April 29, 1970

To the Graduate Council:

I am submitting herewith a thesis written by Roy Davis Smith entitled "Effects of Selected Variables on Prices Received for Calves in the Jamestown 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.

Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:

Vice Chancellor for
Graduate Studies and Research

EFFECTS OF SELECTED VARIABLES ON PRICES RECEIVED FOR CALVES IN THE JAMESTOWN 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

Roy Davis Smith

June 1970

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ABSTRACT

Records of 708 lots of Angus steers and heifers sold in the Jamestown Demonstrational Feeder Calf Sales held each fall from 1955 through 1969 were studied to determine the effects of grade, sex, pen size, and the average weight per pen on the price received per hundredweight and on the price received per head for feeder calves sold.

Choice calves sold for an average of $3.19 per hundredweight more than calves of the medium grade. The choice calves also sold for an average of $0.96 per hundredweight more than calves in the good grade. Medium calves sold for an average of $2.23 less per hundredweight than good calves.

Choice calves sold for $16.02 more per head than the medium grade calves. The choice calves sold also for $5.01 more per head than those calves grading good. Medium calves sold for an average of $11.01 less per head than calves grading good.

Steer calves sold for significantly ($P < .01$) higher prices than did heifer calves. Steer calves, on the average, sold for $3.22 more per hundredweight and $14.35 more per head than did heifers of a comparable grade.

These data indicate that calves in pen sizes of 81-90 sold for more per hundredweight than other groups. Calves in pen sizes 21-30 sold for more per head than did calves in any other pen size group.

When the price received per hundredweight was regressed on the average weight per pen, all other sources of variation held constant;

these data indicate that as average weight per pen increased, the price received per hundredweight decreased.

When the price received per head was regressed on the average weight per pen, within the range of the data, as average weight per pen increased, so did the average price received per head.

The estimates of these parameter indicate that factors affecting the price received for feeder calves in the Jamestown Demonstrational Feeder Calf Sale are similar to those described in other studies involving feeder calf sale data in the Southeast.

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CHAPTER I

INTRODUCTION

The demonstrational feeder calf sales in Jamestown, Tennessee, were organized in 1955. Prior to 1955 two or three ungraded sales had been held on a yearly basis. The feeder calves were brought from farms across the county, weighed and penned according to the individual farmer owner. They were, in other words, sold in the farmer's name.

The Fentress County Livestock Association, organized in 1955, is a non-chartered organization, composed of farmer members from Fentress, Pickett, Morgan, and Scott counties. The purpose of the Livestock Association is to foster and promote the Livestock Industry in the county and adjacent area. The association is governed by a board of five directors. These directors are elected at the membership meeting held each November. Two of the directors are elected for two-year terms on the even years and three are elected for two-year terms on the odd years. The local association is a member or a part of the State Livestock Association.

The Fentress County Livestock Association, after its organization in 1955, began the sponsorship of the feeder calf sales. The sales were conducted with the cooperation of The University of Tennessee, the State Livestock Association, the State Department of Agriculture, and the local stockyard's management.

Although this area is well-suited for cow-calf production, most of the herds are too small to attract buyers to individual farms. The chief

advantage of this type of cooperative marketing program is that farmers are able to put together larger groups of cattle that are more uniform in size and quality. All calves going into the sale are "fresh" from the farm and are graded by the Tennessee State Department of Agriculture personnel according to U. S. Standard Grades. The calves are sold according to sex, weight, and grade. Feeder calf buyers will generally pay premium prices for these calves which are offered for sale direct from the farm and that have been inspected for quality and separated according to weight and grade. These annual sales also enable the buyer to purchase and ship the calves that he needs from a single location.

These feeder calf sales have increased consistently, over the years, in size or in number of calves sold. Likewise the quality of calves being offered for sale has improved steadily.

Since the beginning of these sales, no organized statistical analysis has been made of the effects of various factors on the price for which feeder calves have sold. The objective of this study was to evaluate the effects of grade, sex, pen size (number of calves per pen), and average pen weight on price per hundredweight and price per head of feeder calves sold from 1955 through 1969.

It is hoped that the findings from this study will prove beneficial to farmers in planning their beef production programs. It is hoped that the study will be of help to the sponsors and sales managers in the continued effort to improve the feeder calf sales in Jamestown and at other locations.

CHAPTER II

REVIEW OF LITERATURE

The practice of marketing feeder calves through organized feeder calf sales is not new in this section of the United States. The interest in this method has developed since 1931. Special feeder calf sales were held in West Virginia as early as 1931. The first recorded feeder calf sale in Tennessee was held at Shouns in 1935. Virginia reports the first demonstrational feeder calf sale held in Tazewell in 1938. It was not, however, until 1945 that significant interest and growth began to develop in the practice of marketing feeder calves through organized sales.

The Mountain Breeders' Association was organized as a cooperative in 1953, according to Randell and Wheeler (1955). The feeder calf sale was then moved from Shouns to Johnson City.

Sales were started at Morristown and Crossville in 1952. In 1953 Cookeville and Nashville started sales and in 1954 and 1955 sales were held at Rogersville and Brownsville, respectively.

According to Randell and Wheeler (1955), a total of 351 calves were sold in organized sales in 1953. The Tennessee Feeder Calf Sale Report, shows that thirty-four (34) organized sales were held in Tennessee in the fall of 1969 and a total of 28,221 calves were sold for $3,962,879.50.

There have been relatively few studies to evaluate the effects of selected variables on the price of feeder calves because this method of selling feeder calves has attained its present popularity only in recent

years. Much of the published information has dealt with the factors which tend to affect the general price level of feeder calves.

