A BEEF PRODUCTION PROGRAM FOR GOLIAD COUNTY, TEXAS

by

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INTRODUCTION

A beef production program that requires a minimum of time, employs the least labor and at the same time produces the most economical gains is of greater interest to us now than at any time in the past. Because of the present meat shortage brought about by the demands for meat for our armed forces and for our allies as well as a greatly expanded demand created by vastly increased industrial employment, meat production in the United States should be expanded greatly.

Goliad County with its warm climate, large amount of pasture land with abundance of native grasses, mesquite beans and prickly pear affords a splendid opportunity for a sound beef production program.

In order to get detailed information regarding beef production management practices, a comprehensive questionnaire was sent to representative ranchmen and farmers of Goliad County. One hundred and three responded giving much valuable information and many suggestions regarding management methods. From this and other sources, a beef production program has been developed which it is believed will assist farmers and ranchmen of the county to utilize their land and crops to better advantage than many of them are now doing.

HISTORY AND DEVELOPMENT OF GOLIAD COUNTY

Historians have usually accorded to Cabeza de Vaca and his companions the distinction of being the first white men to set

foot on Texas soil. Cabeza de Vaca was sent to Texas by the Spanish Government in 1528. The Spanish in Mexico made little effort to establish their authority in East Texas. Their attempts had been directed mainly to the establishment of missions in the Rio Grande Valley and the Gulf Coast Area. The Viceroy of Mexico paid no attention to the pleading of the missionaries for strong settlements in East Texas, but Saint-Denis, leader of a French expedition into Texas demonstrated to the Spaniards how easy it would be for the French in Louisiana to take the country. To forestall such a move the Viceroy determined to found the settlements for which the missionaries had been begging for 20 years. The settlements were established in 1716 around the present towns of Nacogdoches and San Augustine. Two years later San Antonio was founded.

For the most part the French and the Spanish got along well together on the frontier, but in 1719 while France and Spain were at war in Europe the Spaniards in East Texas were driven back to San Antonio, and shortly afterwards some Frenchmen under La Salle's leadership tried to found a colony on Lavaca Bay. This failed, and in 1721 the Marquis de Aguayo restored the East Texas settlements, and founded a new one near the coast, on the spot where La Salle's fort had stood. After moving twice, this settlement was finally located at Goliad in 1749.

At the end of the eighteenth century the only Spanish settlements worthy of mention were San Antonio, Goliad, and Nacogdoches. They were not in a prosperous condition. In 1813 the Gutterez-Magee expedition captured Nacogdoches, Goliad, and San Antonio.

These were the only cities of consequence in Texas and life in these was hazardous, with no stability of government either in the province, in Mexico or in Spain. Although the Mexican Government gave the Americans permission to establish colonies in Texas the two nations did not trust each other. Most of the early colonists came to Texas in good faith and were willing to become permanent citizens of the Republic of Mexico. Trouble over some land at Nacogdoches arose between the American colonies and Mexican settlers. The dispute had to be settled by the Mexican authorities at San Antonio, who decided in favor of the Mexican settlers (10).

As a result of this, the Mexican Congress enacted a law forbidding further settlement of Americans in Texas excepting in two colonies, providing for establishment of Mexican convict colonies in Texas, and levying duties on all foreign imports and establishing custom houses. This act brought the first storm of protest and fed underlying causes, of which there were several, to the Texas Revolution and after many years of bloody fighting, Texas won her independence from Mexico. The effort of the Texans to overthrow Santa Anna by means of a Mexican revolution failed. There were many Mexicans who were opposed to Santa Anna, but they did not care to follow the lead of the Anglo-Americans in Texas in taking up arms against the dictator. By the end of the year 1835 practically all Texans were agreed that they would have to declare independence. As a matter of fact, several declarations of independence were issued before the Convention met on March 1, 1836. These declarations were issued by local groups and, of

course, did not represent all of the people. The best known of these local declarations of independence is that signed at Goliad on December 20, 1835. This document, known as the Goliad Declaration of Independence, was signed by 91 citizens of Goliad. Its only importance lies in the fact that it shows the development of a desire for independence. The Texans had failed to receive aid from Mexican liberals and now hoped to receive aid from the United States.

Location and area. Goliad County is a part of the Coastal Plain extending from the San Antonio River on the North to the Blancones Escarpment River on the South. It is located in the southern prairies near the coast, and was created in 1836 from one of the original counties. It was named for the municipality of the same name. The county has an area of 871 square miles, a total population of 8,798, and a population per square mile of 10.1. The assessed valuation of the county is $7,554,200 and crops were harvested in 1939 from 61,338 acres. Tilled and raw land available for crops in 1939 was 95,211 acres. Goliad County is bounded by the counties of Victoria, Refugio, Karnes, Bee and Dewitt.

Goliad, the County Seat, is the principal market and shipping point, one of the oldest towns in Texas, and is famous as the place of the massacre of Texas patriots under Fannin. One of the most notable of the old mission structures, La Bahia, is located there and it is one of the principal points of interest for tourists.

Climate. Goliad County has a subtropical climate. The annual rainfall is 29.99 inches. The elevation varies from sea level in the southeastern part of the county to 1,000 feet in the northwestern part. Rolling plains with open prairies generally covered with thick growths of mesquite, small oaks, chaparral, huisache and other small trees, shrubs and prickly pear predominate in some of the upper portions.

The most densely covered area constitutes the famous Brush Country. Livestock raising, including cattle, sheep and goats, is the principal industry. Goliad County has some dry farming areas in which cotton, corn and sorghum crops are raised in abundance. The county has approximately 230 growing days annually for crops. Frequently in the southern portion winter passes without very much frost, and what frost there is seldom is severe enough to damage citrus and winter truck crops.

Acres in cultivation. The agricultural industry of Goliad County comprises 1,233 farms (census of 1940), with a total of 557,440 acres. This is an average of 452.1 acres to the farm. Forty-one crops were listed separately as having been produced on a large commercial scale in 1943-44, and there were a number of smaller crops produced in minor commercial quantities. The total number of crops produced in Goliad County on a large and small commercial scale is more than 50 and there are in addition some 20 crops grown principally for home consumption.

There has been a rapid transition in Goliad County cultivation. The farming of the county has been most radically affected during the last few years by the enlistments for and the inductions

into the armed services and by the very great shift of farm workers to the war industries. More than two-thirds of the farm workers of military age in Goliad County have gone into the armed services. The induction of men into the armed services, and the movement of tenants and laborers to the cities during 1941 and 1942 left Goliad County farmers facing a serious situation. Much of the farming area of the County is adapted to machine farming. However, war-time restrictions on the manufacture and distribution of farm machinery, due to priorities on metals held by makers of munitions and war machines, has held in check what would otherwise have been a great acceleration of farm mechanization which has made marked progress in Goliad County for more than two decades. A contemporary development has been a marked trend toward livestock raising. In practically all areas of the county there has been some diversion of land from crop growing to livestock raising but notably in those areas with soils poorly suited to cultivated crops. A report of the United States Department of Agriculture as of January 1, 1943 revealed that Goliad County's livestock population was greater than it had been for many years.

Acres in pasture. Permanent pastures are usually located on parts of the farm least suited to cultivated crops, such as low wet land, wood lots, stumpy and rocky fields, poor upland, and steep hillsides. Such conditions make it impossible to establish a rule regarding the area of pasture per cow, and consequently the carrying capacity of the pasture. The total tillable acreage in pasture in Goliad County is 101,039 acres.

The number of acres in woodland is 133,867, according to the United States Census (13). From the survey of 103 ranchmen described in the Introduction, it was found that they had 86,030 acres in pasture land, an average of 853.2 acres per ranch and about eight acres per cow.

Crops grown. Because of the range of soil types from dark loams to sandy and sandy clays, the farmers of Goliad County are able to do diversified farming to a great extent. Some of the crops grown are cotton, corn, grain sorghums, hay, truck crops, peanuts, clover, cow peas, and oats. Considerable quantities of soybeans and broom corn are also grown. Table I, showing the acreage and production of the principal crops of Goliad County, was taken from the 1940 farm census, Statistical Abstract of the United States (14).

Table I. Crops and total yield-Goliad County 1940.

Corn		Grain Sorghums		Hay		Cotton		Peanuts	
Acres	Bushels	Acres	Bushels	Acres	Tons	Acres	Bales	Acres	Pounds
24,026	194,396	2,767	27,123	6,075	9,929	19,694	3,446	391	96,833

From the survey of 103 ranchmen it was found that they raised a total of 50,845 bushels of corn, 1,557 tons of forage sorghums, 1,069 tons of hegari, 535 tons of peanuts, 768 tons of silage, and 1,992 tons of hay.

Livestock grown. As a whole, livestock raising in Goliad County has shown remarkable growth in the last few years. In the early part of 1943 the livestock industry, as measured by the production of meat, hides, wool, dairy and poultry products, was at the highest peak for many years. The Texas Almanac and State Industrial Guide (11) lists the following livestock and livestock products for Goliad County for the year 1943.

Table 2. Livestock and livestock products- Goliad County 1943.

Animal or product	Number	Gallons	Pounds
Horses and colts (over 3 months)	2,720		
Mules and colts (over 3 months)	2,343		
All cattle and calves (over 3 months)	30,419		
Cows kept for milk	3,531		
Hogs and pigs (over 3 months)	3,246		
Sheep and lambs shorn			4,062
Sheep and lambs (over 6 months)	4,243		
Chickens	85,253		
Turkeys	11,764		
Chickens sold live or dressed	30,280		
Chickens raised	97,750		
Turkeys raised	77,110		
Milk produced		965,146	
Butter churned			72,815
Whole milk sold		175,985	
Cream sold			46,744
Butter sold			11,628
Wool shorn			23,154
Eggs (dozen)	719,848		
Honey produced			862

Beef cattle grown. Rapid progress has been made in recent years in the improvement of both beef and dairy cattle breeds. The Hereford breed predominates among the beef animals, and Goliad

County ranchmen take many prizes in livestock shows. The Shorthorn has received some attention in recent years among stock farmers but not to any extent from ranchmen. An interesting development in the county has been the introduction of the Brahma cattle of India. This breed is more resistant to tick and other infestations common to subtropical climate than are the other breeds mentioned. The Brahma has been crossed successfully with the Scotch Shorthorn on the King Ranch, and cattle with Brahma breeding are becoming prevalent over the county and throughout the Gulf Coast Area.

