

Cattle Feeding In The Southern Plains: Past, Present, Future Outlook

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Foreword

Cattle feeding capacity continues to expand in the Southern Plains. Current investment decisions are being made against the backdrop provided by a decade of rapid growth. Whether such growth rates can or will be sustained will partially determine the economic wisdom of investing in new feeding facilities.

By identifying and examining the key economic forces which both facilitate growth and which ultimately exert a restraining influence on still further growth, this analysis provides information important to the person contemplating investment in cattle feeding in the Southern Plains and to the person now involved who must make decisions on whether to expand or change his mode of operation.

Several persons deserve a word of thanks for their assistance in this study. Kirby Cavett, formerly a graduate student in Agricultural Economics, assisted with some of the many calculations. Fred Huffine and his colleagues in the Texas County Extension Center provided much-needed data on cattle fed by counties. There is no regularly published source of such figures on a county basis but the data are essential to an analysis such as this.

Cattle Feeding In The Southern Plains: Past, Present, Future Outlook

Wayne D. Purcell
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The decade of the 1960's witnessed rapid growth in cattle feeding activity in the Plains states of Texas, Oklahoma, Kansas, Colorado and New Mexico. Investment decisions involving millions of dollars were made as feedlots were constructed, slaughtering facilities moved into the area, and the many related services generated. In general, such decisions were made with little hesitation; the cattle feeding industry experienced a substantial geographical readjustment during the decade of the 1960's as the Southern Plains emerged as an important feeding area.

During the late 1960's, the industry as a whole experienced a period of relative prosperity, benefiting from unprecedented increases in demand for fed beef and from significant advances in feeding technology and management skills. Given such favorable conditions, most of the feedlots constructed in the Southern Plains during the 1960's not only survived but prospered.

A new decade is now being launched. For those in the feeding business or those considering feeding, what happens during the 1970's will obviously be important. What are the possibilities that still further expansion in the Southern Plains will be profitable? What are the limits—and how close are they? Information which will provide insight in these areas should prove valuable to those making investment decisions. The purpose of this bulletin is to contribute to the available information which will facilitate the making of economically sound investment decisions with regard to cattle feeding activities in the Southern Plains.

More specifically, the objectives of this analysis are as follows:

1. To describe the pattern of growth of cattle feeding in the Southern Plains during the 1960's;

Research reported herein was conducted under Oklahoma Station Project Number 1449.

2. To enumerate the economic variables which contributed to that growth;
3. To examine the economic variables which are potential constraints on further growth; and
4. To estimate the probable developments in cattle feeding in the Southern Plains during the 1970's.

The Current Situation

Regional or geographical shifts in the feeding of cattle are a matter of recorded history. Figure 1 records developments in three basic feeding areas, employing state data on fed cattle marketings. The increase in the five Southern Plains states, viewed as a feeding area, was approximately 239 percent from 1960 to 1969. The percentage increases in other areas have been lower, at least partly because the 1960 level of marketings was relatively high. This partially explains the 63 percent increase in the

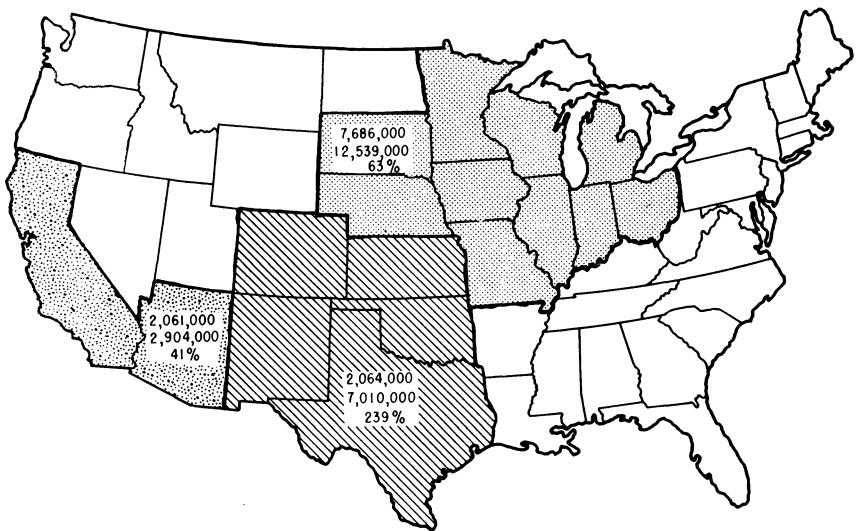


Figure 1. Fed Cattle Marketings in the Major Feeding Areas, 1960 and 1969 with Percent Increases 1960 to 1969

Source: **Livestock and Meat Statistics** — Statistical Bulletin 333 and Supplement for 1969, Statistical Reporting Service, USDA

Legend: Top figure: 1960 fed cattle marketings
 Middle figure: 1969 fed cattle marketings
 Bottom figure: Percent increase, 1960-69

North Central area which encompasses Iowa, the number one feeding state. Fed marketings in Iowa increased 75 percent with an absolute increase of nearly two million head (1,937,000). Nebraska, the important feeding state in the "Western Corn Belt", recorded an absolute increase of 1,927,000 head and a percentage increase of 134 from 1960 to 1969. Nationwide, however, fed marketings increased approximately 90 percent during the period and it is apparent much of this increase occurred in the Southern Plains states.

In Figure 2, attention is focused on the five states in the Southern Plains. The growth in feeding in Texas has occurred at a phenomenal rate. Less rapid but significant increases have occurred in the other four states. Whether such growth patterns can or will be sustained is, of course, a topic of concern in this analysis.

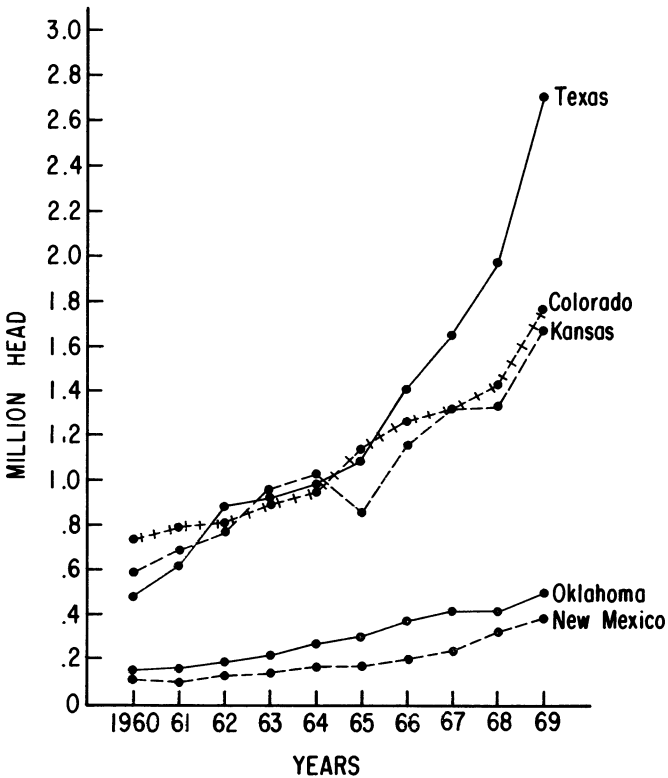


Figure 2. Fed Cattle Marketings, Southern Plains States, 1960-69

Source: **Cattle on Feed Reports, 1960-69**, Statistical Reporting Service, USDA

The Economic Variables

To fully understand the growth of cattle feeding in the Southern Plains requires consideration of the economic forces which have both prompted and supported that growth. Although many factors affect the geographical location of cattle feeding activities, there are three which appear to be of primary importance:

1. The availability and cost of feed grains;
2. The availability and cost of feeder cattle; and
3. The availability of markets for the finished slaughter animal.

These economic variables were the focal point of consideration in an earlier analysis conducted by the author (8). The analysis, based on 1967 data, delineated a "Southern Plains feeding area" as shown in Figure 3. Because of data limitations, however, only one of the centers of feeding activity in this area was subjected to detailed examination. This smaller area is shown in Figure 4 and is roughly in the shape of a circle 100 miles in radius with its center in Guymon, Oklahoma.

Concern that feeding activities were expanding too fast prompted the earlier analysis. The basic conclusions of that analysis, relating to the economic variables listed above, will be summarized below. With the situation changing so fast, periodic re-examination is essential for informed investment decisions.

