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Chapter 13

FORAGE AND ANIMAL PRODUCTION PROGRAMS FOR WEST TEXAS

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CHAPTER 13

FORAGE AND ANIMAL PRODUCTION PROGRAMS FOR WEST TEXAS

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West Texas includes the Rolling Plains, the Northern and Southern High Plains, Southwest and West South Central Texas (map). The southwestern portion of Texas comprises the Trans-Pecos and the west south central counties. These regions have long been livestock producing areas. The potential for growth of the livestock industry in West Texas is high. Future growth is dependent on many factors but will probably be based in large measure on the expanded development and use of improved forages and forage crop management.

THE ROLLING PLAINS

Introduction

An abundance of high quality forage is the foundation for profitable livestock enterprises, whether the forage is grown on native ranges or improved pastures. This is extremely important in the 28-county Rolling Plains area which has long been noted for its cow-calf and stocker enterprises. In January 1972 there were approximately 0.5 million beef cows and 0.7 million stockers. Cow numbers tend to remain fairly constsnt throughout the year while stocker numbers fluctuate with winter pasture conditions. Of the 15.8 million acres in the Rolling Plains, 4.7 million (30 percent) are in cropland while 10.7 million acres (68 percent) are in rangeland. The need for pasture improvement is emphasized in Table 13-1. Of the total of 1.5 million acres devoted to pasture or improved pastures, only 3 percent or about 45,000 acres are fertilized. Sustained studies and application of their results in forage crop production are needed to reach near maximum production potential.

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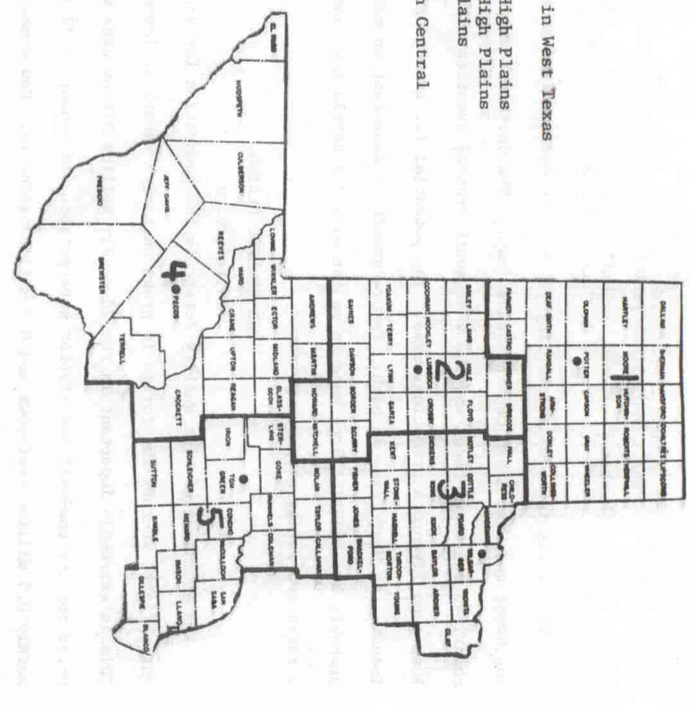

Forages in West Texas

1. Northern High Plains
2. Southern High Plains
3. Rolling Plains
4. Southwest
5. West South Central

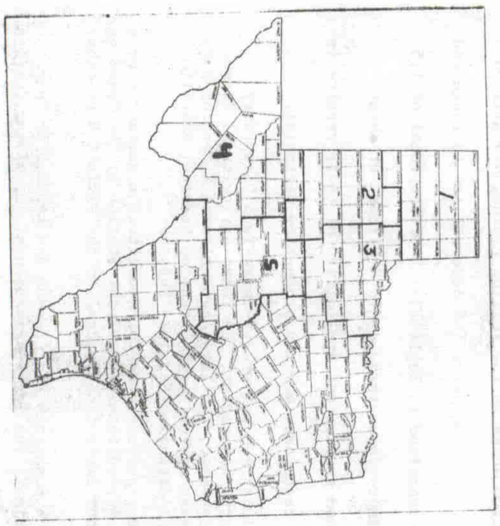

Table 13-1. Pasture Acreage and Number of Pasture Acres Fertilized in West Texas [1/]

1969

Area	Cropland (acres) Used only for Pasture	Cropland (acres) Fertilized	Improved Pasture (acres) Total	Improved Pasture (acres) Fertilized	Total Pasture (acres)	Total Fertilized (acres)
North High Plains	595,106	52,707	516,959	15,646	1,112,065	67,377
South High Plains	446,437	27,737	373,757	4,780	820,194	32,517
Rolling Plains	683,711	34,389	797,290	10,419	1,481,001	44,908
Trans-Pecos	92,768	7,800	415,705	1,185	508,473	8,985
West South Central	552,290	24,788	1,004,255	6,200	1,556,545	30,988
Total Acres	2,370,312	147,521	3,107,966	38,230	5,478,278	184,775

[1/] 1969 Agricultural Census. The figures do not include rangelands, only cultivated acreages.

Cultivated Forages and Their Management for Beef Cattle

Cool-Season Forage Crops

Annuals: Wheat and other small grain pastures offer a fairly dependable source of forage during the winter months. Approximately 1.0 million acres of wheat and 0.5 million acres of other cereals (oats, barley, rye) are planted for winter pasture. Most of the small grains planted for graze-out are nonirrigated. Approximately 70 percent of the total planted acreage prior to 1973 was grazed with stocker cattle weighing 300 to 500 pounds.

Small grains provide an excellent alternative for use either for grain, graze-out or a combination of grazing and grain. Wheat yields in the Rolling Plains area average approximately 18 bushels per acre. Based on 1971 grain prices, net returns from grain averaged about $10 an acre. Stocker gains (Table 13-2)on small grains are good and may exceed 300 pounds per acre. Based on 1972 costs and cattle prices, net returns to land, labor, and management for small grain grazing ranged from $45 to $75 per acre. The interrelationship between income from grain and income from stocker graze-out of small grain will depend on grain prices and cattle prices, including the margin between purchase or initial price and sale price at the end of the grazing season.

