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Economics of Backgrounding Feeder Calves in North Dakota

EDWARD V. DUNN and ALLEN H. ODENBACH

ECONOMICS OF BACKGROUNDING FEEDER
CALVES IN NORTH DAKOTA

By

Edward V. Dunn and Allen H. Odenbach

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FOREWORD

This publication represents a continuation of research into the factors affecting the profitability of livestock production in North Dakota.

The authors wish to extend their appreciation to the cattle producers interviewed; the United States Department of Agriculture, Market News Service; and others who contributed to the completion of the study.

SUMMARY

The sale of cattle and calves represents an important part of the farm income in North Dakota, ranking second only to wheat as the largest single major source of income. In 1968 the sale of livestock and livestock products accounted for 31 percent of the total farm income in North Dakota.

The demand for beef in the United States is characterized by a phenomenal growth. However, North Dakota feedlots presently are not contributing to the supply required to meet this expanding demand. On January 1, 1961, (the peak year of cattle feeding in the state) there were 140,000 cattle and calves in North Dakota being fattened for slaughter. On January 1, 1970, there were only 63,000 cattle on feed. This represents a decrease of 77,000 head, or 55 percent, in the number of cattle being fattened for slaughter in the state over the past nine years.

The trend toward fewer cattle being finished in North Dakota may have been economically inspired. Previous research, however, indicates that the cow-calf operation in which the calves are sold in the fall at weaning time is generally not a very profitable operation. Other methods of beef production may result in higher net returns for North Dakota ranchers.

The purpose of this study was to determine whether backgrounding calves could provide a profitable alternative management strategy by which North Dakota beef cattle producers could improve their level of net income.

Backgrounding programs in this study were characterized by a high ratio of variable cost to total cost. Variable costs were responsible for 83.6 percent of total costs, while fixed costs represented only 16.4 percent of total costs. The average total cost per pound of gain for all ranchers included in the study was 27.06 cents, which included a charge of $2.00 per hour for labor and management. Variable costs were 22.63 cents per pound of gain while fixed costs were 4.43 cents per pound. Feed was the largest individual cost item, representing 58.1 percent of total costs and averaging 15.74 cents per pound of gain. An average total investment of $3,654 was required per ranch for backgrounding 90 calves for 116 days.

A comparison was made of the production costs obtained from the ranchers in the survey and the prices received for choice 300-750 pound feeder calves at the West Fargo terminal market during the time period 1963-1970. The results indicated that averaging the price levels for the entire eight-year period (1963-1970) yielded a positive return to labor and management of $2.90 per head or $1.21 per hour. Average price levels which occurred during the 1963-1965 time period resulted in a return to labor and management of $-1.89 per head or $-0.79 per hour. Applying the costs obtained in this study to average price levels during 1966-1968 yielded a return to labor and management of $4.51 per calf or $1.88 per hour. Average price levels during 1969-1970 provided a return to labor and management of $8.58 per head or $3.59 per hour. The year 1970 resulted in the highest net returns at $21.85 per head for a per-hour return to labor and management of $9.13.

A greater profit potential exists during periods of relatively higher calf price levels than during periods of low levels, even though the prices at the initial stage of the feeding period (price of calves that could be sold at weaning time or purchased for backgrounding) are also high. Returns to labor and management were estimated to range from $1,427 when the November value of the calves was 40 cents per pound, to $-537 when the November value of the calves was 21 cents. The expected return to labor and management per hour ranged from $6.62 when the November value of the calves was at 40 cents, to $-2.49 when the calves were valued at 21 cents. The estimated return to labor and management per head ranged from $15.85 to $-5.96 over the same range in prices. A November price of 27 cents per pound appeared to be the break-even price for the level of costs obtained in this study. The return to labor and management was negative when the November value of the calves was below 27 cents per pound and was positive when the November value was at or above 27 cents.

An analysis of break-even prices and price margins indicated that the producer can withstand a much larger decline in the value of the animal over the course of the feeding period at higher price levels than at lower price levels. Based on the costs obtained in this study, a producer can withstand a 5-cent decline in calf prices from November to March when the November value of the calves is 45 cents and still covers all costs of production, including a $2.00 per-hour charge for labor. However, if the November value of the calves is 21 cents, the selling price must increase by 0.74 cents per pound to allow the operator to cover total costs.

Average daily gain was found to be significantly related to the total cost per pound of gain. Increasing average daily gain from 0.4 to 1.8 pounds was associated with a decline in average total cost of 44.0 to 23.1 cents per pound.

CONCLUSIONS

Based upon the results obtained in this study, backgrounding calves can be a profitable management strategy for North Dakota beef cattle producers. The resources required--primarily feed, calves, labor, and necessary management--are available in sufficient quantities to permit an expansion of backgrounding programs in North Dakota. Adding a winter calf feeding program to a cow-calf operation is a feasible management strategy, since the additional investment in fixed resources for a backgrounding program is relatively small in relation to the total investment already required for a beef cattle operation. In addition, slack season labor often exists for cow-calf producers during the winter months, which could be more fully utilized by a calf feeding program.

ECONOMICS OF BACKGROUNDING FEEDER
CALVES IN NORTH DAKOTA

by

Edward V. Dunn and Allen H. Odenbach[*]

The cattle industry in North Dakota had its beginning in the late 1800's when the majority of the buffalo that grazed the grasslands of the Dakotas were killed and the Indians were moved to reservations. The grazing of beef cattle provided an alternative use for the millions of acres of grassland formerly used by the buffalo.[1] With the vast amount of available grazing land, bonanza ranchers bacame prominent in the Northern Great Plains during the latter part of the nineteenth century.

The dilemma for the cattle industry during the late 1800's was that the abundance of feeder cattle was in Texas while the large supply of grass for feeding cattle was in the Northern Great Plains. The only logical method of combining these two resources was to move the cattle north.[2] Large droves of cattle were moved from Texas to the Northern Great Plains, forming the beginning of the cattle industry in North Dakota.

