management
and
Fertility Studies
Crop
Variety
and
Improvement
Testing
Corn and Grain Sorghum Improvement
Cotton Root Rot Plots
BLACKLAND
EXPERIMENT
STATION
SUBSTATION NO.5
TEMPLE, TEXAS
N
1000
feet in scale



Corn and Grain Sorghum Improvement
Rotations
Grazing
and
New Type
Terraces
Pasture Improvement
Cotton Root Rot Plots
and
Weed Control
Grazing
on Sloping
Land
Improved
Pasture
Beef
Cattle
Feedlots
Crop Rotation and Grazing
Bottomland Pasture Improvement
Grass Tests
Runoff
and
Erosion
Field Plot
Gauging
Rotation
and
Grazing
Virgin Pasture
Runoff
and
Trash Mulch
Studies
Eroded
Land
Improvement



Small stalks and deep roots make cotton well adapted to dry deep fertile soils.

per use of fertilizers and soil fungicides. However, none has given adequate control. A more fundamental type of study is in progress. It is aimed at understanding the relationships between the root rot fungus, soil microbes and soil organic matter, and more effective control of the disease.

Seedling Diseases

Control of damping-off diseases of seedling cotton is important in both yield and mechanical harvest. Tests with a large number of commercial fungicides show seed or within-furrow treatment helps assure dense stands of vigorous plants.

UTILIZATION OF COTTON BURS

Use of strippers for harvesting cotton results in accumulation of large quantities of cotton burs at gins. An organic residue, burs are considered a nuisance and are burned at most gins. Burs are low in nitrogen, but high in potassium content.

Studies of bur compost here show it contains about 1 percent nitrogen, 0.1 percent phosphorus and 3 percent potassium and that it may be converted into a good artificial manure. By adding small quantities of nitrogen fertilizer during composting, the nitrogen content increases to about 3.5 percent, which is high enough to assure rapid nitrogen availability to plants.

CORN IMPROVEMENT

Hybrids and Varieties

The corn breeding research here is aimed at developing inbred lines which will perform well in hybrid combinations in Central Texas. Sources of breeding material were local dent varieties during the first 10 years of this program. Now most of the breeding work is aimed at combining the earliness and stiff stalk characteristics of certain Corn Belt lines with some of the Texas lines. New inbred lines are selected by their performance in preliminary tests and then are tested in single cross combinations with other lines developed in the corn breeding program of the Texas Agricultural Experiment Station at College Station.

The testing program here includes various tests of dent corn hybrids, single crosses and preliminary tests. Personnel from this station supervise various types of corn performance tests at Holland, Hillsboro, Waxahachie, Greenville and McGregor.

Dent corn hybrids which have performed best over a period of years include Texas 26,

Hybrid corn breeding has made a huge contribution to agriculture.

28 and 30, which have yellow grain, a
Texas 17W, an early maturing white gra

Newly released Texas 36 offers prom as a good early hybrid and another ext early hybrid, Texas 38, will be available so Both performed well during the hot, d years of 1954 and 1956, escaping some the unfavorable weather conditions becau of earliness or their ability to tolerate he and drouth.

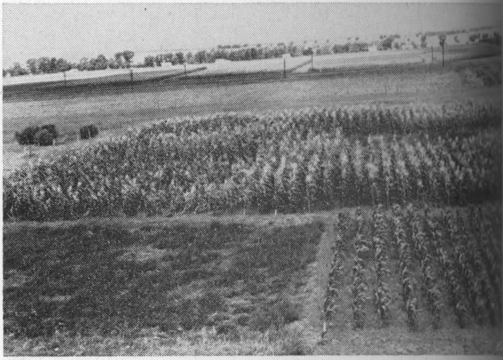
Popcorn and sweet corn tests also a grown.

Sweet corn must have considerable re sistance to ear worm to be adapted to th central Blackland area. Calumet appea outstanding in tests here. Other good hy brids are Huron and certain strains of Ioana Popcorn hybrids such as Purdue 32 and 3 have performed satisfactorily here.

Management and Irrigation

Corn production studies at the Blackla Station include fertilizer in different crop ping systems, spacing studies and a bas study of supplemental irrigation, croppin systems and nitrogen applications.