Table 13-2. Results of small grain grazing demonstrations in the Rolling Plains.

Animal data	County Throckmorton[1/]	Wichita[2/]	Wilbarger[2/]
Starting weight, lb.	487	450	525
Sale weight, lb.	770	761	750
Gain per acre, lb.	283	311	225
Gain per day, lb.	1.56	2.17	2.39
Animal days on pasture	181	143	94
Stocking rate, head/acre	.98	1.0	1.0

1/ Brints, N., unpublished data from a whole Farm Demonstration

2/ 4-H Winter Pasture Contest

Perennials: Cool-season perennial grasses are almost non-existent in pastures in the Rolling Plains area. However, since the release of TAM Wintergreen hardinggrass, a great deal of interest has been generated in permanent cool-season pastures. Four small demonstration plantings of TAM Wintergreen were made in the area in October 1971; two of these winter-killed completely while stands of the other two were severely reduced. Early emergence is necessary for survival the first winter, and this is not always possible with limited fall moisture. Hardinggrass is being grown on the High Plains with irrigation under colder conditions than exist in this area. Researchers feel the grass is sufficiently winter hardy to be grown nearly all over the state.

These experiences indicate that TAM Wintergreen hardinggrass will survive in this area if moisture and temperature conditions permit emergence by mid-September to October 1. Irrigation to insure adequate moisture for early emergence would assist in establishing hardinggrass pastures. Research from other areas indicates that in second and succeeding years the grass is much more cold tolerant than the seedling year. If cool-season perennials can be established, many producers, especially those with cow-calf operations, will be able to winter more livestock without the production hazards associated with annual crops or the expense of using dry hay.

Warm-Season Forage Crops

Annuals: Approximately 97,000 acres of sudans and sorghum-sudan hybrids are planted annually for summer pasture and hay in the Rolling Plains area. The normal use is as a quick hay crop when moisture is available during the summer, but stocker grazing has increased in recent years.

Yields of sorghum hybrids may range from 2 to 6 tons per acre of air-dry forage under dryland conditions and 6 to 16 tons under irrigated conditions (Table 13-3).With hay valued at $25 per ton, net returns are estimated at $16 per acre on dryland with 4.5-ton production and $36 under irrigation with 10-ton production. These relatively low net returns indicate the high cost of production of this crop. Many producers feel greater economic returns are possible by utilizing the crop with livestock.

Table 13-3. Forage yield of sorgo varieties and forage sorghum hybrids at Chillicothe, Texas 1/.

Variety or hybrid	1959 Tons air-dry forage/acre Dryland	Irrigated
Lindsey 115F	5.94	16.44
NK 320	5.76	9.97
NK 300	5.34	11.86
Lindsey 101F	5.69	12.38
Sart	2.43	9.54
DeKalb FS-22	5.26	9.96
Honey	2.27	7.18
DeKalb SX-11 Sudan hybrid	3.11	9.31
Lindsey 92F	4.30	7.14
DeKalb FS-1a	4.51	10.30
Atlas	2.60	6.29
Steckley FS 300	3.00	7.13
NK 145	2.21	7.50
Sumac	2.63	6.39

1/ Quinby and Marion, 1960.

Perennials: Improved perennial grasses in the Rolling Plains have been largely limited to bermudagrasses until recent years. Kleingrass (Figure 13-1) and lovegrasses are creating considerable interest because of their longer growing seasons. Bermudagrass is not ready for grazing or haying until mid-May or early June and stops growth in September. Since cattle are removed from wheat pasture about March 1-10 and since native pastures and bermudagrass are not ready for grazing at this time, a gap exists in forage availability between March 1 and June 1. Lovegrass and kleingrass show potential of filling this gap and extending the growing season further into the fall.

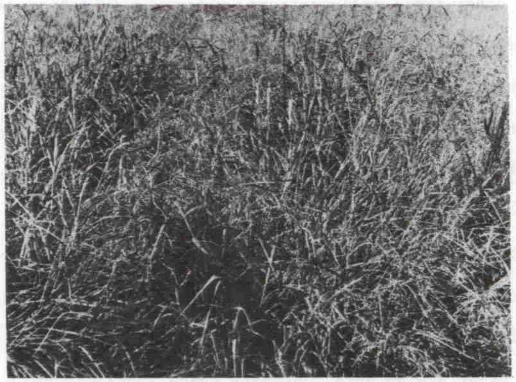

Figure 13-1. Kleingrass

Although some acreages of Midland and Common bermudagrass are grown in some areas where Coastal winterkills, Coastal is by far the predominant variety. Most of the Coastal acreage is in the Wichita Valley area and along the Red River counties where irrigation is available. High production (up to 14 tons per acre) is possible with irrigation and adequate fertilization (Table 13-4). Under dryland conditions, yields range from 2 to 6 tons per acre depending upon fertility levels and moisture.

Doubts have been expressed about the feasibility of profitably grazing Coastal with stockers. A producer in Wichita County (Table 13-5) carried five stockers per acre and produced 1,150 pounds of animal gain per acre in 120 days. He also maintained 150 cows on 300 acres of dryland Coastal and weaned 450- to 470-pound calves. These results indicate what can be done with improved varieties and systematic fertilization of bermudagrass. Not only are fertilizer and water important but also management to keep the grass in a high quality stage.

Table 13-4. Yields of irrigated Coastal bermudagrass under various fertilizer treatments at Iowa Park, Texas.

