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Soil Conservation Management System for Beef Production in the Blacklands of Texas

TEXAS AGRICULTURAL EXPERIMENT STATION

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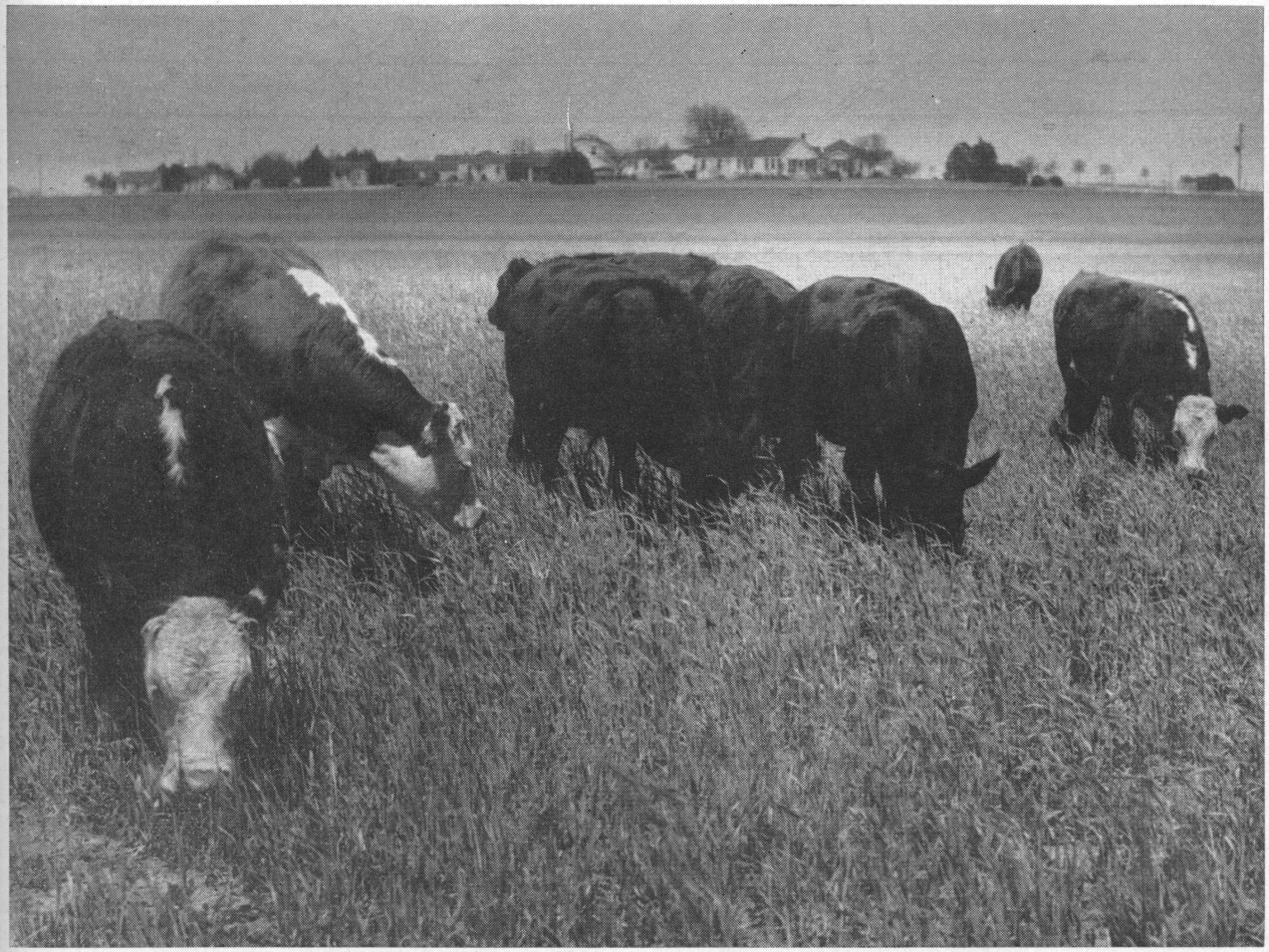

