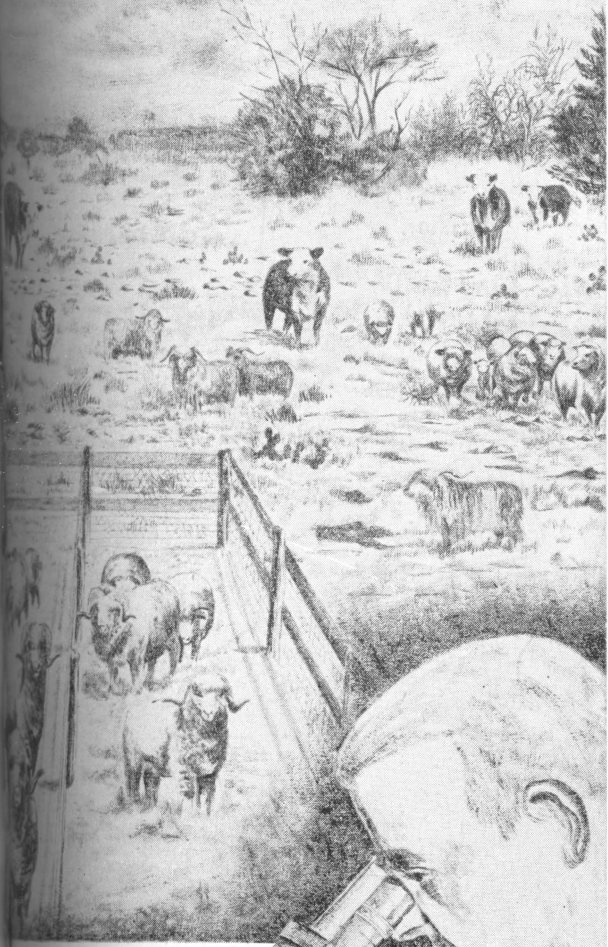


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Welcome to






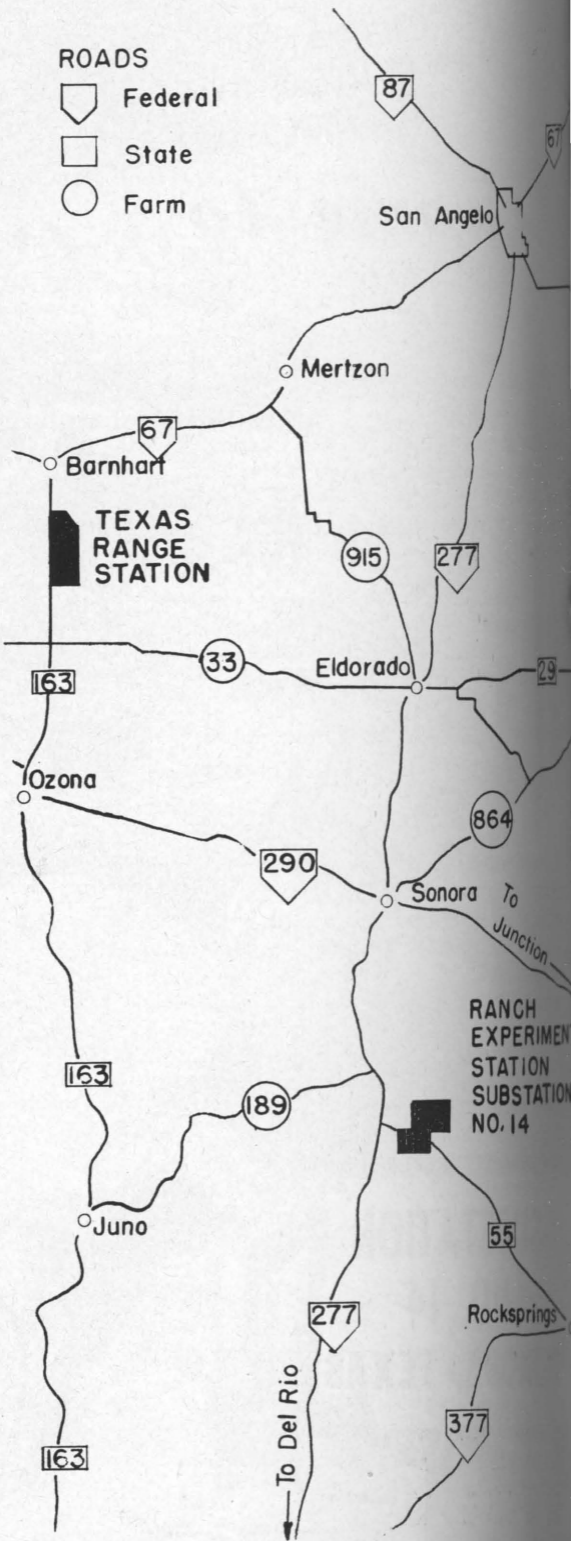
**SUBSTATION
NO. 14
SONORA, TEXAS**

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CULTURAL EXPERIMENT STATION

ROADS

-  Federal
-  State
-  Farm



Welcome
to the
**TEXAS AGRICULTURAL
EXPERIMENT STATION**
Substation No. 14
Sonora, Texas