Ranches during the late 1800's typically ranged in size from a few thousand head of cattle to as large as 100,000 head. Ranches were usually owned by financiers who had accumulated large amounts of money from other industries and invested in the cattle industry because they believed cattle ranching would be a profitable venture--not because they hoped to become permanently established in the industry.[3]

During the severe winter of 1886-87 cattle died by the thousands due to the cold weather and lack of winter feed. As a result, heavy financial losses occurred forcing many of the large cattle companies to cease operations.[4] Some ranchers rebuilt and new ranches were established. But, by the beginning of the twentieth century, bonanza ranching was quickly becoming past history. The influx of homesteaders at the turn of the century signaled the end of the large ranching operations that existed up until that time.

Since the beginning of the cattle industry in North Dakota, the cattle producers have been troubled by droughts, hard winters, sieges of grasshoppers, and low prices. During the last half century a new problem, the cost-price squeeze, has developed. The cost-price squeeze has resulted

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[*]Dunn is an Assistant Professor and Odenbach is a former Graduate Research Assistant.

[1]McCullough, D. G., Some Historical Aspects of the Beef Cattle Industry in Western North Dakota, Unpublished M.S. Thesis, Department of Social Sciences, North Dakota State University, Fargo, North Dakota, 1962, p. 44.

[2]Ibid., p. 48.

[3]Dale, E. E., "Ranching on the Central and Northern Great Plains, 1880 to 1900," The Range Cattle Industry, University of Oklahoma Press, Norman, Oklahoma, 1960, p. 97.

[4]Dale, E. E., "Short Grass and Heather," Cow Country, University of Oklahoma Press, Norman, Oklahoma, 1965, p. 107.

from a more rapid increase in the price of the rancher's inputs relative to the prices the rancher receives for his output. A comparison of the indexes of the prices paid for production inputs and prices received for grain and livestock products illustrates this point. The index of prices paid by farmers and ranchers increased from 95 in 1954 to 117 in 1967 (using 1957-1959 as the base period). The index of prices received by farmers and ranchers has declined from 101 to 96 during the same time period. Therefore, the index of prices received decreased 5 points while the index of prices paid increased 22 points from 1954 to 1967.[5]

<center>

Economic Importance of the Cattle Industry in North Dakota

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Cattle and calves rank second only to wheat as the major single source of income in North Dakota. In 1968 wheat provided $280,702,000 or 30.9 percent of the total income of North Dakota farmers and ranchers. Cattle and calves returned $185,043,000 for 20.4 percent of the total. Sales of all crops accounted for 52.7 percent of the total farm income, while the sale of livestock and livestock products accounted for 31.0 percent.[6]

North Dakota ranked 18th in the nation in the number of cattle and calves on farms and ranches as of January 1, 1970. There were 2,066,000 head of cattle and calves in the state on that date. At the same time, the state also ranked 12th in the number of beef cows two years and older.[7] In 1969 there were approximately 43,000 farms in North Dakota, and an estimated 23,000 of these had cattle and calves.[8]

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Demand for Beef in the United States

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The American people are the world's largest consumers of beef. Total world production of beef is estimated at 33 million tons, and the American people consume one third of this amount.[9]

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[5]Paulson, G. W., Economic Analysis of Beef Cattle and Grassland Management Systems, Unpublished M.S. Thesis, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, May, 1970, p. 6.

[6]United States Department of Agriculture, Statistical Reporting Service, North Dakota Crop and Livestock Statistics, Annual Summary for 1969, Ag. Statistics No. 21, in cooperation with North Dakota State University, Department of Agricultural Economics, Fargo, North Dakota, May, 1970, p. 2.

[7]Ibid., p. 60.

[8]United States Department of Agriculture, Statistical Reporting Service, North Dakota Crop and Livestock Statistics, Annual Summary for 1970, Ag. Statistics No. 23, in cooperation with North Dakota State University, Department of Agricultural Economics, Fargo, North Dakota, May, 1971, p. 74.

[9]Betts, R., "Cattle Ranchers Struggle Against Rising Costs in United States," Jamestown Sun, Jamestown, North Dakota, November 9, 1970, p. 1.

In 1950 the per capita consumption of red meat in the United States was 145 pounds.[10]   By 1970 per capita consumption had risen to 185.5 pounds.[11] Beef (including veal) accounted for nearly all of the increase in per capita consumption rising from 71.0[12] to 116.3[13] pounds during this time span. Beef presently accounts for nearly two-thirds of all red meat consumed in this country. It is estimated that the meat output must increase by 300 million pounds per year for the next five years in order to supply meat to the expanding population at the present per capita consumption levels. It is also estimated that by 1980 Americans will demand one-third more beef than is presently being supplied.[14]

North Dakota's Cattle Feeding Industry

Although the demand for beef in the United States is characterized by a phenomenal growth, it appears that the cattle feedlots in North Dakota are not contributing to the supply required to meet this demand.

On January 1, 1961, the peak year in the number of cattle fed in North Dakota, there were 140,000 cattle and calves being fattened for slaughter in the state.[15] The number of cattle fed that year was estimated to be 29 percent of the previous year's calf crop. On January 1, 1970, there were only 63,000 cattle on feed, which was only 9 percent of the previous year's calf crop.[16] This represents a decrease of 77,000 head, or 55 percent, in the number of cattle being fattened for slaughter in North Dakota over the past nine years.

The number of cattle being fed to slaughter weights in North Dakota is on the decline, yet the two primary resources required--cattle and

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[10]United States Department of Agriculture, Economic Research Service, Cattle Feeding in the United States, Agricultural Economic Report No. 186, Washington, D. C., October, 1970, p. 86.

[11]United States Department of Agriculture, Economic Research Service, Livestock and Meat Situation, Washington, D. C., February, 1971, p. 19.

[12]United States Department of Agriculture, Economic Research Service, Cattle Feeding in the United States, op. cit., p. 86.