Yearling steers pastured on oats-sweetclover, June 1952

THE TEXAS AGRICULTURAL AND MECHANICAL COLLEGE SYSTEM

GIBB GILCHRIST, Chancellor

Soil Conservation Management System for Beef Production in the Blacklands of Texas

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EXPERIMENTAL RESULTS on Houston Black and Austin clay soils at the Blackland Experiment Station at Temple during the past 8 years have shown the value of erosion-resisting and soil-improving crops when measured in per-acre gain of beef steers. These studies were conducted cooperatively by the Texas Agricultural Experiment Station and the Division of Research, Soil Conservation Service, U. S. Department of Agriculture.

Information obtained from a number of practical field-scale grazing trials with grasses, small grains and legumes is given in this publication. An individual producer can adapt the basic principles to his own type of livestock, farming system and land. Texas Station Miscellaneous Publication 65, "Research Sets Patterns for the Central Blacklands," previously described conservation management systems for the Blacklands.

LAND USE SYSTEMS

The Blacklands of Texas can produce beef economically on grasses, small grains and legumes. However, a reserve supply of hay and grain must be provided for cattle maintenance when green grazing is not available, and for feeding to obtain desirable market finish.

By using various combinations of crops to supply the grazing, feed and cash crops needed for a balanced system of farming, the Blackland station is testing the conservation and production value of the following types of land use:

1. Annual grazing of small grain with sweetclover.
2. Two-year rotation of corn, followed by oats and sweetclover.
3. Three-year rotation of Sudan, followed by 2 years of barley with sweetclover.
4. Two-year rotation of cotton, followed by oats with sweetclover.
5. Three-year rotation of corn or grain sorghum, followed by 2 years of small grain with sweetclover.
6. Three-year rotation of corn, followed by cotton, followed by small grain and sweetclover.
7. Seasonal grazing of mixed native grasses.
8. Annual grazing of warm-season grasses, including Bermudagrass, buffalograss and K. R. bluestem, plus volunteer cool-season species.
9. Seasonal grazing of cool-season grass, mostly fescue, with legumes.

Forage from all of the grasses, small grains and sweetclovers are used for grazing, or for hay to be fed with grain to finish out the steers.

LIVESTOCK MANAGEMENT

Good to Choice grade steer calves averaging about 400 pounds are purchased early each fall. They are divided into uniform lots and are numbered individually. If grazing is not available, the calves are fed a ration of approximately 4 pounds of grain, 1 pound of cottonseed meal and all the good hay they will eat. This ration keeps the calves growing and in a condition to gain rapidly when grazing becomes available. The steers are weighed individually before they are turned into the pastures and are weighed monthly thereafter, or each time they are moved from one pasture to another. All results to date have been obtained without protection from the weather. Salt and water are kept before the steers at all times, and they are sprayed monthly when flies are numerous.

Before the steers are put on green pasture, they are filled with hay to avoid bloating. In this 8-year period, no loss is known to have been caused by bloat. One steer was lost in 1949 and two steers (from a total of 106) in 1952 from what may have been acute bloat, but this could not be verified.

At the end of the grazing season, usually late August, the steers are placed in drylot and are fed various rations for 110 to 150 days, depending on the market, the size and condition of the steers coming off of grazing, and the feed available. The station has been successful in finishing steers to Choice grade, and weighing about 1,000 pounds, on grain produced in the Blacklands. Corn, barley and grain sorghum, or a combination of these, have shown good results when fed with cottonseed meal and roughage. Red top cane hay (sumac) has been the standard roughage; however, oats with sweetclover, Hubam sweetclover with Johnsongrass, Sudangrass and fescue have been used successfully in properly balanced rations.

Small Grains-Clovers

Oats and barley, drilled with a sweetclover, give an abundance of forage, good daily gains and often high acre gains, as shown in the accom-

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panying tables. Barley produces earlier grazing in the fall, but oats afford grazing longer into the spring.