Known as the Ranch Experiment Station, Substation No. 14 was established in 1916 in the heart of the greatest sheep and Angora goat producing section of the country to study diseases, breeding and management of these animals under range conditions.

Outstanding research on this station has been development of a vaccine for prevention of contagious ecthyma (soremouth) of lambs and kids, discovery of swellhead in goats, identification of enterotoxemia, research in bluetongue, internal parasite control and numerous poisonous plant problems of sheep and goat ranching.

Studies in animal husbandry here also have contributed materially to the betterment of sheep on the Edwards Plateau. This station was the pioneer in ram progeny performance testing which now is becoming widespread in the sheep and goat ranching areas.

Research to determine more effective ways of range and pasture management began here in 1949 and has resulted in practices now being widely adopted in the Texas range country and in the Southwest. Soil Conservation Service personnel and teachers of vocational agriculture have shown much interest in this work.

A part of the grazing research conducted by Substation No. 14 is the work on the Texas Range Station located near Barnhart, in cooperation with the University of Texas. It comprises 3,160 acres. Much of the research is conducted in cooperation with veterinarians, animal husbandmen and range personnel, and other departments of the Texas A. and M. College System.



Meteorological data recorded here for 39 years has held an important position in research.

This station consists of 3,462 acres located in Sutton and Edwards counties on the Edwards Plateau of Texas. Headquarters is just off State Highway 55, approximately 28 miles northwest of Rocksprings and 27 miles south of Sonora. The average rainfall recorded during the past 39 years is 22.2 inches, with a minimum of 6.13 inches and a maximum of 41.51 inches. The average



Field days are well attended and visitors are always welcome on this station.

last killing frost in the spring is March 19, and the average first killing frost in the fall is November 11, affording an average growing season of 244 days.

Annual and special field days are held for various phases of research. Visitors always are welcome. The address is Box 5518, Sonora, Texas, and the telephone number is 29-K-21.

W. T. HARDY,
Superintendent and Veterinarian

FRED R. CAMPBELL,
Assistant Animal Husbandman

OSCAR L. CARPENTER,
Junior Animal Husbandman

CHARLES W. LIVINGSTON,
Assistant Veterinarian

LEO B. MERRILL,
Associate Range Management

ROBBIE MORRIS,
Secretary

THOMAS E. NIX,
Technical Assistant

EFRIAM B. GARCIA,
Farm Laborer

JOHN L. BAKER,
Foreman, Texas Range Station



Agricultural Research Projects at

Substation No. 14

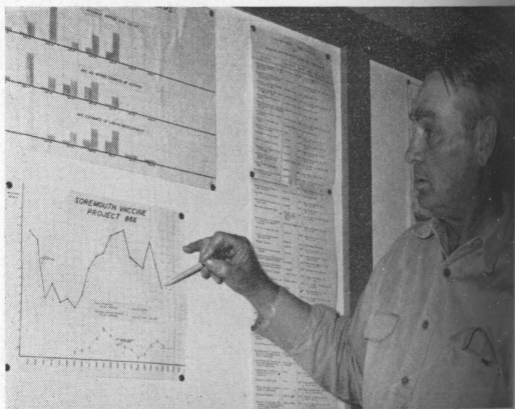
SHEEP AND GOATS

Internal Parasites

The control of internal parasites has always been a problem in management of sheep and goats. This station was instrumental in development of a mixture (90 percent salt—10 percent phenothiazine) which is very successful in the control of the common stomach worm in sheep. This phenothiazine-salt mixture is made available free-choice in the pasture. Drenching is seldom necessary, and then only in years of heavy rainfall.

Soremouth

Development of a vaccine for soremouth (contagious ecthyma) on this station is credited with saving sheep and goat producers over \$700,000 annually. The vaccine was first produced here in 1932 and approximately 1 million doses are being produced annually to help fill the needs of the sheep and goat industry. Use of this vaccine has enabled ranchmen to produce life-long immunity in their lambs and kids. Soremouth



Development of a vaccine on this station for the prevention of soremouth of lambs and kids is credited with saving sheep and goat producers over \$700,000 annually.