Fertilizer studies of corn have show very few economic responses to fertilizer Applications of 30 to 60 pounds of pho phoric acid per acre have resulted in smal but fairly consistent yield increases, bu responses to nitrogen have been inconsisten Corn following a phosphated small grain clover mixture has produced good yield over a period of years without any fertilize



Corn production tests are made in plots including irrigation, crop rotation, plant spacing, nitrogen fertil izer and weather factors.

applied to the corn. In several off-station tests with corn following another row crop, increased yields of corn from fertilizer were more common but somewhat dependent on adequate rainfall in June.

From 7,000 to 9,000 plants per acre (18 to 24 inches apart in 40-inch rows) have given the highest yields of corn over a period of years. Higher plant populations may give slightly higher yields in favorable years with adequate fertility, but decreased yields during unfavorable years. Tests are in progress to determine which corn hybrids produce highest yields with high plant population.

Experiments involving supplemental irrigation, cropping systems and nitrogen fertilization give indications of the value of sweetclover to the following corn crop. The only significant response to nitrogen was in the continuous corn plots. No increases in yield, either with or without supplemental irrigation, resulted from nitrogen applications to corn following sweetclover. Under dryland conditions slight yield reductions have resulted after nitrogen was applied to corn following sweetclover. Supplemental irrigation caused large yield increases except in continuous corn plots where fertility levels had become low. This study will continue over a period of years to determine if there are cumulative effects of the cropping system-treatment combinations on soil characteristics, both physical and chemical.

SMALL GRAIN IMPROVEMENT

Adapted Varieties

Large acreages of small grains are grown in the Blacklands. The testing on the Blackland Station seeks to determine the best varieties for the area, and is part of the overall state and federal research on small grain improvement.

Oats

Several varieties recommended for this area are listed below with a few comments about each.

Alamo—A red seeded, very plump variety with high test weight ordinarily recommended as a spring oat in this area. However, it has averaged 39.6 bushels per acre in

Foundation seed stocks of such outstanding o
as Alamo are maintained on this station.

fall-sown tests and 34.8 bushels per acre in spring-sown tests during the past 6 years. It has stiff straw, upright growth, broad leaf and outstanding resistance to leaf or crown rust and stem rust. Foundation seed of Alamo is produced on the Blackland Station.

New Nortex—A red seeded, moderately winter-hardy variety which produces winter grazing and has an average yield of 47. bushels of grain per acre over a 6-year period.

Mustang—A gray seeded, extremely winter-hardy oat with good resistance to leaf or crown rust, fairly stiff straw, high production of winter grazing, earlier than New Nortex, and produced an average of 43.4 bushels per acre during 1951-56.

Bronco—A red seeded sister of Mustang with excellent winter-hardiness, slow winter growth and later maturity than New Nortex. Although it has yielded an average of 45 bushels per acre during the past 6 years, it is recommended primarily for the northern portion of the Blackland area.

Wheat

Wheat strains and varieties are tested here each year with special attention to yield and disease resistance. Quanah is recommended for the area. It is a hard red winter wheat of medium late maturity with excellent milling quality and a fair test weight.

Barley

Barley produces excellent winter grazing and fair grain yields in this area. Cordova and Texan have performed well. Average yields for 6 years are 28.7 bushels per acre for Cordova and 27.0 for Texan.

Flax

Varieties of flax are tested each year for yield and particularly winter-hardiness since the Temple test is the northern-most test in Texas. These varieties are fall seeded. Flax production is not generally recommended this far north.

SMALL GRAINS FOR FORAGE

Varieties

Small grain varieties which have produced the highest forage yields in plot clipping tests are Mustang, New Nortex, Bronco and Alamo oats and Cordova barley. Yields are 1 to 1.5 tons of air-dry forage per acre during dry years, but are more in wet years. Bronco forage growth occurs later than other oat varieties, making it undesirable for early grazing.

Fertilization

Forage yield increases were obtained from the application of fertilizers to Mustang oats during 1953-56. The most economical rate has been about 30 pounds each of nitrogen and phosphoric acid per

Differences in small grain varieties are studied in tests as a part of a statewide small grain improvement program.

acre, increasing the yield of air-dry forage about 1,000 pounds per acre. The oats have been grown following cotton.

GRAIN SORGHUMS

Variety and Hybrid Testing

The release of grain sorghum hybrids has emphasized the need for information on their yielding abilities, combining characteristics, responses to dates and rates of planting and other factors relating to their adaptation to the Blacklands. Grain sorghum varieties and hybrids are tested here each year, to answer these questions. Such varieties as Plainsman, Redbine 60 and 66, Martin and Combine 7078 have performed well over a period of years. Data, so far, on the hybrids, show that RS 610, Texas 620 and RS 650 are well adapted to this area. RS 590 may be the most reliable on the shallow soils.