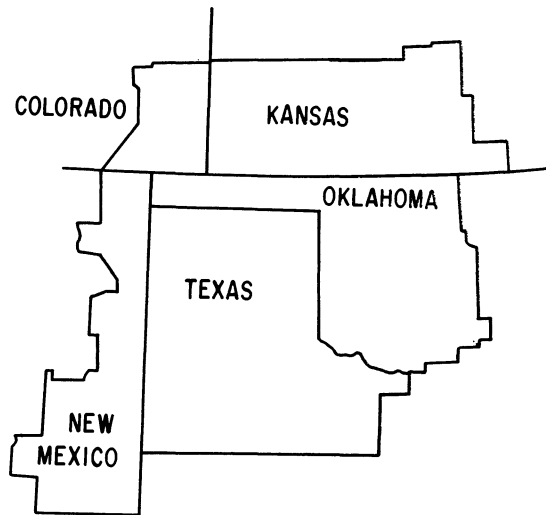


Figure 3. The "Southern Plains" Feeding Area

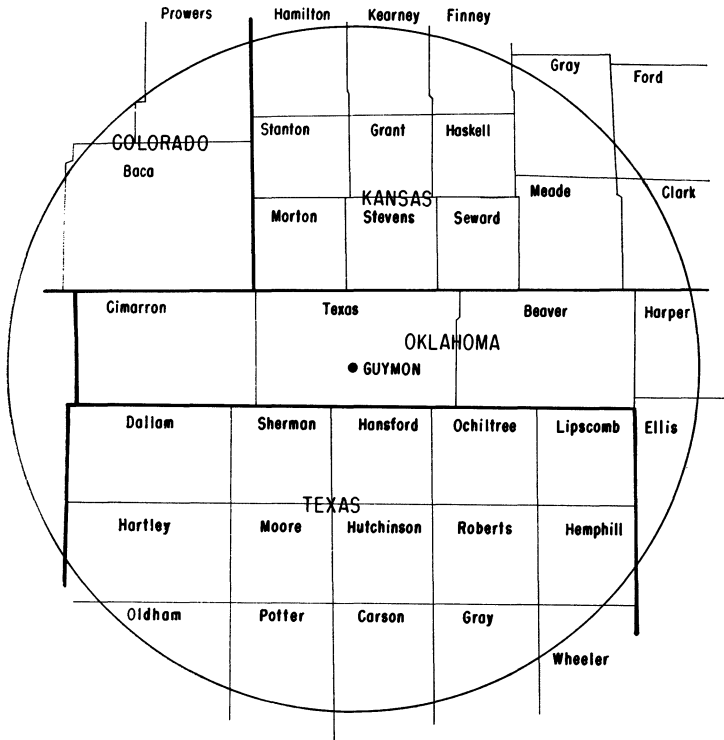


Figure 4. The Guymon Feeding Area

In summary form, the basic conclusions of the earlier analysis were as follows:

1. Feed grains were found to be available in the "Guymon area" in surplus quantities and at prices as low as any in the nation. During 1967, an estimated 1,251,385 cattle were being fed annually in a geographical area in the shape of a circle, with a radius of 100 miles, and centered in Guymon, Oklahoma. Based on 1967 production of feed grains in this area, an *additional* 1,179,113 cattle could have been fed. If the potential for irrigation had been developed to the extent at least one-half of all irrigable land was brought under irrigation, the increased production relative to 1967 production would have permitted an additional 865,104 head to be fed.
2. The main areas of feeder cattle production were found to be in close proximity to the Southern Plains feeding area. Texas, Nebraska, and Oklahoma ranked first, second and third in cow

numbers as of January 1, 1968 with 5.304, 1.964, and 1.923 million head respectively. Inshipments of cattle from the Southeastern states supplement the supply of regionally available feeder cattle. Such cattle from the Southeastern states were found to be lower in average cost for comparable weight and grade than feeder cattle produced in other geographical areas. The Southern Plains feeding area was thus found to be both located favorably relative to the important feeder cattle producing states and able to compete for, and ship in, cattle from the Southeastern part of the U.S. Overall, this led to the conclusion that the Southern Plains had in 1967 a relative advantage, certainly no disadvantage, compared to other feeding regions in availability and cost of feeder cattle.

3. From 1960 to 1967, commercial cattle slaughter increased faster in the Southern Plains area than any other area of the country. From 1965-67, approximately 25 slaughtering plants were cleared for federal inspection in the five Plains states. Eight of these were in the Guymon feeding area. This expansion, when combined with some 36 plants cleared for federal inspection prior to 1965, led to a 1967 slaughter level of over 6.5 million head (in federally inspected plants) in the five Southern Plains states.

Movement of slaughtering facilities into the area was viewed as evidence of the packers ability to compete in the consuming areas from a location in the Southern Plains. Several studies were cited which indicated the Southern Plains packer *can* compete in markets for dressed beef throughout the nation and especially in the rapidly growing market comprised by the Gulf states from Florida to Texas (3, 4).

Availability of markets for the slaughter animal was therefore judged to be no problem for the Southern Plains feeding area in 1967. An already significant slaughter and processing capacity was being rapidly expanded as packers relocated in closer proximity to the rapidly growing feeding activities.

Other variables, judged to be of lesser importance, were examined less thoroughly in the analysis. Among these were climate, labor costs and availability, technology, and the availability and costs of related services (such as veterinary services, assistance of professional nutritionists, etc.). These latter services tend to flow to the areas of concentrated feeding activity. The other factors were considered to be either neutral or in favor of the Southern Plains area as a competitor with other feeding areas. Neither the supply of water available for irrigation purposes nor the changes in cost of applying that water over time were given explicit attention in the earlier analysis. The estimates of irrigation de-

velopment were deliberately kept low to preclude complications relating to the availability of water.

Procedure of Analysis

Using the earlier analysis as a point of departure, the key economic variables will be examined again. Feed grain production, using 1969 data, will be examined relative to the number of cattle fed in the Guymon area in 1969. Regional availability and cost of selected weights and grades of feeder cattle will be considered. Locational shifts in packing and processing operations since 1967 will be examined.

Carrying the analysis further, more explicit consideration will be given the crucial question of the water supply. Available data on the rate of depletion and expected developments in the quantity of water for irrigation purposes, at varying cost levels for application, will be analyzed to permit incorporation of the key issue of water supply into the future outlook for the Guymon feeding area in particular and the Southern Plains feeding area in general. Also scheduled for brief consideration will be the availability of credit as a determining factor in the continued development or maintenance of feeding activity in the Southern Plains.

Overall conclusions will be drawn relative to the prospects for the cattle feeding industry in the Southern Plains. Particular attention will be paid any limits or cautions which loom on the horizon over the next few years. Whatever the situation in the Plains area, an attempt will then be made to place the future potential of this area in a context of national growth and interregional competition in the cattle feeding industry.

The Analysis

Feed Grain Cost and Availability

In comparing interregional or interstate costs of feed grains, it is important to use a "common denominator" to insure comparisons are on a realistic basis. In Figure 5, feed grain prices are shown for the states included in the feeding areas outlined earlier. Corn and grain sorghum are considered, with grain sorghum being converted to corn equivalent, and the average prices are weighted by the levels of production of the two important feed grains in each state. The use of "corn equivalent" provides the needed common denominator.

Examination of Figure 5 provides support for the following observations:

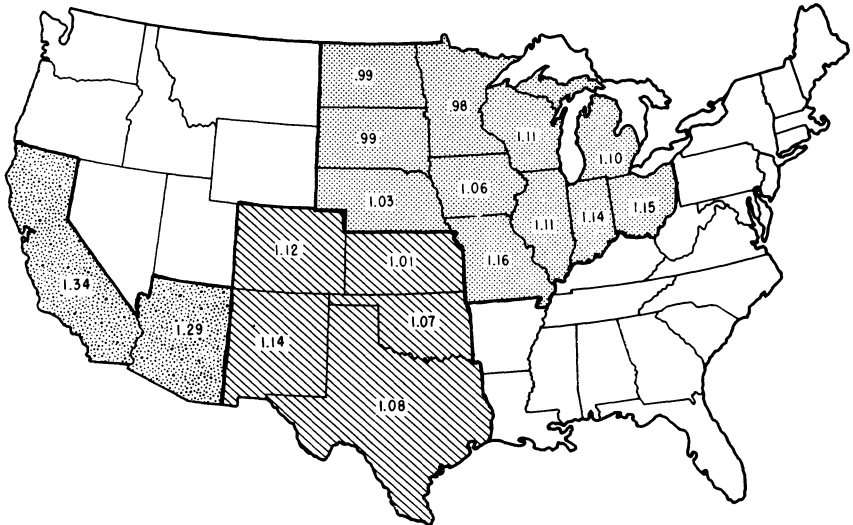


Figure 5. Average Prices Received by Farmers for Corn and Grain Sorghum in Dollars per Bushel of Corn Equivalent, Selected States, 1969

Source: **Crop Production, 1969 Annual Summary and Agricultural Prices, 1969 Annual Summary, Statistical Reporting Service, USDA**

1. The California-Arizona feeding area faces significantly higher feed grain prices; and
2. Prices in the important feeding states in the Southern Plains and Corn Belt feeding areas are comparable.

The relatively low prices in North and South Dakota must be qualified; production of feed grains is low in these states. The price in Minnesota is also low with production of corn at a significant level, over 334 million bushels in 1969.

Overall, the "cost picture" for feed grains in the Southern Plains is favorable. The price of feed grains is similar to prices in the Corn Belt—the same relationship which held in the earlier analysis employing 1967 data.¹ Prices for barley, wheat, and any other less important feed grains were not included in the weighted averages but when such grains are converted to corn equivalent based on feeding value, prices vary little between commodities within a feeding area.

The relatively low prices for feed grains in the Southern Plains implies adequate supplies are available. If the number of cattle being fed

¹Five-year averages were also calculated to protect against the possibility of 1969 being an atypical year. Essentially the same relationship between the feeding areas was found to prevail.

expands so rapidly as to exhaust the area supply of feed grains, prices tend to be "bid up". This has occurred in the California-Arizona area where feed grains are shipped into the area.