The Aberdeen-Angus is also popular in Goliad County. They are of a blocky type, compact and they finish smoothly. Their dressing percentage is claimed to be higher than that of the other breeds. Like the white face of the Hereford, the polled head and black color of the Angus are nearly always dominant in any first-generation cross of a purebred Aberdeen-Angus bull on cows of other breeding. In size they approach the Hereford and Shorthorn.

EARLY DEVELOPMENT OF THE BEEF CATTLE INDUSTRY IN THE UNITED STATES

The first beef cattle in the Western Hemisphere were brought over from Europe by Columbus on his second voyage in 1493, and were intended for work animals for the settlers who attempted to establish a colony on one of the islands of the West Indies. With the coming of settlers to North America from England and the various countries of Europe, came many types and breeds of

oattle. All oolonists brought along the kind of cattle to which they had been accustomed in the home country. These oattle of the several colonies differed in size, color, and length and shape of horn. They did possess one common characteristic - the ability to work. While oattle from the very first were valued for their milk and butter as well as for work, it appears that but little importanoe was attached to their meat. An ox was worked until he was worn out or until a younger, more active animal was ready to take his place. Then he was slaughtered for home consumption, or he was led to town and sold to the butcher for the urban population. Beef was considered a by-product of the work ox and it was considered a gross economic waste to slaughter them when in the prime of life. Some sections wanted to pass a law that would prohibit the slaughter of an able ox under seven years of age.

Early settlers had little inducement to keep more cattle than were needed for the necessary farm work and to supply the home with milk and butter. The towns were small and only a few cattle were needed to supply them with beef. Grass did not grow in abundance east of the Allegheny Mountains, because of so muoh shade and lack of lime in the soil. In two or three colonies, however, oonditions were more favorable for the production of oattle. New England had large open areas of grass land which was a basis for the prosperous beef cattle industry which was established during the latter part of the seventeenth oentury. The beef from these New England farms, pickled and

packed in huge barrels, constituted an important item of the foreign trade of the colonists during the pre-Revolutionary period. The first cattle ranches were established in the Carolinas and Georgia. The long grazing seasons, mild winters, and sparsely wooded uplands were especially favorable for beef production. These states became famous for their "cowpens" and "cowboys." It was said that a steer could be raised as cheaply as a hen. The fat cattle were driven to the seaboard cities, principally Baltimore and Philadelphia, where they were sold to the local butchers. Large shipments were also made to the West Indies during the latter half of the eighteenth century.

The pioneers began to settle in the fertile Ohio River Valley where they found large expanses of grass. Land could be used for farming without clearing away trees, and the crops of corn and wheat produced on this rich soil were amazing. The settlers tilled more ground than was needed locally and obtained a surplus of crops. There were no markets for the surplus crops and therefore they were fed to the farm animals during the winter months. With plenty of grass in summer and feed for winter, cattle were allowed to grow and multiply without any definite limit toward production. Some settlers soon had large herds.

Encouraged by the prospect of a constant European demand for years to come, American cattlemen launched into the cattle business on a scale hitherto unknown. With almost the whole area west of the Missouri, one great pasture free to all comers, all that was necessary to engage in the cattle business was to secure

some cattle, hold them on a section of the public domain favorably supplied with grass and water, and wait until the increase was old enough to be marketed.

Texas was the section from which breeding stock could best be obtained. This increased the demand for Texas cattle. The foundation stock used in the establishment of the range industry was in most cases the long horned Texas cow.

The need for improvement of range cattle was realized early, and steps were taken to secure bulls of superior beef type to cross on the native cows. Probably the first improved breeding to make its appearance in the West was the grade Shorthorn cows taken from Missouri, Indiana, and Illinois into California, Oregon and Colorado following the discovery of gold in the West in 1849. These cattle were largely of Shorthorn extraction and were in most cases good milkers. Purebred bulls were introduced to the range in the early fifties when Captain Richard King bought several purebred Shorthorn bulls in Kentucky and Missouri and shipped them to his 500,000 acre ranch in southeastern Texas. These animals contracted Texas fever soon after arrival and died. Undaunted by his first failure, he made several other shipments enough of which were successful to produce in time a gradual improvement in the cattle of that region. Heavy purchases were made of purebred bulls of Shorthorn and Hereford breeding during the decade following 1880. The first Aberdeen-Angus cattle to reach North America were three purebred bulls imported in 1873 by Mr. George Grant for experiment on his ranch near Victoria, Kansas. Some six years later, steers sired by these bulls

attracted a great deal of attention because of their polled heads and unusual color at Chicago and New York, in which cities they were sold.

With the introduction of purebred bulls, the long horns, so characteristic of the early animals, were considerably shortened, a tendency to fatten at a younger age was observed, and great improvement was made in the fleshing qualities of both the breeding and steer herds. The American farmers were determined to produce the best animals possible to obtain. They made large importations of the very best cattle in England and Scotland, thereby effecting immeasurable improvement in the pedigreed beef cattle of the United States.

Statistics for beef cattle in the United States, Texas and Goliad County. The following figures were taken from Agricultural Statistics (14), United States Department of Agriculture, and from the Texas Almanac and State Industrial Guide (11).

Table 3. Cattle numbers and value, United States, Texas and Goliad County.

	All cattle other than milk cows		All cattle and calves	
	Number	Value	Number	Value
United States	54,585,000	2,831,518,000	78,170,000	3,263,249,400
Texas	5,234,000	144,948,000	6,676,000	199,782,000
Goliad County	17,692	991,794	30,419	1,312,301*

*The statistics showed that the value of Texas cattle was $42.82 per head. The value of cattle for Goliad County was not listed but was found by multiplying the total number of cattle by the average value per head for Texas cattle.

From the eurvey taken of 103 ranchmen of Goliad County in 1944-45, it wae found that they had 20,691 beef cattle, of which 12,050 were grade beef cows, 263 grade beef bulls, 1,384 regietered beef cows, and 419 registered beef bulls. Two thousand eix hundred and sixty-six were other cattle, including milk cows, etc. The remainder was made up of calves, yearlings and other immature stock not of breeding age.

This represents approximately 65 per cent of the entire cattle population of Goliad County and they are in the hands of approximately 10 per cent of the farm and ranch operators. It ie obvious that the 103 surveyed are the leading cattlemen of the county.

The leading breeds of beef cattle in Goliad County are the Hereford, Brahma, Polled Hereford, Aberdeen-Angus, and Shorthorn.

THE DEVELOPMENT OF TRAILING IN THE UNITED STATES

Early eastern trails. In 1805, George Renick of Ohio, heard that cattle were worth more in some of the eastern cities than they were in the west. Accordingly he selected 50 head of his best cattle and drove them 350 miles over the Allegheny Mountains to Baltimore, where he disposed of them at a handsome profit. During the following years, thousande of cattle, fattened on grass and shocked corn, were driven over the mountains to the eastern eeaport markets. Great skill had to be exercised on the part of the drivers to insure the arrival of the cattle at their

destination in good oondition. From three to four weeks would be spent in making the 350 to 500 mile journey from Ohio and twice this time to make trips from central Illinois and Kentuoky. The cattle were allowed to graze in the proper direction a couple of hours during the early morning. They were then driven slowly until about noon, when they were halted for two or three hours for rest and quiet. After this they were allowed several hours to fill up on grass before being bedded down for the night. The distance traveled in a day was from 15 to 20 miles. Driven in this leisurely way, cattle suffered little shrinkage and often arrived at the market in better condition than they were when they began the journey. Upon arrival at the market the cattle would be held on the public or semi-public land outside of the oity until disposed of to the city butchers. The growers received from $20.00 to $30.00 per head for them which was a very high price at that time beoause of the low cost of production.

The first large herd of cattle from Illinois was driven by Mr. J. T. Alexander about 1840. This herd consisted of 250 head, and practically the entire summer was spent in covering the 1200 miles to Boston, where they were sold for $31.00 per head. The praotice of driving oattle to market increased rapidly, until by 1850 it was reported that fully 2,000 head were driven weekly from Illinois alone during the marketing season.

The beginning of cattle trailing in Texas and Goliad County. At the close of the Civil War there was a strong demand for all grades of cattle. A number of alert stockmen ventured upon a new industry, that of driving Texas cattle over the northern ranges to the market. The first attempts were made in 1866 when about 250,000 Texas steers were trailed north with marked success. The entire summer was spent driving the cattle to their destination, and since they were herded over the choicest range, they were generally ready for the block in autumn. This system of marketing, however, was opposed by stockmen outside of the Texas fever zone, as it was feared that the tick infested cattle might seriously menance the entire livestock industry. In spite of this opposition the Texas cattle drivers sent from 300,000 to 600,000 head of cattle north annually and thus carried on a relatively successful business for many years. The southern cattle sent to the cool northern ranges made bigger seasonal gains and attained better size and more desirable form than could be expected if they were kept in the south, and the cost of grazing in the north was no greater. Thus the northern cattle business for some time consisted largely of buying young southern steers and driving them north where they were prepared for market.

Some of the men who started the trailing in Goliad County and their experiences. Some of the pioneers in the trailing of cattle from Goliad County were Cyrus B. Lucas, Martin and Joe O'Connor, W. A. (Buck) Pettus, D. R. Fant, James T. Johnson,

J. E. Pettus, T. A. Colman, Thomas M. Hodges, and Ed. C. Lasate according to Hunter and Saunders (8).

We must not forget those pioneer settlers and ranchmen who were not only empire builders but who also formed the foundation upon which has been erected the American livestock industry as it exists west of the Mississippi. We should be thankful to those pioneer ranchmen who grew into manhood in southwest Texas in the midst of that favored section when it was one vast breeding ground for cattle and horses and from which was afterward to be driven countless thousands of head of cattle north through the Indian Territory from 1866 to 1886, into the wild and unsettled area from Kansas to the British Dominions. In those early days fencing wire had not been invented and in consequence the entire country, except where dotted with ranches, was uncontrolled - a common pasture in which thousands of horses and cattle roamed at will.

I shall endeavor to describe briefly some of the conditions which surrounded the old-time Texas ranchman, his peculiarities and his customs. The country at large was sparsely settled. In a majority of the counties there was barely sufficient population for county organization. The largest and in most instances, the only town in the county was the county seat village with its rock or lumber court house, which was rarely over two stories, and near by, as an adjunct, a one-cell rock or lumber jail. Around the public square were built the few unpretentious storehouses that flaunted the proverbial signs, "Dry Goods and Groceries," or "Dry Goods, Boots and Shoes," as

the case might be. A saloon or perhaps several, could always be found on or near the public square. Clustered about the commercial center, and growing farther apart as the distance increased, were private residences which went to make up the hamlet. After the court house and jail, the hotel, generally a two-story building, was considered the most important, as it was frequently the most imposing structure in the village. There was always a well-constructed school house (there were no free schools in those days) and a comfortable church house at a convenient distance where those pioneer men, women and their families, irrespective of denomination, met together with good honest hearts and worshipped God in spirit and in truth.

