November 1, 1967

To the Graduate Council:

I am submitting herewith a thesis written by George Ira Sellers entitled "Effects of Selected Variables on Prices Received for Calves in the Brownsville Demonstrational Feeder Calf Sales." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Husbandry.

Haley M. Jamison
Major Professor

We have read this thesis and recommend its acceptance:

Harold J. Smith

Robert R. Shrode

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EFFECTS OF SELECTED VARIABLES ON PRICES RECEIVED FOR CALVES IN THE BROWNSVILLE DEMONSTRATIONAL FEEDER CALF SALES

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

by

George Ira Sellers

December 1967

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CRANES CREST

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CHAPTER I

INTRODUCTION

The feeder calf sales in Brownsville, Tennessee, have established themselves as an important part of the livestock enterprise in the southwestern part of Tennessee. These sales were developed in response to the needs of farmers with small herds of cows, generally from 20 to 30 head, to offer attractive lots of feeder calves in large enough groups to attract buyers and successfully compete with the larger producers of the West. Farm income from feeder calves sold in the fall sales has risen from $33,308 in 1955 to $529,858 in 1965. During this 11-year period the number of calves sold increased from 389 in 1955 to 5,011 calves in 1965. The number of fall sales increased from one sale in 1955 to five sales in 1965.

While only a small per cent of the calves produced in this area are sold through the Brownsville sale each fall, county agents and others close to and familiar with the situation estimate that more than 25 per cent of the feeder calves marketed in the area each year are sold on the basis of prices established at these sales.

Since the beginning of the sales, no organized statistical analysis has been made of the effects of various factors on the price of feeder calves sold in the sales. The objective of this study was to evaluate the effects of grade, sex, breed, pen size (number of calves per pen), and pen weight (average) on the price per hundredweight of

feeder calves sold from October, 1955 through 1965.

It is hoped that conclusions drawn from this study will be helpful to breeders and feeders in planning their respective beef production programs and that this study will contribute some ideas which will be useful in improving the Brownsville and other existing feeder calf sales.

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CHAPTER II

REVIEW OF LITERATURE

A few states in the East and Southeast have held demonstration or special feeder calf sales for a number of years. The first recorded feeder calf sale in the East was held in West Virginia in 1931. Tennessee held its first sale at Shouns in 1935, and Virginia held one at Tazewell in 1938. However, most of the expansion of sales within these states did not take place until after 1945, and most of the development of the feeder calf sales in other states has occurred since 1950. The Shouns sale is now held in Johnson City. With the assistance of a marketing specialist from the University of Tennessee, farmers in the Johnson City area in 1953 reorganized the cattlemen's organization known as the Mountain Breeders Association and established it as a cooperative, according to Randell and Wheeler (1955).

There were no additional sales organized until 1952 when sales were started at Morristown and Crossville. In 1953 Cookeville and Nashville started sales, making a total of five sales. In 1954 Rogersville was added and in 1955 Brownsville also was added to the locations holding demonstrational feeder calf sales. At the present the University of Tennessee Agricultural Extension Service, the Tennessee Department of Agriculture, and area feeder calf associations are cooperating in promoting and conducting the sales, as reported by Randell and Wheeler (1955).

Studies dealing with the effects of selected variables on the prices of feeder calves are relatively few, because this method of selling feeder calves has attained its present popularity only in recent years. Much of the information available has been written on the factors which tend to determine the general price level for which feeder calves and feeder cattle sell. Purcell (1956) presented a comparative analysis of cattle prices on Georgia auction markets and the Mid-West terminal markets of Chicago and Kansas City. Brensike (1952), Kristjanson (1949), Nervik (1951), Newberg (1959), and Willis and Ashby (1950) reported on the various ways in which feeder cattle have been marketed in nine North-Central States.

Moore, Wilson, and Riley (1953) reported that Kansas farmers consider the following factors to be the most important when deciding from which market or source they will buy feeder cattle: (1) a conveniently located market, (2) availability of feeder cattle at the market, (3) a variety of feeder cattle from which to choose, (4) custom, (5) small lot transactions, and (6) friendship.

Mitchell (1941) and Robertson and Mitchell (1940) stated that the prices which feeder cattle command are affected by many factors including: (1) the general price level of feeder cattle, (2) grazing conditions in the range country, (3) the position of the cattle cycle, (4) anticipated fat cattle prices for the near future, (5) size of feed crop in the corn belt, and (6) recent profits from cattle feeding operations.