Plans are to continue testing grain sorghum hybrids and aid in the sorghum breeding program by screening some of the materials for their adaptation to the Blacklands.

Management

During the past few years, most grain sorghum acreage in the area has been planted during March. This is rather early for the crop, and experiments here seek to determine what effect dates of planting will have on the yield of both hybrids and varieties.

Sixty to 70 percent of the seed planted will produce established seedlings, and research is in progress to determine the best spacing in the row for maximum grain yields. Spacing seed approximately 2.5 inches apart in rows 40 inches apart has given maximum yields, however yields from other spacings have been only slightly different.

Grain sorghum responses to fertilizer applications usually are similar to those obtained with corn. In several off-station fertilizer tests, combinations of 15 to 30 pounds of nitrogen and 30 pounds of phosphoric acid per acre have increased grain yields a few hundred pounds per acre. Potash alone or in combination with nitrogen has not increased yields. Where grain sorghums follow sweetclover or oats-sweetclover, responses from fertilizers, especially nitrogen, have been rare.

LEGUMES

Sweetclovers

Hubam and biennial sweetclovers are planted with small grains for forage, seed or soil improvement, and to determine the effects of sweetclover on oat grain and forage yields and more about the root systems of the annual and biennial types of legumes. In cropping systems and in field grazing studies, the effects of sweetclovers and other legumes also are being evaluated in relation to soils, moisture, fertilization and the performance of crops following sweetclovers.

Legume Inoculation

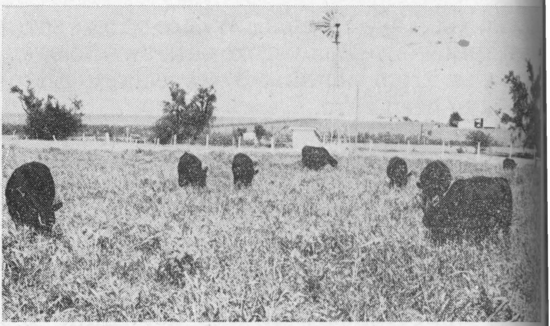
Studies of inoculation of sweetclover in Blackland soils indicate that phosphorus encourages nodule formation and that legume bacteria may be incorporated safely in the phosphate fertilizer. Phosphated soil produced about three times as many root nodules as non-phosphated soils. Nodule bacteria in dry fertilizers in storage survived in greater numbers during a 3-month period than they did in dry soil.

FORAGE SORGHUMS

The silage varieties of sorghum best adapted to this area are Sourless, Atlas, Hi-Hegari, Sumac, Honey and Honey x Leoti which yield up to 6 to 7 tons of air-dry forage per acre. In 3 years of testing, forage sorghums have produced more tonnage than two hybrid corns, Texas 28 and 30. Sumac and Hegari, when planted thick, make good hay.

SUDANGRASS

Sudangrass is an important summer forage plant for the Blackland area. It produces relatively high yields of forage of good quality for grazing or hay. Varieties which have produced the most forage in clipping experiments on the Blackland Station



Sudangrass varieties and management for summer grazing are evaluated.

are Tift, Piper, Sweet and Common, in that order. Tift now is being used in fields for grazing.

WARM-SEASON GRASSES

Production

Australian beardgrass has consistently produced high forage yields on the Blackland Station. Even during dry years, it produced 1.75 tons of forage per acre. Other species tested include buffel, Indian, blue panic and Johnsongrass. Johnsongrass has made good forage yields the first year and then dropped rapidly after a year of clipping.

K. R. bluestem has been one of the consistent high producers of forage in plots, and is being grown successfully in combination with cool-season clovers on depleted, eroded soil on the station.

Side-oats grama variety tests show that the top forage producers are Mauldin, Encinoso, Texas, Hope and Tuscon. Mauldin shows promise of being one of the better pasture grasses in this area. When moisture conditions are favorable, it will produce 2 tons of forage per acre.

Buffelgrass yields have been fair. Even during extremely dry years, it produced 0.5 to 1.0 ton of forage per acre. Yields have been much higher, in favorable years, but seedings in field areas have not been successful.