For the purpose of this review, the literature will be analyzed from the standpoint of what has been reported on each of the following factors: grade, sex, weight, pen size, and average weight per pen. The examination of the literature will be made in the order given above.

I. GRADE

In a study of records of 1,049 lots of steers and heifers sold in the Cookeville sale, Cole (1969) reported that choice calves sold for an average of $2.24 per hundredweight more than calves of the medium grade. Choice calves averaged $0.60 per hundredweight more than good calves of the same weight. Medium calves sold for an average of $1.64 less per hundredweight than good calves. Choice calves sold for $11.45 more per head than medium grade calves and $3.31 more per head than calves grading good. Medium calves sold for an average of $8.14 less per head than calves grading good.

Jamison and Sellers (1968) affirmed that the grade of feeder calves had a highly significant effect on the price received per hundredweight. Choice calves averaged $3.27 per hundredweight more than medium calves and $1.20 more than good. Medium grades averaged $2.07 per hundredweight less than good.

Walker (1961) stated that choice steer calves averaged $1.58 per hundredweight more than good grades. Steers grading medium averaged $1.91 per hundredweight less than good grades. Choice heifers averaged

$1.79 more than good heifers and medium heifers averaged $1.97 per hundredweight less than good grades.

It was reported by Greathouse, Cole, and Magee (1968), that there was a significant difference between the price paid for choice cattle and most other grades. In all cases, differences were observed; however, the differences between the choice and prime grade in the 1966 sales and the good and choice grade classification in the 1967 sales were not significant.

Williamson (1958) found that fancy and choice steers averaged $2.11 per hundredweight more than good grade steers and medium grade steers averaged $1.44 per hundredweight less than heifers grading good.

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 than to the feed supply per animal unit in the United States. The study was made using August 1 to July 31 as a crop year basis. However, he found that 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 et al. (1953) reported that during the period 1938 to 1950, the average price of choice steers weighing 500-800 pounds varied from 6 to 12 dollars per hundredweight above the price of good grade 500-800 pound feeder steers.

Purcell (1956) illustrated that, over a four and one-half year period, good grade feeder steers averaged $3.20 more per hundredweight

than medium grade steers on five Georgia markets, and $3.42 more on two midwest terminal markets.

Harper (1957) found a wide variation between the high and low price received per hundredweight for calves within the same grade. For choice steers the range was $9.00 per hundredweight, $10.70 for good, and $12.50 for medium grade steers. For heifers the range was $5.90, $8.60, and $6.10 per hundredweight for the choice, good, and medium grades, respectively. However, the average price per hundredweight was closely related to the grade level. Choice calves averaged $22.00; good, $20.53; and medium, $18.73.

Badenhop (1956) reported that the effect of grade on price was significant for all classes of slaughter cattle and calves. The price differential between steers and heifers of various grades averaged $1.65 per hundredweight and ranged from a low of 10 cents to a high of $3.65. 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 expected.

II. SEX

Jamison and Sellers (1968) found that, on the average, steer calves sold for $2.64 more per hundredweight than did heifer calves. Harper (1957) reported that the average price received for steers, all grades, was $20.85 per hundredweight and $17.81 for heifers.

Greathouse, Cole, and Magee (1968) reported that heifers sold for a significantly lower price per hundredweight than steers in 1966 and 1967. The differences were $4.27 and $4.40 per hundredweight for the two years, respectively.

Cole (1969) found that steer calves sold for significantly ($P < .01$) higher prices than did heifer calves. Steer calves, on the average, sold for $3.64 and $15.14 more per hundredweight and per head, respectively, than heifers of a comparable grade.

III. WEIGHT

A variation of $5.55 per hundredweight was attributed to weight difference in steers by Walker (1961). Steers in the 301 to 350 pound classification brought the highest prices and those in the 651 to 700 pound classification the lowest price. In a similar analysis Walker found that the variation in price for heifers was $3.65, with those in the 301 to 350 pound weight class bringing the highest and those in the 601 to 650 pound class bringing the lowest price.

Williamson (1958) found that steer calves weighing between 401 to 500 pounds sold for significantly higher prices than heavier or lighter steers. The 301 to 400 pound lots averaged 21 cents per hundredweight less than the 401 to 500 pounds 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 group, respectively. The same trend was noted for heifers but the differences were not statistically significant.

Cox, Eisenach, and Mitchell (1953) reported lighter steers tend to be more expensive than the heavier steers. They further stated that the highest prices paid 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.

Prices noted by Nervik (1951) were generally higher during the spring than in the fall, but the gains made during the summer months ordinarily more than offset the seasonal higher prices in the spring.

IV. PEN SIZE

In a study of 21 Virginia feeder calf sales from 1951 through 1956, Williamson (1958) found a definite price advantage for steer calves sold in larger lots and an indication that the average price of heifers increased as the size of the sale lot increased. He also reported that the price of steers increased consistently and significantly as the size of the sale increased. Sales with 901 to 1100 head averaged 46 cents per hundredweight higher than the 701 to 900 head (base group); those with 1,101 to 1,300 head, 26 cents higher; 1,301 to 1,500 head, 95 cents higher; and those sales with 1,500 head, $1.72 per hundredweight higher than the base. The price averages for those sales with less than 700 head were lower than the base. The size of sale did not have the same consistent effect on the average price of heifer calves as on the price of steer calves.