Riley (1952) reported that the average annual price of "good" stocker steers at Kansas City was more closely related to the average

annual price of "medium" slaughter steers at the market than the feed supply per animal unit in the United States, using the August-July crop year basis. However, when other factors were held constant, the feed supply per animal unit was a highly significant factor in explaining the average annual price of good stocker steers at Kansas City.

Cox, Eisenach, and Mitchell (1953) reported that the highest prices for stocker and feeder steers occur in April, May, and June, while the lowest prices occur during the late fall and early winter months of October, November, December, and January. Nervik (1951) reported that prices are generally higher during the spring than in the fall, but the gains made during the summer months ordinarily more than offset the seasonal decline in price in the spring.

St. Clergy, Goodwin, and Woodin (1956) reported that groups outsold the singles, grade for grade, at the Delhi, Louisiana, feeder calf sale held in November, 1956. "Choice" animals sold in groups averaged $16.87 per hundredweight, compared with $15.48 for those sold singly. Similar results were reported for the other grades. The price advantage of groups was more evident for steer calves than for heifers. Those findings generally agreed with the results of other feeder calf sales in Louisiana.

Based on records of 21 Virginia feeder calf sales held annually from 1951 through 1956, Williamson (1958) reported that prices of steer calves increased consistently and significantly as the size of sale increased. The average difference in price attributed to size of sale amounted to 36 cents per hundredweight for each increase of 200 head.

The size of sale did not have a consistent or statistically significant effect on the average price of heifer calves. Badenhop (1956) reported that the effect of size of market on the price of slaughter cattle is not clearly evident except that it suggests a higher price at the larger markets for most classes of cattle and calves.

In studying the effects of breed on the prices received for feeder calves, Walker (1961) found that there was no significant difference in average price between Hereford and Angus steer calves even though Angus steers averaged 20 cents per hundredweight more than Herefords. However, he found that Angus heifers averaged $1.06 per hundredweight more than Hereford heifer calves. Williamson (1958) found that steer calves of Angus breeding averaged 16 cents per hundredweight less than Herefords. Angus heifers averaged 39 cents per hundredweight more than Hereford heifers, and Shorthorn heifers 16 cents per hundredweight less than Herefords. Straight-bred calves sold significantly higher per hundredweight than crossbred. The average difference was $2.03 and $1.77 per hundredweight for steers and heifers, respectively.

Harper (1957), reporting on the feeder calf sale at Eunice, Louisiana, noted that there was a wide variation between the high and low price received per hundredweight for calves within the same grade. For steers, the difference amounted to $9.00 per hundredweight for choice grade, $10.70 for good grade, and $12.50 per hundredweight for the medium grade. For heifers this difference amounted to only $5.90, $8.60, and $6.10 per hundredweight for the choice, good, and medium grades, respectively. However, the average price received was closely related

to the grade level. Choice calves averaged $22.00; good, $20.53; and medium, $18.73. Walker (1961) found that steer calves that graded choice averaged $1.58 per hundredweight more than those that graded good, while steers that graded medium averaged $1.91 per hundredweight less than steers in the good grade. The price advantage of grade was more evident for heifers than for steer calves. Choice heifers averaged $1.79 more than those grading good, and medium heifers averaged $1.97 per hundredweight less than those in the good grade. In contrast to steers, the difference in price per hundredweight between the good and choice grades was somewhat more, indicating that possibly some choice heifers were bought for breeding purposes.

Williamson (1958) reported that fancy and choice grade steer calves averaged $2.11 per hundredweight more than good grade steers, and medium grade steers averaged $2.45 lower than those grading good. The corresponding difference for fancy, choice, and medium heifers was $1.45 above and $1.44 below those heifers grading good.

Cox, Eisenach, and Mitchell (1953) reported that during the 12-year period 1938 to 1950, the average price of choice steers weighing 500-800 pounds varied from 6 to 12 per cent above the price of good grade 500-800-pound feeder steers.

Riley (1952), in a comparison of prices of feeder cattle with prices of slaughter cattle by correlation analysis, suggested that in all cases there appears to be a closer relationship between prices for feeder cattle and the approximate slaughter grade for which these same cattle might qualify than there was between prices for the corresponding

feeder and slaughter grades. Badenhop (1956) reported that the effect of grade on price is significant for all classes of slaughter cattle and calves. For steers and heifers, the price differential between grades averaged $1.65 per hundredweight and ranged from a low of 10 cents to a high of $3.25. In general, price increased with grade but not in the same proportion, suggesting that animals in the higher grades did not sell for as much as might be expected.