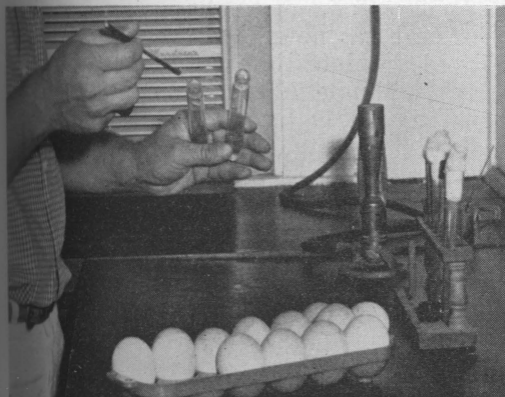
does not produce a severe disease, usually only a scab forms on the lips. However, wounds resulting from this disease are very attractive to the screwworm fly, and screwworm infestation caused many deaths in sheep and goats prior to development and use of this vaccine. Soremouth virus is very resistant and will persist in scabs for several years if protected from direct rays of the sun. Therefore, once the vaccine, which contains fully virulent virus, has been used on a ranch, vaccination should be continued each year.

Enterotoxemia

This station was the first to recognize and describe enterotoxemia in baby and feeder lambs, and as a result a vaccine was produced. Methods of management to prevent or stop outbreaks of enterotoxemia also were developed and proved on this station. This disease is characterized by sudden death of baby lambs. The causative agent, a bacteria, was isolated and described and found to be identical to that causing enterotoxemia in England.

Sporadic Bovine Encephalomyelitis

Known as brain fever, sporadic bovine encephalomyelitis affects baby calves and occasionally older cattle. Affected calves are often termed "dummies" and will stand or lie motionless and will not suckle unless placed in position. Animals usually die unless given feed and water until they eat and



Living chick embryos are innoculated with virus to determine its growth habits in research to develop bluetongue vaccine.

drink without assistance, usually about two weeks.

This disease was first observed in Texas in 1941. Usually one or two calves become affected, but at least in one herd up to 30 percent of the calves became stricken. The virus of this disease has been isolated and inoculated into living chicken embryo in work directed toward developing a vaccine.

Research is underway here also in an effort to determine the cause of hard yellow liver. This disease affects sheep and cattle, often causing a large death loss when outbreaks occur.

Poisonous Plants

Of all poisonous plants bitterweed causes the highest loss in sheep flocks on the Edwards Plateau. As little bitterweed as 1.3 percent of a sheep's body weight will cause death in 24 hours. In order to control bitterweed poisoning, animals with its symptoms should be penned and fed a concentrate and good quality hay until they recover. The animals then may be turned back to pasture.

This station was established primarily to investigate swellhead in sheep and goats, a condition proved later to be caused by a poisonous plant — sacahuiste. Since then other plants tested here by feeding have been found to be poisonous. Most common are guajillo, lechuguilla and coyotillo. Some of the more common plants which poison cattle as well as sheep and goats are carpet weed, loco weed and oaks in the budding stage.

There has never been any experimentally proved antidote that can be fed to livestock which will neutralize the plant poison before or after it has been consumed by the animals.

Two control methods recommended and based on research by this station are the elimination of poisonous plants by mechanical or chemical means, and range management designed to produce more palatable plants for animals to graze.

Bluetongue

Bluetongue is a virus disease of sheep, which prior to 1948, was known to exist only in South Africa. However, in 1948 it was



A lamb is "bled" for a sample for testing reactions to vaccines for sheep and goat diseases.

noticed affecting sheep on this station. Since that time bluetongue has been recognized as existing in most of the sheep raising areas of the United States. It is transmitted by a biting gnat. Sheep affected with bluetongue seldom die as a result of the infection, but become lame, lose weight and the muzzle and lips usually become inflamed and swell. Later a crust forms over the muzzle, making this lesion attractive to screwworm flies. Outbreaks of bluetongue can cause heavy losses to sheep ranchmen. Research at this station contributed much to the development of a successful vaccine now widely used.

LAMB AND WOOL PRODUCTION

Detailed records have been kept on the sheep flock here since 1917 when 100 grade ewes were purchased, and six registered ewes were added the next year.