St. Clergy, Goodwin, and Moodin (1956) summarized a study comparing feeder calves sold as singles versus groups. They found that the groups outsold 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 similar animals sold singly. Similar results were reported for other grades. The price advantage due to grouping was more evident for steer calves than for heifers. These findings generally agree with results of other feeder calf sales

in Louisiana. In addition, Walker (1961) found a definite price advantage for selling steer calves in larger lots. Steer calves grouped in lots of 81 head or more sold higher than those selling in smaller lots and sold for $1.81 per hundredweight more than those in lots of 1 to 10 head. Heifers in groups of 51 to 60 head sold for $1.57 per hundredweight more than those in lots of 1 to 10. These two lot size classifications represented the extremes with respect to selling price per hundredweight.

Greathouse, Cole, and Magee (1968) reported that cattle selling in lots of one to five head averaged 75 cents less per hundredweight than those sold in lots of sixteen to twenty-five head. They also reported that no significant differences were found between sale groups of various sizes until lot size reached forty-six to fifty head in 1966 and the fifty-five to sixty-five head in 1967. These limited data would indicate that there is no price advantage for sale groups of more than sixty-five head. This was substantiated by Jamison and Sellers (1968) who concluded that as pen size increased above twenty-six head, the price per hundred decreased. When calves were sold in pens of ninety-one head or more the price per hundredweight and price per head increased according to data presented by Cole (1969). However, the differences in price per head were not significant.

V. AVERAGE WEIGHT PER PEN

Williamson (1958) used pens averaging 401 to 500 pounds per head as a base group for comparison and observed that the pens weighing 300 to 400 pounds averaged 21 cents per hundredweight less than the base group.

Those weighing 501 to 600 pounds and 601 pounds to 700 pounds sold for $0.50 and $1.30 less than the base group, respectively. This observation was substantiated by Jamison and Sellers (1968) who reported that as average weight per pen increased beyond 481 pounds the price received per hundredweight decreased. Cox, Eisenach, and Mitchell (1953) also presented data indicating that light steers tend to be more expensive than heavy steers.

Cole (1969) found that when the price received per hundredweight was regressed on the average weight per pen and all other sources of variation were held constant, the price received per hundredweight decreased as average weight per pen increased. When the price received per head was regressed on the average weight per pen, within the range of the data, as average weight per pen increased, so did the average price received per head.

A study of various ways in which feeder cattle have been marketed in nine North-Central States was reported by Brensike (1952), Kristjanson (1949), Nervik (1959), Newberg (1959), and Willis and Ashby (1950).

Factors affecting the prices for feeder cattle, as reported by Mitchell (1941) and Robertson and Mitchell (1940) include: (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.

Williamson (1958) found that Angus steer calves averaged 16 cents per hundredweight higher and Shorthorn steers $1.05 per hundredweight lower than Herefords. Angus heifers averaged 39 cents per hundredweight

higher and Shorthorn heifers 16 cents per hundredweight less than Herefords. Except between Shorthorn and Hereford heifers, these differences were all statistically significant. Straightbred calves sold significantly higher per hundredweight than crossbreds. These average differences were $2.30 and $1.77 per hundredweight for steers and heifers, respectively.

Jamison and Sellers (1968) reported that Angus calves, on the average, sold for 39 cents per hundredweight more than Hereford calves.

CHAPTER III

EXPERIMENTAL PROCEDURE

I. SOURCE OF DATA

The data used in this study were collected over a 15-year period (1955-1969) from the Jamestown, Tennessee, Demonstrational Feeder Calf Sales. Although sales were held in the spring of most years, only the fall sales were used in this study. The location of this sale and the area that it serves are shown in Figure 1.

A total of 708 pens of Angus calves (15,050 animals) of varying size, weight, and grade were found suitable for this study to determine the effects of year, grade, sex, number of calves per pen, and average weight of pen on the price received per hundredweight and the prices received per head of feeder calves in the Jamestown sales. In some years as many as two sales were held each fall during a 30-day period.

II. RULES AND REGULATIONS OF THE JAMESTOWN FEEDER CALF SALES

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

1. All consignors entering calves in the Fentress County Feeder Calf Sale are required to be bona fide members of the Fentress County Livestock Association. Membership dues for the Fentress County Livestock Association are $3.00.