It has been found that early September planting of small grains and sweetclovers will produce an abundance of fall and winter grazing when good weather prevails. Highest forage production is obtained when plenty of soil nitrogen is available. A legume crop in the farming system ahead of the small grain, or in combination with it, will normally provide this nitrogen, or it may be applied as a commercial fertilizer. Also, tests have shown that small grains and sweetclovers need additional phosphorus. The Blackland station uses and recommends approximately 40 pounds of available phosphoric acid per acre applied in bands and in contact with the small grain seed, some 2 inches deep.

Barley is more winter-hardy than most common varieties of oats; however, the new Mustang variety of oats is about as hardy as barley. Sweetclover is sometimes severly damaged by cold weather. At the station, sweetclovers are planted directly above the oats and fertilizer, about one-third inch deep, so that the roots can reach the phosphorus fertilizer quickly. In this way, sweetclover seedlings are believed to have their best chance for survival.

Grasses

Fescue grasses — Alta, Alta 144 and Kentucky 31 — when seeded in combination with sweetclovers or alfalfa, show some promises for cool-season grazing, especially on moist fertile land.

Bermudagrass and buffalograss, with normal moisture, have always supplied good grazing in the late spring, summer and early fall.

K. R. bluestem has been tested on eroded soil and creek bottom pasture. The results have not been favorable for rapid gains or for high returns per acre.

Native meadow, when properly managed, gives a good daily gain and a fair acreage production.

Other grasses tested at the station include buffel, smooth brome and blue panicum, but no grazing results have yet been obtained.

Legumes

Hubam, Madrid and Evergreen sweetclovers have given variable acre yields and fair to good daily gains. Tests have shown that they can be used alone or in combination with small grains. The biennial sweetclovers provide a longer summer grazing period than Hubam. Summer cattle gains from biennial sweetclovers drilled with small grains were from 20 to 65 pounds per acre in 1952 (a dry summer), after the small grain crop was grazed off or harvested. Hubam sweetclover planted alone gave 309 pounds of steer gain per acre in 1946, with maximum growth in May and June. Cattle must develop a taste for sweetclover before they will eat it readily. Sweetclover may cause bloat but no known losses have occurred from it on the Blackland station.

Tests have shown that alfalfa cannot be grown successfully as a perennial in much of the Blacklands because of cotton root rot. There is hope that it may find a limited use in combination with grasses.

Sorghums, Including Sudan and Johnsongrass

Sorghums are well adapted to most of the Blackland area. Forage sorghums have a definite place where livestock farming is practiced. Quadroon grain sorghum, grazed in the dough stage during one season, gave good results.

In one trial, in 1946, Hegari grain sorghum failed to give high returns as a grazing crop.

Tests have shown that Sudangrass is the most important annual summer crop for grazing. The station is using Sweet Sudan. Common Sudan also has been satisfactory in grazing trials.

Johnsongrass, used in combination with small grain or sweetclover, has given good grazing results. When Johnsongrass alone has been grazed, cattle gains have been only fair.

The following tabular records show average steer gains from various crops for a period of years:

Table 1. Oats with sweetclover, 5 to 53 acres annually[1]

Grazing period[2]	Initial weight, pounds	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
Dec. 5, 1945 to Feb. 27, 1946	414	99	1.8	178[3]
Nov. 13, 1946 to Aug. 20, 1947	419	160	1.9	304
Mar. 6 to June 25, 1948	454	80	2.1	167
Jan. 1 to May 19, 1949	480	129	1.3	168
Jan. 1 to May 19, 1950	490	142	1.6	227
Dec. 12, 1951 to May 29, 1952	456	150	1.8	265
6-year average		127	1.7	218

[1]Soil types, Houston Black clay and Austin clay. Slopes, 2 to 5 percent. SCS capability units II-2, II-2x and III-2x.
[2]Oats winter-killed in 1951, partly because seeded preparation was inadequate for proper, deep planting. No grazing.
[3]Oat crop harvested. Other years the entire crop was grazed on these fields.