The present flock includes about 130 registered ewes with records on weight at wean-



Detailed records have been kept on the sheep flock since 1917 for use in lamb and wool production research.

ing (as yearlings), face covering, belly covering, skin-fold counts, conformation score, length of staple, spinning counts, grease fleece weights and clean fleece weights (as yearlings).

In skin fold studies, results show that while mature folded ewes yield slightly more grease wool, smooth mature ewes produce longer staple, heavier body weights and higher body scores. Studies with yearling ewes showed that there was no difference in grease or clean wool production but the smooth group possessed greater body weight and staple length than the folded yearlings.

In a study involving a comparison of relative values of ewes producing twins contrasted to those producing singles, it was found that ewes producing twins yielded about 40 pounds more lamb per head than those raising singles.

Studies involving comparison of various face coverings yielded results favoring animals with naturally open faces. Even ewes whose faces were sheared failed to produce equally as well as those with naturally uncovered faces. Observations still are being made in this respect in conjunction with livestock studies at the Barnhart Station with grade ewes.

Research with emergency rations during the drouth provided very valuable data on relative values of prickly pear, gin trash, molasses and alfalfa hay as economic drouth



Ground prickly pear with thorns removed proved beneficial in emergency drouth rations for sheep in feeding tests here.

feed. It was found that chopped singed prickly pear provided a suitable supplement when such was needed.

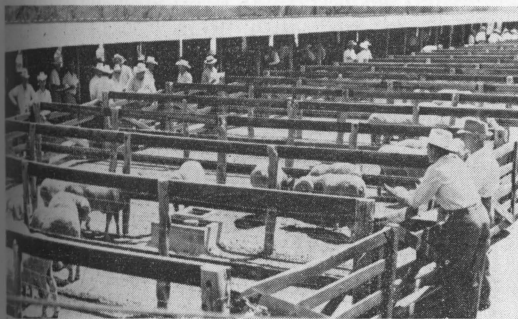
Current research involves cooperative breeding tests, whereby tested rams are being compared with non-tested rams under range conditions, the effect of vitamin A on fleece and lamb production, and the effect of thyroxine implants upon fleece and lamb production.

Ram Progeny and Performance Testing

More than 1,100 rams have been fed and tested in ram performance and progeny tests conducted on this station annually since 1948 in cooperation with ranchmen. These rams, for the most part, are fed in sire groups of four. They are primarily of the Rambouillet breed. Records taken include body weights and gains, grease fleece weights, clean fleece weights, spinning counts, staple lengths, face covering scores, belly covering scores, skinfold counts and conformation scores. These records can be used to advantage to aid breeders in making selections of stud rams as sires to increase pounds and quality of lamb and wool.

Research has shown that by the use of high producing sires, improvement will result in the offspring. Tests show clean fleece weights, staple lengths and face covering are highly heritable. Selection for improvement in these traits, as measured by the performance of rams on tests, will yield more rapid progress in these respects.

Two types of information are available from these tests: (1) performance records



More than 1,100 rams have been fed and tested in ram performance and progeny tests conducted on this station in cooperation with ranchmen.



This excellent fleece measuring $4\frac{1}{2}$ inches in 11 months was produced by a ram performance-tested here.

showing the merit of a ram as measured by his production on the test, and (2) progeny records determined by the average performance of a sire group, usually four rams.

Performance records on a ram are available by the time he is 14 to 16 months of age, whereas a ram is at least three years of age before progeny data are available. While ram performance records are available at an earlier age than progeny records, the latter are more accurate of a sire's true breeding ability. Both types of records can be used to select stud rams with a greater degree of precision.

Fleece measurements are made at the Wool Research Laboratory located on the campus of Texas A. and M. College.

Goats

Much research has been done here on Angora goats, although none are bred on the station at this time. From 1921 to 1949 a flock of Angora goats was maintained here for breeding research. Complete, individual records were kept, resulting in valuable contributions to the Angora goat industry. The records here are recognized as the most comprehensive on goats in the United States.

RANGE MANAGEMENT

Range management research was begun on this station in February 1949 and has continued without interruption, except from

July to November 1953 when drouth conditions became so critical the heavily grazed pastures could no longer support livestock. During that period stock was removed from all pastures. The study includes the interaction of soils, vegetation, rainfall, livestock and wildlife grazing. Most of the range management work here has been under extreme drouth conditions except the first 2 years and during 1957 when conditions were good.