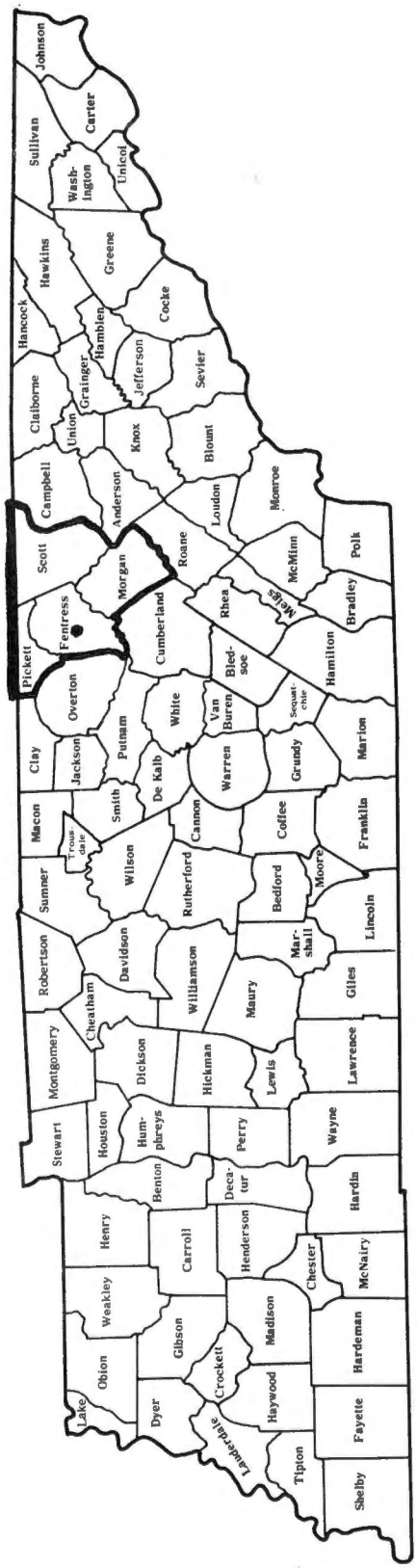

Figure 1. Location of Jamestown, Tennessee, feeder calf sale and area serviced.

2. The minimum weight for all calves being entered in this sale will be 300 pounds and the maximum weight will be 800 pounds for steers and 650 pounds for heifers.
3. All calves must be produced on the farm of the member consignor.
4. All calves entered in the sale must be out of cows which are owned by the consigning member. No calves will be entered in the sale except in the name of the breeder member.
5. All calves entered in this sale must be out of beef type cows (May be either purebred or grade). Calves will not be accepted which are out of cows with dairy breeding or questionable background. All calves must be sired by a purebred registered beef bull.
6. Only calves officially accepted by the field inspection committee will be allowed to be sold in the Fentress County Feeder Calf Sale. All calves must be in the barn or in a small lot, preferably with their mother, at the date and time when the field inspection team will inspect them.
7. All male calves must be castrated with a knife or elastrator and clear by the time of summer field inspection.
8. All calves entering sale must be naturally polled or properly dehorned and healed by summer field inspection.
9. All calves entering this sale will be required to be vaccinated with the three-in-one shot for Blackleg, Malignant Edema, and Hemorrhagic Septicemia. Vaccination will be done at least two weeks before and not more than six weeks before sale time.

Vaccination schedules will be arranged by County Agents. All calves will be tagged with ear tags which will be furnished by the association. A certification will be made to be presented by the farmer on the date of the sale that calves bearing said ear tags have been vaccinated.

10. A fee of $1.00 per calf will be charged for calves accepted for the sale to help defray the cost of advertising the sale. This will not include the cost of selling, or commission charge, to be collected at the sale.
11. All calves will be identified by number and grade markings, weighed separately, graded and placed in a pen with other calves of same breed, grade, and weight the day of the sale, to be sold in pen lots, not as individual animals consigned by any particular breeder.
12. All calves which do not grade either medium, good, or choice will not be accepted and sold. And these will be loaded back on trucks.

III. INSPECTION OF CALVES

Each consignment of calves was inspected on the farm several days prior to a given sale by a committee, usually made up of the County Agricultural Extension Agent and a member of the Board of Directors of the Jamestown Feeder Calf Association. They were again inspected before or immediately after unloading at the sale. As the calves were inspected on the farm, the inspector checked for any indication of dairy breeding in both calves and their dams, or any other condition or abnormality in

the calves consigned to the sale that would have prevented them from being accepted at the sale. At the second inspection, the committee at the sale barn checked for sickness and other conditions or abnormalities that might have been overlooked on the farm or that might have developed after the farm inspection.

IV. GRADES AND GRADING OF CALVES

The calves were brought to the sale in the morning of a given sale day and a hip tag was attached to each calf with a special cement before the calves were unloaded. These hip tag numbers were 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 marked each calf with its proper feeder grade. The calves were 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 were classified as "odd lots" and were not accepted at the sales.

V. WEIGHING OF CALVES

As each calf was weighed there was an individual weight ticket made which included the sex, grade, weight, hip tag number, and pen number. The minimum and maximum weight limitations for graded lots, were 300 and 800 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 was that heifers weighing more than 650 pounds were not accepted.

VI. PENNING OF CALVES

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

VII. SELLING OF CALVES

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

VIII. CLASSIFICATION OF DATA AND METHOD OF ANALYSIS

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

Pen size in these data ranged from 1 to 120 calves per pen. In order to obtain a more realistic estimate of pen size effects, pen size was divided into twelve discrete classes. The discrete classes represented pen size in increments of ten animals.

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

A study of the unadjusted means indicated no significant interaction between the various classes of effects.

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

It also was thought that an analysis to include number of head per pen as a continuous variable, and an analysis to include number of head per pen as a discrete variable would yield some useful information.

TABLE I

FORMAT USED FOR IBM CARDS

Data	Code	IBM Card Column Numbers
Location		
Jamestown	3	1
Grade		
Choice	13	2-3
Good	10	
Medium	07	
Sex		
Heifers	01	4-5
Steers	02	
Breed		
Angus	01	6-7
Hereford	02	
Year		
1955	55	8-9
1956	56	
1957	57	
1958	58	
1959	59	
1960	60	
1961	61	
1962	62	
1963	63	
1964	64	
1965	65	
1966	66	
1967	67	
1968	68	
1969	69	
Sale number		
First	01	28-29
Second	02	

TABLE I (continued)

Data	Code	IBM Card Column Numbers
Pen size (no. of calves/pen)		
1-10	01	30-31
11-20	02	
21-30	03	
31-40	04	
41-50	05	
51-60	06	
61-70	07	
71-80	08	
81-90	09	
91-100	10	
101-110	11	
111-120	12	
Price/head	Actual price	32-36

The assumed models considered appropriate for the analyses were:

$$Y_{ijl} = u + g_i + s_j\, b_{1ij} + b_{2ij} + e_{ijl}$$

$$Y_{ijkl} = u + g_i + s_j + P_k + b_{2ijk} + e_{ijkl}$$

Where:

Y_{ijl} = the average price per hundredweight and the average price per head of the j^{th} sex of the i^{th} grade.