Herds of cattle and horses grazed in every direction, and each ranchman, by his mark and brand, was able to identify his stock and secure its increase. The old-time ranchmen and their cowboys generally would fail to find some of their year's increase when they worked their herds in this vast territory. As a result there was each year a small percentage of unmarked and unbranded calves. These animals, after being weaned from their mothers, would henceforth be abroad on the prairies, the property of whoever found and branded them, and in cowboy parlance were called "mavericks." Those old-timers were content to round up their cattle twice a year and brand their calves. Their provisions, flour, coffee, dried beef and bedding, were loaded on a pack horse which was driven with the saddle ponies. In those days of open range and free grass, it was a custom practiced by the people to round up such cows as were easily penned, regardless

of ownership in most cases, and milk them during spring, summer and fall, branding the calves in the cow's brand.

There was an unwritten law, recognized by the good women of the towns as well as of the country, that whenever a party of cow hunters rode up and asked to have bread baked, it mattered not the time of day, the request was to be cheerfully complied with. This custom grew not from fear of being insulted, for the cowboys were the champion defenders of womanhood and would never have uttered a disrespectful word in a lady's presence. The sack was lifted from the pack horse and brought in, and in due time the bread wallets were once more filled with freshly cooked biscuits and the cowboys rode away with grateful appreciation. The generous hearted cowboys would always leave with her half a sack of flour or a money donation.

There were few banks in those days and cattlemen kept money in different places around their homes and carried money with them on their pack horses for when they bought stock they paid cash for it in silver or gold. One of the old-timers of Goliad County, finding himself with considerable money on hand and having no immediate use for it, decided to bury it. Choosing an especially dark night he went down to his cow pen, dug up one of his fence posts, put the money in the hole and put the post back in the hole, again fastening the fence to it. Several years later he found himself in position to use this secreted fund but he had forgotten the post under which he had buried it and all signs of his former visit had been obliterated. He was compelled to dig up one-half of his cow pen before he secured the coveted deposit.

The "round up" with its chuck wagon, its high-priced chef and bit of fare a la carte, soon took the place of the "pack horse." The "outfit" consisted of a trail boss, as many cowboys were needed, and the chuck wagon. They would bid their loved ones goodbye and with their large herds of cattle from the hundreds to several thousands, would start up the trails, some never to return. The trail that led from Goliad County to Kansas and beyond was called the Chisholm Trail. The trail drivers took plenty of food, clothes, guns, and ammunition, for the robbers and Indians often proved to be dangerous. They expected cattle and horse stealing and often would have to give the Indians several beeves or horses to pacify them.

PRESENT STATUS OF THE CATTLE INDUSTRY, MANAGEMENT METHODS AND RECOMMENDED CHANGES FOR GOLIAD COUNTY

Goliad County's rural population is made up mostly of three groups of farmers. One group grows a variety of crops, among which are both grains and forage for livestock. Another specializes in ranching, growing only roughage for winter feeding, and still another group is engaged mostly in the production of purebred beef cattle, growing only enough feed to support this industry. The leading breed of purebred cattle in Goliad County is the Hereford. Occasional herds of Angus and Brahmas are found, however.

In the aforementioned survey of Goliad County, ranchmen were selected from a cross section of the county in such a way as to get a true representation of the beef production program of the

county. Each of them filled out a questionnaire answering questions about their beef production methods. Table 4 lists some of the summary information obtained from the questionnaires. From the survey it was found that 68 of the ranchmen owned their ranches, 25 of them rented their ranches, and 10 of them owned part of the ranch and leased a part. The 103 ranchmen surveyed had a total of 86,020 acres of land, 16,532 acres of which were in cultivation. They owned 20,691 beef cattle, of which 1,384 were registered beef cows and 419 were registered beef bulls, 12,050 were grade beef cows, 263 were grade beef bulls, and 2,266 were other cattle including milk cows, etc. The remainder was made up of calves, yearlings and other immature stock, not of breeding age.

In addition to grass there is an abundance of cactus or prickly pear growing in Goliad County. Ranchmen are taking advantage of it and are buying pear burners to burn off the thorns in order that the cattle may eat the fleshy leaves. The survey showed that 71 of the 103 ranchmen burned pear for their cattle. From the survey it was also found this group produced 50,845 bushels of corn, 1,557 tons of forage sorghum, 1,992 tons of grass hay, 1,069 tons of hegari and 535 tons of peanuts and 880 tons of silage were put up.

Five thousand, two hundred and twenty-six bushels of corn, 386 tons of hay, 62 tons of hegari and 318 tons of protein supplement were bought by the 103 ranchmen.

The principal winter feed is hay, corn, silage, pear, and protein supplement. Cottonseed cake and meal, peanut meal and

Table 4. Ranch statistics for Goliad County. (Averages from survey of 103 ranchmen).

1. Acres in farm or ranch	995.7
Acres in cultivation	160.5
Acres in pasture	835.2
2. Number of cattle per farm or ranch	201.0
Number of cows per farm or ranch	103.3
Number of bulls per farm or ranch	3.7
3. Number of acres in pasture per animal	4.15*
4. Number of cows per bull	28.0
5. Age calves are marketed (months)	10.4
6. Weight calves are marketed (pounds)	537.9
7. Age cows are sold from herd (years)	9.5
8. Percent of calf crop sold	68.1
9. Percent of heifer calves kept for breeding	83.0
10. Percent of calves sold as stockers and feeders	26.7
11. Percent of calves sold as baby beeves	2.0

*This does not indicate the rate of stocking since much of the young stock is pastured for only a part of the season. Also some temporary pasture is used in addition to this.

a little alfalfa and soybean oil meal are the principal sources of protein fed. For the summer most of the cattle are allowed to graze in the pasture, although a few farmers plant soiling crops for summer feeds for purebred cattle.

The marketing of cattle by this representative group of stockmen is done by several methods. Fifty-one stockmen sell through commission companies, 26 at auction sales, 20 to local buyers and six by a combination of all these methods.

Eighty-seven ranchmen allowed their bulls to run with the cows during the entire year, 16 did not follow this practice. The age for breeding heifers was found to be two years. All the ranchmen use the hot iron for branding with the exception of three who use a liquid brand. There were 69 ranchmen who used the knife for castrating and 34 who used the Burdizzo type emasculator. Only one farmer used the chemical method for dehorning, while 61 used patented horners, nine used saws and 33 did not dehorn at all.

The average age at which most calves were sold was a little over 10 months, and the average weight was 537.9 pounds. The percentage calf crop sold was 68.1 percent. Eighty-three percent of the heifer calves were kept for breeding. This is a larger percentage than is commonly held back for this purpose and indicates a rapid increase in the cattle population which actually did mark the period of this study. The percentage of calves sold as stockers was 26.7 and the percentage sold as baby beeves was two percent. The average age at which the cows were culled was nine and one-half years.

From the survey it appears that some of the weak points of the management practices followed were the following: Too little use of improved summer pastures, not enough feed raised for the cattle, not enough protein fed, bulls kept with cows too long, too few calves dehorned, calves kept too long before selling, and not enough attention to disease and pest control. However, the age for breeding cattle, the age for culling and the method of castrating and branding perhaps cannot be improved upon.

Management of the range cattle. I recommend that the cattle of Goliad County be left largely to their own resources while on the range, but that their welfare be generally looked after by experienced riders. The chief business of the riders is to see that the cattle are kept on good feed, that they are provided with sufficient salt of the right kind, and to give prompt attention to cases of insect damage. Raising cattle on permanent pastures simplifies the matter of fencing, provided skilled attention is given to supplying of water, shade and feed bunks. The pastures of Goliad County have never been a complete failure, and while they may be cut short on account of adverse climatic conditions, they may always be relied upon to furnish some grazing.

Pastures should be gone over once or twice a year to remove weeds before they ripen their seeds. This can be done on the smaller pastures but it will be impracticable on most of the large ranches in Goliad County. It is my belief that a given acreage of pasture will furnish more feed if fenced into medium-

sized divisions than it will if left in one large pasture since fencing permits rotational grazing. One of the principal points to be observed in the management of pastures is not to overstock them. Cattle require luxuriant, not closely cropped grass, and if they are furnished with a continuous and abundant supply, will make satisfactory gains at low cost.

Whether cattle are to be fattened with grain or grass, their management will depend upon their age, condition, quality and the time of marketing them. If they are young cattle, either calves or yearlings, and it is intended to market them during the pasturing season, they will need to be fed grain continuously from the time they are turned to grass until marketed. The younger the cattle the more important it is to feed some concentrate rich in protein as a supplement to corn. Both peanut meal and cottonseed meal are extensively used for this purpose. If it is desirable to finish older cattle in the shortest possible time, those feeds may be fed to advantage. With older cattle well wintered the method of management will depend largely on whether the cattle feeder plans to market during early, middle or late summer. If early, that is by June 15, I am strongly of the opinion that the cattle should never be turned on grass, but finished in the dry lot. Such cattle are usually so far advanced in flesh at the opening of the pasture season that if they are turned to grass the shrinkage is too great to make the method practicable.

If there is a good quantity of old grass left from the preceding season it is good practice to turn cattle to grass early,

whereas, if all the grass is of a fresh growth, severe scouring will likely follow such a practice. Where pastures are grazed closely the preceding fall the grass should be allowed to get a good stand and to make considerable growth before the cattle are turned on them.

Fall and winter feeding is not a serious problem in Goliad County unless the pastures are over-stocked or the ranchmen have some very old cattle on hand, because of the warm climate, the abundance of native grass, mesquite beans and prickly pear.

The prickly pear grows wild and is found on most of the farms. Pear burners are used to remove the thorns. The prickly pear has a wide, thick, thorny leaf, is very appetizing to livestock, is succulent and grows rapidly. It is also hard to kill. It may be burned and the cattle allowed to eat it down during the winter, then in the spring when the thorns are not burned the cattle will not eat it until it is ready to graze the following winter.

Plenty of roughage, pear, and a small quantity of protein supplement furnish a cheap but satisfactory winter ration. The wintering of cattle for subsequent fattening on grass and prickly pear is the most economical management method by which the grass and pear can be converted into cash. Summer fattening is usually more profitable than winter fattening and should be much more generally practiced. Those in possession of good pasturage who wish to make the best use of it should not feed liberally on corn during the winter months. In this connection it may be stated that, as a general proposition, the more cattle gain on concen-

trates in winter the less they will gain on grass in summer.