Walker (1961) reported that steer calves in the 301- to 350-pound classification averaged more and the 651- to 700-pound classification averaged less in price per hundredweight than the other weight groups. The difference in price per hundredweight between the highest priced and lowest priced weight groups for steers was $5.55. For heifer calves the variation in price per hundredweight from the highest priced weight group to the lowest priced weight group was considerably less than in the steers. The 301- to 350-pound weight classification was highest in price per hundredweight as in the steers, and brought $3.65 more than the 601- to 650-pound weight group, which was the lowest priced lot.

Williamson (1958) reported that steer calves weighing from 401 to 500 pounds sold for significantly higher prices than those heavier or lighter. The 300- to 400-pound lots averaged 21 cents per hundredweight less than the 401- to 500-pound group, and those weighing 501 to 600 pounds and 601 to 700 pounds sold for 50 cents and $1.30 less than the 401- to 500-pound weight classification, respectively. In heifers the same trend was noted as with the steer calves but without statistical significance. Cox, Eisenach, and Mitchell (1953) reported that lighter

steers tend to be more expensive than the heavier animals.

According to Walker (1961), there is a definite price advantage for selling steer calves in larger lots. This was not a linear trend, however. Steer calves grouped in lots of 1 to 10 head averaged less in price than any other group based on the number of animals in the lot. Animals selling in lots of 81 or more head averaged higher in price than those selling in smaller lots and sold for $1.81 more per hundredweight than those in lots of 1 to 10 head. Heifer calves in groups of 1 to 10 head averaged lower in price per hundredweight. Those in the 51- to 60-head groups were highest and sold for $1.57 per hundredweight more than the lowest priced group. The difference in price between heifers sold in the 1- to 10-head groups and those sold in the 51- to 60-head groups approached significance at the 5 per cent level.

Williamson (1958) reported that a definite price advantage was shown for selling steer calves in larger lots, and there was an indication that the average price of heifers increased as the size of sale lot increased. Harper (1957) reported that a higher price was received for each grade of both steer and heifer calves when sold in groups than when sold singly.

Harper (1957) reported that, grade for grade, steers averaged higher in price than heifers. The average price received for steers, all grades, was $20.85 per hundredweight and $17.81 for heifers.

CHAPTER III

EXPERIMENTAL PROCEDURE

I. SOURCE OF DATA

Records were available from the Brownsville, Tennessee, Feeder Calf Sale as far back as the first sale which was held in 1955. The years 1955 through 1965 were chosen for this study. The location of this sale and the area that it serves is shown in Figure 1. They have held feeder calf sales in the spring as well as in the fall, and held yearling sales also in 2 years, but only the feeder calf sales in the fall were selected for this analysis. A total of 1,049 pens of calves of varying size, weight, and grade were usable in the study to determine the effects of different variables including grade, sex, breed, number of calves per pen (pen size), and average weight of pen (pen weight) on the price of feeder calves in the Brownsville, Tennessee, sales. The analysis was done on a "within-year" basis. Information was taken directly from the sales summary sheets and punched on IBM cards for processing.

II. RULES AND REGULATIONS OF THE BROWNSVILLE FEEDER CALF SALES

The following regulations and procedures are applicable to all sales that are held:

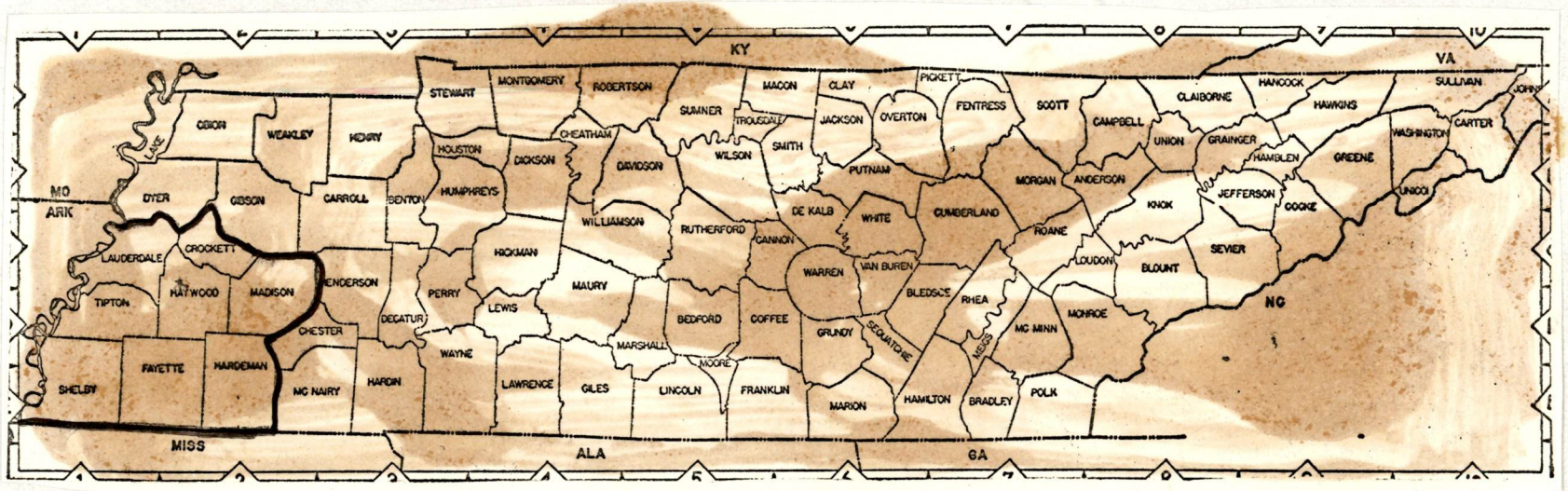

Figure 1. Location of Brownsville, Tennessee, Feeder Calf Sale and area served.

1. All calves must be out of good beef type cows (may be either grade or purebred). Calves will not be accepted which are out of cows having any dairy blood as well as those with a questionable background.

2. All calves must be sired by a registered beef bull.

3. All calves must be inoculated against blackleg, malignant edema, and hemorrhagic septicemia.

4. The minimum weight of the calves consigned must be 300 pounds at sale time, and the maximum weight must not be over 700 pounds at sale time. The maximum weight for heifers at sale time is 600 pounds.

5. Calves should be born between October 1st and May 1st.

6. All bull calves must be castrated by knife.

7. All calves must be dehorned.

8. Only members of their respective county livestock associations will be allowed to sell calves in these sales.

9. Consignors must agree to put Tennessee Feeder Calf Tag in the ear of each calf he sells through association sales. These tags will be furnished each consignor. This is necessary to keep up with original owners of the calves, especially heifers, since Bang's vaccination is not required or advised.

10. A fee of $1.00 will be deducted from your check on each calf processed through the sale. This covers cost of advertising and promoting of the sales.

11. Any farmer that sells his calves before the sale, after consigning his calves, will not be allowed to sell his calves in the following sales, until the Board of Directors of the Brownsville Feeder

Calf Association passes on and approves such.

12. All farmers that consign calves to the feeder calf sales will guarantee his heifers open up to 600 pounds. Any farmer that sells a bred heifer in the feeder calf sale will refund to the first purchaser 20 per cent of the first purchaser's original cost.

III. CONSIGNMENT PROCEDURE

When the feeder calf producer decides to sell his calves through the Brownsville Feeder Calf Sale, he must give the number of calves along with the sex and breed to the local County Agricultural Extension Office at least 1 month in advance of the sale. The agent makes a county report to the Association Secretary at a specified time.

IV. INSPECTION OF CALVES

Each consignment of calves is inspected on the farm several days prior to the sale by a committee, usually made up of the County Agricultural Extension Agent and a member of the Board of Directors of the Brownsville Feeder Calf Association. They are again inspected before or immediately after unloading at the sale. As the calves are inspected on the farm, the inspector checks for any indication of dairy breeding in both the calves and their dams, or any other condition or abnormality in the calves consigned to the sale that would prevent them from being accepted at the sale. At the second inspection, the committee at the sale barn checks for sickness and other conditions or abnormalities that may have been overlooked on the farm or may have developed since the farm inspection.

V. BREEDS

During the first few years, there was only one fall sale, and all breeds and crossbreds were sold in the same sale. In 1965 there were five fall sales, dividing the Angus steers in two sales, with one sale each for Angus heifers, Hereford steers, and Hereford heifers. In order to determine the effect of breed on the prices paid for feeder calves, the animals were classified by breed according to the typical color markings of the breeds. It is likely that some of those classified as straightbreed (Angus or Hereford) may not have been entirely free of crossbreeding. White-face-blacks were penned and sold separately at Angus sales.