[13]United States Department of Agriculture, Economic Research Service, Livestock and Meat Situation, op. cit., p. 19.

[14]Ibid., p. iv.

[15]Vangsness, E. C., Feeder Cattle Produced and Fed in North Dakota, 1950-1970, Information Compiled from North Dakota Crop and Livestock Reporting Service.

[16]Ibid.

feed--are available in sufficient quantities. Approximately 30.5 million bushels of feed barley, 45.5 million bushels of oats, and 2.3 million bushels of corn are available for feeding each year.[17]

In 1969 there were approximately 960,000 calves raised in North Dakota,[18] and yet by January 1, 1970, only 633,000 calves remained on farms in the state.[19] North Dakota farmers and ranchers had marketed over one-third of their 1969 calf crop by January 1, 1970. The number of calves under 500 pounds in North Dakota feedlots on this date was only 24,000.[20] It is apparent that a large number of the calves produced in North Dakota were exported to other states for feeding.

Objectives of the Study

The primary purpose of this report is to determine whether back-grounding calves is a profitable practice for North Dakota farmers and ranchers. The specific objectives of the study are to:

1. Determine the returns from backgrounding calves in North Dakota

2. Determine the costs of backgrounding calves in North Dakota

3. Determine the variables that affect the cost per pound of gain of calves backgrounded in North Dakota

PROCEDURE

The data included in this study were obtained through personal interviews with ranchers. County agents throughout Nroth Dakota provided the names of producers that had weaning weight records of calves produced in 1969. A preliminary mail survey was taken to determine which producers among those having records of weaning weights also backgrounded their calves in 1969. The responses from the preliminary survey of ranchers provided the list of names of producers with whom personal interviews were conducted to obtain the cost data used in this study. The approximate locations of the ranchers surveyed for the study are designated in Figure 1.

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[17]Dunn, E. V., Hogs and North Dakota Grains, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1970.

[18]Vangsness, op. cit.

[19]United States Department of Agriculture, Statistical Reporting Service, North Dakota Crop and Livestock Statistics, Annual Summary for 1969, op. cit., p. 59.

[20]United States Department of Agriculture, Statistical Reporting Service, Cattle on Feed, Washington, D. C., January 1, 1970, p. 12.
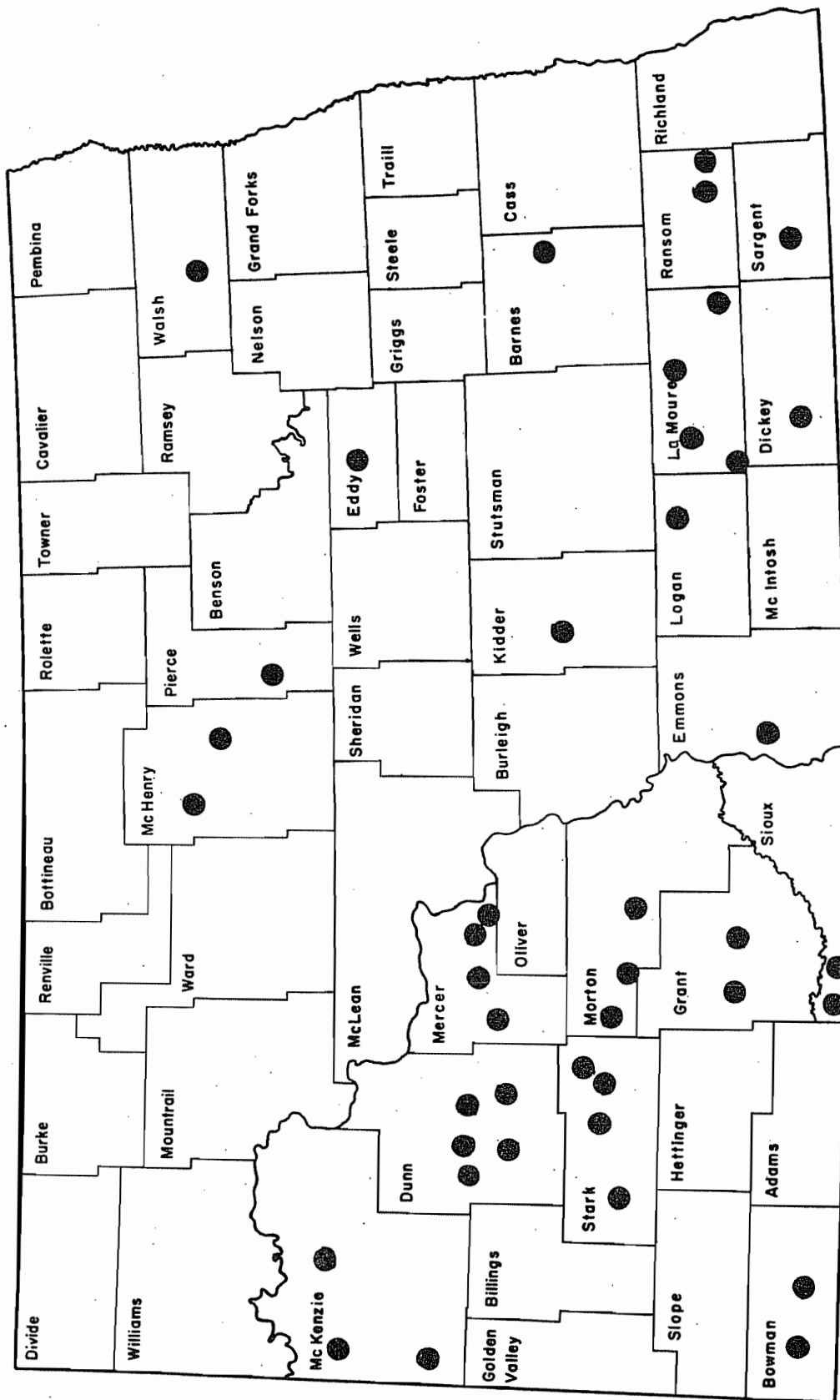
Figure 1. Location of Operators Included in the Survey of Calf Backgrounding Operations, North Dakota, 1970.