Treatment, lb./acre			2-Year Average
N	P_2O_5	K_2O	Lb. of hay/acre[1/]
0	0	0	4,000
0	50	50	5,400
100	50	50	7,000
200	0	0	9,400
200	50	0	8,400
200	0	50	9,000
200	50	50	9,600
300	50	50	12,600
400	0	0	14,600
400	50	0	14,000
400	0	50	14,600
400	50	50	15,800
400	100	50	15,600
500	50	50	17,000
600	50	50	18,800
800	50	50	21,200

Brooks, Caldwell and Fisher, 1961.

1/ Yields do not include first cutting in first year because of incomplete stand nor treatments of 1000 and 1200 lb. of N in the second year which did not increase yield above the 800 lb. treatment.

Table 13-5. Farm grazing results with irrigated Coastal bermudagrass in Wichita County (June 1 - October 1).

150 head weighing 250-300 lb.
30 acres - 2 pasture rotation
Fertilizer - 600 lb. of 33-0-0
Stocking rate - 5 calves per acre
Gain per animal - 230 pounds
Gain per acre - 1150 pounds

Weeping lovegrass, a warm-season perennial bunch grass, has been grown in the Rolling Plains for a number of years. This grass is adapted to the sandy soils of the area. If fertilized and grazed closely, it will produce acceptable quality forage from late winter throughout the summer and into the fall (Table 13-6). The usual recommendation is to utilize weeping lovegrass from March 15 to July 15, defer grazing for 60 days, and graze again in fall and winter.

Table 13-6. Average daily gain of heifers on Ermelo weeping lovegrass, Wheeler, Texas 1/.

	Lb./head/day		
Month	1970[2/]	1971[2/]	Average
April	3.3	0.07	1.70
May	1.0	1.68	1.34
June	2.5	1.78	2.14
July	2.5	2.24	2.37
August		2.00	2.00

1/ Scott, D.L., D. Reeves, W.B. Hooser, M.W. Hatter. Results of Northwest Texas Research Demonstration Program. Texas Agric. Ext. Ser. and Texas Agric. Exp. Sta., 1971.

2/ Initial weights of animals: 1970 - 410 pounds, 1971 - 466 pounds.

Interest in wintering cattle on standing lovegrass is increasing. A wintering study in Wheeler County indicated that the quality of standing weeping lovegrass forage may be adequate to maintain cows with little loss in weight provided consumption is at the expected level.

Several introduced warm-season grasses produce good yields in the Rolling Plains (Table 13-7) comparing favorably with bermudagrasses and exceeding the production of native species. Acceptable yields and qualities can be obtained only if proper management and fertilization practices are used.

Kleingrass (Figure 13-1) is becoming popular in the Rolling Plains though no research has been done with the grass in the area. Plantings by producers in the area range from a few acres on prepared seedbeds to several hundred acres overseeded on rangeland which had been either grubbed or root plowed and raked.

Plantings have been about 75 percent successful. Overseeding rangelands in Baylor and Stephens counties has proved successful. Plantings in Wilbarger, Foard, Childress, and Throckmorton counties on prepared seedbeds also have been successful. A few plantings failed on some sandy soils due to blowing out and weed competition in the spring of 1972. Kleingrass has about the same growing season as lovegrass but better forage quality and will fill the existing grazing gap in forage availability in late winter and fall in a similar manner to lovegrass.

Table 13-7. Air-dry forage yields and crude protein content of perennial warm-season grasses, Wheeler, Texas. August 10 and Sept. 1. 1971

Species and variety	Lb./acre of air-dry forage Aug. 10	Sept. 1	Crude Protein %
Lehmann lovegrass PMT-732	10,780	7,600	10.6
Old World bluestem PMT-587	6,580	9,800	12.4
Ermelo weeping lovegrass	6,500	8,150	12.0
Wilman lovegrass PMT-2121	5,740	7,500	10.2
Morpa weeping lovegrass	5,180	6,150	10.3
Kleingrass 75	3,920	7,450	11.7
Crabgrass	6,440		10.9

Scott, D.L., D. Reeves, W.B. Hooser, M.W. Hatter. Results of Northwest Texas Research Demonstration Program. Tex. Agric. Ext. Ser. and Tex. Agric. Exp. Sta., 1971.

Alfalfa for Hay

Alfalfa is an important forage crop in certain counties in the Rolling Plains. Approximately 30,000 acres are grown with an annual production of some 65,000 to 70,000 tons of hay. Most acreages are irrigated, but the crop is also grown on dryland. Alfalfa is used for hay, seed production, grazing, feeding as green chop, and dehydrating. The demand for high quality alfalfa hay in other areas of the State encourages production at its highest potential. Economic studies show that yields may be increased by 2-3 tons per acre with high level management. This would result in about a 25-percent increase in returns to producers not realizing

maximum potential. Irrigated alfalfa, under high level management, has produced net returns in excess of $42 per acre (Table 13-8). If the land is owned, the cost shown for land actually is additional income. The returns are conservative for the reason that alfalfa hay value actually exceeds $50 per ton. Thus, alfalfa hay production is still a profitable enterprise. Application of further research on management, fertilization and varietal improvement could make alfalfa one of the most profitable crops in the Rolling Plains.

Silage Crops

Forage sorghum hybrids are essentially the only crops in the Rolling Plains utilized for silage (Figure 13-2). Although corn is generally considered to make higher quality silage, it is not well adapted to the Rolling Plains because of the high temperatures and limited rainfall. Approximately 18,000 acres of sorghum hybrids are grown with an average yield of 7 tons per acre. Under irrigation and high level management, 15 to 17 tons per acre are produced. While production costs and silage value will change with the economy, silage is not a high cash return crop (Table 13-9). Consequently, most of the silage produced is used in small feedlots or for on-the-farm feedings.

Figure 13-2. Sorghum hybrids for silage are grown on approximately 11,000 acres in the Rolling Plains.