In examining the question of feed grain availability, the "Guymon area" as outlined earlier will be employed as a frame of reference and as an indication of the current status of the Southern Plains feeding area. The 1967 production of corn and grain sorghum in the area would have fed an additional 1.179 million head, a 94 percent increase beyond the 1.251 million head being fed annually in 1967.²

Figure 6 paints a comparable picture for 1969. Only corn and grain sorghum are used to facilitate comparison with the 1967 results. A total of 2,787,800 head could have been fed using 1969 production of corn and sorghum for grain. An estimated 2,288,492 head were being fed annually in 1969.³ The difference or number of additional cattle which could have been fed is 499,308, less than one-half the figure for 1967. The 1967 analysis revealed Finney and Clark counties in Kansas, Beaver and Harper counties in Oklahoma, and Gray and Lipscomb counties in Texas to be deficit counties in terms of feed grain production—more cattle were being fed than could be supported without shipping grain into the county. Figure 6 shows the list of "deficit counties" increased to 13 in 1969 (the shaded counties are the deficit counties). Examination of Figure 6 reveals much of the potential which existed in 1967 had been exploited by 1969, especially in Texas and Oklahoma. Take away the significant surpluses of feed grain in the counties in Southwestern Kansas and the entire area would be on a "breakeven" basis with all feed grain production in the area being used in the area.

The situation changes little by bringing in wheat as a feed grain. The value of wheat as a feed grain is still a topic of discussion among cattle feeders and nutritionists. The "breakeven" prices presented in Table 1 were used to convert wheat to corn equivalent (and the conversion for grain sorghum, discussed earlier, as well). Feeding tests at Oklahoma State, Kansas State, and computer formulations of least-cost rations at Oklahoma State verify the validity of the table. The Kansas State work, reported by Brethour, suggests the value of wheat is even greater than that shown in the table when used at levels no higher than 50 percent of the concentrate (2). So, the conversion factors in the table are used as a conservative estimate of the feeding value of wheat.

²The calculations employed a ratio of 6 pounds of concentrate (corn equivalent) per pound of gain. Assuming 400 pounds of gain per animal, concentrate requirements were then 2400 pounds per animal. The surplus grain in the area was converted to potential increases in the number of cattle which could be fed using the 2400 pounds of grain per head.

³This estimate was provided by the Extension Center in Texas County, Oklahoma. A survey was taken to estimate the one-time capacity by counties in the Guymon feeding area. Annual capacity was calculated as 2.25 times the one-time capacity. Cattle fed annually, the statistic used in this analysis, was then calculated as 85 percent of the estimated annual capacity.

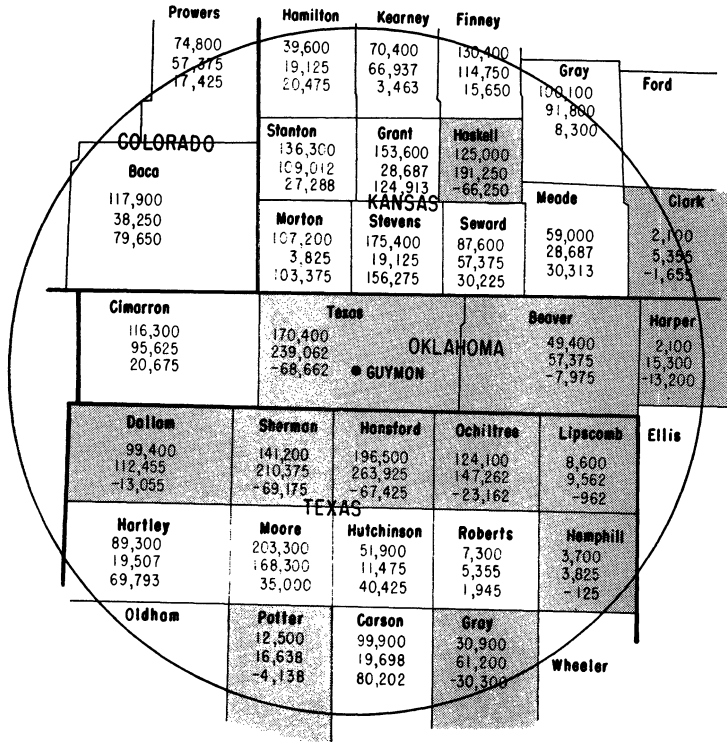


Figure 6. Number of Cattle Which Could Have Been Fed Based on 1969 Production of Corn and Grain Sorghum, Number Fed in 1969 and Additional Cattle Which Could Have Been Fed, By Counties, Guymon Feeding Area

Legend: Top figure: No. head which could have been fed in 1969
 Middle figure: No. head actually fed in 1969
 Bottom figure: No. additional cattle which could have fed; deficit counties are shaded

Figure 7 records, by counties, the additional cattle which could be fed based on feeding 20 percent of the 1969 wheat production. Comparing these figures to the "deficits" in the shaded counties of Figure 6 reveals Clark county in Kansas, Beaver county in Oklahoma, and the counties of Ochiltree, Lipscomb and Hemphill in Texas would be removed from deficit status if 20 percent of the wheat production were fed. However, only Ochiltree is a really significant cattle-feeding county. Totaling all counties, an additional 480,800 head for cattle could have been fed using this proportion of wheat production.

Checking five-year averages to guard against the possibility of un-

Table 1. Estimated Break-Even Prices for Wheat, Milo, and Corn in Cattle Feeding Rations.

Cost of Milo per cwt.	Cost of Corn per Bushel	Cost of Wheat per Bushel
\$1.50	\$.86	\$1.00
1.55	.89	1.03
1.60	.92	1.07
1.65	.95	1.10
1.70	.98	1.13
1.75	1.01	1.17
1.80	1.04	1.20
1.85	1.07	1.23
1.90	1.10	1.27
1.95	1.13	1.30
2.00	1.15	1.33
2.05	1.18	1.37
2.10	1.21	1.40
2.15	1.24	1.43
2.20	1.27	1.47
2.25	1.30	1.50
2.30	1.33	1.53
2.35	1.36	1.57
2.40	1.39	1.60
2.45	1.41	1.63
2.50	1.44	1.67

Source: Estimated from feeding trials and computer formulations for least-cost rations

usual conditions in 1969 reveals the same pattern. The five-year averages for Texas county in Oklahoma and the counties of Carson and Dallam in Texas showed a slightly higher feeding capacity than for 1969. The difference was small, however, and of little significance; these are the counties which developed relatively early as producers of feed grain and cattle feeding areas in the early 1960's. Only Texas county is a really significant cattle feeding county at present.

The margin was much thinner in 1969 than in 1967. Without considering the possibility of feeding wheat, feed grain production in the Guymon area would have fed over one million additional cattle in 1967. In 1969, the surplus production would have fed less than one-half million head. Just how narrow the margin must become before prices are bid up is difficult to predict—some margin or excess is necessary to meet requirements other than cattle feeding and provide for the inter-state movements of grain which do occur. In late 1969 and the early months of 1970, grain sorghum prices moved above \$2.00 per cwt. in the Texas and Oklahoma panhandle areas. Though the feared "shortage" of feed grains did not develop and prices later fell, developments during this period may well be indicative of what could happen if increased feeding activity in the Southern Plains results in a "bidding up" of feed grain prices in the area.

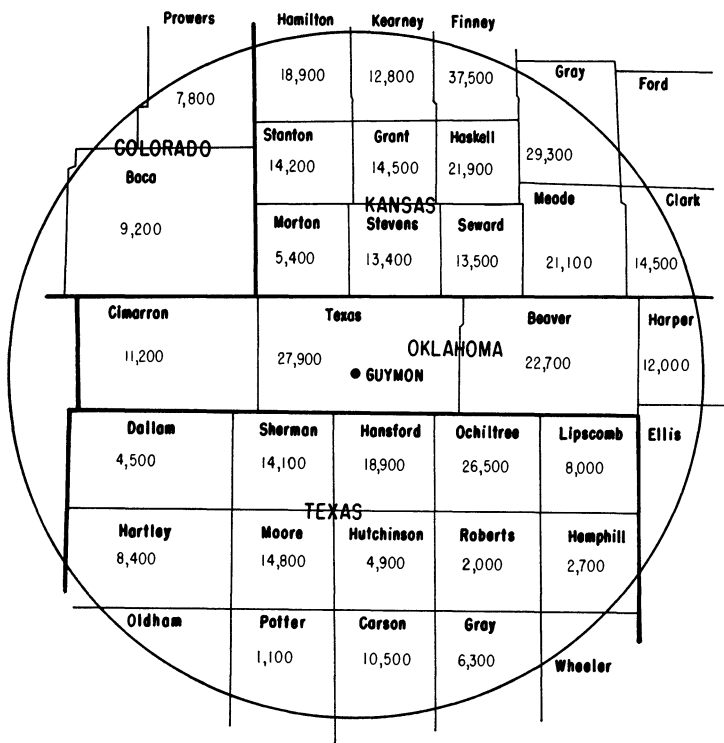


Figure 7. Additional Cattle which Could Have Been Fed by Using 20 Percent of the 1969 Wheat Production, By Counties, Guymon Feeding Area

Cost and Availability of Feeder Cattle

Figures 8 and 9 show the average prices over a 5-year period for two grades of feeder cattle at selected markets. No clear-cut advantages accrue to any one area; the prices in the Southern Plains compare favorable with other feeding areas. The Southeastern markets show somewhat lower prices. Many of these cattle flow into the Southern Plains for feeding with intermediate stops on small grain pasture. In a 1968 report, Dietrich estimated 12.6 and 14.9 percent of the cattle fed in Texas and Oklahoma respectively originated in Louisiana, Arkansas, Mississippi or Alabama (5). Overall, then, the Southern Plains feeding area compared favorable with other feeding areas during the 1963-67 period.