VI. GRADES AND GRADING OF CALVES

The calves are brought into the sale in the morning of the sale and a hip tag is attached to each calf with a special cement before the calves are unloaded. These hip tag numbers are recorded on a receiving slip with the producer's name and address on it. Before the calves reach the scales, a grader from the State Department of Agriculture marks each calf with its proper feeder grade. The calves are graded and classified as choice, good, or medium in the sales. Consequently, the same grade classifications were used in this study. Animals grading below medium are classified as "odd lots" and are not accepted at the sales.

VII. WEIGHING OF CALVES

As each calf is weighed there is an individual weight ticket made out which records the breed, sex, grade, weight, hip tag number, and pen number. The minimum and maximum weight limitations for graded lots, were 300 and 700 pounds, respectively. In all of the sales the calves were allotted on a 50-pound weight interval. For the purpose of this study, the 50-pound weight intervals were used, and the calves were classified in the following groups: 301-350 pounds, 351-400 pounds, 401-450 pounds, 451-500 pounds, 501-550 pounds, 551-600 pounds, 601-650 pounds, and 651-700 pounds. The only exception to this weight classification is that heifers cannot weigh more than 600 pounds.

VIII. PENNING OF CALVES

As each calf comes off the scales, it is penned according to sex, grade, breed, and weight classification. The number of calves penned and sold in a particular lot at a sale is determined by the number of calves of a certain breed, sex, grade, and weight delivered to the sale. Occasionally, an attempt is made to pen them into predetermined size groups, such as semi-trailer lots.

IX. SELLING OF CALVES

The sale order is determined by the association officers with the help of employees of the State Department of Agriculture and Agricultural Extension Service Animal Husbandry Department. However, the first few

pens sold are some of the higher grading, more uniform calves. It is believed that this tends to set a price pattern for the sale and generally helps the overall price of the sale. The pen sheets which contain all necessary information about each pen of calves is thoroughly checked before the pen is sold (Appendix). The pen sheets are arranged according to the sale order and are in the sale ring when each pen is sold. The price and buyer's name is recorded on the pen sheet and the sheet is returned to the sale office for necessary calculations and payment to consignors. All calves are sold by the pound rather than by the head.

X. CLASSIFICATION OF DATA AND METHOD OF ANALYSIS

Pen summary sheets, which included the number of calves sold, sex, breed, grade, average weight, and average selling price per hundredweight were available for all of the calves used in this study. These data were taken directly from these sheets, coded, and punched into IBM cards according to the format presented in Table I.

Since these observations were not available on each individual calf, the pen was used as the experimental unit in the analysis of these data.

Because of the disproportionate subclass frequencies, least-squares methods as described by Harvey (1960) were used in the analysis to obtain estimates of the effects of grade, sex, breed, the continuous variables of average number of head per pen and average weight per pen on the price received per hundredweight for feeder calves.

TABLE I

FORMAT USED FOR IBM CARDS

Data	Code	IBM Card Column Numbers
Location		
Brownsville	2	1
Grade		2-3
Choice	13	
Good	10	
Medium	07	
Sex		4-5
Heifer	01	
Steer	02	
Breed		6-7
Angus	01	
Hereford	02	
White-face-black	03	
Year		8-9
1955	55	
1956	56	
1957	57	
1958	58	
1959	59	
1960	60	
1961	61	
1962	62	
1963	63	
1964	64	
1965	65	

TABLE I (continued)

Data	Code	IBM Card Column Numbers
Pen number	Actual number	10-12
Pen size (no. of calves/pen)	Actual number	13-15
Pen weight (av. wt. of calves/pen)	Actual number	16-18
Prices/cwt./pen	Actual number	19-22
Total weight of pen	Actual number	23-27
Sale number		28-29
First	01	
Second	02	
Third	03	
Fourth	04	
Fifth	05	

A study of the unadjusted means indicated there were no significant interactions between the various classes of effect.

It was thought that an estimate of the year effects would be uninformative; therefore, the analysis was done on a within-year basis.

The assumed model considered appropriate for the analysis was:

$$Y_{ijkl} = \mu + g_i + s_j + b_k + b_1 n_{ijkl} + b_2 w_{ijkl} + e_{ijkl}$$

$$i = 1, 2, 3$$

$$j = 1, 2$$

$$k = 1, 2, 3.$$

When:

Y_{ijkl} = the price per hundredweight of the lth pen of the kth breed in the jth sex of the ith grade.