Table 13-8. Estimated costs and returns for irrigated alfalfa in Foard and Wilbarger Counties, high level management.1/

Item	Unit	Price or Cost/Unit	Quantity	Value or Cost
1. Gross receipts from hay	Ton	50.00	8.00	400.00
TOTAL				400.00
2. Variable Costs				
Preharvest				
Fertilizer (0-92-0)	Acre	19.32	1.00	19.32
Insecticide	Appl	3.50	3.00	10.50
Custom Spray	Appl	1.50	3.00	4.50
Machinery	Acre	1.07	1.00	1.07
Tractors	Acre	0.14	1.00	0.14
Irrigation machinery	Acre	38.52	1.00	38.52
Labor (Tractor & machinery)	Hour	2.25	0.83	1.87
Labor (Irrigation)	Hour	2.25	2.27	5.10
Interest on Operating Capital	Dol.	0.09	20.19	1.92
Subtotal, Preharvest				82.94
Harvest Costs				
Cost Harvest & Haul	Bale	0.48	264.00	126.72
Subtotal, Harvest				126.72
TOTAL VARIABLE COST				209.66
3. Income Above Variable Costs				190.34
4. Fixed Costs				
Machinery	Acre	0.81	1.00	0.81
Tractors	Acre	0.16	1.00	0.16
Irrigation machinery	Acre	51.48	1.00	51.48
Prorated Establishment Cost3/	Acre	89.74	0.13	11.22
Land (Net rent)3/	Acre	83.81	1.00	83.81
TOTAL FIXED COSTS				147.48
5. TOTAL COSTS				357.14
6. NET RETURNS				42.86

1/ Texas Crop Budgets, (081 5400 520 0), developed by Extension Economists - Management, Texas Agricultural Extension Service. June, 1974.

2/ Establishment costs prorated over eight years.

3/ Land charge uses landlord share of gross (1/3) less 1/3 of fertilizer and harvest.

Table 13-9. Estimated costs and returns for sorghum-sudan silage in Knox and Haskell Counties, high level management. 1/

Item	Unit	Price or Cost/Unit	Quantity	Value or Cost
1. Gross receipts from Silage	Ton	9.00	11.25	101.25
TOTAL				101.25
2. Variable costs				
Preharvest				
Seed	Lb.	0.14	10.00	1.40
Fertilizer (60-0-0)	Acre	12.60	1.00	12.60
Machinery	Acre	2.31	1.00	2.31
Tractors	Acre	3.62	1.00	3.62
Labor (Tractor & Machinery)	Hour	2.25	2.86	6.44
Interest on Operating Capital	Dol.	0.09	7.82	0.74
Subtotal, Preharvest				27.10
Harvest costs				
Cost Harvest & Haul	Ton	4.50	15.00	67.50
TOTAL VARIABLE COST				94.60
3. Income above Variable Costs				6.65
4. Fixed Costs				
Machinery	Acre	3.50	1.00	3.50
Tractors	Acre	4.13	1.00	4.13
Land (Net rent)2/	Acre	6.98	1.00	6.98
TOTAL FIXED COSTS				14.61
5. TOTAL COSTS				109.21
6. NET RETURNS				-7.96

1/ Texas Crop Budgets. (088 6000 6000 0). Developed by Extension Economists-Management, Texas Agricultural Extension Service. June, 1974.

2/ Land charge is 1/3 of gross less 1/3 of fertilizer and harvest.

THE HIGH PLAINS - NORTH AND SOUTH

Introduction

The High Plains area is characterized by a level terrain that greatly enhances extensive and large-scale cash crop farming. Livestock programs are important and contribute substantially to the economy of the region. Cow-calf and stocker production have been the major endeavors. The large scale development of the feedlot industry within the past decade has shifted the emphasis to stockers with a marked decrease in cow-calf operations. The demand for feedlot replacements has induced many cash crops producers to add livestock production, mainly stockers, to their enterprise. Improved forage production is primarily from irrigated and dryland wheat, rye, barley, oats, sorghum-sudan hybrids, alfalfa, cool-season perennial grasses, and warm-season perennial grasses, mainly Midland bermudagrass. The acreage in improved irrigated pastures has always been relatively small and has fluctuated widely as farmers adjusted their cotton, grain sorghum, wheat, and other enterprises to keep up with agricultural development, to meet requirements of the economy, and to comply with governmental programs. Permanent pastures and cropland used only for pasture in the North and South High Plains have gradually increased to 1,932,259 acres in 1969 (Table 13-1).

Forage crop production is of increasing importance to the economy of the region. As water supplies are reduced in all West Texas, it is likely that a large part of the once irrigated acreages devoted to cash crops will be planted to improved forages adapted to limited irrigation. Research information will assume greater importance in the future.

Cultivated Forages and Their Management for Beef Cattle

Cool-Season Forage Crops

<u>Annuals</u>: Wheat, rye, barley, oats, and triticales are the winter annuals grown in the High Plains of Texas for both grain and forage. Wheat occupies annually more than 2 million acres, about 90 percent of which is grazed during the winter season. The acreage of rye has increased in recent years, being used especially for graze-

out on the sandier soil types. Barley, oats, and triticales are grown to a lesser extent with an annual acreage totaling less than 100,000. Oats are not sufficiently winter hardy to be dependable in most of the High Plains. Triticales were first introduced to the High Plains about 1969. These were spring types and were not sufficiently winter hardy to provide sustained grazing during the winter and spring periods of production. In recent forage tests conducted by Porter (1972), two winter types showed adequate winter hardiness with forage production approaching that of adapted wheat and rye varieties.

Research at Bushland and Texline shows that Elbon rye ranks highest among the cereals in total forage production. Will barley produces the most forage during the fall period, but its winter and spring production is substantially reduced in some of the tests due to winterkilling. There is little difference between adapted wheat varieties in total forage production, but TAM-Wheat 101 ranks first among the wheats. A wheat-agropyron derivative (DeKalb 9290) produces extended spring grazing. This probably can be attributed to its high level of sterility which delays maturity. The more winter-hardy ryes and wheats produce the most forage during mid-winter because the leaves remain normal and are capable of resuming growth on warm days. The less winter-hardy cereals such as barley, oats, and some wheats practically cease to grow during cold weather because most of the foliage turns brown from freeze damage.