● Designates location of ranches surveyed

Certain counties had a much higher participation of ranchers in performance testing programs than other counties, so weaning weights were available from a larger number of producers in these counties. Certain areas of the state are also more conducive to beef production than others. These two factors account for the lack of a uniform dispersion of ranchers included in the survey as illustrated in Figure 1.

Producers of registered cattle were excluded from the sample of ranchers surveyed since they often produce and merchandise their calves in a much different manner than do commercial operators. This study is concerned with the preparation of calves for feedlots; whereas, the objective of registered breeders is the production of seed stock for breeding purposes.

CHARACTERISTICS OF THE SAMPLE

The information obtained from the questionnaire included the costs incurred and the number of pounds of beef produced by the calves on the backgrounding programs. The questionnaire also provided information regarding the types of feed used in the backgrounding process and whether the feed was purchased or homegrown.

A total of 55 ranchers were interviewed, 42 of which provided sufficient data to be used in this study. The 42 ranchers included in this analysis backgrounded a total of 5,719 calves and had records of initial and final weights on 3,778 or 66 percent of this total. The remaining 34 percent of the calves consisted largely of replacement stock and final weights on these often were not available. The 3,778 head represents those calves which were strictly on a backgrounding program, and the costs and returns presented in this study are calculated for these calves only. If the calves on the backgrounding program were fed and housed in the same lot as other calves for which initial and final weights were not available, the costs of production were separated on a percentage basis. An adjustment in costs was made in situations where the calves not on the backgrounding period used the facilities for longer periods of time.

Calves for which initial and final weights were available consisted of 60 percent steers and 40 percent heifers. The average number of calves on the backgrounding program per ranch was 90 head and ranged from 28 to 309 head.

Calves at the beginning of the feeding period averaged 421.9 pounds per head and weighed an average of 572.1 pounds at the end of the backgrounding program for an average total gain per head of 150.2 pounds. The average daily gain for all calves was 1.3 pounds and ranged from 0.4 to 1.84 pounds per day.

The majority of the calves in this study graded choice and low choice, according to the rancher's estimates. However, a number of operators did report the selling of a few calves that graded good.

November was the most common month in which calves were weaned and started on a feeding program. The average length of the feeding periods for all ranches was 116 days and ranged from a low of 28 to a high of 206 days.

TYPES OF FEED USED

Oats was the most common component of the rations fed by the 42 operators included in this study. Approximately 93 percent (Table 1) of the ranchers utilized oats in their feeding programs. The importance of oats in the ration is likely due to the fact that oats is raised with substantial success in virtually all parts of the state. In 1969 the average per acre yield of oats in North Dakota counties ranged from a low of 46 to a high of 65 bushels per harvested acre. A five-year average (1964-1968) of oat yields in North Dakota counties ranged from 34.6 to 58.0 bushels per acre.[21]

Oats is also one of the most popular feed grains when fed in growing rations to calves weighing less than 550 pounds, such as those under consideration in this study. Oats is lower in energy than barley or corn and, thus, enhances the growth of calves without causing an undesirable amount of condition or fleshiness of the calves at relatively light weights.[22]

Barley and corn were used only to a limited extent by the ranchers interviewed. These two concentrates are considered the major fattening grains in North Dakota and are typically used to a greater extent after the calves have reached the 650-700 pound weight level. The southeastern part of North Dakota is the only major corn producing region in the state, so corn is not as readily available in all parts of the state as is oats. Barley is often substituted for corn in a fattening ration for calves in the central and western parts of North Dakota.[23] However, barley is not raised to the extent that oats is in many parts of southwestern North Dakota.

Commercial feeds were fed by 17 percent of the operators and were commonly used only during the first two or three months of the feeding period after weaning.

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[21]United States Department of Agriculture, Statistical Reporting Service, North Dakota Crop and Livestock Statistics, Annual Summary for 1969, op. cit., p. 44.

[22]Dinusson, Wm. E., D. O. Erickson, C. N. Haugse, and M. L. Buchanan, "Oats in Rations for Growing Calves," North Dakota Research Report, No. 24, Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, January, 1969, p. 17.

[23]Rude, L. C., Investigation and Analysis of Cattle Fattening in North Dakota, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, March, 1957, p. 13.

TABLE 1. RELATIVE IMPORTANCE OF VARIOUS FEED TYPES USED IN CALF
BACKGROUNDING RATIONS, NORTH DAKOTA, 1970.

Type of Feed	Percent of Operators[a]
Grains:	
Oats	93
Barley	12
Corn	5
Screenings	7
Silage:	
Corn	57
Oats	7
Sorghum	5
Hay:	
Alfalfa	45
Alfalfa and tame grass mixture	29
Tame grass	36
Prairie and slough	14
Commercial feeds	17
Supplement	50

TOTAL NUMBER OF FARMERS: 42

[a]This column will total over 100 percent since farmers used more
than one type of feed in their rations.

Screenings were fed by 7 percent of the operators. This feed is
a by-product of the grain cleaning process and is a mixture of grain and
weed seeds. Screenings are generally available from local elevators in
a limited supply.

Supplements were fed by 50 percent of the ranchers and were generally
utilized throughout the entire feeding periods.

Corn silage was the second most popular type of feed and was used by
57 percent of the operators. Corn silage in particular was found to be
quite popular throughout the southern one-half of the state. Oats silage
was used by 7 percent and sorghum silage by 5 percent of the operators.

Alfalfa was the most common type of hay used in the ration (utilized
by 45 percent of the operators). Among the producers feeding alfalfa, many
also included a nonlegume hay as part of the ration. Tame grass hays used
by ranchers included brome, crested wheat, and oats hay. Tame grasses were

fed by 36 percent of the operators while an alfalfa-tame grass mixture was used by 29 percent of the producers. The least commonly used hay types were prairie and slough hay which were fed by only 14 percent of the operators.