Figure 10 reveals the 1968 and 1969 prices for Choice 550-750 lb. steers at selected representative markets around the country. The same pattern appears to hold; prices a bit lower in the Southern Plains and the

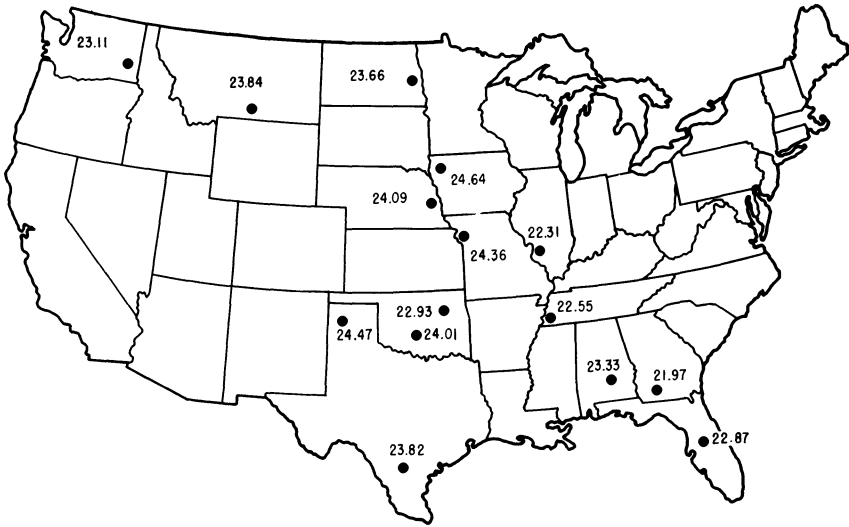


Figure 8. Average Price, 1963-67, of Good Grade 300-550 Pound Steers, Selected Markets

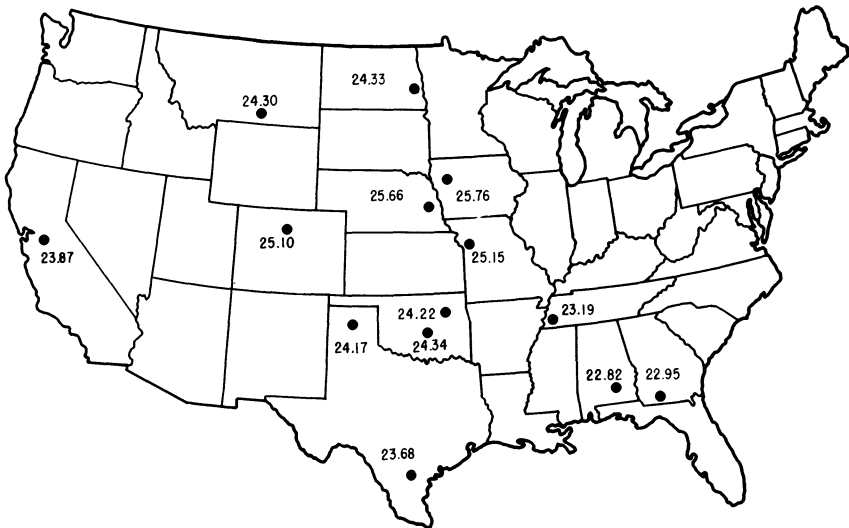


Figure 9. Average Price, 1963-67, of Choice 500-800 Pound Feeder Steers, Selected Markets

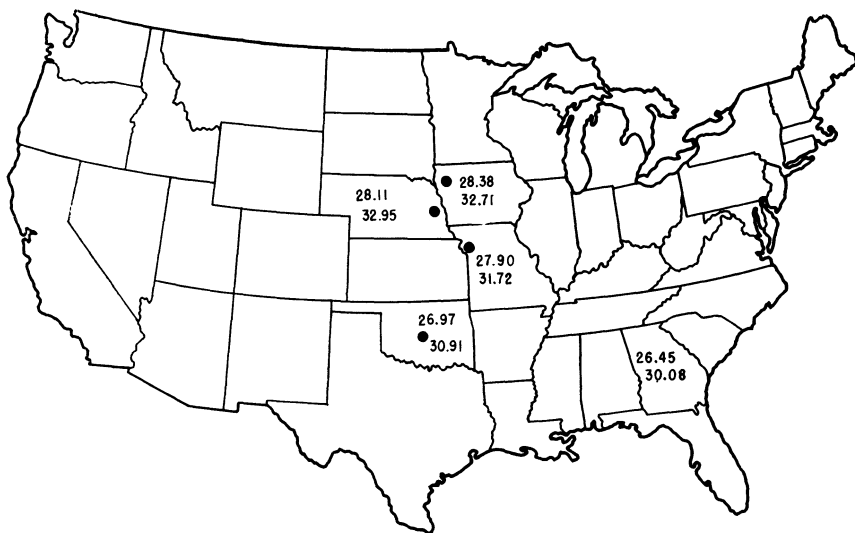


Figure 10. Average Price for Choice 550-750 lb. Steers, Selected Markets for 1968 and 1969, Dollars per Cwt.

Source: **Livestock, Meat and Wool Market News**, Consumer and Marketing Service, USDA

Legend: Top figure: 1968
Bottom figure: 1969

Southeastern part of the country. The prices shown in Georgia are average prices for Georgia auctions, prices which should be representative of the Southeast.

Information on the relative availability of feeder cattle is provided by examining the top 10 states in terms of cow numbers. Figure 11 indicates Texas, Oklahoma, Missouri, Nebraska and Kansas rank first through fifth respectively. In terms of physical proximity, therefore, it is apparent feeder cattle are available to the Southern Plains feeding area in general and the Guymon area in particular.

The situation is not quite this simple, however. There is much movement of feeder cattle between areas and states—not all feeder cattle are fed where they are produced. Historically there has been heavy shipment of feeder cattle from Texas, Oklahoma and Kansas to the eight north central states of Minnesota, Michigan, Nebraska, Iowa, Ohio, South Dakota, Indiana and Illinois. Figure 12 records (1) the number shipped into this North Central region from selected states for the years 1962 and 1968, and (2) the percentage increase or decrease over this period.⁴

⁴Since the data series covers only those shipments reported to the various State Veterinary offices, the total volume of shipments is understated by some unknown but surely significant amount. Comparable data are not available for 1969.

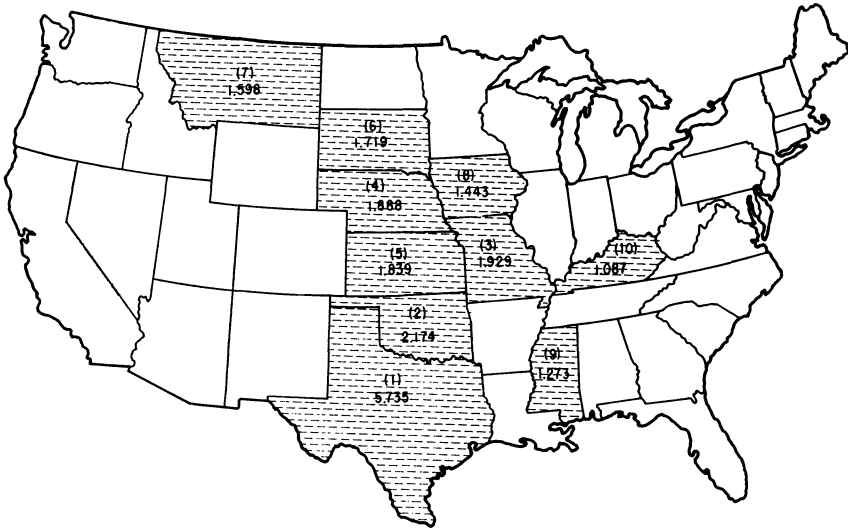


Figure 11. Number of Beef Cows 2 Years Old and Older in Million Head and the Top Ten States in Beef Cow Numbers, January 1, 1970

Source: **Livestock and Poultry Inventory, January 1, 1970**
Statistical Reporting Service, USDA

Shipments from Kansas and Oklahoma increased slightly, shipments from Texas show a substantial decrease. Considering the three states combined—and these are the important feeder cattle producing states in the Southern Plains region—the reported direct shipments decreased by 119,189 head, a drop of 9.5 percent. Examination of the figure suggests these shipments are being replaced by increased inshipments from the north-northwest states, especially Montana, and the neighboring states of Missouri, Kentucky and Tennessee.

Availability of feeder cattle ultimately has impact on cost of the cattle. As the current adjustments continue to evolve, we can anticipate the following developments:

1. More feeder cattle produced in Texas, Oklahoma, Kansas and the other Southern Plains states will be fed in the area;
2. Shipments of feeder cattle out of the Southern Plains states into other feeding areas, especially the Corn Belt, will continue to decrease; and
3. The price of feeder cattle from the Southeastern states may be “bid up” as both the Southern Plains and Corn Belt feeding areas compete for these cattle.