The effect of grazing termination date on grain production and economic returns is relatively complex and is dependent on fertility level, variety, seeding date, and perhaps various climatic factors. Pope (1963) found that fertilized (120 pounds N per acre) grain yields under irrigation in the North Plains were not reduced by grazing until March 15 and were reduced only 15 percent with an April 1 grazing termination date. Conversely, unfertilized grain yields were reduced 25 and 50 percent by grazing until March 1 and April 1, respectively. Not only did fertilization permit later grazing without reducing grain production, forage production was increased approximately four times with 120 pounds N per acre.

Shipley (1972) reported similar results on the effects of grazing termination dates at the North Plains Research Field at Etter when fertilized grain yields were not reduced by grazing if grazing was terminated by early April.

Shipley (1972) found that the main advantage of high seeding rate was in fall forage production. Spring forage production and grain yield were not enhanced by increasing the seeding rate from 60 to 90 pounds per acre under irrigation conditions.

Irrigation management influences cereal growth. Two fall irrigations may be about equal to three in terms of total seasonal forage production (Shipley and Regier, 1972), and both these irrigation treatments produce more forage than either one fall irrigation or no fall irrigation. Spring forage production is enhanced by fall irrigation, but there is no advantage in spring production to more than one fall irrigation. Information is still needed on the number and timing of spring irrigations in relation to amount of forage produced and the duration of the spring grazing period.

Perennials: In the states west of Texas, more than 5 million acres are devoted to irrigated pastures of improved cool-season grasses and legumes. Irrigated pastures of improved species, managed properly, occupy a strong competitive position with most field crops (Keller and Carlson, 1967). Approximately 100,000 acres are devoted to irrigated pastures in the High Plains (New, 1971). Since irrigated pastures are expensive to establish and maintain, the following should be weighed carefully: the availability of water, the grazing needs of the livestock to be produced, the capabilities of the land, the carrying capacity of the species utilized, the place of irrigated pastures in the overall farm or ranch operation, and finally the probably costs and returns of the enterprise (Jones and Brown, 1949; Keller and Carlson, 1967; Peterson et al., 1959; Pratt et al., 1971; Somerhalder et al., 1969; Stewart, 1970).

Data from the High Plains (Dawson, 1948; Nesbit, 1952), research findings from adjacent Western States, and unpublished observations from demonstrations and

farmer-operated pastures indicate that smooth bromegrass, tall fescue, orchardgrass, perennial ryegrass, tall wheatgrass, and TAM Wintergreen hardinggrass are among the cool-season perennial species adapted to the High Plains.

Mixtures of cool-season legumes and grasses are utilized, but most pastures established in recent years have been planted with grass mixtures or single species. Tall fescue is used in many irrigated pastures. In Swisher County, for example, this species is widely accepted and growers report good gains from cattle grazing on it. The biggest disadvantage of pure stands of fescue is the unpredictable incidence of fescue foot and related disorders causing poor gains. Bromegrass, orchardgrass, and perennial ryegrass are usually grown in mixtures because their high palatability precludes differential grazing and prolongs the duration of the peak production period.

Alfalfa, generally regarded as a warm-season forage crop, is sometimes used in mixtures with cool-season grasses. It is well adapted to the region and will grow with smooth bromegrass, perennial ryegrass, and other adapted grasses. Alfalfa is highly competitive and requires intensive management to maintain in mixtures (Dawson, 1948; Nesbit, 1952). The hazard of bloat with alfalfa limits its use. Adequate procedures for maintaining a reasonably low rate of loss from cattle grazing in alfalfa, vetch, or other legumes, would result in more extensive utilization of these species.

Warm-Season Forage Crops

Annuals: Forage sorghums, sorghum-sudan hybrids, sudan-grass varieties, sudangrass hybrids, and pearl millet are annuals used currently for pasture and hay in the High Plains. Foxtail, proso, and millets are used to some extent for hay and as cash crops under dryland conditions. They are not suited for irrigated production because of their low yield potential and are not adapted to grazing because of their shallow root system. Sudans and sorghum-sudan hybrids are important temporary pasture, summer hay, silage, and emergency crops in both the irrigated and dryland regions of the High Plains. Most plantings of these annual crops are utilized as summer pastures in cow-calf and stocker operations. A recent survey (New, 1971) shows that in 1971 approximately 158,000 irrigated and 302,000 nonirrigated acres were used in the production of forage crops for grazing in the High Plains area.

Under irrigation, yields of the sudans and sorghum-sudan hybrids (Figures 13-3 and 13-4) range in yield from 3.5 to 6.0 tons of dry forage per acre (Rosenow, 1965; Walker, 1968). Yields under dryland conditions range from 0.8 to 1.8 tons dry forage per acre (Mitchell County, 1972).

Figure 13-3. A good stand of sorghum-sudangrass hybrid in early heading stage being windrowed in preparation for baling. This crop was produced on Pullman clay soil with two irrigations.

Figure 13-4. Baled forage sorghum occurs in a range of quality depending on plant maturity and weather conditions. The thick pithy stems require a long drying period to avoid spoilage after baling.

In the High Plains, approximately 133,000 acres of silage crops were grown in 1971 (New, 1971) with 99,456 acres of this being in corn. Information on the comparative productivity under High Plains conditions of the many summer annual forages is not available. In the Panhandle such forages are usually produced after harvest of a wheat crop with little attention given to soil fertility and a low priority to irrigation. Drouth stress sometimes results in accumulation of lethal levels of nitrates in both hay and grazed forage. Frost damaged regrowth causes temporary danger from hydrocyanic acid.