Table 2. Barley with sweetclover, 8 to 25 acres annually[1]

Grazing period	Initial weight pounds	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
Jan. 4 to Mar. 28, 1945	484	84	1.4	116
Dec. 5, 1945 to July 8, 1946	406	128	1.5	192
Mar. 24 to Sept. 8, 1949	520	108	2.2	239
Apr. 11 to June 1, 1951[2]	599	101	0.8	81
Dec. 12, 1951 to May 16, 1952	457	141	1.8	254
4-year average		112	1.6	176

[1]Soil types, Houston Black clay and Austin clay. Slopes 2 to 4 percent. SCS capability units II-2, II-2x, III-2x and III-2.
[2]Poor stand of barley, caused by severe winter drouth.

Table 3. Sweet Sudan, 5 to 14 acres annually[1]

Grazing period[2]	Initial Weight, pounds	Final weight, pounds	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
July 6 to Oct. 31, 1945	568	782	166	2.2	363
July 8 to Oct. 29, 1946	722	841	101	1.2	121[3]
May 28 to Oct. 29, 1947	593	830	134	2.0	269
May 17 to Sept. 8, 1948	583	800	205	2.0	404
June 1 to Sept. 23, 1949	600	840	176	2.6	458
May 29 to Aug. 20, 1952	753	860	168	1.4	240[3]
6-year average			158	1.9	309

[1]Soil types Houston Black clay and Austin clay. Slopes 2 to 4 percent. SCS capability units II-2, 2x and III-2x and 2.
[2]Sweet Sudan not used in 1950 or 1951.
[3]0.75 ton hay harvested per acre.

Table 4. Mixed native grass[1], 8 acres annually[2]

Grazing period	Initial weight, pounds	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
Apr. 9 to July 23, 1947	513	79	1.6	126
Apr. 8 to July 1, 1948	436	54	1.7	91
Apr. 15 to July 1, 1949	565	48	1.6	73
Apr. 17 to July 1, 1950	543	47	1.7	79
Apr. 11 to July 1, 1951	605	51	1.6	80
Apr. 1 to July 1, 1952	508	60	2.3	142
6-year average		56	1.8	99

[1]Mostly little bluestem, side-oats grama, Indiangrass and big bluestem, with some Texas wintergrass and native forbs.
[2]Soil types, Houston Black clay and Austin clay. Slopes, 0 to 5 percent. SCS capability units I-2, II-2 and II-2x.

Table 5. Bermudagrass - buffalograss[1], 34 to 45 acres annually[2]

Grazing period	Initial weight, pounds	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
Jan. 30 to Nov. 12, 1946	444	177	0.6	106
Nov. 13, 1946 to Oct. 15, 1947	413	214	0.7	150
Apr. 8 to Oct. 1, 1948	495	171	0.9	154
Mar. 24 to Oct. 3, 1949	520	126	1.6	197
May 1 to Sept. 1, 1950	505	80	1.8	141
Mar. 22 to Aug. 1, 1951	560	156	1.1	168
6-year average		154	1.0	153

[1]Includes rescue, little wild barley and Texas wintergrass, which often give valuable early spring pasture.
[2]Soil types, bottomland and Houston Black clay. Slopes, 0 to 1 percent. SCS capability units V-4 and I-2.

Table 6. Miscellaneous grazing, 3 to 10 acres[1]