Heifers are usually bred the first time at two years of age. This varies according to growth and development of the heifer. It is a good policy to start breeding heifers as early in life as their development will permit, since the habit of conception will be more persistent in succeeding years.

Older cows which are bred yearly to produce calves in March and April will be mated during the months of May, June and July. With cows nursing calves at this time, it is an ideal season for mating because they are usually well flushed as a result of having had access to lush, green spring pasture. If the practice is one involving the fall calving of cows, mating takes place during the early part of the winter. In this case the daily feed allowance of the cows should be increased prior to the mating time, so that if possible they will be gaining slightly in weight.

There will be little difficulty in settling cows provided they are healthy and mated to vigorous, fertile bulls. In any large number of females there is always a small percentage of barren individuals. The causes of sterility are numerous and variable. If a high percentage of the females fail to conceive, the situation is one for concern and steps should be taken immediately to discover the cause or causes and correct these.

Selecting the breeding herd. The sire represents at least 50 percent of the herd in influence and importance, and therefore it does not pay to buy a cheap bull at a sacrifice of good breeding and individuality.

The individuality of the sire depends upon type, size, feeding capacity, ruggedness, masculinity, quality, meat development and breed character. The particular breed of sire is not as important as his individuality, his genetic background and the performance of his ancestors as breeding animals. Briefly stated, the sire must have sufficient size to insure the transmission of growing ability to his progeny.

Feeding capacity and ruggedness are indicated by the following characteristics: Deep middle, heavy bone, short, wide head, well distended nostrils, large muzzle and wide open and clear eyes. Additional features signifying constitution and feeding ability are a deep wide chest, deep well-sprung ribs, straight legs, a pliable hide, and activity on foot.

Masculinity in the sire is an indication of vigor and prepotency. Massive head features combined with a heavily crested neck are secondary sex characteristics worthy of note. These characteristics appearing early in the life of a calf place a stamp of merit on the youngster as a prospective herd sire.

Practically the same points should be present in cows as those which were emphasized in sires, except for the matter of sex character. Instead of masculinity, refinement and roominess are features most desirable in cows from the standpoint of sex differences.

The cow's udder should be sound and adequate to nourish the calf through the suckling period. Indications of copious milk production frequently are frowned upon by exclusive producers

of beef because of the danger of udder difficulties with such cows. However, progressive range producers are giving more attention to selection of moderately heavy milk-producing cows.

The selection of breed character in cows is not emphasized to the extent that it is with bulls. The individuality of cows constituting the foundation herd is the important thing. Eventually, through the use of purebred sires of the same breed, sufficient breed character will be imparted to the progeny to give them uniformity and all the other desirable features which breed character signifies.

As far as possible, females which conform to the standard of excellence of the breed should be selected. If this is accomplished it will insure a uniformity in type that is highly desirable. If in addition to this it is possible to select cows and heifers that are similarly bred, they will be more likely to produce uniformity in their offspring and a uniform lot of stockers, feeders, or fat cattle sell for more than an uneven lot.

There are a few general considerations in selecting beef cows which should be mentioned, such as form, quality and constitution. The main characteristics to be sought in form are shortness of leg, breadth, good top and underlines, full flanks, and straight legs. The bone, head and hair should indicate quality as opposed to coarseness on the one hand or delicacy on the other. A good constitution is evidenced by a broad, deep chest, a good heart girth, and a lively condition of the hair coat.

Grading up the breeding herd. Obviously it would be too expensive for all ranchmen who wish better bred stock to purchase purebred cattle of both sexes. The alternative is to grade up their present stock by the use of purebred sires. Since offspring carry one-half of the blood of their sire, they will for all practical purposes, be purebred although not eligible for registration, in four or five generations, providing purebred sires are used continuously.

Although the work of improving the beef cattle in Goliad County has been making steady progress in the past 12 years, much remains to be done. Several of the ranchmen still have cattle of low grade. It must be demonstrated to these ranchmen that they cannot afford to keep scrub stock. They should realize that the better bred animal fattens more quickly, is more symmetrical when finished, is ready for market earlier than the scrub, and commands a higher price.

The survey showed that the bulls and cows were kept together on most of the ranches, and little thought was given to mating the best bulls with the best cows. The use of scrub bulls was altogether too general and inbreeding often was so intense that the native cattle produced on the smaller farms were, with few exceptions, inferior in quality.

It should be remembered that with careful selection of sires the offspring in the first generation cross will carry 50 percent improved breeding. In the next generation they carry 75 percent, and this percentage increases progressively until after a few generations of crosses the animals are more than 99

percent pure breeding. Good ancestry will not make a poor individual a good parent. The dsirable animal is one which has both good ancestry and good individuality. Stockmen should know that it is much less costly to build up a herd by buying a well-bred sire, even when the expense for a single animal does seem disproportionate, than it is to raise the herd's level by buying better females.

I recommend that breeders buy the best bulls they can afford, and that at each succeeding purchase an effort be made to get a better one. It is important that the grower build on one line of breeding. When the blood lines are not changed with each purchase the improvement is quicker and more certain. Prepotent sires of good blood are a requisite in improving a herd, but good females are also important, hence culling must be practiced continuously and with a rigorous hand. The breeder who is successful raises his standards with every generation and weeds out the weak individuals or those that are not of the desired type. This results in the best females being kept in the breeding herd. When the best are mated with superior males the resulting offspring is bound to be above the average of the herd.

Production and care of calves. The best herd of calves is one in which uniformity of age, size and breeding predominates. Bulls should run with the cows only during a definite breeding season. My survey of Goliad County showed that the majority of the ranchmen allowed their bulls to be with the cows all the year. This causes calves to vary greatly in age and consequently they do not have an even chance at the forage, and the supply of

milk which is also influenced by the character of the feed. The cow should be bred to drop her calf after the severe winter weather is over and before she has a large flow of milk from the grass for the calf cannot and does not need to take much milk at first. When the grass comes she increaaes in milk and the calf is better able to take the increased amount. The calf which gets this grass all the first summer and until frost comes grows as well as any other calf. After this he should be fed so as to keep growing and not be allowed to lose flesh. If range calves come in the fall the cows would not give enough milk and the grass which is one of the largest factors helping to sustain growth, would not be available or would be limited in amount for several months. Well-bred general farm calves that come early enough to go on grass in the spring, be weaned in the fall, fed liberally through the winter, and marketed the next spring are an excellent source of income for Goliad County farmers.

In beef production, running the calf with the cow constantly is the most primitive and often the best way. This practice is followed most on farms and ranches where the acreage is large, land cheap, and labor scarce. A well-bred calf running with its mother on grass will weigh around 400 pounds at six months of age. Under present conditions the range is the cheapest place to raise calves and those of good breeding raised there are equal in every respect at least until weaning time, to those raised in intense farming districts, when handled the same way.

By having those calves come in January which are intended as show or breeding stock, they are of sufficient size by September or October to be in good show and sale condition. They generally meet with a readier sale than later born calves. If intended for the show ring, the earlier calves have an advantage since young calves do not show as well as older ones.

The period of gestation for cattle is approximately nine months. Accordingly, if the calves are to come in January or early spring the bulls should be removed not later than July, for then the latest calf may come early in May. Heifers should not be permitted to calve until they are from 27 to 30 months of age. They will usually mate at the age of from six to 12 months and if allowed to run with the bull they will calve so early that their growth will be stunted. It is important, therefore, that the heifers be kept separated from the breeding herd from the time they are weaned until they are of breeding age.

A summary of the chief factors concerned in calf production follows: (1) supplemental feeding of concentrates or suitable hay in the winter where the range forage is short or of poor quality; (2) abundant range feed of good quality, water, and ample salt at all seasons; (3) efficient bull service; (4) a definite breeding season; (5) segregation of the breeding animals from the heifers and steers; and (6) the elimination of inferior, weak, or barren cows and of shy breeders.

The weaning of calves on farms usually is done when the calves reach six months of age. This gives the nursing mother

ample time to recover from the strain of a lactation period and also permits the diversion of nutrients toward the development of a new fetus. If spring calves are to be finished as baby beef and marketed at from 10 to 12 months of age, the calves may be removed from the cows and placed immediately in the winter feed lot.

If the operator thinks it advisable to graze the calves and finish them as older cattle, weaning is best accomplished by removing the cows and isolating them at some point as remote as possible from the calves.

Early spring calves should never be permitted to follow their mothers to the winter range. To avoid a set-back the calves should be placed in a pasture where the forage is of the best and held there for several weeks during the weaning period. The best practice is to feed the calves throughout the winter all the hay they will take. Where plenty of hay is not available and where the native forage begins growth early, as it does in Goliad County, the calves seldom need hay for more than two months but merely until they can be turned out on the green feed. Calves dropped later in the summer or in the fall need their mothers' milk throughout the winter; hence they should not be weaned until the following spring, when they should be placed on good green forage.

Calves should be branded while they are still running with their mothers. The object of branding is to establish ownership as well as to identify to buyers the quality stock which the owner raises, the class of bulls used, and the integrity of the

owner. Branding is a simple operation, the only difficult feature being to hold the animal securely. On the open range calves are usually roped by the neck or hind leg and dragged to the place of branding. The roping method of branding, however, is laborous, slow, requires some skill at rope manipulation and is subject to some accident on the part of the men, calves, and horses. A large crew of men is required if there are many animals to brand in a short time.

The chute and swivel-block method that was developed in southern California call for a chute and a three-inch swivel block fastened in the top of a concrete block or post set in the ground so that the top is flush with the surface of the ground. The lariat, which is passed through the block, is provided with a knot so placed as to prevent choking the animal. The end of the rope used on the hind legs of the animal terminates in a hook, hence a loop can be made around the hind legs of the animal when snubbed to the post. The advantage of this method is that the labor is greatly reduced and that the operation is easier for the men, cattle and the horses.

It is important that the branding irons be of simple design and of good size. When the iron is applied, it should be red hot, for otherwise the brand will be blurred. Cattle with long, thick hair require a much hotter iron than do those with short, thin hair. It is diffioult to get the iron too hot, but if it is not hot enough it must be held on the skin so long that the tissues far beneath the surface will be deadened, resulting in subsequent irritation and slow healing with the constant

danger of maggot infestation. It is recommended that heifer calves be branded the last number of the year in addition to the regular design in order to have a definite record of the age of each breeding cow.