<u>Perennials:</u> The main improved warm-season perennial grass used is Midland bermudagrass; but varieties of sideoats grama, indiangrass, switchgrass, kleingrass, weeping lovegrass, and others are grown in permanent pastures. Most of these species can be utilized in both dryland and irrigated pastures, but species such as bermudagrass, introduced from humid regions, must be grown on irrigated land.

Midland bermudagrass is more efficient for cow-calf programs than for stocker enterprises. Under low level production conditions, it produces no more forage than common bermudagrass. However, Midland has a high yield potential when it receives adequate amounts of water and fertilizer (Table 13-10). Coastal bermudagrass which may produce higher yields in its area of adaptation often winterkills in the North High Plains. Other strains of bermudagrass are found in the region, but they are either less productive than Midland or have not been tested adequately to prove their worth.

Table 13-10. The effect of sewage effluent and nitrogen on the average yields of Midland bermudagrass, Lubbock, Texas, 1968-69.

Source of Water	Yield of dry matter - lb./acre			
	No Nitrogen		400 lb. Nitrogen	
	1968	1969	1968	1969
Well water	514	1,224	9,484	10,981
Sewage effluent	1,817	2,972	12,081	13,474

Because the forage quality of Midland bermudagrass is low at times, supplementary feed may be necessary to obtain satisfactory livestock gains. Some Midland bermudagrass plantings are being replaced by row crops, resulting in a sharp decrease in acreage. In many cases, inadequate water and fertilizer have limited production, and little attention has been given to the development of grazing systems. Some native grasses, too, will respond to irrigation and fertilization (Table 13-11). Indiangrass, which was not included in the test, is sometimes used as an irrigated pasture species.

Weeping lovegrass is generally grown on deep sandy soils under dryland conditions. Kleingrass is being considered as a possible new species for the region.

Table 13-11. Forage yield of three native grasses grown under irrigation and fertilized with four rates of nitrogen, Lubbock, Texas, 1968.

Nitrogen lb./acre	Yield of dry matter - lb./acre		
	Premier sideoats grama	Spike bristlegrass	Grenville switchgrass
0	7,032	3,480	3,834
200	8,787	4,662	6,009
400	9,778	4,851	7,269
600	9,852	5,146	7,420

Alfalfa for Hay

Demand for alfalfa hay has increased in this area with increased cattle feeding in recent years. Many feedlot operations include alfalfa in the ration. Most of this hay is now being imported from outside Texas - primarily from Colorado and New Mexico. Water requirements for alfalfa are almost twice that for such crops as grain sorghum or cotton. Careful consideration should be given to this fact when plans are made to include alfalfa in the crop rotation.

Development of labor saving harvesting equipment has resulted in a more favorable attitude among farmers toward the production of alfalfa. Accumulators, mechanical bale loaders, cubing machines, and field stackers are some of the most recent improvements. Farily large acreages of alfalfa are usually necessary to justify the investment in such equipment; however, custom harvest of smaller acreages is sometimes available.

Alfalfa may be used for hay, silage, green chop, dehydrated feed, pasture, or seed production. Commercial companies, moving into the area, are contracting for standing or windrowed hay. Thus, alfalfa production without the large investment in harvesting equipment and with a minimum labor requirement is possible.

Varieties best adapted in the Northern High Plains include Cody, Buffalo, Lahontan, and Zia. These are all resistant to bacterial wilt, and all except Buffalo are resistant to the spotted alfalfa aphid. All four are classified as moderately winter hardy with Zia being less hardy than the others. Mesilla, a synthetic variety developed and recently released by the New Mexico Agricultural Experiment Station, appears to have promise for Texas. Like Zia, it is resistant to the spotted alfalfa aphid, but also is resistant to the green pea aphid. It is equal to Zia in disease resistance and has yielded more forage in New Mexico tests. Other recently developed varieties such as Dawson, Washoe, and Kanza may be useful because of their resistance to insects, good winter hardiness, and production potential.

SOUTHWEST AND WEST SOUTH CENTRAL TEXAS

Introduction

The Southwest Texas area has long been considered primarily a range area. However, in Extension Districts 6 and 7, which comprise some 40 counties in Southwest Texas, a total of 2,065,018 acres is devoted to pasture or improved pasture (Table 13-1). Presently less than 20 percent of the acreage is fertilized annually. Most of the animal operations involved in Southwest Texas historically have been cow-calf or ewe-lamb in which breeding herds are maintained for long periods of time. However, in recent years, particularly on irrigated pasture land, utilization of stocker animals destined for feedlots has become more prevalent. For the most part stocker programs involve primarily beef cattle, although lambs are used in parts of the area.

Cultivated Forages and Their Management for Beef Cattle

Cool-Season Forage Crops

Annuals: Winter annual pastures in Southwest Texas are usually planted to wheat, oats, barley, and limited acreages of rye. In the Trans-Pecos region, barley is the principal small grain grown due to its salt tolerance (Figure 13-5). In other areas of Southwest Texas, particularly the dryland areas, oats are used because of early growth potentials and wheat because of its cold tolerance. Small-grain pastures are utilized by stocker beef cattle primarily destined for area feedlots. In the eastern edge of the Southwest Texas area, small-grain pastures are

established under dryland conditions and frequently grazed by lambs. In the area west of the Pecos River, all of the forages, both winter and summer, must be irrigated. Therefore, growing stocker beef cattle is about the only practical animal production program since all the gain from stockers is sold contrasted with only the calf gain in cow-calf operations. Approximately 100,000 acres of irrigated cropland in the Pecos and El Paso areas and limited acreages in other parts of the area are used for forage.

Figure 13-5. Stocker cattle grazing barley. Because of its salt tolerance barley is the small grain most often grown in the Trans-Pecos region.