PURCHASED AND HOMEGROWN FEEDS

Only 24 percent of the operators purchased any of the major feed components used in their feeding programs with the exception of salt, minerals, and other supplements. In all cases the amount of salt, mineral, and other supplement purchased was only a small portion of the total amount of feed fed. Part of the feed purchased was in the form of a commercial feed which was used at the beginning of the feeding period. Those purchasing the commercial feeds stated that they did so primarily because they felt it would reduce stress and improve gains in the initial post-weaning feeding period.

The three most common feed ingredients--oats, corn silage, and hay-- were all largely homegrown. A few operators did purchase additional oats for feeding beyond what they produced on their own farms or ranches.

PRICES OF FEEDER CALVES

Although costs of production, such as feed cost, play a major role in determining the profitability of backgrounding operations, the value of the calves at the beginning and end of the feeding period plays an important role in determining the level of net return from cattle feeding. Feeder calf prices are characterized by relatively wide fluctuation as compared to more gradual upward trends in the price of other resources employed in the production of calves. Consequently, the following factors-- long-term price movements, seasonal variation in feeder calf prices, increase in weight of the calf which occurs over the course of the feeding period-- must be taken into consideration when analyzing the profitability of back-grounding calves.

Long-Term Price Movements of Feeder Calves

The prices of feeder calves have been known to vary widely over a number of years. The price of feeder calves is determined largely by the number of brood cows on farms and follows a 10-12 year cycle. However, there is some evidence that the length of the cycle may become shorter because beef cattle in recent years are ready for slaughter at younger ages than they were several decades ago.[24]

The prices and trend in feeder cattle prices are diagrammed in Figure 2. This diagram includes one complete cattle cycle covering a span of approximately 11 years, beginning with a peak in prices in 1959 and ending

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[24]Shepherd, G. S., _Agricultural Price Analysis_, Iowa State University Press, Ames, Iowa, 1963, p. 42.
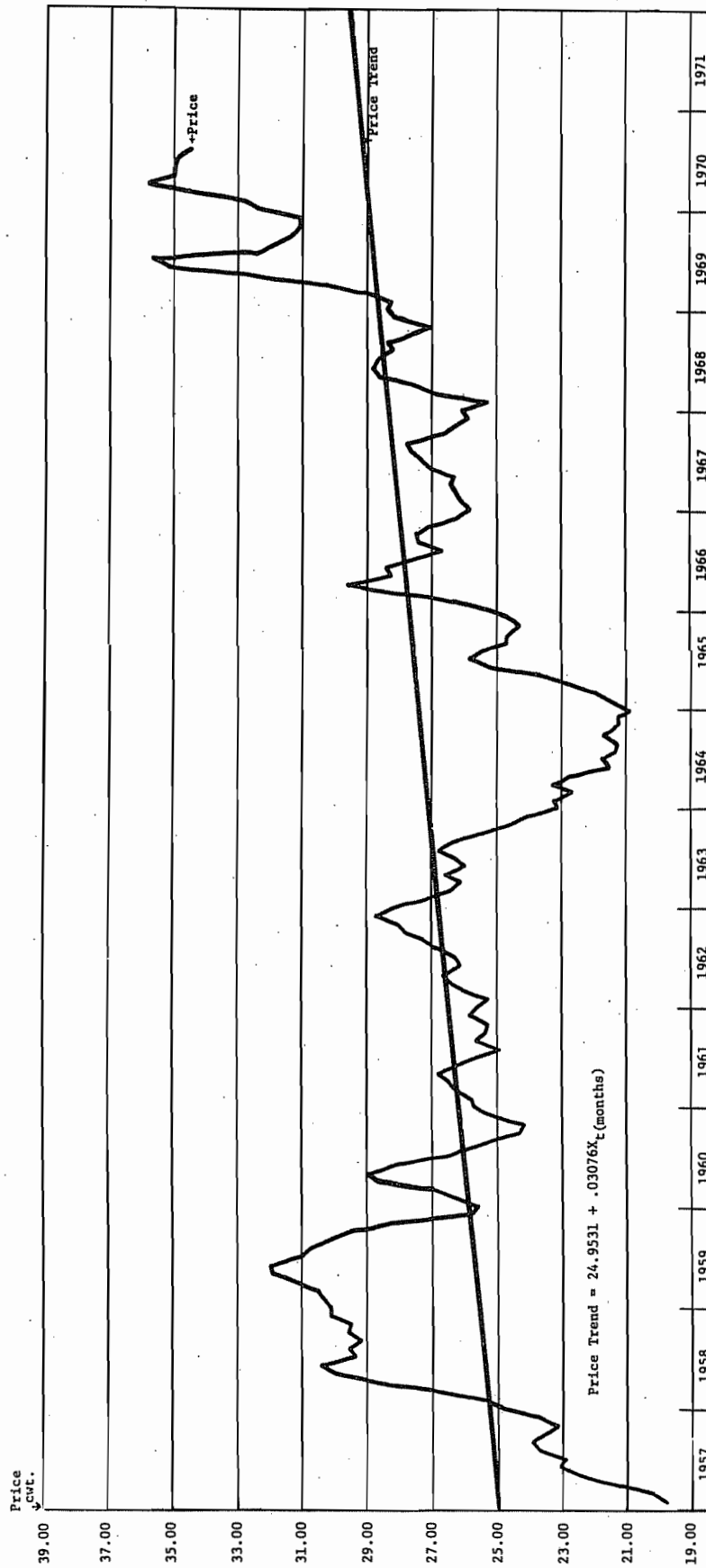
Figure 2. Monthly Prices and Price-Trend Line for 500-800 Pound Choice Feeder Steers at Kansas City, 1957-1970.