Ear markings are objectionable because they detract greatly from the appearance of the animals. Horn branding is an excellent means of numbering aged, horned cattle but is useless with calves, yearlings, polled breeds and de-horned cattle. The best mark of identity that has yet been devised for the cattle of a breeding herd is tattooing the ear with indelible ink. The advantage of this method is that the mark is permanent and in no way disfigures the animal. Its only serious objection is that the animal must be caught and the ear closely examined before the mark can be seen. Tattoo ear marking outfits, including an initial letter and a set of 10 figures, can be purchased at any stockman's supply house for about $6.00. Some purebred record associations require that calves be properly tattooed before they are accepted for registration.

Castration of bull calves is performed purely for economic reasons. It results in a more symmetrical development of body, a better balance between front and hind quarters, and improves the texture, tenderness and flavor of the beef. Moreover, steers are much quieter in the feed lot than bulls and fatten in a shorter period of time. This fact alone would justify castration.

It is my opinion that a calf is never too young to be castrated providing both testicles have descended into the scrotum. Calves castrated when quite young never develop a "staggy"

appearance. Snapp (16) states that castration is best done when calves are from four to 10 weeks old. The castration of older animals is always attended with more risk but seldom do any serious complications develop. Fully matured bulls should seldom be castrated but should be fattened and sold entire. Castration should be performed when weather conditions are most favorable. Early spring, late fall and the winter months are considered the best time for castration in Goliad County. Summer castration is objectionable on account of flies that cause screw worms.

Another method of castration is with the Burdizzo type of emasculator, a type of pincers, which crushes the cord through the unbroken skin. These instruments are used successfully on both young and old animals and have the advantage of permitting a bloodless operation leaving no open wound. These methods described apply only to the animal in a normal condition. Before the operation is made everything should be examined to see that it is as it should be, otherwise a special operative procedure will be necessary.

Dehorning cattle is almost universally practiced by Goliad County stockmen who raise cattle of good quality. Cattle without horns have an equal chance at the feed in close quarters; they are easier to handle; and are more uniform in appearance. Moreover, without horns cattle cannot gore one another at the feed trough, water or salt trough, or in transit to market. Among horned cattle there is always a tendency of some to be "bossy" and keep the timid ones away from their share of shelter

and feed. Dehorning tends to curb the aggressiveness of such animals, thus decreasing feed lot losses from this source.

The shrinkage in weight during shipment is less with hornless than with horned cattle since they are quieter. Hornless cattle are especially preferred for eastern shipment and for export, but quite often even local butchers also discriminate against horned cattle.

From the survey of the 103 ranchmen of Goliad County, it was found that most of them used either the clippers or saw for dehorning. There is very little choice between the use of the saw and clippers in regard to the quality of work done. The younger the animal is when dehorned the better since the horns of the young animals are relatively soft and can be removed with far less shock than is suffered by older animals. The use of the saw requires a longer time and causes greater pain. By the use of clippers the operation is done much more quickly and is all over with before the animal has a chance to struggle. When the clippers are used the blood vessels supplying the horn are cut off smoother than with the saw, consequently bleeding does not stop as quickly. Where either saw or clippers are used it is necessary to get one-eighth to one-fourth of an inch below the point where the horn and skin grow together to prevent further growth. Unless this precaution is taken, the horn is likely to continue to grow, giving an unsightly appearance to the head. It is more dangerous to cut the horn one or two inches distant from the head than at the skull, because the blood vessels which circulate through the horn are separated at the base in very

small capillariee, while a little farther out these small veesels unite into larger veins which would bleed more copiously than the capillaries.

As a rule, no special precautions are neceseary to prevent excessive bleeding. While the flow of blood is considerable immediately after the horn is removed, it ordinarily diminishes rapidly owing to the formation of a clot. If a heavy flow of blood persists to the point where the animal becomes weak and faint, the main artery severed should be ligated with an ordinary piece of cotton or silk thread. The thread is drawn under the artery by means of a sewing needle. Often a hot iron or hot fire shovel is used to sear the horn etub and thus stop heavy loss of blood.

The operation should not be performed during fly time or very cold weather, the best time being in the fall after the flies have gone and before cold weather eets in. When the horn is cut off the frontal sinus is opened, and during cold weather the air drawn in at each inspiration is likely to cause catarrh and give rise to serious trouble. If done in fly time the cavity frequently becomes fly-blown and filled with maggots which prevents its healing and causes great agony to the animal. The operation should be performed on a pleasant day when the animals can be turned out after the work of dehorning is completed. It is well to have on hand some bandages, pine tar, hot irons, and eome absorbents to check the flow of blood.

Another method of dehorning by the use of caustic soda or potash, is recommended by Sampson (15) and Kyle (9). The caustic

is applied to calves up to about two weeks of age. First the hair around the knobs where the horns are forming should be clipped. With a moistened stick caustic, obtainable at any drug store, each embryo horn should then be rubbed alternately three or four times, allowing the caustic to dry each time before applying more. The area burned or cauterized should be about the size of a dime. After being treated, the calves should be kept out of the rain and should not be allowed to lick each other or to rub their heads against anything for an hour or more, otherwise, the caustic solution may run down over the calf's head and cause blindness or severe soreness of the skin.

Salt and salting. Salt is essential to the growth of all kinds of livestock. The amount of salt to feed depends upon the kind of feed. Cattle on green pasture will need more salt than cattle on dry lot feeding. On ranges cattle will use more salt in the spring than at any other season. Records kept by Hansel (6) at the Kansas Agricultural Experiment Station showed a monthly consumption of 2.83 pounds of salt per head during the early part of the grazing season, and only 1.42 pounds during the late summer and fall. On the other hand, Iowa steers that were on full feed in the dry lot during the winter and early spring, consumed but 0.64 pound of salt per head per month as a five-year average, according to Clatfelter (5).

The amount of salt put out will depend on the kind of salt, the weather conditions and the kind of receptacles used. The principal kind of salt used for livestock is rock salt. It is

not the most suitable form because it takes one animal too long to get enough to satisfy the appetite. Crystal and compressed salt are more satisfactory as far as the animal is concerned, although where the rainfall is heavy more will be wasted than when rock salt is used. In using crystal salt the best method is to put out about twice as much salt as is needed so as to allow for some waste and yet leave enough for the livestock. Salt should be put out in troughs, wooden boxes or specially constructed deep salt receptacles.

The proper distance between the salt and water depends upon the topography of the range. Salt should not be placed where the grass is short or where there are poisonous weeds but should be placed in areas where the grass is good. Salt should be moved as soon as the grass has been eaten down in the vicinity. By skillful moving of salting places and having several salt areas on the ranch, pastures may be grazed more evenly and the cattle distributed better over the range. The best gains are made by cattle where they are well distributed over the range. Where salt is placed from one-half to three-quarters of a mile from the water the grass is eaten off more uniformly because the animals graze in a fan shape distance from the salt to the water. As a general rule salt should not be placed at the watering place - one of the commonest mistakes made by range cattle men. The salt grounds should be marked and numbered in order that the proper rotation can be used in salting. The locations should not be more than a mile apart but should be situated so that the forage on the side hills and

on other accessible range will be utilized uniformly. Just enough salt should be placed on each site to hold the animals sufficiently long to consume the season's forage.

Where large numbers of pregnant cows are in the pasture, phosphorus should be mixed with the salt at the rate of one pound of phosphorus to 10 pounds of salt, as insurance against phosphorus deficiency. The owner should see to it that the salting and all other operations necessary in successful range husbandry are attended to properly.

Watering and fencing. It would be too expensive to relocate wells or tanks at the best locations on a farm or ranch where watering places are already established. Whenever it becomes necessary to drill a well or construct a tank, it should be placed in the best location with respect to the others that are already present. Frequently, piping water from one well to a tank at another location is cheaper than drilling another well. The distance of the wells apart will depend upon the topography and the size of the pasture.

Division fences are used to separate farms, different pastures, roads and fields. Where pastures are separated it makes it possible for seasonal, rotational grazing, for segregation of the breeding stock from the steers and young heifers, for holding stock during round-ups, and to control the number of animals on the grazing unit.

The range rider has a great responsibility and his service is invaluable on a ranch. He should be willing, trustworthy and efficient. His main duties are to see that salt is kept out,

the containers repaired, that the fences are in good repair and that any sick, weak, lame or bogged-down animals are cared for. He should burn dead carcasses and attend to any other minor details as they present themselves.

General winter husbandry. From the survey of the Goliad County ranchmen, it was found that the general method of handling livestock in the winter was to let them run at large in the pasture and field and feed just enough to keep them from losing weight. Management is almost as important as the feed. The feed lot should not be allowed to become boggy with mud. Older cattle and the cows with calves should be separated and fed more liberally.

Corn is a good feed either for grain or silage. Fed in either form with any kind of dry hay and with cottonseed meal, it forms a well balanced winter ration. Neither soybeans nor alfalfa is grown extensively in Goliad County and the best protein supplements are peanut meal and cottonseed meal.

It is good management to graze lightly during the summer the pastures intended for winter grazing. This will insure a thick, heavy cover of long grass capable of furnishing feed for a large number of cattle at the beginning of the winter. Nevertheless, a majority of the cattle may stay in good condition almost the year around on grass which they harvest themselves. It is best to limit the breeding herd to a number which the range will carry in poor years, which is approximately 50 percent of the grazing capacity in years of normal rainfall. The surplus forage in good years may be utilized to advantage

by holding over or buying young animals which may be disposed of in times of drought. In this way all of the range is made available for the breeding herd during the critical drought period.

Cattle should be turned into fields as soon as the crops are harvested in the fall. During the winter they should not be fed all of the previously mentioned feeds that they will eat but should be run on pasture and fed a little roughage and protein supplement.

Table 5 lists a number of recommendations made by the ranchmen themselves, of practices which in their opinion would contribute most to the improvement of the beef cattle industry of Goliad County. These are noteworthy and indicate definitely that the producers are giving much thought to their problems.

In addition to what the ranchmen are doing I recommend that since the bulk of the winter ration should consist mostly of the common farm roughages, that more of them be raised. Where it is convenient oats should be planted for winter pasture. The winters of Goliad County are not long nor severe and for this reason the range affords some grazing during the entire winter season if the pastures are not overstocked. Sufficient forage sorghums and corn should be grown for silage. The trench silo is an excellent method of storing silage. In those sections where pear is grown it is a good substitute for silage and should form a part of the ration for the breeding herd. Owing to its succulent nature, it tends to stimulate a good flow of milk and to keep the digestive system well regulated,

Table 5. Recommendations made by 103 ranchmen for the improvement of beef production in Goliad County.