Irrigation is usually the most expensive single item in crop production in the Trans-Pecos (Table 13-12). The crop production expenses involved with irrigation, either pumping, distribution, or labor, may exceed $40 per acre. The high water cost necessitates attention to all aspects of income-producing properties of a crop. If grazing alone had been considered as the principal product of the crop in the Pecos County demonstration (Table 13-12) then the returns are about $20 per animal; returns per animal and per acre for grazing amounted to $20 and $47, respectively, under the economic conditions in 1971-72. However, the combination of stocker grazing and grain production produced a net return per acre of almost $100. In this case, grain yields actually were lower than the average for the area. Yet the system still returned a profit of almost $100 an acre in 1972.

Table 13-12. Stocker grazing and grain production on irrigated barley and triticale in Pecos County, 1971-72. 1/

Item	Value or cost (per acre)
Income	
Cattle (2.39 @ 537 lb. @ $0.37)	474.87
Grain	59.36
Total	534.23
Production costs	
Land preparation	9.75
Seed and fertilizer	13.67
Irrigation	41.20
Grain harvest	9.96
Interest (operating capital and cattle)	14.05
Cattle (2.39 head @ 372 lb.x $0.37 + $2.00/hd)	333.40
Land charge ($200/acre @ 7%)	14.00
Fencing (temporary)	.63
Total production costs	436.66
Net return	97.57

1/ Garner, Pat C. Stocker grazing and grain production demonstration. Mimeo report. Pecos County Agricultural Extension Office. 1972. Based on approximately 80 acres consisting of 60 acres of barley and 20 acres of triticale.

This demonstration showed that the forage and grain production capabilities of the crop must be utilized fully in view of the high cost of production. Some factors not shown in Table 13-12 include a stocking rate of 2.39 animals per acre and a 111-day grazing period extending from October 10 through January 29. The rate of gain per head per day during the mid-winter period was 1.49 pounds.

When this set of animals was sold, the operator had to make the decision whether to manage the crop for grain production or to introduce another set of

calves which would graze the pasture until about mid-May. Such a decision must be based on prices and other information determining the most profitable route to follow. However, theoretical calculations of costs and returns for each alternative show this decision must be based on anticipated grain and feeder cattle yields and market prices of grain and cattle (Table 13-12). In an average year the decision would probably be in favor of one set of calves and a grain crop if average yields of grain could be anticipated.

Perennials: In most of Southwest Texas, summer temperatures are too high for good growth of cool-season perennial grasses. However, TAM Wintergreen hardinggrass has shown considerable potential, and sizable acreages are being planted. The Davis Mountains in the Trans-Pecos have only a short period of very high summer temperatures, making the mountain area suitable for many cool-season species. Per acre returns from irrigated cool-season pastures in the Trans-Pecos area compare favorably with returns for most crops produced in the area (Table 13-13). The most serious difficulty with irrigated permanent pasture may be the large investment in animals required to utilize the forage produced. Again stocker operations in which all animal gain can be sold may be the most profitable use for these pastures. With proper selection of pasture species and good animal management, such pastures can be economical. Research is needed to determine the grass species and the management systems by which such pastures can be profitably utilized.

Warm-Season Forage Crops

Annuals: Sorghum-sudan hybrids for summer temporary pastures are used in both irrigated and dryland areas in Southwest Texas. Work at the Texas A&M University Agricultural Research Station at Pecos (Table 13-14) showed that dry matter yields range from 2 to 5 tons per acre under irrigation. Most production from these crops is grazed at high stocking rates rather than machine harvested.

Table 13-13. Animal performance, costs, and returns for fifty acres of cool-season irrigated permanent pasture in Dell City, Hudspeth County, 1971.1/

Returns:	Value or cost (Per acre)
Cattle weight off pasture 3838.37 lb. @ 33¢	$ 1,266.66
Pasture for 5 bulls and 6 cows	8.44
Total returns	$ 1,275.10
Costs:	
Cattle weight on pasture 2979.03 lb. @ 37¢	$ 1,102.24
Establishment cost of pasture 2/	14.00
Maintenance cost $50 acre 2/	50.00
5.4 bales hay	5.00
.31 ground milo @ $50 ton	4.90
60 lb. liquid supplement	4.36
Total cost	$ 1,196.00
Net return	$ 79.10

1/ Lindsey, K.E., C.W. Neeb, C.A. Taylor, P.W. Jacoby, Jr., and R.D. Siegmund. 1971. Field Crop Demonstration and Research Summary, Extension District No. 6, Texas Agricultural Extension Service.

2/ Includes land, labor and equipment depreciation charges.

Table 13-14. Yields of irrigated forage sorghums at Pecos, 1969-71.1/

Variety or Hybrid	1969 Green ton/acre	1969 Dry ton/acre	1970 Green ton/acre	1970 Dry ton/acre	1971 Air-dry ton/acre
Sweet Chew	18.2	3.6	21.2	3.6	3.3
Sweet Sioux	16.7	5.1	15.7	3.0	3.2
Sucrosse	15.7	4.2	17.6	3.5	3.3
NK 9363	14.2	4.5			
NK Trudan #2	12.8	2.8			
NK 9377	12.1	2.6			
NK L9426 (Millet)	10.6	2.7			3.0
Red Top	8.9	2.1			1.8
PAG-1 2/			17.4	2.8	
PAG-2 2/			17.5	3.9	
ACCO Aztec			19.8	3.8	
ACCO 8815			18.2	3.3	
ACCO 8811			21.5	4.4	1.8
ACCO X-7804					2.0

1/ Hefner, J.J. Unpublished data. Tex. Agric. Exp. Sta., Pecos, Texas.

2/ PAG-1 was planted in pre-irrigation moisture, PAG-2 was dry planted through propazine treated soil.