μ = population mean price when equal subclass number exist.

g = the effect of grade with 3 classifications

1 = choice

2 = good

3 = medium.

s = the effect of sex with 2 classifications

1 = steers

2 = heifers.

b = the effect of breed with 3 classifications

1 = Angus

2 = Hereford

3 = crossbreed.

b_1 = partial regression of Y on number of calves per pen.

b_2 = partial regression of Y on average weight of calves per pen.

e_{ijkl} = random errors.

In a preliminary analysis, the effect of the partial regression of the number of calves per pen and the average weight per pen to include the linear, quadratic, cubic effects, and all combinations thereof were included. Estimation of the quadratic and cubic effects did not improve the R^2 value of .56. Therefore, these effects were not included in the final analysis.

The least-squares estimates of means were compared to see if they were significantly different at the 5-per cent or 1-per cent levels of probability according to the procedure outlined by Duncan (1955) and modified by Kramer (1957).

CHAPTER IV

RESULTS AND DISCUSSION

The arithmetic means and standard deviations of traits studied are found in Table II. The least-squares estimates of the effects studied on the price per hundredweight are shown in Table III. The analysis of variance is presented in Table IV.

I. GRADE EFFECTS

The estimates as shown in Table III show that grade of calf has a highly significant effect ($P<.01$) on the prices received per hundredweight of feeder calves. Choice calves sold for an average of $3.27 per hundredweight more than calves of the medium grade. The choice calves also sold for an average of $1.20 per hundredweight more than the calves in the good grade. Medium calves sold for $2.07 less per hundredweight than good calves. These estimates are well within the range of the findings of Williamson (1958) who reported that choice steer calves averaged $2.11 per hundredweight more than good grade steers. Walker (1961), in a study involving Tennessee calves, reported that choice steers averaged significantly higher in price than good or medium calves.

II. SEX EFFECTS

These data indicate that sex of calf had a highly significant effect ($P<.01$) on the price received per hundredweight of feeder calves.

TABLE II

ARITHMETIC MEANS AND STANDARD DEVIATIONS OF TRAITS STUDIED

Year	Sale No.	Total Head	No. of Pens	Average Size of Pens Number	Average Wt. of Calf Pounds	Average Price Per Cwt. Dollars
Overall means		26,949	1,049	25.69 ± 0.61	481.27 ± 2.94	24.00 ± 0.07
1955	1	389	66	5.89 ± 0.73	491.36 ± 10.27	18.10 ± 0.25
1956	1	562	69	8.14 ± 0.73	502.49 ± 10.46	15.57 ± 0.15
1957	1	570	59	9.66 ± 1.22	494.11 ± 11.36	21.27 ± 0.30
1958	1	580	35	16.57 ± 2.82	508.94 ± 15.36	25.12 ± 0.52
1958	2	450	37	12.16 ± 1.74	497.37 ± 14.52	29.95 ± 0.68
1959	1	791	39	20.28 ± 2.16	476.66 ± 16.20	28.11 ± 0.38
1959	2	909	40	22.72 ± 2.18	485.05 ± 17.06	27.61 ± 0.43
1960	1	1,083	37	29.27 ± 3.56	462.72 ± 16.58	24.82 ± 0.22
1960	2	846	44	19.22 ± 2.31	461.95 ± 14.82	25.05 ± 0.45
1961	1	1,009	36	28.02 ± 3.01	502.55 ± 18.21	25.74 ± 0.37
1961	2	947	34	27.85 ± 2.80	499.70 ± 18.74	26.62 ± 0.36
1961	3	1,081	45	24.02 ± 2.60	441.20 ± 11.75	27.28 ± 0.48
1962	1	1,320	31	42.58 ± 4.79	494.74 ± 19.07	27.63 ± 0.46
1962	2	1,359	41	33.14 ± 3.39	485.85 ± 16.28	29.06 ± 0.44
1962	3	1,409	53	26.58 ± 2.96	439.45 ± 11.15	26.30 ± 0.46

TABLE II (continued)