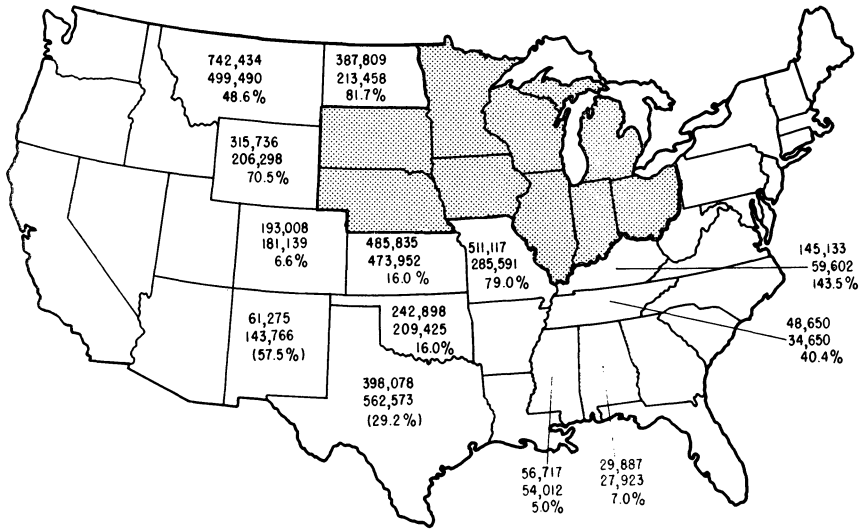


Figure 12. Direct Shipments of Stocker and Feeder Cattle Into Eight North Central States, By State of Origin for 1962, 1968 with Percentage Increases (Decreases) 1962 to 1968

Source: **Livestock and Meat Statistics**, Statistical Bulletin 333 and Supplement for 1968, Statistical Reporting Service, USDA

Legend: Top figure: No. head, 1968
 Middle figure: No. head, 1962
 Bottom figure: Percent change, 1962-68

Overall, the 1969 picture of feeder cattle availability is not unfavorable to the Southern Plains area. Problems are emerging in the form of increased competition for cattle from the Southeast, cattle which have quality and growth potentials which have proven desirable for many Southern Plains feeders. Some of the “bargains” in the form of cattle offering potential for compensatory gain and/or moving at relative low prices may disappear. As this occurs, the importance of physical proximity to the feeder cattle producing states will prove to be increasingly important to the competitive position of the Southern Plains feeding area.

Availability of Markets for Slaughter Cattle

The number of federally inspected slaughter plants in the Southern Plains has increased rapidly as the move to a decentralized marketing system continues. Figures 13 and 14 depict the location of federally inspected plants in 1965 and 1970 respectively. The growth during this five-year period has been dramatic.

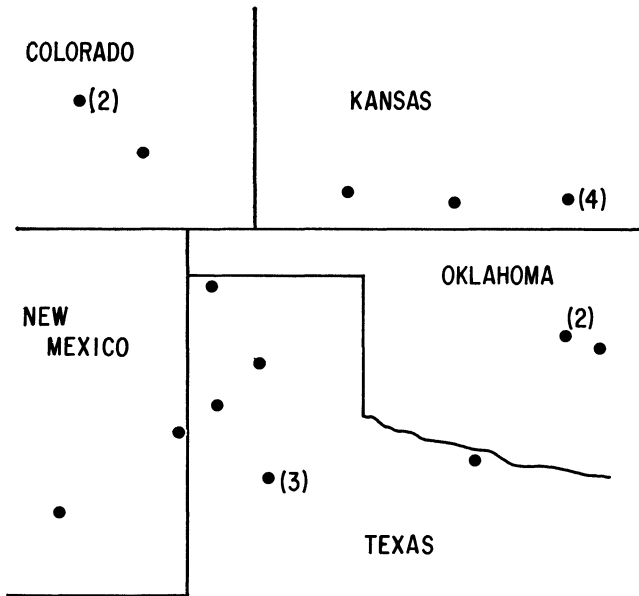


Figure 13. Location and Number of Federally Inspected Slaughter Plants, March 1, 1965

Source: **Number of Livestock Slaughter Plants**, March 1, 1965 and 1970, SRS, USDA, May, 1970

Figure 15 provides information on the relocation of the packing industry which occurred throughout the decade of the 1960's.

A number of studies support the economic soundness of the relocation which is still occurring. The packer located in the Southern Plains can compete effectively in the markets for dressed beef. Shipments from the area hold a strong competitive edge over packers in other areas in the battle for the "Gulf Coast market", the area stretching from Florida to Texas. In terms of increases in population and income, the two most important factors in a strong and increasing demand for beef, the Gulf Coast market is the fastest growing market in the country. The Southern Plains packer can also compete in the East Coast and the West Coast markets. Crom's study, which allows predetermined adjustments such as expanded feeding in the Southern Plains, suggests the competitive edge the area holds will increase in the future (3, 4, 9).

Availability of packers in the area helps to insure a strong and competitive market for slaughter beef in the Plains states. There are no indications the current movement of slaughtering facilities into the most

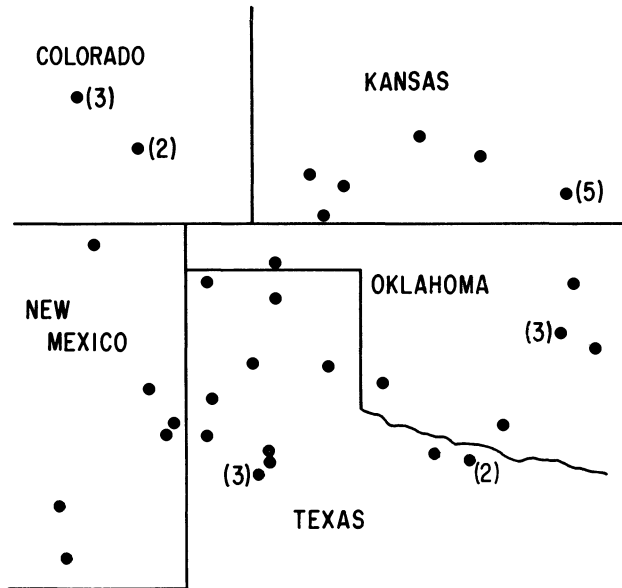


Figure 14. Location and Number of Federally Inspected Slaughter Plants, March 1, 1970

Source: Number of Livestock Slaughter Plants, March 1, 1965 and 1970, SRS, USDA, May, 1970

rapidly growing feeding areas will be reversed. Consequently, during 1969 and currently, the market for slaughter cattle in the Southern Plains feeding area has been strong.

The Availability of Water

In the 1967 analysis, continued development of irrigable land in the Guymon feeding area was pointed to as a factor permitting continued expansion of feeding in the area. By bringing each county in the area up to one-half its potential, an additional 865,104 head could have been fed. The relevant information is summarized in Figure 16. The shaded counties show, as of 1967, the counties where less than one-half the irrigable land had been developed for irrigated crop production.

As noted earlier, there was only indirect reference to the question of water availability in the 1967 study. Until recently, there has been no concrete basis upon which expectations of the availability of water could be established.

The recent analysis by Bekure provides a much-needed rigorous look at the important question of water availability (1). The geographi-

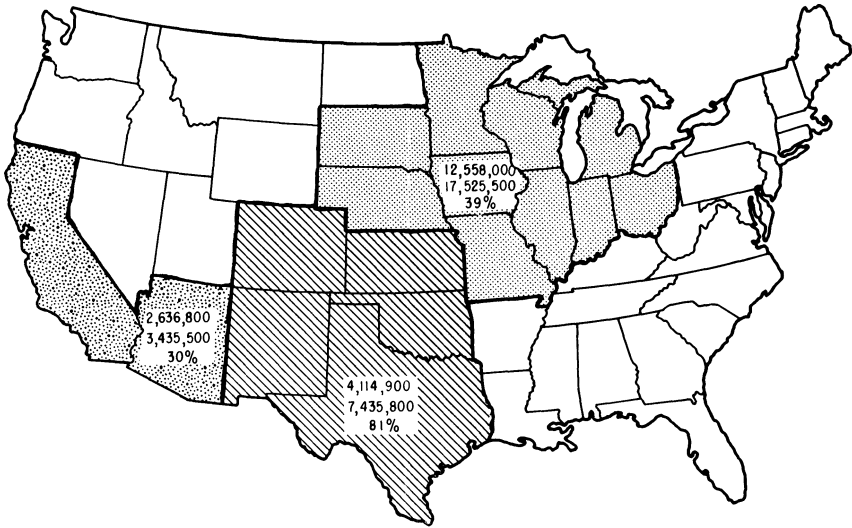


Figure 15. Commercial Cattle Slaughter by Areas, Number Head Slaughtered and Percentage Increases 1960 to 1969

Source: **Livestock and Meat Statistics**, Statistical Bulletin 333 and the Annual Supplement for 1969, Statistical Reporting Service, USDA

Legend: Top figure: Slaughter 1960
 Middle figure: Slaughter 1969
 Bottom figure: Percent increase 1960-69

cal area covered by the Bekure study is shown in Figure 17. The area is comparable to the Guymon feeding area with which this analysis has dealt. Basic conclusions drawn by Bekure provide information relevant to any investment decision in this feeding area.