SOURCE: Livestock and Meat Statistics

Price Trend = 24.9531 + .03076$X_{t(months)}$

with another in 1970. The trend line in Figure 2 illustrates a general
upward trend in feeder calf prices. However, actual prices vary widely
from this trend line over a number of years and even within the same year.
For example, the price of choice 500-800 pound feeder steers at Kansas City
declined by 34 percent (32 to 21 cents per pound) from 1959 to 1964 and
increased by 71 percent (21 to 36 cents per pound) from 1964 to 1970.
Assuming a 650-pound feeder steer, this 15-cent increase in price per pound
represents an additional $97.50 the seller would have received in 1970 as
compared to 1964 for selling a calf of similar weight and grade.

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Seasonal Variation in Prices
of Feeder Calves

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Feeder calf prices exhibit a somewhat regular pattern within a
single year, generally moving from lower prices during weeks of heaviest
marketings to higher prices when marketings of calves are lower. On the
average, the rise in prices from low to high should be about equal to the
difference in cost of producing feeder calves during an "off-season."[25]

Average monthly prices received for choice 550-750 pound feeder
steers at the West Fargo market from 1963-1970 are illustrated in Figure 3
by the eight-year average price line. It is evident from the eight-year
average price line that during the 1963-1970 period, the prices received
for 500-750 pound feeder steers were normally higher during the summer
months of May through August and lower during the fall and winter months
(September through April).

The average monthly prices for the 500-750 pound feeder steers are
also averaged for shorter periods of time (1963-1965, 1966-1968, and 1969-
1970) to determine whether the seasonal variation in prices has changed
over the 1963-1970 time span. The average monthly prices for the shorter
time spans all exhibit similar seasonal price variations with the peaks
in prices occurring during the summer months and the lows occurring in
the fall and winter months. Although the peaks and lows in prices of the
shorter time spans usually occurred during different months, the same
basic pattern in prices is still displayed by all of the time periods con-
sidered. The most recent time period, 1969-1970, was actually the most
pronounced and had the widest range in prices. This would indicate that
the seasonal variation in prices of feeder cattle does not seem to be
diminishing to any degree, at least through 1970.

The calves included in this study were fed for 116 days, on the
average, and were normally started on feed in November, which suggests
that the calves would generally be sold in March. The eight-year average
price line in Figure 3 indicates that only a slight increase occurred in
the March price over the November price for choice 550-750 pound feeder
steers at West Fargo. However, since the calves gain in weight during
the feeding period, an actual decline in the value of the calves on a
per-pound basis can be expected.

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[25]Ibid., p. 43.
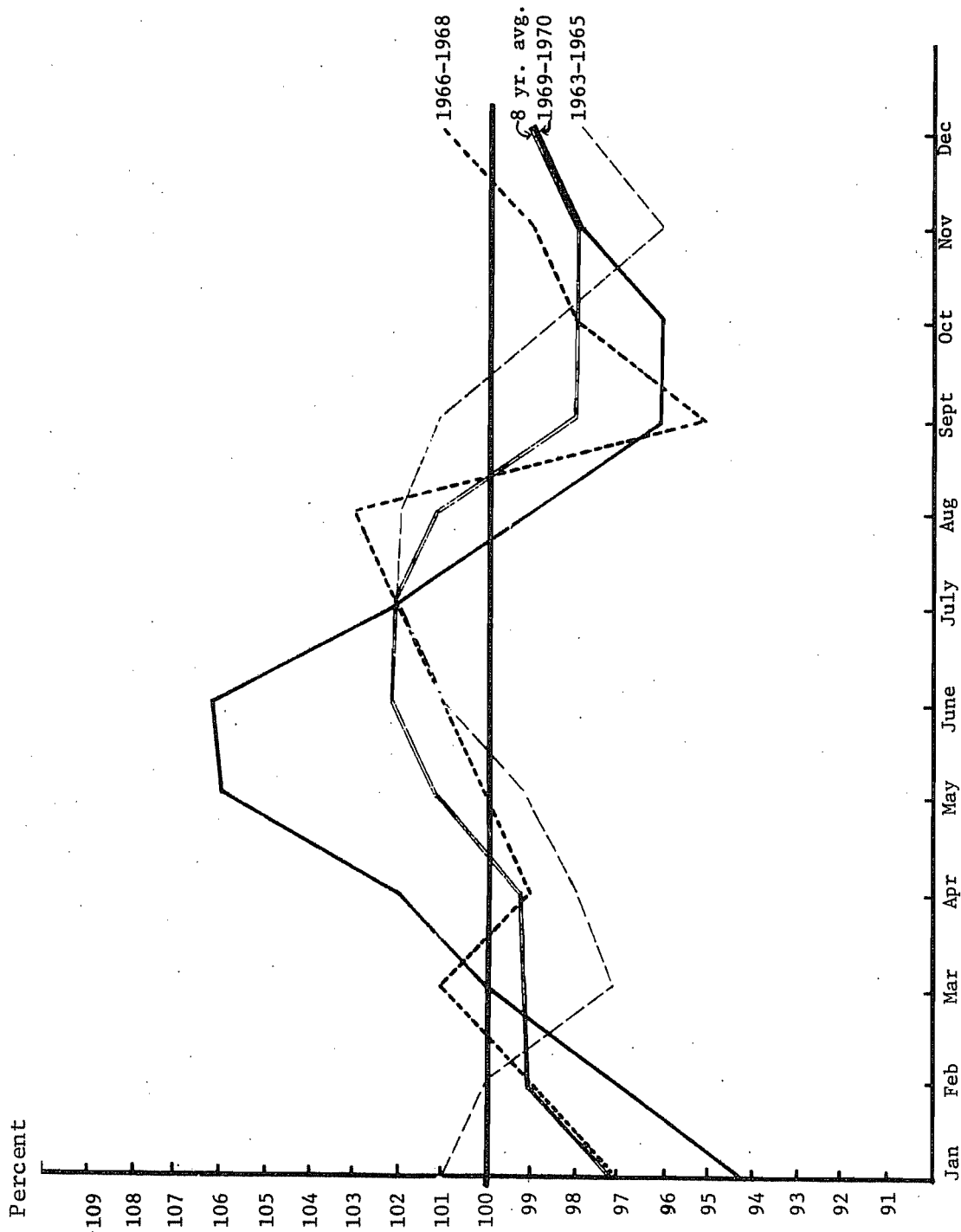
Figure 3. Percent Variation of Monthly Prices From the Average Price for Each Specified Time Period for Choice 550-750 Pound Feeder Steers, West Fargo Terminal Market.