Perennials: Irrigated bermudagrasses produce large amounts of forage in the Trans-Pecos area. Irrigated bermudagrass will carry heavy stocking rates (Table 13-15), but animal gains are not always satisfactory, especially with stocker cattle. There is a tendency to increase stocking rate as production is increased or as it is assumed to increase with fertilization or irrigation. However, previous research has shown an average daily gain decrease with increased stocking rate, especially if the stocking rate influences forage availability or grazing selectivity. The reduced daily gain under the extreme conditions may be reflected in reduced acre gains. Thus, the decreased average daily gains or acre gains in this case are not necessarily the result of high nitrogen. Increased carrying capacity was expected with an increased nitrogen level, but it is possible that the stocking rate exceeded the optimum for the best gain. Thus, grazing management may be the key to profitable production of improved, high-producing pastures. The average daily gain decreased as the season progressed regardless of the nitrogen rate used. This suggested a decrease in quality of the forage which may also reduce forage intake, either or both of which would affect rate of gain. The decrease in daily gain noted in this study has also been noted by producers in the region.

In recent years, kleingrass and buffelgrass have been introduced into the area. In 1970 nurseries of these grasses were established in Sonora and Pecos, and in 1971 in El Paso. The success of a kleingrass nursery at Sonora prompted the establishment of an additional 20 acres of Kleingrass 75. However, no results are available from this pasture.

Alfalfa for Hay

Alfalfa is a potentially important hay crop in both the El Paso Valley and the Pecos area (Figure 13-6). Both irrigation and phosphorus fertilization are essential for high levels of production in these areas (Longenecker and Lyerly, 1963). Hay yields were increased appreciably by more frequent irrigation and also by higher rates of applied phosphate (Table 13-16). Highest average yield of 9.76 tons per acre was obtained with 14-day irrigations and 240 pounds of phosphate per acre

Table 13-15. Summary of irrigated Coastal bermudagrass grazing trials, April 29, 1963, to September 23, 1963, at Balmorhea, Texas.1/

lb. N/ acre	AVERAGE DAILY GAIN: April 29 to July 10 lb.	AVERAGE DAILY GAIN: July 10 to Sept. 23 lb.	AVERAGE DAILY GAIN: April 29 to Sept. 23 lb.	PER ACRE GAIN: April 29 to July 10 lb.	PER ACRE GAIN: July 10 to Sept. 23 lb.	Total gain/ acre lb.	Steers grazed/ acre July 10-Sept. 23 av. no.	Hay cut/ acre lb.
84	1.04	.33	.68	419	140	559	5.6	1,410
168	.95	.50	.72	478	263	741	7.0	2,580
252	.88	.28	.58	543	232	775	9.8	2,715
336	.97	.06	.52	669	51	720	10.5	2,845

1/ Melton, A.A., J.P. Wells and F.L. Fisher, 1964.

every second year. An interesting aspect of this trial is that the lowest rate of phosphorus and the most extended irrigation period of 28 days gave an average yield of 7.66 tons. This yield is considerably higher than the average yield of about 4.5 tons per acre throughout the El Paso Valley. These results suggest that factors other than irrigation and phosphorus may affect yields in the area.

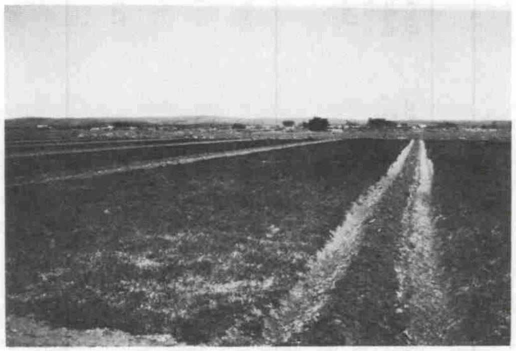

Figure 13-6. Irrigated alfalfa in Pecos County.

Table 13-16. Three-year average yields, tons per acre, of Zia alfalfa hay as affected by irrigation frequency and applied superphosphate, Texas A&M Agricultural Research at El Paso, 1960-62.

Irrigation frequency, days	P_2O_5 applied, 1st and 3rd years, lb./acre 80	160	240	Irrigation frequency average 1/
14	8.79	9.09	9.76	9.22
21	7.67	8.52	8.39	8.20
28	7.66	8.17	8.54	8.13
Phosphate average 1/	8.04	8.59	8.90	

Longenecker, D.E and P.J. Lyerly, 1963.

1/ LSD (.05) for phosphate averages, 0.37 ton; for irrigation frequency averages, 0.41 tons.

Recent results at the Trans-Pecos Agricultural Research Station at Pecos (Table 13-17) are quite in line with the yields obtained 10 years earlier by Longenecker and Lyerly (1963) on the El Paso Station. With sound management, the forage yields of alfalfa in both the El Paso Valley and Pecos area could easily reach 7.5 to 8.5 tons per acre. Yields of these magnitudes would make alfalfa a profitable crop. Irrigated alfalfa also is used for grazing in Southwest Texas (Figure 13-7) but requires intensive management of both the cattle and the pasture.

Table 13-17. Forage production of two Alfalfa varieties, Pecos, Texas, 1971.

Date harvested	Yield, tons/acre	
	Zia	Common
May 10	1.02	0.88
June 11	1.94	1.72
July 8	2.12	1.96
August 5	1.53	1.47
September 8	1.44	1.40
October 10	0.63	0.61
TOTAL	8.68	8.04

Hefner, J.J. Unpublished data. Tex. Agric. Exp. Sta., Pecos, Texas, 1972.

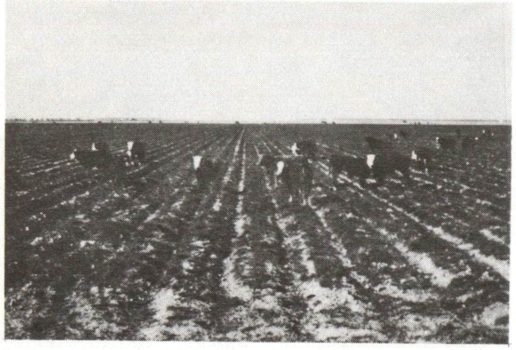

Figure 13-7. Cattle grazing alfalfa during the winter in Ector County.

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