The development of irrigated crop production was projected by Bekure using two different "models". One of the more significant differences between the two models was in the rate at which irrigation would be expanded. The results of the projections, in terms of those dimensions important to the analysis, might be summarized as follows:

1. Under the conditions imposed by the model dealing with the slower rate of development, (a) the annual irrigated acreage of grain sorghum was projected to double between 1965 and 2010, (b) the annual irrigated production of wheat increased by about 13.5 percent from 1965 to 1990, and (c) the annual irrigated acreage of corn would increase to 51,245 acres by the 1990's, an increase of 41 percent.

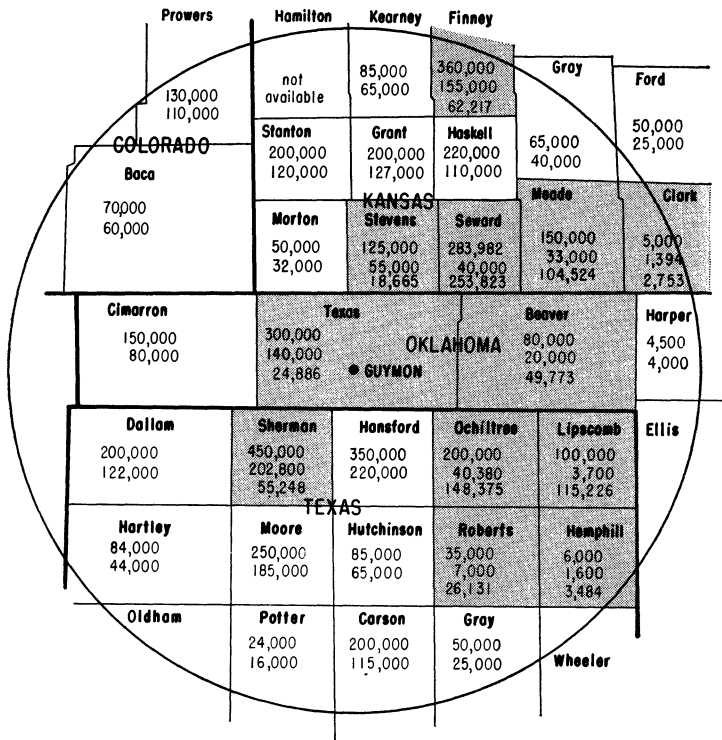


Figure 16. Acres Feasible to Irrigate, Acres Irrigated, and Added Cattle Which Could Be Fed If All Counties Realize At Least One-Half of Their Irrigation Potential, Guymon Feeding Area, 1967

Legend: Top figure: Acres feasible to irrigate
 Middle figure: Acres irrigated in 1967
 Bottom figure (if any); Added cattle which could be fed by bringing irrigation up to one-half of potential — counties are shaded

- Under the conditions of the model dealing with the faster rate of development, the annual irrigated acreages and production of grain sorghum, wheat and corn would grow to 215 percent of their 1965 level by 1990.

The rate of development is, of course, difficult to predict in exact terms. The two rates Bekure has used might be viewed as a lower and upper bound on the rate at which irrigation development will occur.

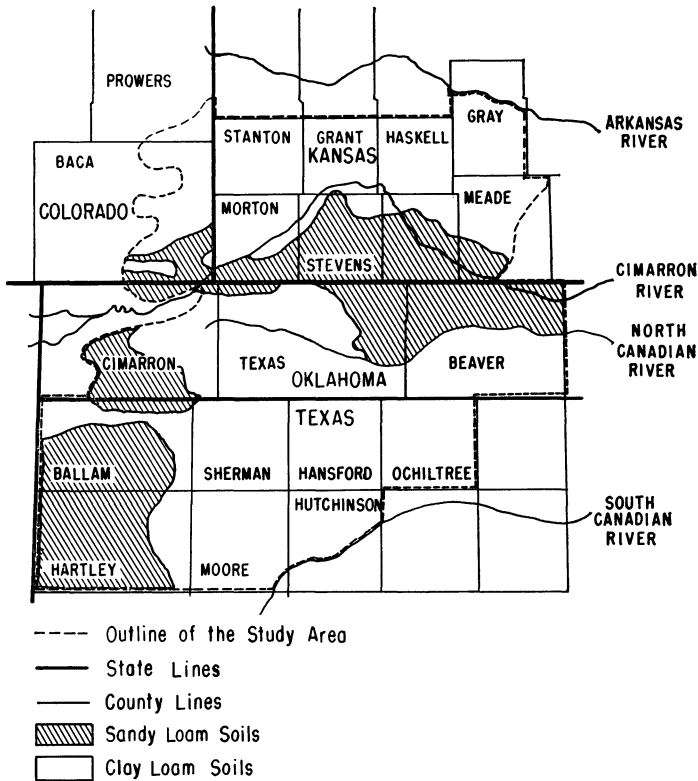


Figure 17. Study Area for the Bekure Analysis: The Central Ogallala Water Formation

In discussing the policy implications of the results, Bekure offers the following observation:

“One can conclude that if irrigation development occurs as projected by Model II, the population of the area should be concerned about uneconomic mining of ground water after 1990.”

Even assuming the most rapid rate of development and thereby depletion of the water supply, there remains a 20-year period over which the availability of water should not be a serious restraint on crop production.

The cattle feeder will be quick to realize the 20-year period will in all probability be long enough to permit the newly constructed feedlot to “pay off”. Several cautions are in order, however, before investments are made:

1. While the water supply in the Guymon feeding area will in general be adequate in the near future, this does not mean an

- individual's irrigation well is guaranteed not to go dry as the underground water level is gradually lowered.
2. Bekure's analysis makes provision for the increased cost of pumping and applying water as the water level is lowered but this does not mean the inefficient or high-cost producer will not be caught in a cost squeeze long before 1990.
 3. The Bekure study does not apply generally throughout the Southern Plains feeding area—it is applicable to the Guymon feeding area since the study area was essentially the same as this particular feeding area.

The third and last observation above is especially important. In the older areas of concentrated feeding in the Southern Plains, the outlook in terms of the available water supply is far less encouraging. Fortunately, additional information on other areas within the larger Plains area is now available.

One of the earliest areas to develop as a cattle feeding center was the area around and to the northwest of Lubbock, Texas. In Figure 18, an area including the Texas counties of Lubbock, Hale, Lamb, Castro, Parmer and Deaf Smith is outlined. These six counties marketed 977,000 fed cattle in 1969. Feedlot capacity as of January 1, 1969 totaled 772,000

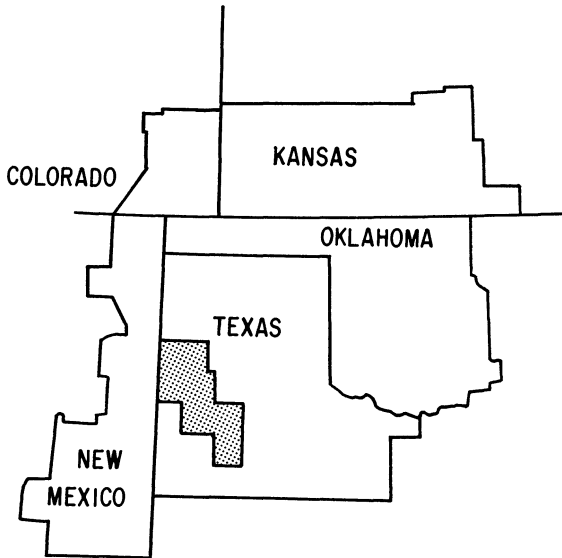


Figure 18. The "Lubbock Feeding Area" of Texas: Lubbock, Hale, Lamb, Castro, Parmer and Deaf Smith Counties

(one-time capacity). In this area, water availability is likely to be a problem in the near future.

A study released in December of 1969 projects the production of feed grain in the area encompassing the six counties mentioned above (7). In the region as a whole, production of grain sorghum is projected to drop from an estimated base of 131,576 cwt. in 1966 to 34,469 cwt. in 1990. Due to differences in soil type and related physical soil properties, the drop is expected to be even more dramatic in a sub-region which includes much of Hale and parts of Lamb and Castro counties—from 38,052 cwt. in 1966 to 5,575 cwt. in 1990. In every case, the decrease was projected to originate by 1970.

Just what the total impact of developments in water availability will be and when such developments will have their maximum impact is difficult to predict. It does not appear the outlook has seriously curtailed feedlot development in the area referred to above. Table 2 records total marketings and one-time capacity in lots larger than 1,000 head for 1968 and 1969. Also shown, by comparing the number of existing lots in 1968 and 1969, is the number of new feedlots constructed between January 1, 1969 and January 1, 1970.