Coastal Bermudagrass is producing high yields on previously cultivated land. This w variety of Bermudagrass has survived e cold and drouth in this area for several ars and is promising for wider use in ackland soils, especially on moist sites. ore information is needed about management of Coastal to get higher yields and for establishment in competition with other ecies.

rtilization of Bermudagrass

Fertilizer tests show that Common and astal Bermudagrass respond to fertilizer eatments, but that Coastal will produce ore forage from the same amount of fertilizer. Coastal has responded to a combination of nitrogen and phosphoric acid or to trogen alone. Nitrogen applications up to pounds per acre are economical during vorable years.

tablishment

The use of warm-season grasses is seriusly limited because of the difficulty of eir satisfactory establishment in competion with volunteer Johnsongrass, sourrass and weeds.

Additional study of crop rotations, with eater emphasis on evaluations of associad weather and soil influences, is expected provide a basis for additional increases in elds and efficiency of warm-season rasses.

ROOT SYSTEMS

Research on crop and production improvement should consider the detailed relations of plant roots to soil and climatic facors. Root systems have been determined digging up various plants under natural owing conditions. Cotton roots were found extend more than 5 feet below the surace. The roots were cut off at this depth, the entire length was not determined. Unr greenhouse conditions, cotton seedling ots have grown about 1 inch per day for at ast 30 days.

Madrid sweetclover roots were cut off at ore than 5 feet. The entire length of the ots was not determined.

Bermudagrass roots dug in permanent

pasture were more than 5 feet down, but d
not include the entire length.

Mature corn roots were found to be
feet long. This was the entire length. Co
grown in the greenhouse for 10 and 13-d
periods produced total root systems 38 a
51 inches long, respectively.

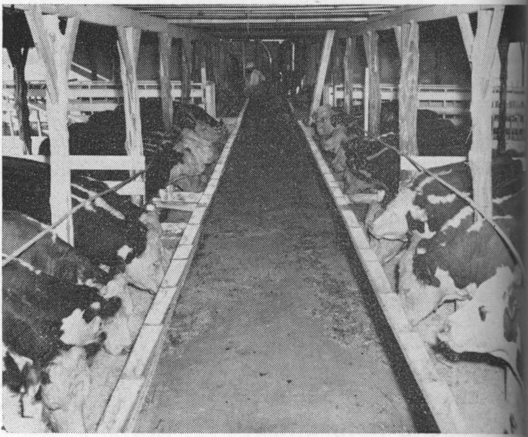
Plainsman and hybrid grain sorghu
grown in the greenhouse for 10 days pr
duced total root systems 18 and 15.5 inch
long, respectively.

Buffalograss roots were found to go
feet deep. They were much larger and ma
more of them were in the lower depths th
Bermudagrass roots.

BEEF CATTLE

Stocker calves of Good or Choice quali
are purchased annually for grazing and fee
ing experiments. Systems have been work
out by which beef production has been pro
itable over a period of years. Improved gra
ing crops and practices are introduced a
tested continually, and many combinatio
of homegrown rations have been compar
in the feedlot. Feeding cattle without she
ter has given results almost equal to resul
with shelter. Stilbestrol hormone has bee
profitable during 2 years under Blacklan
conditions. Hormone implants and oth
new methods will be included in future be
production experiments.

Complete cost calculations are being o
tained to provide accurate information o



Home-grown rations and management for b production are tested under Blackland conditions.

the profit or loss involved in different methods of feeding and handling cattle.

CROP ROTATIONS

Crop rotation studies have been conducted on the Blackland Station for many years. Some advantages and disadvantages of many different sequences of crops have been determined. No single rotation is superior in all respects, but results have been consistently favorable where warm-season row crops have been rotated with cool-season crops of small grain and sweetclover. In some cases, row crop yields have been higher when sweetclover was grown with small grain. In other cases, row crop yields have been as high or higher following small grain alone.

Apparently, there are several advantages of alternating cotton, corn or grain sorghum with cool-season broadcast crops. Over the past 5 years, dryland corn yields have averaged 50 bushels pere acre following continuous corn. Under irrigation, corn after sweetclover averaged 90 bushels per acre and continuous corn 48 bushels. Dryland cotton, in several different experiments, has shown yield increases of 80 to 300 pounds of seed cotton per acre from the warm-season—cool-season systems versus cotton following cotton. One of the experiments has been in operation for 8 years.