Year	Sale No.	Total Head	No. of Pens	Average Size of Pens Number	Average Wt. of Calf Pounds	Average Price Per Cwt. Dollars
1963	1	1,065	33	32.27 ± 3.94	499.90 ± 18.95	26.04 ± 0.55
1963	2	1,336	40	33.40 ± 3.33	499.32 ± 16.20	26.33 ± 0.27
1963	3	1,630	45	36.22 ± 3.50	445.15 ± 12.55	24.36 ± 0.37
1964	1	1,105	27	40.92 ± 5.69	503.88 ± 20.20	21.96 ± 0.25
1964	2	1,807	50	36.14 ± 4.03	496.86 ± 14.25	20.91 ± 0.27
1964	3	858	22	39.00 ± 5.94	453.90 ± 15.14	18.56 ± 0.39
1964	4	874	25	34.96 ± 5.95	451.96 ± 16.36	19.48 ± 0.40
1965	1	1,240	30	41.33 ± 4.51	493.32 ± 18.11	25.04 ± 0.20
1965	2	843	31	27.19 ± 3.57	485.61 ± 19.03	24.85 ± 0.24
1965	3	925	31	29.83 ± 4.04	490.16 ± 19.06	24.25 ± 0.18
1965	4	871	22	39.59 ± 5.94	448.90 ± 16.58	21.40 ± 0.17
1965	5	1,092	27	40.44 ± 5.86	455.48 ± 16.86	21.53 ± 0.28

TABLE III

LEAST-SQUARES ESTIMATES[a] AND STANDARD ERRORS OF THE EFFECTS STUDIED

Variable	No. of Pens	Average Price Received Per Pound
Grade		
Medium	354	-1.778 ± .07[b]
Good	411	0.287 ± .08[c]
Choice	284	1.491 ± .07[d]
Sex		
Females	426	-1.320 ± .08[b]
Steers	623	1.320 ± .09[c]
Breed		
Angus	505	0.414 ± .10[b]
Hereford	487	0.018 ± .14[c]
X-bred	57	-.432 ± .13[d]
Regression of Y on:		
No. of head/pen		-.007 ± .003*
Average weight/pen		-.010 ± .001**

[a]Estimates are deviations from the overall adjusted mean when equal numbers exist per subclass. The overall arithmetic mean of average price per hundredweight was $24.00.

[b,c,d]Those estimates followed by the same letter within a column within a subclass do not differ significantly at the 0.01 level of probability.

*P<.05.

**P<.01.

TABLE IV

ANALYSIS OF VARIANCE OF PRICE RECEIVED

Source	Degrees of Freedom	Mean Squares
Grade of calf	2	812.566**
Sex of calf	1	697.461**
Breed of calf	2	21.110**
Regression of Y on:		
No. of head/pen	1	12.718*
Average wt./pen	1	806.831**
Error	1,003	

*P<.05.

**P<.01.

Steer calves on the average sold for $2.64 more per hundredweight than did heifer calves.

All choice steer calves, on the average, sold for $2.64 per hundredweight more than heifers of the same grade. As was expected, choice grade calves were higher in price per hundredweight than good grade calves, and animals that graded good sold for more than those that graded medium.

There appeared to be a greater difference per hundredweight between choice and medium heifers than between choice and medium steers. This would indicate that possibly some choice heifers were bought for breeding purposes.

These findings are in agreement with those of Walker (1961) who reported that choice grade steer calves had an average price of $1.08 per hundredweight more than good grade calves and that medium grade calves sold for $1.91 less per hundredweight than calves grading good. Williamson (1958) reported similar results.

III. BREED EFFECTS

These data indicate a significant effect ($P<.01$) among breeds. Angus calves, on the average, sold for 39 cents per hundredweight more than Hereford calves, whereas both Angus and Hereford calves sold for significantly more than crossbred calves.

These differences are similar to those reported by Walker (1961) and Williamson (1958) who reported a difference of 20 and 16 cents, respectively, per hundredweight in favor of Angus calves.

IV. NUMBER OF HEAD PER PEN

A significant ($P<.05$) negative relationship existed when price received per hundredweight was regressed on the average number of head per pen. From these data one could conclude, within the range of the average number of calves per pen represented in this study, that as pen size became larger the price received per hundredweight decreased. A possible explanation for this may be the fact that many of the high grading heifers were purchased locally as potential herd replacements and steers were purchased locally by operators of small feed lots.

V. AVERAGE WEIGHT PER PEN

The average weight per pen was a significant ($P<.01$) source of variation in this study. When the price received per hundredweight was regressed on the average weight per pen (with all other sources of variation held constant), these data indicate that as average weight per pen increased the price received per hundredweight decreased. This indicates that the buyers were willing to pay more for light-weight calves than those having heavier weights. An inspection of the arithmetic means of each sale indicates this to be true, as shown in Table II, page 22.