Soils

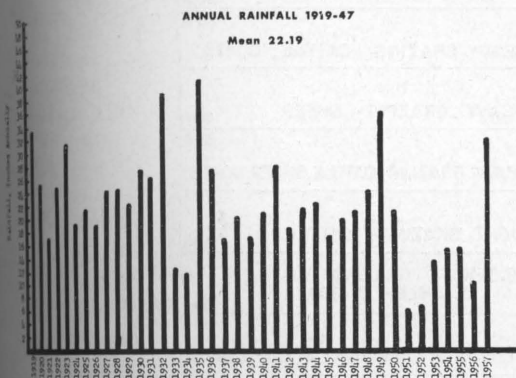
The soil types are composed primarily of Tarrant stony clay, with slopes of 0 to 8 percent, and of Tarrant silty clay with slopes of 0 to 3 percent. There are small amounts of Valera clay, Abilene silty clay, Iron clay and Frio gravelly clay with slopes less than 2 percent. The calcium content is high. Only a small amount of research has been conducted here to determine the economic value of fertilizer. Results from fertilizer studies to date have been negative.

Vegetation

The vegetation here is primarily curly mesquitegrass, with lesser amounts of grama and bluestems intermixed with several species of forbs. There is an overstore of oak and other brush species as well as several noxious plants such as prickly pear and bitterweed.

Rainfall

Prolonged drouth had a marked effect on the reaction of pastures to grazing. Rain-



Much of the grazing management research conducted on this station has been under extreme drouth conditions.

SUTTON

COUNTY LINE

EDWARDS

DEFERRED ROT

MODE

DEER-LIVESTOCK

MODERATE GRA

HEAVY GRAZING

LIGHT GRAZING-

LIGHT GRAZING

MODERATE GRA

REGISTERED BREEDING SHEEP

REGISTERED BREEDING SHEEP

232.5 A

BREEDING TRAP

417

REGISTERED BREEDING SHEEP

41.6 A

CULTIVATED AREA

BRUSH CONTROL

BRUSH CONTROL

REGISTERED BREEDING SHEEP

CULTIVATED AREA

368

LIGHT GRAZING- CATTLE, GOAT

80 A

80 A

HEAVY GRAZING CATTLE, GOATS

HEAVY GRAZING- SHEEP

80 A

80 A

HEAVY GRAZING-CATTLE,SHEEP,GOATS

LIGHT GRAZING - CATTLE

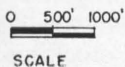
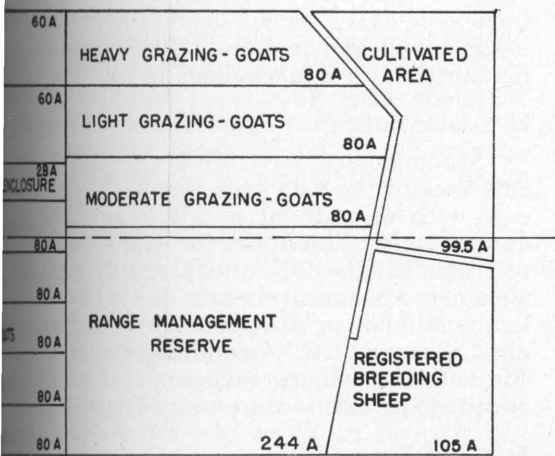
80 A

MODERATE GRAZING- CATTLE,SHEEP & GOATS

80 A

80 A

MODERATE GRAZING - CATTLE, GOATS



TEXAS AGRICULTURAL
 EXPERIMENT STATION
 SUBSTATION NO.14
 SONORA, TEXAS
 3462 - ACRES

CONTROL

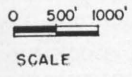
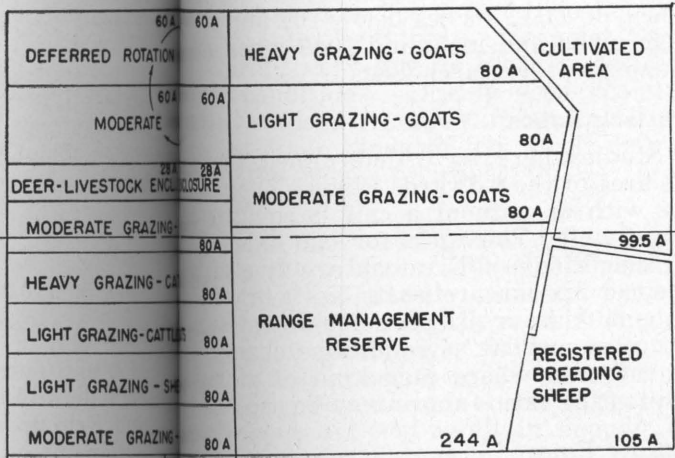
PLANT PRODUCTION