Practice suggested	Number
1. More rigid and systematic culling program	42
2. Use of better breeding stock	39
3. Better feeding practices	33
4. Keep fewer cattle and give better care	18
5. Lighter stocking of pastures and more attention to pasture and range improvement	18
6. Better system of breeding	1
Total	151*

*A number of ranchmen listed more than one practice which evidently they considered of equal importance.

as well as being a good appetizer. Pear or silage from sorghum fed with dry roughage and cottonseed meal makes a satisfactory winter ration for cattle. I suggest that the ranchmen put up all the dry roughage that is available and try always to keep a surplus on hand in order to have emergency feed in case of a severe winter or long drought.

Marketing. From the survey it was found that the ranchmen of Goliad County culled their cows at from seven to 14 years of age with an average of nine and one-half years.

The calves were marketed at from six months to three years of age with an average of 10.4 months. These same calves weighed from 175 pounds to 1,000 pounds with an average weight of 537.9 pounds. (See Table 4). There were a few, however, that weighed from 1,050 to 1,400 pounds. Whether this age and weight for marketing calves constitutes the best management practice is open to question. Goliad County is not in the corn belt and does not have a surplus of grain such as is found in the corn belt. Instead it has an abundance of range, with native grasses, mesquite beans, and pear. A limited amount of grain and other feedstuffs are raised. If cattle were finished for market in Goliad County they would have to be shipped to the large distant markets which would create an expense that would not be as economical as selling them principally as stockers and feeders. I recommend that more investment be put in the cow herd due to the fact that a certain percentage of the choicest female calves must be retained as replacements. As long as good quality beef-bred calves weighing 400 pounds or

more at six months of age or at weaning time can be sold at prices near the present level of from $50.00 to $60.00 per head, this is a more profitable program than it would be to keep them until they are several months older, even though they were heavier.

Three, four and five-year-old steers, which were common on the market a few years ago, have been replaced almost entirely by calves, yearlings and a few two-year-olds. A number of causes have contributed to this changed condition. Americans are consuming less meat per capita than they formerly did. The decreased size of the American family has created a demand for smaller cuts. Hotels and other public eating places are also buying smaller cuts because they now receive about the same price for a medium-sized steak as for a large one (quality again having won over quantity). The chief reason for this shift, however, is the fact that the returns from the sale of young animals are proportionately greater than when they are held over to maturity.

The demand for young feeder cattle in the corn belt has increased so rapidly that Goliad County cattle growers should practically abandon their steer herds and replace them with breeding cows. The advantage of the more rapid turnover is favorable to the producer, the feeders, and the ultimate consumer.

RAISING PUREBRED CATTLE

In the raising of purebred cattle there is more money invested than there is with grade cattle and they are expected

to sell for a higher price. Practically the same management methods as for farm herds should be followed. In establishing a purebred herd of cattle in Goliad County, first a good blood line should be selected from a reliable and experienced breeder. In the blood line the qualities desired in the breeding herd should be selected, then maintained by rigorous culling.

Generally, all purebred cattle of high grade not intended for slaughter should be registered, especially in periods of high prices. Registration adds to the sale value and makes it possible for the immediate offspring to be registered. Breeders are responsible for accuracy of records. The association may at any time require the breeder to support the application for registry by private records. If records are not in writing, doubt may be cast upon their accuracy and registration refused. Accurate written records protect the breeder's reputation and satisfy the association.

The herd bull. Mature bulls used in registered herds should be effective in mating 35 to 40 cows per season. The young bull 18 months of age should not be mated with more than 20 cows. The bull should be fed a concentrated ration during the breeding season as it will cause him to be more active. In smaller herds it is practical to permit the bull to run with the breeding females during the breeding season, particularly if the herd is on pasture; although the best results in mating will be attained by keeping the bulls separated from the cows so that the services may be regulated and the potency of the bull conserved. One service per cow is generally all that is

necessary. Hand-mating has the additional advantage of facilitating the keeping of records. Table 6 from Coffey (2) shows how mating should be carried out with bulls of different ages.

Table 6. Number of cows per bull of different ages and by different methods of breeding.

Age of bull	Number of cows (pasture mating)	Number of cows (hand-mating)
1½ to 2 years	12	20
3 years	20	30
Mature	30	50

In the winter a ration composed of approximately 16 pounds of silage, seven to nine pounds of legume hay, and six pounds of grain should be adequate to keep the herd bull in good breeding condition. If kept in a lot the bull should be provided with facilities for exercise. This keeps him strong in his legs and prevents the hoofs from growing long and cumbersome. Young bulls which are to be offered for sale should be sold at from 12 to 18 months of age. They will thrive better if they are kept in groups of three to five each and are of similar age and size.

A ration composed of equal parts by weight of ground corn, ground oats and bran fed in combination with hay or pasture should give excellent results. Calves should receive all the grain mixture they will eat at the beginning. Later the grain

mixture may be limited to one pound per 100 pounds of live weight. Calves should be kept completely isolated from cows and heifers after they are weaned. Adequate exercise is essential to the development of the straight, strong legs which are so highly desirable in show and service bulls.

The breeding cows. Good pasture alone is adequate for mature nursing cows and springer heifers in Goliad County except those that are to be used in the show herd. In such cases it is necessary to segregate these females from the other cows of the herd and provide them with a supplementary grain ration. During the winter most of the cow herd can be kept on a ration in which roughage predominates. Cows which are to be bred during the winter should be given one-half to one pound of grain per head daily in addition to all the hay they will eat, for two or three weeks before mating. This additional feeding facilitates satisfactory mating. Heifers may be fed much the same as young developing bulls. In the case of heifers which are intended for the show ring, it would be wise to extend the nursing period to 12 months of age. This will involve the use of nurse cows since the dam of the calf must be released for subsequent gestation and nursing.

Developing calves. In developing calves for baby beef or show the correct type with which to start is the calf with short legs, a wide deep body, straight lines and straight legs with a nicely balanced body conformation.

Any number of suitable grain mixtures may be used in fitting a show calf along with hay and grass. The following rations

taken from Extension Circular 167 of the Oklahoma Agricultural College (4), are suggested for feeding show calves.

Suggested rations (by weight) for feeding show calves

Ration 1

1 part corn, kafir or barley
1 part oats (preferably ground)
1 part bran

Ration 2

1 part corn, kafir or barley
1 part bran
2 parts ground oats

Ration 3

3 parts corn
2 parts ground oats
1 part bran
1 part linseed oil meal

Ration 4

4 parts corn, kafir or barley
1 part bran
1 part ground oats
1 part linseed oil meal

Ration 5

6 parts ground corn
2 parts ground oats
1 part bran
1 part linseed oil meal

Ration 6

65 parts shelled corn
25 parts oats
10 parts linseed oil or cottonseed oil meal

Ration 7

85 parts ground corn
15 parts linseed oil or cottonseed oil meal

These rations are to meet the needs of the show calf through successive stages of fattening. For the calf which is to be carried on to maturity for breeding purposes, rations 5, 6 and 7 contain too much corn.

The following rules adapted from Farmers Bulletin 1135 (12) are recommended for cattlemen of Goliad County in developing purebred calves:

1. Provide a nurse cow, permitting the calf to nurse twice daily.
2. Start feeding the grain mixture and hay as soon as the calf shows interest in taking feed other than milk.

3. Never have more than half the grain ration made up of corn at any time for calves which are to be grown into breeding animals.
4. If the calf develops scours, reduce the milk and eliminate the bran and oil meal from the ration. When digestive difficulties disappear, the calf may be returned gradually to the regular ration.
5. Provide a variety of feeds if possible.
6. Regulate the hay allowance so that no paunchiness develops.
7. In case the calf is to be carried beyond one year of age, care must be taken to avoid the development of fat patches and roles. This is done by limiting sharply the grain ration, especially corn, and feeding more roughage.
8. A thorough grooming each day will tame the calf and improve the condition of the hair.
9. Sudden changes in the feeds used or in the amounts given should be avoided.
10. The calf should receive sufficient feed but should not be over-fed.
11. Unnecessarily disturbing the calf checks the rate of gain.
12. Moldy, musty or otherwise spoiled feeds should not be fed to calves.
13. Prepared "stock feeds" or "remedies" are generally more expensive and less efficient than home-mixed feeds.
14. A healthy calf does not need condition powders and condiments.

DISEASES AND PESTS OF CATTLE COMMON IN GOLIAD COUNTY - THEIR SYMPTOMS AND CONTROL

The most common diseases in order of their occurrence as reported by 103 Goliad County ranchmen are listed in Table 7 following:

Table 7. Diseases and pests of cattle in Goliad County as reported by 103 ranchmen.

Pink eye - 39	Lumpy-jaw - 15
Screw worms - 31	Contagious abortion (Bang's disease) - 11
Blackleg - 25	Stomach worms - 11
Scours or diarrhea - 16	Creeps - 3

Following is a brief discussion of the symptoms and treatment of each of these diseases adapted from Atkinson, et al. (1) and Hultz (7).

Pink eye. This is a contagious inflammation of the eye and is not fatal but often causes the loss of an eye. A good treatment is to bathe the eye several times daily with a solution of three drams of boric acid in three ounces of warm water. Only a few drops should be used at a time. A dark place is more suitable for calves while affected with this disease. Cattle with this disease should be isolated. There are several commercial remedies which if used according to the directions, are effective. In the case of registered or valuable cattle, a veterinarian should examine and treat the eye.

Screw worms. The adult stage of the screw worm is a bluish green blow fly with three dark stripes along the back between the wings and with a yellowish-red face. The screw worm itself, which is the larval stage, is a parasite of all warm blooded animals and attacks wounds of all types. To keep down screw worm infestations, stock should not be castrated, branded or dehorned during the warm months. All wounds and scratches should be treated and cattle should be watched for cuts and scratches. The place of attack depends on the location of the injury and any wound in any part of the animal may become the site of screw worm infestation.

Screw worm infestation must be treated individually, therefore, all infested animals should be placed where they can be examined and treated in a way that will save time and labor and with maximum protection from injury that may result from handling.

The Bureau of Entomology and Plant Quarantine has found that benzol is the best general screw worm killer and recommends the commercial grade (90 percent) for the killing of screw worms in infested wounds. It may be applied with a syringe, can or poured from a bottle. The wound should be cleaned with cotton as benzol will not mix with blood, therefore, some of the worms may not be killed. It takes from two to three minutes to kill the worms. After the first benzol has been in the wound for three minutes, it should be cleaned out and another application made. After it stays in three minutes a piece of cotton saturated in benzol should be placed into the opening of the

wound. The wound and area should be coated with commercial pine-tar oil.