Y_{ijkl} = the average price per hundredweight k^{th} pen size of the j^{th} sex of the 1^{th} grade.

u = population mean price per hundredweight and per head where equal subclass numbers exist.

g = the effect of grade with three classifications

1 = medium

2 = good

3 = choice

s = the effect of sex with two classifications

1 = heifers

2 = steers

P = the effect of pen size with twelve classifications

1 = pen size 1-10
2 = pen size 11-20
3 = pen size 21-30
4 = pen size 31-40
5 = pen size 41-50
6 = pen size 51-60
7 = pen size 61-70
8 = pen size 71-80
9 = pen size 81-90
10 = pen size 91 - +

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 error.

CHAPTER IV

RESULTS AND DISCUSSION

For ease of discussion the analysis of the two independent variables; namely, grade of calves and sex of calves with average weight per pen and average number of calves per pen as continuous independent variables will henceforth be referred to as Analysis I. The analysis containing three independent variables, grade of calves, sex of calves, and pen sizes, with average weight per pen as a continuous independent variable will henceforth be referred to as Analysis II. The dependent variables in both analyses were price per hundredweight and price received per head. No attempt was made to separate means within a subclass when three or more effects were included. The arithmetic means and standard errors of the traits studied are presented in Table II.

The least-squares estimates of the environmental effects on price per hundredweight and per head from Analysis I are presented in Table III. The corresponding analysis of variance is presented in Table IV. The least-squares estimates of the environmental effects on price per hundredweight and price received per head for Analysis II are presented in Table V. The corresponding analysis of variance is presented in Table VI.

I. GRADE EFFECTS

The estimates as shown in Tables III and V indicate that grade of calf has a highly significant effect ($P < .01$) on the price received per hundredweight and on the price received per head of feeder calves.

TABLE II

ARITHMETIC MEANS AND STANDARD ERRORS OF TRAITS STUDIED

Year	Sale No.	Total Head	No. of Pens	Avg. Size of Pens Number	Avg. Wt. of Calf Pounds	Avg. Price Per Cwt. Dollars	Avg. Price Per Head Dollars
Overall means		15,050	708	21.26 ± .74	496.5 ± 4.45	24.93 ± .10	122.55 ± .99
1955	1	405	39	10.38 ± 1.53	471. ± 15.32	18.62 ± .43	87.51 ± 3.39
1956	1	503	43	11.70 ± 1.24	486.4 ± 16.96	17.82 ± .40	86.38 ± 3.45
1957	1	522	48	10.88 ± 1.38	512.2 ± 18.07	21.43 ± .43	108.29 ± 3.46
1958	1	512	43	11.91 ± 1.22	488.3 ± 17.55	30.27 ± .57	144.88 ± 3.91
1959	1	660	45	14.67 ± 1.43	498.2 ± 18.34	26.71 ± .61	130.44 ± 3.99
1960	1	567	44	12.89 ± 1.63	494.4 ± 17.77	23.31 ± .30	114.36 ± 3.79
1961	1	665	46	14.46 ± 1.30	501.7 ± 17.93	25.89 ± .38	127.74 ± 3.54
1962	1	876	47	18.64 ± 2.35	503.4 ± 17.80	27.56 ± .34	137.20 ± 4.13
1963	1	957	49	19.53 ± 2.24	502.4 ± 17.39	25.00 ± .43	123.77 ± 3.83
1964	1	1070	45	23.78 ± 3.00	496.8 ± 17.76	21.20 ± .32	105.17 ± 3.94
1965	1	1536	46	33.39 ± 3.67	497.3 ± 17.41	23.27 ± .40	115.26 ± 4.17
1966	1	1688	64	26.37 ± 3.46	487.1 ± 14.41	27.04 ± .36	130.71 ± 3.74
1967	1	1799	48	37.48 ± 4.46	506.6 ± 17.41	25.61 ± .35	128.60 ± 4.03
1968	1	967	29	33.34 ± 5.35	522.7 ± 23.84	28.28 ± .51	144.64 ± 4.29
	2	617	24	25.71 ± 4.82	455.7 ± 25.28	24.91 ± .23	112.66 ± 5.73
1969	1	1027	27	38.04 ± 6.67	527.4 ± 25.08	32.65 ± .47	169.40 ± 5.95
	2	679	21	32.33 ± 5.24	478.3 ± 21.66	28.69 ± .36	136.82 ± 6.01

TABLE III

LEAST-SQUARES ESTIMATES[a] OF THE EFFECTS STUDIED
(ANALYSIS I)

Variable	No. of Pens	Avg. Price Received Per Cwt. ($)	Avg. Price Received Per Head ($)
Grade			
Choice	236	1.384	7.009
Good	243	0.421	2.001
Medium	229	-1.805	-9.010
Sex			
Heifers	300	-1.610	-7.175
Steers	407	1.610	7.175
Regression of Y on:			
Average no./pen		0.003	0.001
Average weight/pen		- .013	0.186

[a]Estimates are deviations from the overall adjusted mean when equal numbers exist per subclass. The overall arithmetic mean of price per hundredweight and price per head was $24,93 and $122.55, respectively.