223 A

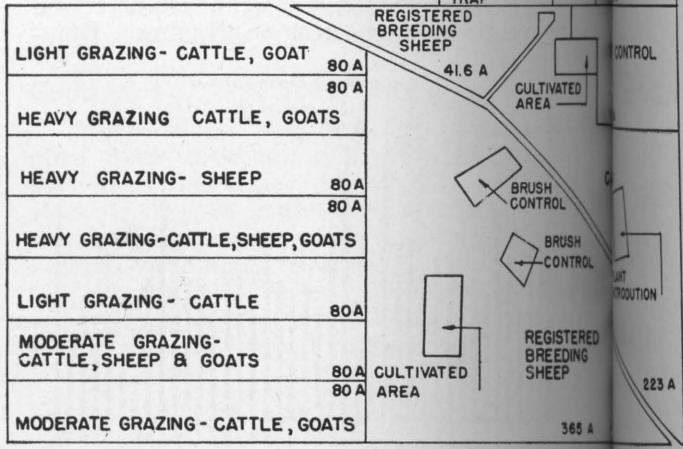
SUTTON

COUNTY LINE

EDWARDS



TEXAS AGRICULTURAL
EXPERIMENT STATION
SUBSTATION NO.14
SONORA, TEXAS
3462 - ACRES



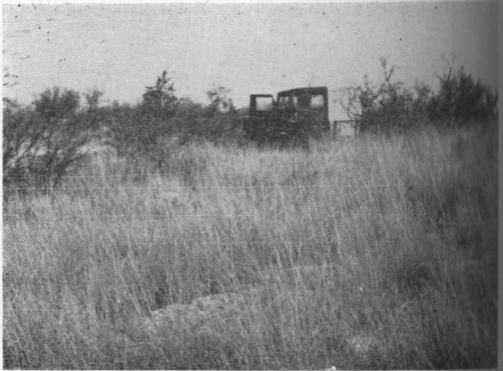
fall for 7 years during this range study was by far the lowest precipitation period on record. The average for this period was 12.86 inches, or 11.11 inches below the annual average up to and including 1949 when range management research began.

Livestock Ratios

Studies here have determined that for this area of the Edwards Plateau one mature cow with or without a calf is equal to one animal unit. The ratio for one animal unit of other kinds of livestock are five mature sheep or six mature goats, with or without lambs or kids, or six deer. These ratios may change somewhat as conditions change, but for the area where each kind of animal is adapted the ratios above may be used safely.

Stocking Rates

Research here has established that a moderate rate of stocking is 32 animal units per section for carrying a breeding herd in this area of the Edwards Plateau, provided



Grazing management tests here have shown that moderately grazed ranges mean weight gains and grass to prevent erosion and runoff compared with heavy stocking which leaves little or no grass.

the rangeland has enough grass cover to prevent excessive runoff and erosion. A ranchman can carry 32 breeding units per section without danger of being forced to liquidate breeding animals at heavy financial losses, even during very dry or other undesirable grazing conditions. During good years, or years with above average rainfall, calves and lambs or other kinds of dry stock may be held on the range to utilize excess forage if available.

A heavy rate of 48 animal units per section of grazing land produced a sharp decline in carrying capacity, although per-acre livestock gains were slightly more during the first years of the study. At the same time a light rate of grazing by 16 animal units per section produced an increase in carrying capacity, but did not result in enough improvement in vegetation to justify the low livestock weight gain per acre.

Grass Introduction

Tests are being conducted here as a part of a statewide project to determine the grass species, both introduced and native, best adapted for drouth resistance and revegetation. Severe drouth conditions during the test have made it difficult to obtain stands of seedlings. However, four outstanding selections have been made and are being tested further. They are strains of green sprangle-top, big bluestem, cane bluestem and side-oats grama. If these species meet all re-



Tests with many grasses are being conducted on this station as a part of a statewide project of the Texas Agricultural Experiment Station to determine species with drouth resistance and for revegetation.

quirements they will be placed in increased plots for commercial seed production.

Deferred Rotation Grazing

Deferred rotation grazing is capable of producing greater pasture improvement at 32 animal units per section than pastures continuously grazed by 16 animal units per section. Livestock gains per acre on these pastures are nearly as great as on pastures grazed continuously by 48 animal units per section. While the carrying capacity of pastures grazed continuously at a heavy rate was declining below 30 animal units per section, the carrying capacity on the moderately grazed, deferred rotation pastures was increasing from 32 animal units in 1949 to about 40 animal units in 1957.