Some advantages of 2-year systems, in addition to higher yields, include reduced water runoff and soil erosion, higher soil organic matter levels and less need for nitro-

Many different crop rotations are tested on this station.

gen fertilizers. An important detail of management is early summer plow-out following small grain and sweetclover. This prevents excessive use of subsoil moisture and offers maximum opportunity for storage of late summer and fall rainfall. In addition, early plowing may permit raw residues to decompose enough to release plant nutrients needed for maximum crop growth.

FIELD SCALE INTEGRATION

New or improved materials and farming methods are tested in experimental fields. Soil conservation evaluations involve measured crop yields, chemical and physical determinations and estimates of erosion.

Economic calculations by cooperating agricultural economists are being used to determine the advantages and disadvantages of several systems or combinations of practices on different kinds of land.

With cotton acreages limited, it is especially urgent to find the most economical methods of cotton production of desired quality without soil deterioration. It is essential for farmers to have reliable information as to the second and third best choices to make in adjusting to changes in government farm programs, price relationships and market quality demands.

To help farmers obtain full benefit from new research developments, and to meet changing conditions, the Blackland Station is obtaining field results from combinations of practices as well as detailed data on specific factors on small plots and under laboratory conditions.

Improved farming practices are integrated in field scale tests. Rotations including cotton and small grain with sweetclover increase cotton yields and provides better conservation.

STATE-WIDE RESEARCH

The Texas Agricultural Experiment Station is the public agricultural research agency of the State of Texas, and is one of ten coordinated parts of the Texas A. and M. College System.

The Main Station and headquarters are located at College Station, with 21 substations and 9 field laboratories located throughout major agricultural areas of Texas. In addition research is conducted at other locations in cooperation with the Texas Forest Service, Game and Fish Commission of Texas, Texas Prison System, the U. S. Department of Agriculture, University of Texas, Texas Technological College, Texas College of Arts and Industries and King Ranch. Some experiments are conducted on farms and ranches and in rural homes.

The Texas Agricultural Experiment Station is conducting about 400 active research projects, grouped in 25 programs which include all phases of agriculture in Texas.

Research results are carried to Texas farm and ranch owners and homemakers by specialists and county agents of the Texas Agricultural Extension Service.

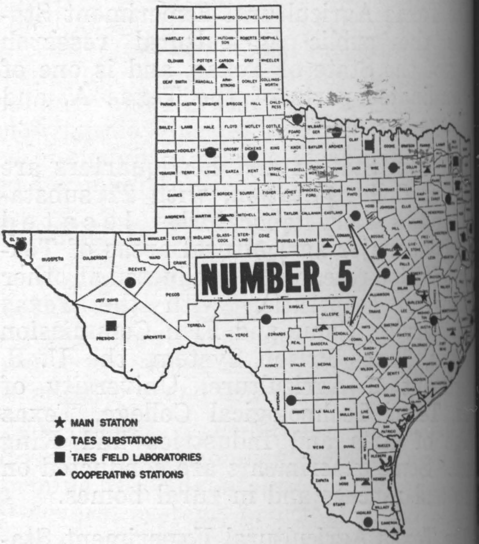
ADMINISTRATION

R. D. LEWIS
Director

R. E. PATTERSON
Vice Director

College Station, Texas

AGRICULTURAL RESEARCH seeks the WHATS, the WHYS, the WHENS, the WHERES and the HOWS of hundreds of problems which confront operators of farms and ranches, and the many industries depending on or serving agriculture. The workers of this substation, along with those of the Main Station and other field units of the Texas Agricultural Experiment Station, diligently seek to find solutions to these problems.



FOR BETTER LIVING

Today all people have a stake in agricultural research. The quality and quantity of food, feed and fiber available for their welfare are dependent on the information developed through organized research.

The Texas Agricultural Experiment Station concerns itself with problems confronting, and likely to confront, farmers and ranchmen, rural homemakers, farm groups and representatives of other organizations depending on or serving agriculture.

Agriculture up to now usually has kept abreast of demand. But continued agricultural research is necessary to point the way toward maintaining and improving our productive resources, lowering cost of production, improving quality, expanding markets, devising new and better methods for growing, processing, distributing and utilizing farm and ranch products, and toward better city and country living.

Researchers of the Texas Agricultural Experiment Station are dedicated to that aim. *Today's Research is Tomorrow's Progress.*