An Overall Generalization — The situation relative to water availability is not the same throughout the Southern Plains. Of the two areas considered, the outlook over the next 20 years is much more favorable for the Guymon area than for the “Lubbock area”. The current expansion in Lubbock county and the counties to the north and west will be restrained, it would appear, in the near future by water limitations. In terms of impact on the Southern Plains as a whole, we will see the following develop during the 1970’s:

1. The rate of growth in the area will decrease, at least partially due to water availability, and the overall level of feeding will tend to reach a plateau and begin leveling off; and

Table 2. Marketings of Fed Cattle, Capacity, and Number of Lots 1968 and 1969, Selected Counties in Texas

County	Total Marketings (head)		Capacity (head)		No. Lots	
	1968	1969	1968	1969	1968	1969
Castro	77,000	124,000	50,000	109,000	6	8
Deaf Smith	255,000	387,000	173,000	264,000	10	12
Hale	66,000	81,000	41,000	87,000	6	8
Parmer	110,000	226,000	108,000	195,000	7	10
Lamb	53,000	60,000	24,000	52,000	4	5
Lubbock	117,000	99,000	64,000	65,000	8	8

Source: *Texas Livestock Statistics*, Texas Dept. of Agriculture and USDA

2. There will be both relocation of current facilities within the Plains area and a tendency for any new development to come in those sectors which can still offer potential in terms of feed grain production and the water needed for irrigation.

Financing of Feeding Operations

During 1969 and the first part of 1970, there has emerged concern over the adequacy of available financing for cattle feeding operations in the Southern Plains. Some feel this will be the first factor to become a restraint on continued development. Unfortunately, there is little concrete evidence available upon which any analysis can be completed.

New lots *are* being built throughout the Plains area. Table 2 gave information on the expansion in a six-county area in Texas where water shortages may be felt first. Such new investment in fixed facilities tends to offset any arguments suggesting investment capital is not available—the financing is being made available.

Undoubtedly, much of the recent concern springs from the operating levels of many of the Plains feedlots during the first two quarters of 1970. There have been reports—verified and valid reports—of lots operating far under capacity. This does not necessarily mean, however, that adequate operating capital was not available. The high interest rates and the large negative margins (fed cattle prices minus feeder cattle prices) apparently prompted many feeders to drop back on their operating levels. As feeder cattle prices drop relative to fed cattle prices late in 1970, the lots are beginning to “fill” again and approach capacity levels.

This is not meant to imply that financing a cattle feeding operation is easy. The capital requirements are large—around \$40-50 per head for the initial investment and another \$10 per head in feed inventories and other operating needs. Doll arrives at a total capital investment of \$3 million for a lot with capacity of 10,000 head, using the \$40 and \$10 figures mentioned and an average “worth” of \$250 per head for each animal in the lot (6). As he notes, the magnitude of the credit needs does present a problem. Local lending agencies are seldom large enough to handle credit needs for the larger feedlot. Consequently, the feeder must use several sources—including commercial banks, Federal Land Banks, production credit associations (PCA's) or individuals. Commercial banks provide a high percentage of the needed credit. Dietrich, in a 1967 survey, found commercial banks provide over 60 percent of the investment capital and over 80 percent of the operating capital for the large feedlots in Texas. In Oklahoma, the PCA's handled more of the load but the commercial banks still provided roughly one-half the total capital needs of the large lots (5).

The limited evidence available suggests that while securing financing is not always easy, the feeders in the Southern Plains are succeeding in securing financial support. Some, as Doll notes, have “gone public” (sold stock to the public). Local commercial banks have relied on loans from correspondent banks in the metropolitan areas when credit demands exceed legal lending limits of the smaller local banks. Overall, one would predict that adequate financing will be available so long as the rate of return on the investment is favorable. Other constraints, such as feed grain availability and water shortages, appear to be more important in the near future. If limits are reached, then the costs of operating will rise, the rate of return on investments will be less favorable, and financial support become increasingly difficult to get.

A Word on Demand

Feed grains, feeder cattle, irrigation water and slaughtering facilities provide the necessary conditions for production but in no way guarantee increased production or feeding will be economically feasible. In the final analysis, there must be sufficient demand if any increased production is to be moved without substantial reductions in price.

Figure 19 suggests the demand situation has been *very* favorable—especially in the latter part of the 1960’s. Since 1965, per capita con-

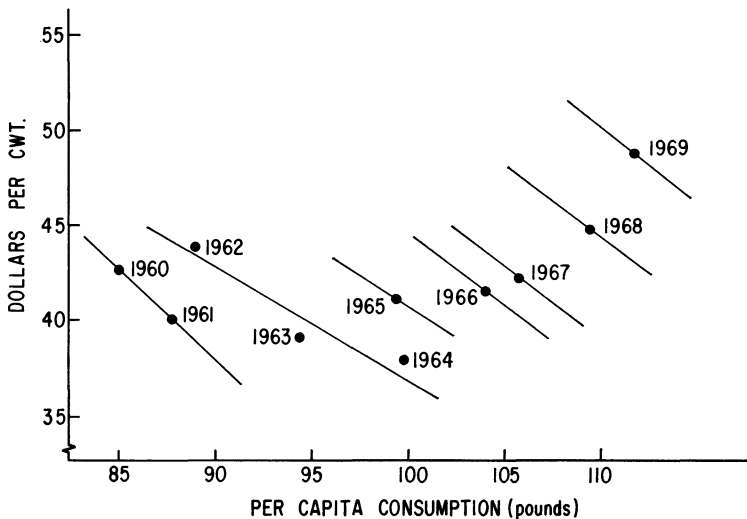


Figure 19. Relationship Between Wholesale Prices for Choice Beef Carcasses and Per Capita Consumption of Beef, 1960-69

sumption of beef has increased steadily *at rising prices*. This is a rather unusual economic relationship and has not been seen in the beef industry since World War II. The only reasonable explanation for such a relationship is that demand for beef is increasing each year, meaning each price-consumption point during 1965-69 is on a different demand curve. Deflating the price data using the Wholesale Price Index reduces the magnitude of the increases since 1965 but does not eliminate the positive relationship between price and consumption.

A highly positive relationship between income and expenditures on beef, coupled with a general preference for beef relative to other meats, is generally considered to be the causal factors behind the increases in demand. Whatever the causal factors, the demand situation is important in considering the outlook for any cattle feeding area.

National and Regional Growth Patterns

With a strong boost from an expanding demand, the number of fed cattle marketed has increased rapidly throughout the 1960's. Figure 20 traces the growth pattern for national fed marketings and for each of the "feeding areas," identified earlier, since 1960.

Close examination of the relationships presented in Figure 20 suggests the following observations:

1. The growth in fed marketings at the national level has been remarkably stable and consistent throughout the 1960's;
2. The *rate* of increase in fed marketings in the Southern Plains has increased since 1966;
3. The increase in fed marketings in the Southern Plains in 1969 over 1968 was roughly equal the nationwide increase over 1968 (1,521,000 head); and
4. The level of fed marketings declined in the Corn Belt states in 1969.

Growth in fed marketings in the Southern Plains, then, accounted for all the national growth in 1969. Such growth in the Southern Plains can be sustained only if other feeding areas fail to increase feeding levels or actually experience decreases. Further examination of the likelihood of such developments is needed to better establish the outlook for the Southern Plains area.

First and foremost, the 1969 decline in feeding in the Corn Belt states appears to be a temporary development. The first quarter of 1970 saw both marketings and placements running at about the same levels as for 1969. During the second quarter, however, placements in the key Corn Belt states of Iowa, Nebraska, and Minnesota were up relative to 1969—and up more than the national average. And the pattern appears

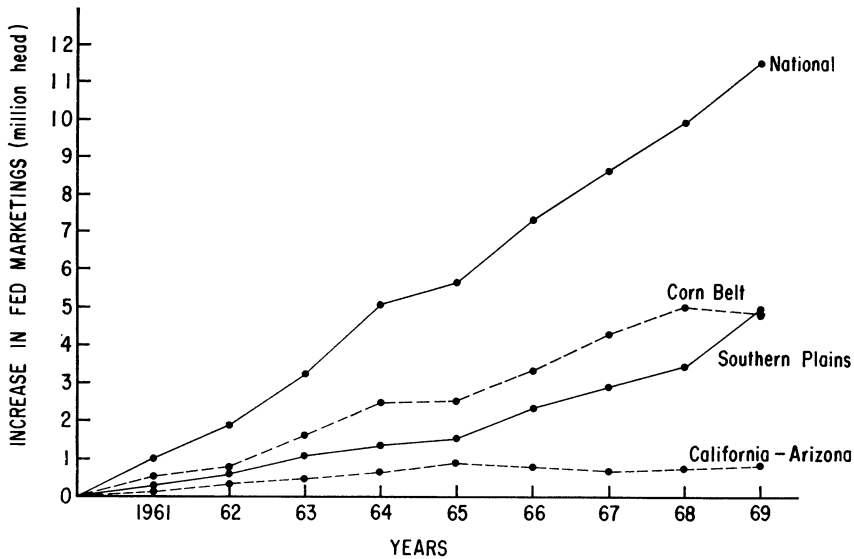


Figure 20. Increase Over 1960 in Fed Cattle Marketings: National, Corn Belt Feeding Area, Southern Plains Feeding Area and the California-Arizona Feeding Area

to be holding: placements in Iowa and Nebraska were up 113 and 89 percent respectively during July, up 11 and 36 percent respectively during August relative to the same months in 1969.

Just the opposite seems to be developing in the Southern Plains: by mid-year in 1970, both fed cattle marketings and placements were slowing from the hectic pace of 1969. Even Texas, the state where growth has been most rapid, is experiencing some "cooling"—placements during August, for example, were down seven percent in August relative to August 1969.