Combinations of Livestock

A combination of several kinds of livestock (cattle, sheep and goats) has repeatedly proved more desirable for both the livestock and the vegetation being grazed. Sheep grazed at the heavy rate with cattle and goats produced 2.8 pounds more wool per head than sheep on a pasture grazed heavily by sheep alone. Losses from bitterweed poisoning have been repeatedly higher on pastures grazed by sheep alone than on pastures grazed by a combination of livestock. Pastures heavily grazed by sheep alone have had death losses from bitterweed of 20 percent and 15 percent during the last 2 years, while on pastures moderately grazed by a combination of livestock there were no losses due to bitterweed poisoning.



A combination of livestock (cattle, sheep and goats) has repeatedly proved more desirable for both livestock and the vegetation being grazed.

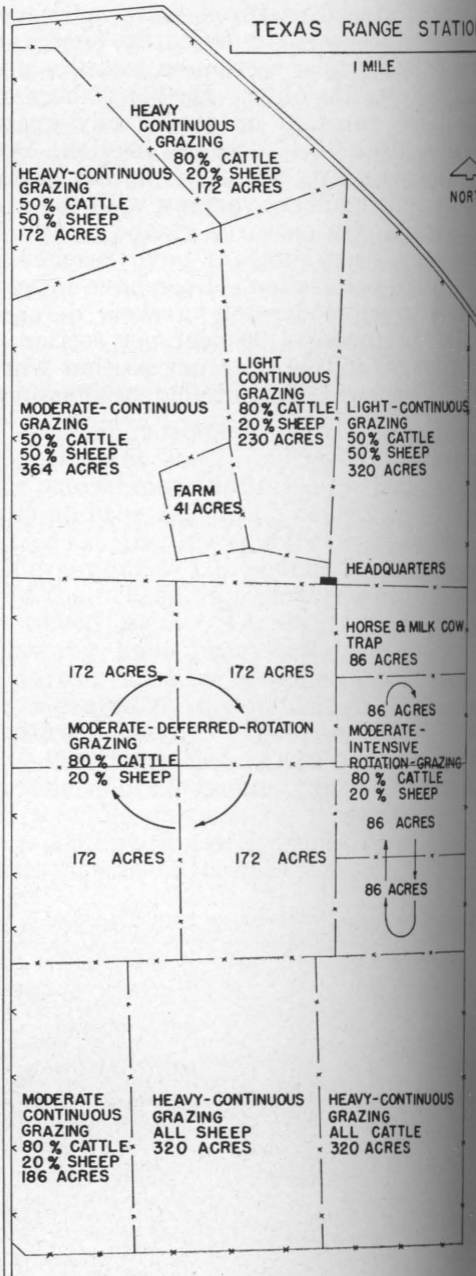
Deer Reaction to Grazing

Deer population shows a close relationship to grazing intensity and livestock combinations. Deer numbers decrease sharply on heavily grazed pastures, from no deer on pastures grazed heavily by cattle, sheep and goats, to 32 deer per section on pastures used heavily by cattle only. Deer numbers remain fairly constant on moderately grazed pastures, about 30-40 deer per section. Deer increased on nearly all of the lightly grazed pastures, the numbers varying with the kind of livestock. On pastures grazed lightly by cattle only, deer numbers have reached as high as 120 per section. Deer have increased greatly on moderately grazed, deferred rotation pastures, to 60 deer per section on the average, and 96 deer per section where cover is somewhat better.



TEXAS RANGE STATION

1 MILE



The Texas Range Station

Barnhart, Texas

The Texas Range Station which comprises 3,160 acres in Crockett county has been used for grazing research since 1938 by the Texas Agricultural Experiment Station in cooperation with the University of Texas. Records of livestock reaction, vegetation changes and weather conditions are maintained.

Grazing Management

Research on this 16-pasture station includes tests with sheep and cattle grazing at different rates of stocking and in different systems of deferred-rotation grazing. Emphasis during the past 20-year period has been aimed at determining methods for reducing losses from the poisonous bitterweed and encouraging uniform grazing of tabosa-grass. Range pitting and reseeding studies also are being conducted under controlled livestock grazing.

Results show that this system of grazing management has had a pronounced influence on livestock performance. In general, both cattle and sheep have produced higher calf and lamb crops and heavier offspring under



This fence-line contrast on the Texas Range Station between a heavily stocked sheep pasture, left, and a pasture moderately stocked with a combination of sheep and cattle, right, yields valuable information on grazing management for West Texas.

moderate rates of stocking. On a per-acre basis, the heavier rates of stocking have produced slightly more pounds of livestock products per acre, but the vegetative conditions on the heavier stocked pastures have declined seriously. Reduction of stocking rates in 1953, during the severe drouth, prevented serious damage to the vegetation on most pastures.