Formula 62 is recommended by the Bursau of Entomology and Plant Quarantine for areas where screw worms are present every year. Formula 62 is made of the following mixture:

	Parts by weight
Diphenylamine (technical grade)	3½
Benzol (commercial)	3½
Turkey-red oil (ph-10 or neutral)	1
Lamp black	2

It is also possible to buy the formula already prepared.

It is not necessary to remove the dead worms after using Formula 62 as they soon drop out of the wound. When the dead worms drop out of the would they carry part of the substance with them, therefore, it is necessary to repeat the treatment in 24 to 48 hours. It is also recommended that regular treatments be given twice a week until the wound is healed. In addition to these above, there are a number of screw worm killers advertised, chloroform being one of the best.

Blackleg. Blackleg is a disease that is found in every section of the United States and attacks mostly young cattle from four to 10 months old. The blackleg germ enters the body through a pierced hole in the skin, such as a wire scratch or a thorn injury. It is found mostly in high grade or registered animals that are in the best condition. The symptoms of blackleg are loss of appetite, high fever and suspension of rumination, followed by great depression. Breathing becomes more rapid, the animal moves about with difficulty, lies down frequently and if

water is available will drink a little at a time. Often a swelling will appear on almost any part of the body or on the legs above the knee or hock joint. Tumors may appear on flank, neck, chest or rump. They are very painful. They increase rapidly in size and in a few hours cover a large portion of the body. When the tumors are rubbed or stroked with the hand, a peculiar crackling sound under the skin is heard. The tumor is cool to the touch and painless in the center. If the tumor is opened, a frothy, dark-red fluid is discharged. Animals in this condition do not live long for as the swelling increases in size the general symptoms become more intense. The temperature may reach 107° F., and the respirations may exceed 140 a minute. The animal is unable to rise, the extremities become cold, and sometimes before death the temperature falls and may become subnormal. There is a trembling of the muecles which, as death approaches, may develop into violent convulsions. Death usually occurs from 12 to 36 hours after the first appearance of the symptoms. A few cases linger for from three to four days, and the diseased animal may recover.

Medical treatment has thus far proved useless in cases of blackleg. The only effective and reliable means known for protecting animals against blackleg is vaccination.

Anti-blackleg serum is also being produced for treating calves already affected with blackleg, as well as producing a passive immunity in exposed animals of an infected herd. This product, however, is rarely used at the present time in the United States.

If it is definitely known that an animal has the blackleg it should be killed and burned. All animals that die from blackleg should be burned and if death occurred in the feed lot all straw should be burned and the ground, troughs, and walls should be sprayed with a strong disinfectant. If wood is not available for burning, the dead animals should be buried in a hole at least six feet deep and the carcass covered with quick lime and the top of the ground thoroughly sprinkled with a strong disinfectant. A two percent solution of oreolin or any dip or disinfectant containing thymol or eucalyptol is recommended. If blackleg has been on the ranch recently, or if calves are brought from a region infected with blackleg, they should be vaccinated immediately. Calves kept in badly infected pastures or lots should be treated as young as three or four weeks of age, and again when they are from six to eight months old.

There are several vaccines for blackleg put out by different companies. Directions for the use of blackleg vaccine accompany the packages. If improperly done, vaccination may not only fail to protect the animal injected, but may actually spread other unrecognized diseases from one animal to another. Therefore, a veterinarian, a competent county agent, a vocational agriculture teacher, or a person who has had experience in vaccinating, should assist one who is vaccinating for the first time. One is unable to determine whether the immunizing properties of vaccine have been imparted until 10 or 12 days after vaccination, when a slight rise im temperature and sometimes a slight swelling may be noted at the point of injection. As vaccine is thus a preventive and

not a curative agent, it is not advisable to vaccinate an animal after the symptoms of blackleg have developed, though the serum mentioned previously, if available at the onset of the disease, might be effective.

Scours or diarrhea. This is a very common disease of calves usually from the time they are born until they are five months of age, although older animals are not immune to it. Treatment should begin as soon as the disease is discovered. Affected calves get very little nourishment from the milk and feed eaten and hence lose flesh rapidly, becoming thin and weak and often die. This disease is caused by bacteria or their products, improper feed, sudden change of feed, too much or too rich milk, chilling, feeding from unclean vessels, lack of salt and many other causes.

A pint of castor oil or linseed oil is helpful when the trouble is caused by feed with irritating properties. Then the feed should be cut down to half or even stopped for one or two feedings.

Where scours are caused by the presence in the digestive tract of harmful bacteria which bring about the formation of toxic products, the first step in the treatment should be the administration of an internal antiseptic that will tend to destroy these harmful organisms. In addition to this treatment a mild purgative should be given to rid the system of the objectionable toxins as soon as possible. Most drug stores and feed supply houses carry antiseptics which give very good results. If used they should always be administered according to the

printed directions. Four to eight ounces of castor oil or one-half teaspoonful of formalin with one pint of water may be a successful treatment.

There are several different kinds of scours that occur in calves and it may be necessary to give a special treatment for the particular kind of scours. In that case it is advisable to consult a veterinarian. As a general remedy, one ounce of castor oil with a teaspoonful of creolin and 20 grains of subnitrate of bismuth in severe cases has proved good. The usual bismuth and creolin treatment should be repeated, along with flaxseed tea, every four hours. For mild cases either two raw eggs, a cup of coffee, gruels, scalded milk, parched rye flour or a decoction of oak bark, is recommended.

Lumpy-jaw. This disease is known to the veterinarian as Actinomycosis. It is an infectious disease of cattle which is characterized by the formation of tumors and abscesses. Its presence is indicated by a round swelling near the angle of the jaw, usually quite hard and generally firmly adhered to the surrounding parts. The swelling grows large and finally breaks open in the form of an abscess which discharges thick, creamy pus and becomes filled with raw, easily bleeding tissue. It is caused by a fungus which attacks the tissues of the throat and the bones of the upper and lower mouth, gaining entrance by means of sharp particles of food such as pear spines, or sharp grasses. Also, when the mucous membranes in the mouth are injured by decayed teeth, the fungus finds ready lodgment. Growths may be formed in the mouth and pharynx of such size as

to interfere with eating and breathing. Not all swelling in the region of the neck is due to lumpy-jaw and if in doubt a veterinarian should be consulted.

The most satisfactory treatment is complete removal of the growth by surgery. This can be done where the growth is not too firmly adhered to the surrounding parts, by cutting open the growth, washing the pus out, and packing with gauze or cotton saturated with tincture of iodine. If a veterinarian is not available the animal may be given large doses of potassium iodide in a drench. One to three drams of this drug is given daily from seven to 14 days. The size of the dose varies with the size of the animal. Two drams are given an animal weighing 1,000 pounds. Animals with only common market value should be sold as only in advanced cases of the disease are the carcasses likely to be condemned as unfit for food.

Contagious abortion (Bang's Disease). Contagious abortion causes more fear among cattlemen than all other ailments combined. This trouble is commonly known as Bang's disease and is caused by a bacillus infection. In case of infectious abortion, the bacillus is attracted to the fetus, at which point it thrives best and there is interference in the channels of nutritional communication between mother and fetus. Finally, the fetus dies and either is retained in the uterus in a mummified condition or is prematurely expelled, as is usually the case.

The abortion organism is generally taken in through the mouth by way of food, water or licking objects which contain discharge material from infected cows.

Bulletin 290 of the Missouri Agricultural Experiment Station lists the following steps in the procedure involved in the eradication of infectious abortion:

1. If abortion occurs in a herd, isolate the animal promptly. Do not take the risk that the abortion was due to accidental injury or shock or to some nonspecific infection.

2. Destroy the aborted fetus and afterbirth (placenta), burn or bury them deeply, adding quick lime before covering with earth.

3. Disinfect the stall and stable litter where the abortion occurred. Use compound cresol or some other good disinfectant. If the abortion occurred in the open field or in the cattle yard, cover the spot with freshly slaked lime, or sprinkle thoroughly with a disinfectant which has a disagreeable odor to prevent healthy cattle from licking up the infected material.

4. If the afterbirth has been retained, consult the local veterinarian, who will give appropriate treatment to prevent complications leading to chronic inflammation of the uterus or to conditions that may result in temporary or permanent sterility. For several days after the abortion has taken place, sponge or spray the rump, tail, vulva, escutcheon or other contaminated portions of the body with an antiseptic solution or other standard disinfectant in proper strength. Spray the stall and the contaminated bedding with the same disinfecting solution. This will prevent the stableman from carrying infection on his feet to the stalls occupied by healthy cattle.

5. Keep abortion cow in quarantine until uterine discharge has ceased. The period of quarantine should be from three to eight weeks. Before releasing for quarantine, sponge or spray the rump and tail and other parts of the coat of the animal liable to contaminate with a disinfectant which has a sufficiently disagreeable odor to prevent cows from licking soiled parts. A blood test should be made of the abortion cow, as well as of all sexually mature females in the herd. To free herd from abortion there is only one course open and that is to dispose of all cows showing a positive reaction to the blood test.

Stomach worms. Moisture and poorly drained pastures favor the development of the stomach worm. If low pastures are used they should be drained properly. If possible pastures should never be over-stocked. Burning pastures will help control stomach worms. The herd should be changed to a fresh pasture as often as possible. Cattle should be watered with tanks or troughs raised above the ground.

Calves should be separated from older cattle which are infested with stomach worms and they should not be put on pastures recently occupied by sheep and goats. All affected animals should be isolated, kept in clean surroundings, and given plenty of nourishing feed.

If part of the herd has stomach worms the entire herd should be treated and the cattle moved to a fresh psture if possible. They should be kept off feed from 12 to 24 hours before they are treated. Bluestone or copper sulphate has been used extensively throughout the world in the treatment of sheep and cattle for stomach worms. To prepare the solution, one pound (avoirdupois) of pure bluestone should be powdered and dissolved in nine and one-half gallons of warm water. It is better first to dissolve the bluestone in two or three quarts of boiling water, then add the remaining quantity of cold water, and mix thoroughly. This solution may be given to cattle in the following doses:

Calves	3½ to 4 fluid ounces
Yearlings	6 fluid ounces
Two years and older	12 to 16 fluid ounces

In making up the solution only clear blue crystals of bluestone should be used. Bluestone with white patches or crusts should not be used. It is especially important that the bluestone and water be weighed and measured and the size of the dose graduated according to the age of the animal. If the bluestone treatment is used the cattle should receive no water until several hours after drenching.