In trying to summarize the growth developments and place the interregional developments in perspective, the following observations appear to be in order:

1. The level of feeding in the California-Arizona area is likely to remain relatively stable at about 2.75 to 3 million head;
2. The Corn Belt states will likely continue to expand feeding operations at an average of around .75 to .9 million head per year; and
3. The Southern Plains feeding area will experience a slowing of the rate of growth in feeding activities relative to the growth which occurred in 1969. Growth in fed marketings nationally is

likely to average around 1.5 million head in the early 1970's. If this estimated annual growth is to be shared by the Corn Belt and the Southern Plains, an increase of .6 to .75 million head per year is likely to be realized in the Southern Plains. If increases beyond this level are to be sustained, they will necessarily come as the result of relative decreases in feeding activity in other feeding areas. As limits on feed grain availability are approached and projected water shortages realized, it will prove increasingly difficult for the Southern Plains area to exert the competitive pressure which will be required to restrain growth of feeding activity in the Corn Belt or other feeding areas.

Summary and Conclusions

The question of where growth in a production activity is likely to occur is never easy to answer. The location of cattle feeding activities is no exception. Though the overall pattern of developments is complex, there are certain factors of key importance in determining the inter-regional patterns of growth.

Perhaps the most important factor is the availability of feed grains. Cattle feeding activity grew at a phenomenal rate in the Southern Plains feeding area during the 1960's, this growth being prompted by a surplus of relatively low-cost feed grain. Grain sorghum production increased in the area and fed cattle marketings grew from a five-state total (Texas, Oklahoma, Kansas, New Mexico and Colorado) of 2.064 million head in 1960 to 7.010 million head in 1969.

Periodic analyses have checked the continued growth potential in the Plains area. Focusing on one of the centers of feeding activity encompassed by a circle of 100 miles in radius and centered in Guymon, Oklahoma a 1967 analysis by the author revealed surplus supplies of feed grains in the area. By projecting irrigation development, the potential supplies of feed grains were even more favorable to continued expansion of feeding activity—the number of cattle being fed in 1967 could have been doubled without feed grain shortages. But the situation had changed by 1969; this analysis reveals much of the potential which existed in 1967 has now been exploited. Based on 1969 production figures, there was surplus grain in the Guymon area to feed another .5 million head, far less than the 1.14 million head in 1967. The projected growth possibilities from 1967 have been achieved—fed cattle marketings in the "Guymon area" totaled an estimated 2.288 million head in 1969, up from 1.251 million head in 1967. The growth in feeding facilities is overtaking the growth in feed grain production in the area.

A second important factor is that of feeder cattle cost and availability. The Southern Plains area is located in proximity to the major sources of feeder cattle. Texas and Oklahoma ranked first and second respectively in beef cow numbers as of January 1, 1970. The availability of Texas or Oklahoma produced cattle for the Southern Plains feedlot is complicated, however, by a complex pattern of interstate and inter-regional movements of feeder cattle. Many of the Texas and Oklahoma produced cattle move to the Corn Belt for feeding. At the same time, the Southern Plains feeder brings in feeder cattle from the southeastern states. The movements are based partly on tradition and are partly economically motivated. The Corn Belt feeder prefers, generally, the "straight line" cattle from breed-oriented producers in the Plains states. Conversely, the Southern Plains feeder likes the cross or mixed breeds from the southeastern states, many of which offer—the feeders believe—favorable growth and gain potential. And to this date, the cost of cattle from the southeastern states has generally been lower.

The interstate movement patterns are changing. As the Southern Plains continues to increase in number of cattle fed, the Plains feeder will increasingly turn to Texas, Oklahoma, Kansas and the adjoining areas as sources of feeder cattle. Competition for the cattle from the southeastern states will become more intense, thus strengthening the tendency to feed more locally produced feeder cattle. Though some of the cost advantage the Plains feeder has realized by going to the southeastern states as a source will be eliminated, the Southern Plains will have a location advantage in terms of feeder cattle availability.

A third factor, markets for fed beef, presents no restraints on growth in the Southern Plains area. Slaughtering facilities are moving to the areas of concentrated production and shipping out dressed beef, primal cuts, or retail-ready packages of beef. A number of interregional competition studies support the ability of the Plains-located packer to compete in markets across the country. These packers are expected to dominate the rapidly growing Gulf Coast market stretching from Florida to Texas.

Still a fourth factor, the available water supply for irrigated feed grain production, looms important on the horizon. Currently available research indicates the Guymon feeding area will not experience major problems within the next 20 years. Other areas in the Southern Plains region do not have so favorable an outlook. A six-county area including and to the northwest of Lubbock County, Texas was examined in this analysis. These six counties marketed almost one million head (977,000) of fed cattle in 1969. Recent research projects a marked drop in feed grain production in these and the surrounding counties during the

1970's as water supplies for irrigation purposes are depleted. Water shortages will, therefore, become a restraint on continued development of feeding in certain areas of the Southern Plains within the next few years.

The impact of financial considerations as a factor affecting growth in the Southern Plains area is difficult to pinpoint. While scattered feedback from the feeding area suggests financing is becoming a restraining factor, there is little evidence to support this position. Growth *is* occurring and new feedlots *are* being financed and constructed. Fed cattle marketings jumped more in 1969 than for any previous year. Financial requirements are large, especially production capital, but to this point adequate capital has been made available. While high interest rates are likely to temporarily postpone investment decisions and localized inadequacies in financing will develop, this does not appear to be among the more serious restraints on future growth of feeding in the area.

In brief terms, the conclusion which can be drawn from this analysis and which have relevance to the future outlook for the Southern Plains feeding area are as follows:

1. The level of feeding in the Southern Plains is approaching a point at which the availability of locally produced feed grains will become a restraining force on further growth in feeding. Bidding up of feed grain prices can reasonably be anticipated and new or recently constructed feedlots can anticipate some difficulty in securing adequate supplies of feed grains at costs which will allow them to compete. The amount of unused capacity in the Plains area is likely to increase.
2. Physical proximity to the heart of the feeder cattle producing areas of the country will become increasingly valuable to the Southern Plains feeder. Increased competition for feeder cattle will eliminate the opportunity to bring in lower cost cattle from the southeastern states and force the feeding of more Texas, Oklahoma and Kansas produced feeder cattle. Shipments of cattle from the Plains states to the Corn Belt for feeding will continue to decrease.
3. Adequate markets for fed cattle will continue to prevail in the Plains feeding area. The movement of slaughtering and processing facilities into the area will continue so long as feeding levels expand and this market area will increase in importance relative to other market areas for live cattle.
4. The availability of water for irrigation purposes is beginning to exert significant controls on the rate of development in the Plains area. In the 1970's, the influence will be felt in the form

of shifts in the location of new feedlots within the area and the possible relocation of existing lots. The overall rate of growth in the entire area will slow down as the related issues of water availability and feed grain production results in smaller supplies and/or higher prices of feed grain.

5. Other factors, such as water and feed grains, will prove to be more restrictive influences on the rate of growth in the area than will financial considerations. Though periodic "squeezes" on available finances will develop, any problems will not have a great deal of impact on growth and development of feeding activities in the area over time.

The message for potential investors in the Southern Plains feeding area is relatively clear. The period during which investment decisions could be made by relying on the rapid growth in the area to "make the operation go" is past. Future growth will be at a more restrained level and will be limited by the national level of growth which in turn must be shared with the older feeding areas, especially the Corn Belt. Even if the currently favorable trends in demand for beef continue, the Plains feeder can look forward to narrower margins as feed grain surpluses disappear and the competition for both feed grains and feeder cattle become keener.

References Cited

1. Bekure, Solomon, *An Economic Analysis of the Intertemporal Allocation of Ground Water in the Central Ogallala Formation*, Unpublished Ph.D. Dissertation, Oklahoma State University, May, 1971.
2. Brethour, J. R., *Feeding Wheat to Cattle*, Bulletin 487, Kansas Agricultural Experiment Station, February 1966.
3. Brokken, Ray F. and Earl O. Heady, *Interregional Adjustments in Crop and Livestock Production: A Linear Programming Analysis*, Technical Bulletin 1396, Iowa Agricultural Experiment Station and ERS, USDA, July 1968.
4. Crom, Richard J., *Simulated Interregional Models of the Live-stock-Meat Economy*, Agricultural Economics Report No. 117, ERS, USDA, June 1967.
5. Dietrich, Raymond A., *The Texas-Oklahoma Cattle Feeding Industry: Structure and Operational Characteristics*, Texas Agricultural Experiment Station in Cooperation with USDA, December 1968.

6. Doll, Raymond J., *Cattle Feeding in the Tenth District: Financing*, Monthly Review, Federal Reserve Bank of Kansas City, July-August 1970.
7. Hughes, William F. and Wyatte L. Harman, *Projected Economic Life of Water Resources, Subdivision Number 1 High Plains Underground Water Reservoir*, Technical Monograph 6, Texas Agricultural Experiment Station, December 1969.
8. Purcell, Wayne D., "Are We Overdoing It?", Paper presented at the Oklahoma Cattle Feeders Seminar, Stillwater, February 6-7, 1969.
9. Willams, Willard F. and John W. Malone, *Interregional Competition in Fed Beef: Tentative Spatial Equilibrium Solutions with Implications for the Oklahoma Beef Industry*, Processed Series P-473, Oklahoma Agricultural Experiment Station, 1964.