CHAPTER V

SUMMARY

Records of 1,049 lots of steers and heifers sold in the Brownsville Demonstrational Feeder Calf Sales held each fall from 1955 through 1965 were studied to determine the effects of breed, sex, grade, average number of calves per pen, and the average weight per pen on the prices received per hundredweight for feeder calves sold.

Choice grade calves sold for an average of $3.27 per hundredweight more than calves grading medium. The medium grade calves sold significantly lower than the calves grading good.

Steer calves sold for significantly ($P<.01$) higher prices than did heifer calves. On the average, steer calves sold for $2.64 per hundredweight higher than heifers.

Differences in prices received per hundredweight among breeds, although small, were statistically significant. Both Angus and Hereford calves sold for higher prices than did crossbred calves. Angus calves sold for 39 cents per hundredweight more than Hereford calves.

As the number of calves within a lot increased, the price received per hundredweight decreased. This relationship, in these data, was significant ($P<.05$).

When the price received per hundredweight was regressed on the average weight per pen, these data indicate that as the weight per pen increased, the price received per hundredweight decreased significantly.

LITERATURE CITED

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LITERATURE CITED

Badenhop, M. B. 1956. Marketing cattle and calves through auction markets in Tennessee. Tenn. Agr. Exp. Sta. Bul. 247.

Brensike, V. John. 1952. Marketing feeder cattle and sheep in the North Central Region. Neb. Agr. Exp. Sta Bul. 410.

Cox, C. B., E. J. Eisenach, and M. P. Mitchell. 1953. Beef cattle prices. Ind. Agr. Exp. Sta. Bul. 582.

Duncan, D. B. 1955. Multiple range and multiple F-tests. Biometrics 11:1.

Harper, Alvin C. 1957. A report on the Eunice Feeder Calf Sale. La. Agr. Exp. Sta. and Ext. Serv. DAE Circ. 216.

Harvey, Walter R. 1960. Least squares analysis of data with unequal subclass numbers. U.S.D.A. ARS-20-8.

Kramer, Clyde Young. 1957. Extension of multiple range tests to group correlated adjusted means. Biometrics 13:13.

Kristjanson, B. H. 1949. Marketing feeder cattle in North Dakota. N. D. Agr. Exp. Sta. Bul. 354.

Mitchell, M. P. 1941. Factors affecting beef cattle prices. Purdue Agr. Ext. Bul. 224.

Moore, Clarence A., C. P. Wilson, and Harold M. Riley. 1953. Marketing feeder cattle and calves in Kansas. Kan. Agr. Exp. Sta. Bul. 361.

Nervik, Ottar. 1951. Marketing South Dakota feeder cattle. S. D. Agr. Exp. Sta. Bul. 409.

Newberg, R. R. 1959. Livestock marketing in the North Central Region. Ohio Agr. Exp. Sta. Res. Bul. 846.

Purcell, J. C. 1956. Comparative analysis of cattle prices on Georgia auctions and Midwest terminal markets. Ga. Agr. Exp. Sta. Bul. N. S. 26.

Randell, C. G., and Anna E. Wheeler. 1955. Feeder calf sales in the Southeastern states. U.S.D.A. Farmer Coop. Serv. Circ. 9.

Riley, Harold M. 1952. Factors that determine the price of feeder cattle. Neb. Agr. Exp. Sta. Bul. 410.

Robertson, Lynn, and M. Paul Mitchell. 1940. Prices of beef cattle. Ind. Agr. Exp. Sta. Bul. 445.

St. Clergy, Clyde, Jimmy Goodwin, and M. D. Woodin. 1956. A report on the Delhi Feeder Steer and Calf Sale. La. Agr. Exp. Sta. Circ. 198.

Walker, William H., III. 1961. Effects of weight and grade and other selected variables on prices of calves in Tennessee feeder calf sales held in the fall. Master's Thesis. University of Tennessee, Knoxville, Tennessee.

Williamson, K. C. 1958. Effects of selected physical and economic variables on prices of calves in Virginia feeder calf sales. Master's Thesis. Virginia Polytechnic Institute, Blacksburg, Virginia.

Willis, W. J., and R. C. Ashby. 1950. Buying and selling feeder cattle in Illinois. Ill. Agr. Exp. Sta. Bul. 541.

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APPENDIX

EXAMPLE OF THE PEN SHEET USED IN THE BROWNSVILLE FEEDER CALF SALES

DATE _____ Pen No. _____

NAME	MARKS	BUYER	NO.	KIND	WT.	PRICE	AMOUNT