Another good remedy for stomach worms is the use of phenothiazine. Phenothiazine may be administered in gelatin capsules at the rate of 30 grams (approximately one to 1.5 ounces) for calves, and 50 to 60 grams (two ounces) for yearlings and older animals, as a treatment for stomach worms. The above capsules can be purchased at most drug stores. Phenothiazine has also been used successfully at a rate of 0.1 gram per pound or 10 grams (2.5 drams) per 100 pounds of body weight. The capsules should be lubricated with mineral oil to facilitate swallowing. It is advisable to use the half-ounce capsules for small calves to prevent choking. Phenothiazine may be purchased in a liquid form and given as a drench. It may also be given dry in the feed, with or without preliminary fasting.

Following is a description of a simple drenching tube that can be made on the farm and which will be found very useful in the drenching of livestock. The tube consists of a piece of rubber tubing about three feet long and one-half inch or smaller in diameter, with an ordinary enamel coated funnel inserted in one end and a piece of brass or iron tubing four to six inches long, of suitable diameter, inserted in the other end. The metal

tube is placed in the animal's mouth between the back teeth, and the dose is poured into the funnel, which is either held by an assistant or fastened to a post. The flow of liquid through the tube is controlled by pinching the rubber tubing near the point of union with the metal tube. The animal may be dosed either when standing or when lying down on its side. Great care should be used to avoid getting the solution too strong or the dose too large.

In drenching with long-necked bottles, the dose may be first measured and poured into the bottle, and a point marked on the outside with a file so that the subsequent doses may be measured into the bottle itself.

Creeps. Creeps is described as brittleness or softness of the bones found usually in adult animals. The bone substance loses its compactness and becomes brittle and fractures may occur easily. The following symptoms will be observed. The animal has a stiff, laborious gait; there is pain and swelling of the joints and a constant shifting of the weight from one leg to another. The animal will attempt to eat bones, manure, decayed wood, dirt, leather and other objects. The upper bones of the legs, the hip bones and the middle bones of the spinal column are the principal ones involved. The disease occurs on old worn-out soil poor in phosphorus and has been observed to follow dry seasons.

The treatment recommended is to give feed rich in minerals such as beans, cowpeas, clover, oats, cottonseed meal or wheat bran. Cottonseed meal is one of the best feeds for this purpose.

Bone meal placed in a clean container should be kept before the cattle at all times. To get the cattle started to eating, it may be necessary to add salt at first and gradually cut down on the salt until the bone meal alone is fed.

COST ACCOUNTING AND BUDGETING IN LIVESTOCK PRODUCTION

After deciding to raise cattle for beef production it is necessary to make a systematic study of the annual costs and the net returns, and to ascertain whether it is possible to so budget the expenditures that they will not exceed the income. The producer should choose a 12-month period for each book-record summary and inventory. January 1 is commonly used as the beginning and end of the fiscal year because it corresponds with the income tax reports. It is important that a definite and regular closing date be adopted. Accuracy of inventory values is essential. Although exact income and expense figures can be obtained each year, the matter of profit or loss for any one year must be considered relative. By recording high enough inventory values at the end of each year it is possible in an established business never to show a loss. The usefulness of a stockman's inventory depends entirely upon the correctness of his appraisals. The safest livestock inventory is procured by taking average prices and disregarding wide fluctuations in the market.

It is not always possible to plan the details of management several months in advance, nor to predict the exact income from sales. It is nevertheless helpful to prepare a budget that will express one's hopes and plans. With plans well worked out, the

operator has a valuable check each month of the trend of his business. He obtains some information on the way the grazing capacity of the different pastures is holding up, the amount of autumn and winter feeds he will have, the amount of concentrates and roughages that can be sold, the number of animals that can be marketed in prime condition, the approximate time of their disposal and the price that may be expected.

A budget for a cattle ranch would take into account such major items of expense as the following:

Labor:

- Breeding cows
- Bulls
- Purchase of stockers and feeders
- Transportation
- Veterinary service
- Interest on investment in cattle

Feed:

- Pasture (grazing fees and rentals)
- Supplemental feeds

Taxes:

- Assessments on cattle
- Assessments on work stock and other livestock
- Assessments on equipment

General expenses:

- Work horses
- Machinery and harness
- Seed

Miscellaneous expense:

- (Including rent, insurance and other unclassified expenses)

After accounting for all costs the operator is then ready to begin his year's work by making out his inventory and recording

expenses and receipts as they occur during the year. Appearing in the following several pages are simple forms which would suffice for practically any beef production program, according to Davis (3),

At the end of the year the inventory should be summarized and the new year's inventory opened with the balance from the preceding year's business. The comparison of the two will show how much the list and its valuation have increased or decreased during the year. If it has increased the enterprise must be credited and if it has decreased the enterprise must be charged with the difference. In making up each list the kind of property, number or quantity, the price of each unit, and the value should be included. The list should include livestock, feeds, buildings, tools, notes held and other assets. Actual market values at the farm should be used as nearly as possible. Livestock born during the year should be recorded in a table to aid in making the inventory at the end of the year. They will not be given any value until the end of the year or when they are sold.

Table 8. Inventory form

Items	Beginning of Year			Close of Year		
	Quantity	Price	Value	Quantity	Price	Value
Total						
Net increase or decrease for year						

All labor connected with the enterprise should be entered in the labor record whether it be for chores, other productive labor, marketing or miscellaneous, and should be divided into the headings shown below.

Table 9. Farm labor record.

Date	Kind of work	Self		Others		Horse		Equipment	
		Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost
	Total expense for labor								

All feed purchased for the herd should be recorded at the time of purchase, and a record kept of each delivery of feed raised on the farm for home use. When the silo is filled or when a crib of corn is to be used entirely for the cattle enterprise, it can all be charged accordingly at the time on the books. Smaller lots will need to be entered from time to time.

Table 10. Feed record.

Date	Kind of Feed	Quantity	Price Per Unit	Value
Total				

All livestock purchased should be recorded on a form similar to that in Table 11.

Table 11. Livestock Purchase Record.

Date	Kind of Animal	Quantity	Price Per Unit	Value
Total				

Receipts should include all sales, notes paid, credits for natural increase in herd and manure credits, etc., and be recorded as suggested previously.

Table 12. Receipts.

Date	Items	Quantity	Price Per Unit	Value
Total				

Summary statement. From the former records it is easy to make a summary at the completion of the year (or production cycle) for the beef production enterprise. The net increase is the difference between the total receipts and total expenses. Such items as machinery charges may be added to the labor record. The use of machinery is usually taken care of in the depreciation in value shown in the inventory at the end of the year. The summary made up from the accounts at the end of the season or of the project may be made according to Table 13.

Table 13. Summary Statement Form.

Expense	Value	Receipts	Value
Inventory beginning of year		Inventory end of year	
Miscellaneous expense		Receipts - cash	
Hired labor		Used for feed	
Horse labor		Used in home	
(1) Self labor			
(2) Total cost		(4) Total income	
(3) Less self labor, (2) minus (1)		(5) Net income, (4) minus (2)	
		(6) Labor income (4) minus (3)	

These items, with suitable adaptations to local conditions and kind of livestock raised, will approximate the financial statement for the business as a whole.

CONCLUSIONS

This study was based on data obtained from conversations with the ranchmen of Goliad County, from practical experiences and observations while living among them for the past 12 years, and from information obtained by a survey of 103 ranchmen of the county, regarding their methods of management of their beef production program.

From the sources above and from the ideas of some of the leading authorities on beef production in the country, the following conclusions were drawn:

1. Beef herds must be improved through buying better bulls, through better selection of breeding stock, and by a rigorous and systematic culling program.

2. Bulls should generally be kept with cows only during the breeding season in order to allow for more uniformity in the age of calves and to preserve the potency of the bull.

3. More common farm roughages should be raised and fed and more protein supplements fed.

4. Calves should be sold at younger ages and a larger investment made in the cow herd.

5. Ranchmen should improve their methods of combatting diseases and insects.

6. A well rounded program with improved management, sound planning, and accurate bookkeeping would contribute to the improvement of the beef production program of Goliad County.

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LITERATURE CITED

(1) Atkinson, V. T. and others.
Special Report on Diseases, Washington, D. C. Government Printing Press. p. 227:217:23:453: 1942.

(2) Coffey, Joel S. and Jackson, Lyman E. Livestock Management, New York, Lippincott, J. B. p. 70-124. 1940.

(3) Davis, H. P., Warmelschirchen, L., Dickinson, S., Smith, W. H., Coffey, W. C., and Nisonger, H. W. Livestock Enterprises, Chicago. Lippincott, J. B., p. 99-164. 1937.

(4) Extension Circular 167.
Feeding Show Calves, Oklahoma Agricultural College. p. 1-26. 1940.

(5) Glatfelter, G. V.
Breeders' Gazette, Chicago. Vol. 78, Part 2. December 16, 1920. p. 1315.

(6) Hansel, R. L.
Breeder's Gazette, Chicago. Vol. 80, August 11, 1921. p. 181.

(7) Hultz, Fred S.
Range Beef Production, New York, John Wiley and Sons, Inc. P. 95-115. 1930.

(8) Hunter, J. M. and Saunders, George W.
The Trail Drivers of Texas. Nashville, Cokesbury Press 2nd ed. p. 525:193-207. 1925.

(9) Kyle, E. J. and Alexander, E. R.
Agriculture in the Southwest. Dallas, Charles Scribner's Sons. p. 282-302. 1940.

(10) Texas Almanac and State Industrial Guide, Dallas.
Dallas News. p. 79-81. 1936.

(11) Texas Almanac and State Industrial Guide, Dallas.
Dallas News. p. 41-42:89-105. 1944.

(12) The Beef Calf, Its Development and Growth.
U. S. Dspartment of Agriculture Farmers' Bulletin 1135. p. 1-29. 1937.

(13) United States Census, Agriculture. Vol. II. Third Series, Part 2. p. 116-127. 1930.

(14) Statistical Abstract of the United States.
p. 626-627. 1943.

(15) Sampson, Arthur W.
Livestock Husbandry on Range and Pasture, New York.
John Wiley and Sons, Inc. p. 243-258;286. 1928.

(16) Snapp, Roscoe R.
Beef Cattle, Their Feeding and Management in the
Corn Belt States, New York. John Wiley and Sons, Inc.
p. 425-441; 152-163. 1925.