Grazing period	Initial weight, pounds	Grazing crop	Steer grazing-days per acre	Daily steer gain, pounds	Steer gain, pounds per acre
Mar. 28 to Apr. 25, 1945	490	Alfalfa with rescuegrass	56	0.8	44
Feb. 27 to June 17, 1946	562	Hubam sweet-clover alone	196	1.6	309
Sept. 8 to Sept. 28, 1945	745	Quadroon sorghum	80	2.2	172
July 17 to Sept. 12, 1946	585	Hegari sorghum	136	0.6	75
May 22 to Oct. 9, 1946	532	Johnsongrass	127	0.8	98
Dec. 5, 1945 to Aug. 14, 1946	412	Oats-Hubam-Johnsongrass	135	1.3	174
Nov. 13, 1946 to July 9, 1947	417	Oats-Hubam-Johnsongrass	80	1.5	147
May 21 to June 25, 1947	568	Johnsongrass	42	2.3	98
Feb. 1 to June 1, 1950	505	Fescue grass	90	1.4	123
May 1 to June 1, 1950	492	Fescue with alfalfa	62	1.0	60
Mar. 8 to July 12, 1951	547	Fescue with alfalfa	116	1.6	186
Mar. 8 to June 1, 1951	505	Fescue	47	1.1	50
Apr. 11 to July 12, 1951	586	K. R. bluestem with some Johnsongrass	52	0.9	48

[1]Soil types, Houston Black clay and Austin clay. Slopes, 0 to 4 percent. SCS capability units I-2, II-2, III-2, II-2x and III-2x.

DISCUSSION AND RECOMMENDATIONS

Soils of the Texas Blacklands, where cotton and corn have long been the main farm crops, are probably among the most erodible in the United States. With continuous row crop cultivation on a 4 percent slope at Temple, the soil has washed away at a rate that removes about 1 inch in 10 years.

In a livestock farming system, soil and water losses can be so reduced that the top soil will last almost indefinitely, since most grazing crops give good protection to the soil. These grazing crops provide an abundance of organic matter for soil conditioning, and the sweetclovers add nitrogen, which is probably the most common limiting plant food in Blackland soils. Corn and grain sorghum yields have been increased significantly on all classes of land following small grain with sweetclover. Cotton yields have been increased, and cotton root rot has been reduced in rotations that include grazing crops of small grain and sweetclover.

Field observations indicate that there has been no soil or water lost from a 16-acre unterraced field with a slope of 2 to 3.5 percent in the 4-year period, 1949-52. This field was cropped as follows: 1949, barley with Evergreen sweetclover; 1950, Evergreen sweetclover; 1951, corn; and 1952, barley with Madrid sweetclover. The loss with continuous row crops on a 4 percent slope for the same period was 4 inches of water and 6 tons of soil per acre, annually. On Class II land (Austin clay soil, 1 to 3 percent slope), a 2-year rotation of corn following oats with sweetclover, lost only a trace of soil and water during these same years.

The net income from land used to support livestock in 1951, a very dry year, was about $50 per acre. The net income from the better livestock system in 1952, a more favorable year for grazing but with lower livestock prices, was also about $50 per acre.

The main objective of soil and water conservation together with increased production of crops and beef cattle are obtained at the Blackland station by careful management with the following crop balances: Class I and II land (slopes, 0 to 3 percent), half in small grains with sweetclovers and half in row crops; Class III (slopes, 3 to 5 percent), two-third in small grains with sweetclovers and one-third in row crops.

Warm and cool-season grasses often are needed to improve the soil and to replace a part of the small grain on all land classes. However, present results indicate that, to approach year-around grazing, major emphasis should be placed on small grain for cool-season grazing, and biennial sweetclover and Sudangrass for the summer. Well-managed native grass and Bermuda-buffalograss pastures fit well into the grazing program for this area, especially on land that is too wet (Class V) or too erodible (Class III and IV) for simple cultivation. Highest returns are obtained from grass pastures when treatment and management practices are used that provide plenty of available phosphorus and nitrogen, and that maintain cool-season grasses and legumes as well as the main warm-season species.

Results at the Blackland station show that beef production can be profitable in this area. At the same time, there is an urgent need for more information about how to get higher returns per acre from grass and legume crops that conserve and improve the soil. Further progress is expected from studies now underway on improved methods of land preparation and treatment, better grazing management, and superior forage species or a combination of species. Reduced costs of production, as well as higher and more consistent steer gains throughout the year, appear to be real possibilities within the next few years.