Demand for Feeder Calves

An increase in the weight of a calf normally results in a total increase in the value of the calf, but also results in a decrease in calf value on a per-pound basis. To determine the decrease in price per pound resulting from an increase in calf weight, the prices of choice steers and heifers weighing 300-550 pounds were compared to calves weighing 550-750 pounds (see Tables 1 and 2 in the Appendix).

Four separate demand functions were developed for choice feeder calves and are illustrated in Figure 4. The demand functions represented include an eight-year (1963-1970) average price for 300-750 pound feeder calves and the average prices for calves within the same weight range for three other shorter spans of time within the same eight-year period.

The demand functions presented in Figure 4 are based upon average prices received for 300-750 pound feeder calves at West Fargo for each of the different time periods considered. These demand functions are used in making adjustments in prices at selling time due to the increased weight which the calves have gained during the feeding period.

The demand functions in Figure 4 show that a more rapid decline in price occurred as the weight of the calves increased during the period of relatively higher prices (1969-1970) than during the period of lower prices (1963-1965). During the 1969-1970 period when prices were relatively high, an additional 100 pounds of gain were associated with an average decrease in price of approximately 1.5 cents. During a period of relatively lower prices, such as 1963-1965, an additional 100 pounds gain per calf was associated with an average price decline of only 0.9 cents. During the 1966-1968 period when prices were close to the average prices for the eight-year period, each additional 100 pounds of gain were associated with an average price decrease of approximately 1.0 cent over the entire eight-year period.

COSTS OF PRODUCTION

The practice of feeding calves on a backgrounding program during any one year results in fixed and variable costs being incurred by the producer. Variable costs are the only costs considered by the rancher in deciding whether or not to produce in the short run.[26] If the production process generates returns equal to or greater than the costs of the variable resources, it is rational for the rancher to feed calves during the short-run period. In making long-run planning decisions, the rancher uses both fixed and variable costs. A producer must cover all costs of production if he is going to continue operating in the long run.[27]

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[26]Short run is a period of time which is not long enough for the rancher to vary all the productive resources used in producing beef.

[27]Long run is a period of time long enough for the rancher to vary all productive resources used in producing beef.
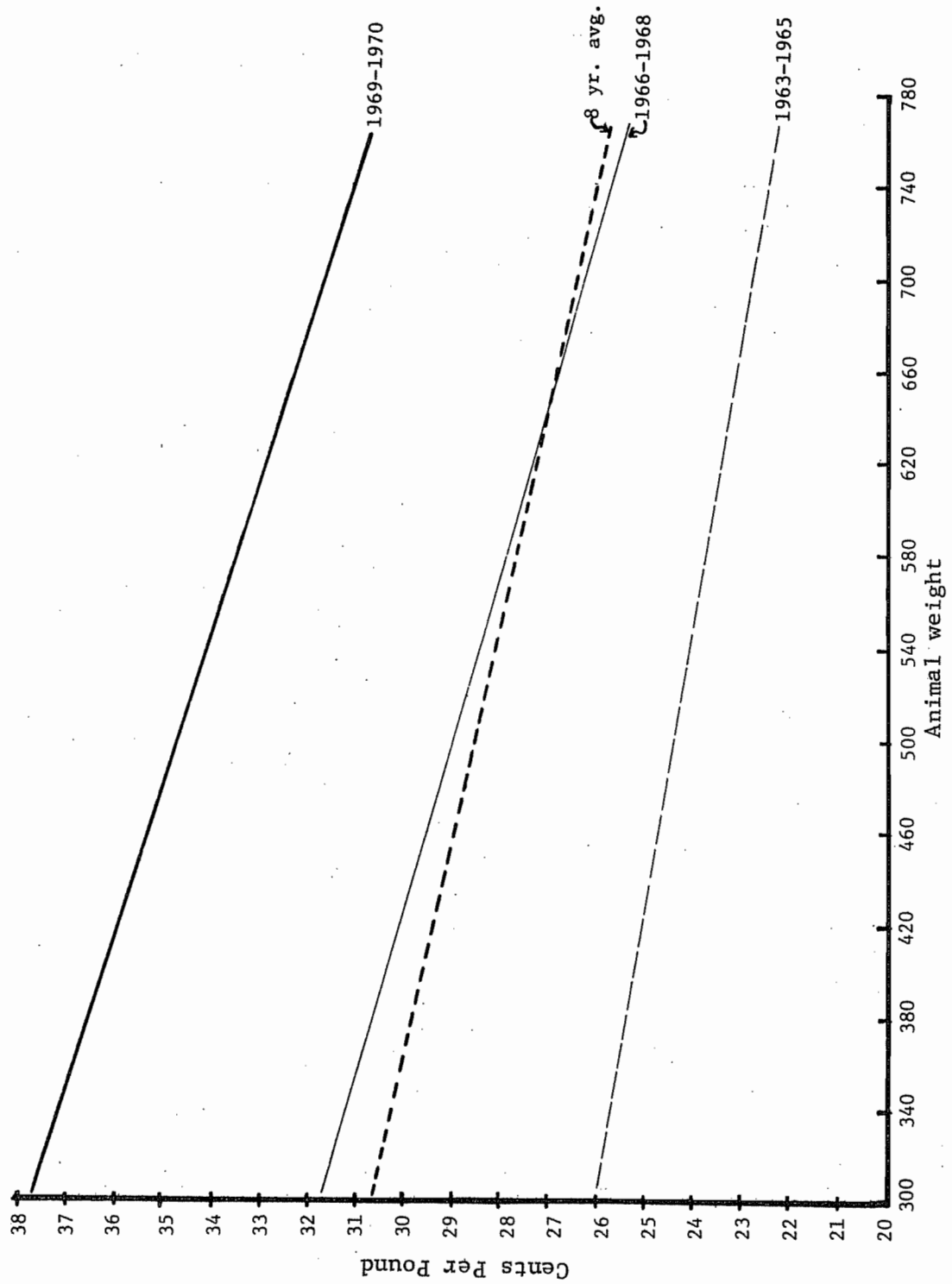
Figure 4. Demand for Choice 300-750 Pound Feeder Steers and Choice 300-700 Pound Feeder Heifers at West Fargo (1963-1970).