Some bitterweed poisoning of sheep has occurred on all pastures on this station during years of high seasonal rainfall. However, more trouble has been consistently associated with the heavier rates of stocking. The lakebed areas on this station have been a constant source of bitterweed trouble regardless of grazing treatment. Research on bitterweed will be continued until more satisfactory means of coping with this problem are developed.

Records of vegetation change since 1938 show that sideoats grama, vine-mesquite and cane bluestem grasses are more abundant on the lightly stocked pastures. Tobosagrass has been affected very little by the grazing practices for the past 20-year period. Cattle have utilized tobosagrass more uniformly than sheep, but sheep have caused damage to this grass by spot grazing on the open ridges. Livestock utilization of tobosagrass has noticeably increased after mowing to remove the old growth. Buffalo and curly mesquite grasses have fluctuated in abundance from year to year much more than tobosagrass. However, these grasses have made remarkable recovery following high rainfall periods. The three-awn grasses have increased under heavy stocking, particularly heavy grazing by sheep. Annual weeds have



Effects of management systems on lamb and wool production and bitterweed poisoning are studied on experimental pastures here.

varied in their response to grazing treatment but are usually less abundant on sheep pastures than on cattle pastures. Prickly pear and Cholla cactus have increased under all grazing treatments as well as in the exclosures.

Comparisons of sheep and cattle performance under various combinations have shown that both classes perform better on a per-head basis when part of their numbers are replaced with the other classes of livestock. In general, this has been true with both stocking rates studied, although cattle do not seem to be influenced as much by the combination as sheep. It appears that moderate rates of stocking with combinations of sheep and cattle are desirable in the area, both from the standpoint of livestock production and vegetative response.

Calf production per acre under deferred-rotation grazing has been consistently greater during the drouth than under continuous grazing at the same stocking rate. During several of the years studied, the deferred pastures even outproduced pastures stocked continuously at a much higher rate. The deferred-rotation pastures have maintained a satisfactory vegetative condition all through the drouth and have had less fluctuation in livestock production and condition than any of the other pastures. These studies are being expanded to include some additional variations in grazing systems.

Livestock Breeding

Several sheep studies have been superimposed on the bitterweed research on the Barnhart Station. For several years, high, medium and low-producing rams have been bred to the 215 ewes here to test the relative performance of the offspring. Results have proved that ram performance records are a good guide to offspring performance in such traits as clean fleece, weight, staple length, face covering and skin folds.

Observations also have been made on the flock here to test the effect of face covering on lamb production. In the past it has been found that open-faced ewes produce more pounds of lamb per ewe bred than ewes with covered faces, even though the faces are sheared to prevent vision impairment.



Calf production studies on the Texas Range Station yield information on stocking rates, management systems and breeding practices for this range area.

Cows on this station are bred to high, medium and low-gaining bulls secured on loan from cattle breeders cooperating in gain testing research at the Balmorhea Station. The relative gaining ability of the calves is demonstrated by evaluating and weighing the offspring each year. Records show that at weaning time the offspring sired by high-gaining bulls averaged 438 pounds compared with 418 pounds for the offspring of low-gaining bulls. After feeding, weights were 760 pounds compared with 704 pounds for the low gainers.



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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.

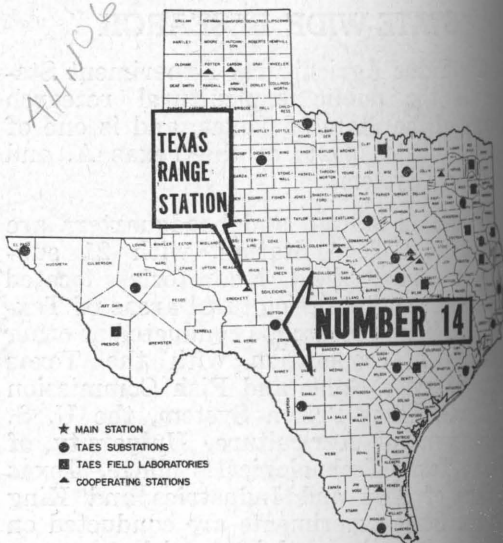
R. D. LEWIS
Director

R. E. PATTERSON
Vice Director

College Station, Texas

G. W. THOMAS
Research Coordinator for West Texas
Lubbock, 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 better city and country living.

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