TABLE IV

ANALYSIS OF VARIANCE OF PRICES RECEIVED
(ANALYSIS I)

Source	Degrees of Freedom	Mean Squares	
		Avg. Price Per/Cwt.	Avg. Price Per/Head
Breed of calf	2	608.947**	15294.373**
Sex of calf	1	1409.339**	27984.043**
Regression of Y on:			
Average number/pen	1	1.717	0.288
Average weight/pen	1	1211.207**	25754.070**
Residual	686	2.162	54.163
R^2		.72	.92

**P < .01.

TABLE V

LEAST-SQUARES ESTIMATES[a] OF THE EFFECTS STUDIED
(ANALYSIS II)

Variable	No. of Pens	Avg. Price Received Per Cwt. ($)	Avg. Price Received Per Head ($)
Grade			
Choice	236	1.402	7.085
Good	243	0.381	1.713
Medium	229	-1.783	-8.798
Sex			
Heifers	300	-1.583	-6.985
Steers	407	1.583	6.985
Pen size			
1-10	290	-.254	-1.110
11-20	162	0.028	1.479
21-30	85	0.402	5.645
31-40	59	0.010	1.172
41-50	33	0.036	0.622
51-60	29	0.053	-1.090
61-70	18	-.824	-2.801
71-80	6	-.173	-1.375
81-90	11	0.545	1.428
91- +	11	0.192	-1.124
Regression of Y on:			
Average weight/pen		- .012	.189

[a]Estimates are deviations from the overall adjusted mean when equal numbers exist per subclass. The overall arithmetic mean of price per hundredweight and price per head was $24.93 and $122.55, respectively.

TABLE VI

ANALYSIS OF VARIANCE OF PRICES RECEIVED
(ANALYSIS II)

Source	Degrees of Freedom	Mean Squares	
		Avg. Price Per/Cwt.	Avg. Price Per/Head
Breed of calf	2	597.182**	14770.581**
Sex of calf	1	1314.359**	25598.864**
Pen size	9	279.693**	156334.919**
Regression of Y on:			
Average weight/pen	1	1013.034**	234689.660**
Residual	678	2.133	52.603
R^2		.72	.93

**P < .01.

In Analysis I choice calves sold for an average of $3.19 per hundredweight more than calves of the medium grade. The choice calves also sold for an average of $0.96 per hundredweight more than the calves in the good grade. Medium calves sold for an average of $2.23 less per hundredweight than good calves.

Also, the data in Analysis I indicates that choice calves sold for $16.02 more per head than the medium grade calves. The choice calves also sold for $5.01 more per head than those calves grading good. Medium calves sold for an average of $11.01 less per head than calves grading good.

In Analysis II choice calves sold for an average of $3.18 per hundredweight and $15.88 per head more than calves of the medium grade. The choice calves sold also for an average of $1.02 per hundredweight and $5.37 per head more than the calves in the good grade. Medium calves sold for an average of $2.16 less per hundredweight and $10.51 less per head than good calves.

These estimates are comparable to the findings of Cole (1969) who reported that choice calves averaged $2.24 per hundredweight and $11.45 per head more than calves of the medium grade. Jamison and Sellers (1968) reported also that choice calves averaged $3.27 per hundredweight more than calves of the medium grade. Williamson (1958) in a study involving Virginia calves, reported that choice steer calves averaged $2.11 per hundredweight more than good grade steers.

II. SEX EFFECTS

Sex of calf in both analyses had a significant effect ($P < .01$) on the price received per hundredweight and on the price received per head of feeder calves. Steer calves in Analysis I, on the average, sold for $3.22 more per hundredweight and $14.35 per head more than did heifers of a comparable grade.

In Analysis II steer calves sold for $3.17 more per hundredweight and $13.97 more per head than heifers of the same grade.

These findings are in general agreement with those of Jamison and Sellers (1968) who reported that steer calves on the average sold for $2.64 more per hundredweight than did heifer calves. Cole (1969) in his study involving Tennessee calves, reported that steer calves sold for $3.64 more per hundredweight and $15.14 more per head than did heifers of comparable grade. Williamson (1958) reported similar results.

III. PEN SIZE EFFECTS

In Analysis I, the average number of calves per pen was considered as continuous variable. The regression of the price received per hundredweight and the price per head on the average number of calves per pen was not significant in these data. These data indicate that for an increase in pen size by one animal the price per hundredweight decreased $0.003, and the price per head decreased $0.001. Whereas, in Analysis II when pen size was included as a discrete variable in the model, the effects were highly significant for price received per hundredweight and the price received per head. These data indicate that calves in pen

sizes of 81-90 sold for more per hundredweight than those in other groups. Calves in pen sizes 21-30 sold for more per head than did calves in any other pen size group.

The capacity of a 32-foot, double deck cattle van for 497-pound calves is approximately 58 head. As can be seen from Figure 2, buyers were willing to pay more per hundredweight for a trailer load or two trailer loads than they were for any number of partial loads. However, these data suggest also that local feeders or individuals desiring 25 calves were willing to pay a premium.

Figure 3 suggests that when calves were sold by the head individuals desiring 25 head were willing to pay a premium.

These findings are in general agreement with those of Cole (1969) who reported that calves in pen sizes of greater than 91 sold for more per hundredweight than calves in any other pen size group. Jamison and Sellers (1968) reported a significant ($P < .05$) negative relationship when price per hundredweight was regressed on the average number of head per pen.

IV. AVERAGE WEIGHT PER PEN EFFECTS

The average weight per pen was a highly significant ($P < .01$) source of variation in Analyses I and II. When the price received per hundredweight was regressed on the average weight per pen, 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 per hundredweight than those having heavier weight. When price

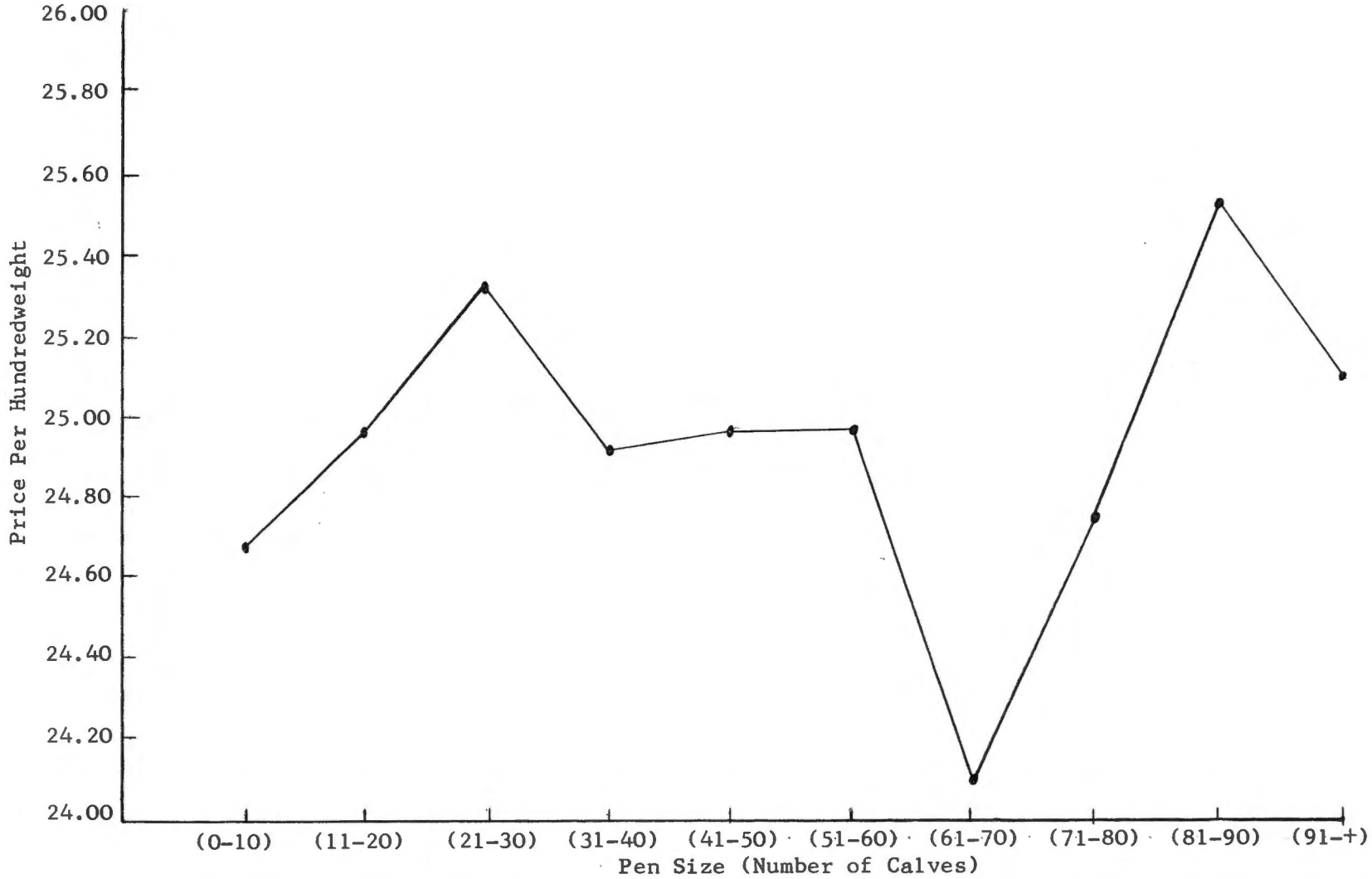

Figure 2. Effects of pen size on price per hundredweight.

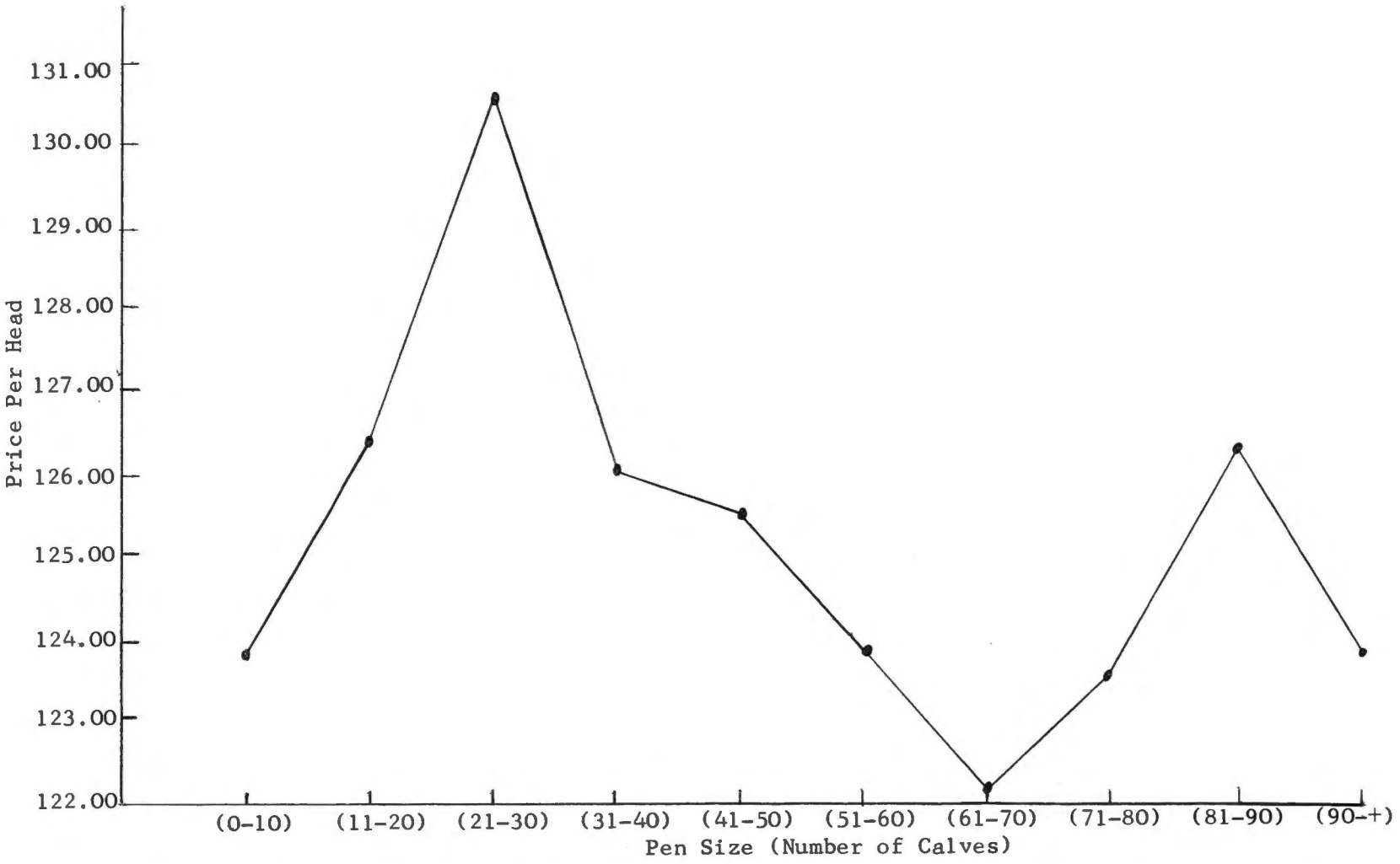

Figure 3. Effects of pen size on price per head.

received per head was regressed on the average weight per pen, within the range of these data, as the average weight per pen increased, so did the average price received per head. These data indicate also that although lighter weight calves sell for more per hundredweight, for every pound increase in average weight the price per head increases $0.19. From these data one could conclude, that selling light weight calves was undesirable if the cost of producing the extra gain was less than $0.19.

These findings are in general agreement with those of Cole (1969), Jamison and Sellers (1968), and Williamson (1958).

CHAPTER V

SUMMARY

Records of 708 lots of Angus steers and heifers sold in the Jamestown Demonstrational Feeder Calf Sales held each fall from 1955 through 1969 were studied to determine the effects of grade, sex, pen size, and the average weight per pen on the price received per hundredweight and on the price received per head for feeder calves sold.

Choice calves sold for an average of $3.19 per hundredweight more than calves of the medium grade. The choice calves also sold for an average of $0.96 per hundredweight more than calves in the good grade. Medium calves sold for an average of $2.23 less per hundredweight than good calves.

Choice calves sold for $16.02 more per head than the medium grade calves. The choice calves sold also for $5.01 more per head than those calves grading good. Medium calves sold for an average of $11.01 less per head than calves grading good.

Steer calves sold for significantly ($P < .01$) higher prices than did heifer calves. Steer calves, on the average, sold for $3.22 more per hundredweight and $14.35 more per head than did heifers of a comparable grade.

These data indicate that calves in pen sizes of 81-90 sold for more per hundredweight than other groups. Calves in pen sizes 21-30 sold for more per head than did calves in any other pen size group.

When the price received per hundredweight was regressed on the average weight per pen, all other sources of variation held constant; these data indicate that as average weight per pen increased, the price received per hundredweight decreased.

When the price received per head was regressed on the average weight per pen, within the range of the data, as average weight per pen increased, so did the average price received per head.

The estimates of these parameter indicate that factors affecting the price received for feeder calves in the Jamestown Demonstrational Feeder Calf Sale are similar to those described in other studies involving feeder calf sale data in the Southeast.

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VITA

Roy Davis Smith was born September 9, 1924, in Jackson County, Tennessee. He graduated from Jackson County Central High School in 1943. He then served three years in the U. S. Naval Air Corps.

He received his first two years of college work at David Lipscomb College, Nashville, Tennessee. Then because of interest in the study of Agriculture, he enrolled at Tennessee Technological University, Cookeville, Tennessee, in the fall of 1948. He was graduated with a B. S. degree in Agricultural Education in 1950.

He was employed by the Macon County Board of Education as an instructor for the Veteran's Farm Training Program where he remained until 1955. He was then employed as County Agricultural Agent in Fentress County and he is currently serving in this capacity.

Mr. Smith enrolled in The University of Tennessee Graduate School to attain a Master's degree in Animal Husbandry which he expects to receive in June, 1970.

Mr. Smith was married in 1948 to the former Ruby Nell Anderson of Gainesboro, Tennessee. They have three sons, Danny, age 20, Ronny, age 19, and Ricky, age 12.