The figures in Table 2 show that the backgrounding programs for the ranchers surveyed in this study were characterized by a high ratio of variable cost to total cost. Variable costs represent 83.6 percent of total costs (or 22.63 cents per pound of gain) while fixed costs represent only 16.4 percent of total costs (or 4.43 cents per pound of gain). The total cost per pound of gain is 27.06 cents. An average of $3,654 was required per ranch for backgrounding 90 calves for 116 days.

TABLE 2. ANNUAL FIXED, VARIABLE, AND TOTAL COSTS FOR BACKGROUNDING 90 CALVES FOR 116 DAYS IN NORTH DAKOTA, 1970[a]

Item	Total Capital Requirements Per Ranch[b]	Cost Per Head	Cost Per Pound of Gain	Percent of Total
	(dollars)	(dollars)	(cents)	
Fixed costs	598	6.65	4.43	16.4
Variable costs	3,055	33.94	22.63	83.6
Total costs	3,654	40.59	27.06	100.0

[a]All values appearing in this table are averages for the 42 ranches included in the analysis.

[b]Includes a charge of $2.00 per hour for labor and management.

Fixed Costs

A detailed breakdown of fixed and variable costs of backgrounding is presented in Table 3. The figures in this table are based upon a 116-day feeding period for 90 head of calves. Total fixed costs per pound of gain was 4.43 cents and averaged $6.65 per head for the entire 116-day feeding period. The two major categories of fixed costs were depreciation and interest on investment in buildings, improvements, machinery, and equipment. Interest on investment was the most important fixed cost item, representing 2.72 cents per pound of gain, while depreciation accounted for only 1.71 cents per pound. The annual total per ranch expenditure for fixed resources was nearly $600.

Variable Costs

Total variable costs per pound of gain averaged 22.63 cents during the 116-day feeding period. The average total variable cost per head was $33.94.

The variable costs appearing in Table 3 are categorized under two major subheadings--feed costs and nonfeed variable costs. Feed cost was the single most important variable cost item, being responsible for 58.1 percent of the total cost of production and representing an average of

TABLE 3. ANNUAL PRODUCTION COSTS FOR BACKGROUNDING 90 CALVES FOR 116 DAYS IN NORTH DAKOTA, 1970[a]

Item	Total Capital Investment Per Ranch	Cost Per Head	Cost Per Pound of Gain	Percent of Total
	(dollars)	(dollars)	(cents)	
Fixed Costs:				
Depreciation	231	2.57	1.71	6.3
Interest[b]	367	4.08	2.72	10.1
Total	598	6.65	4.43	16.4
Variable Costs:				
Nonfeed variable costs:				
Labor[c]	431	4.79	3.19	11.8
Interest[d]	202	2.24	1.49	5.5
Miscellaneous	189	2.10	1.40	5.2
Death loss	110	1.22	0.81	3.0
Total	932	10.35	6.89	25.5
Feed costs	2,123	23.59	15.74	58.1
Total	3,055	33.94	22.63	83.6
Total Costs	3,653	40.59	27.06	100.0

[a]All values appearing in this table are averages for the 42 ranches included in the analysis.

[b]Includes interest on buildings, improvements, machinery, and equipment at 7.5 percent.

[c]Represents total labor required including that provided by the ranch manager.

[d]Includes interest on investment in variable resources for one-half the length of the feeding period at 7.5 percent.

15.74 cents per pound of gain. The value of the feed utilized during the feeding periods was established by assigning a market value to homegrown feeds and by using the actual cost of purchased feed. The total feed cost for feeding 90 calves for 116 days averaged $2,123 per ranch or $23.59 per head.

Nonfeed variable costs comprised the second largest cost category and accounted for 25.5 percent of the total cost of production. These costs amounted to 6.89 cents per pound of gain for a total per head cost of $10.35. The average per ranch expenditures for nonfeed variable costs were $932.

Nonfeed variable costs include labor, interest on investment in variable resources, miscellaneous costs, and animal death loss. Labor was the most important of these four items, being responsible for 11.8 percent of total costs. Interest was second in importance at 5.5 percent, followed by miscellaneous costs at 5.2 percent, and death loss at 3.0 percent.

Labor required for backgrounding was valued at $2.00 per hour for all ranchers.[28] The average number of hours required for backgrounding 90 calves for 116 days was 215.4 hours which results in an average labor cost of $4.79 per head.

Interest on investment in variable resources was assessed for only one-half of the feeding period since these typically are not all incurred initially but are incurred throughout the entire production period. The interest rate applied in determining interest on investment was 7.5 percent and accounted for approximately 1.5 cents per pound of gain.

Miscellaneous costs include outlays for fuel and lubricants, electricity, veterinary supplies and services, repairs for equipment, buildings and corrals, plus other minor expense items which were incurred during the production process but which were not specifically identified under one of the other cost categories.

Animal deaths were found to equal 0.8 percent of the total number of calves started on the backgrounding program. The cost of death loss averaged $110 per ranch and represented a cost of $1.22 per head for calves sold. Only 17 of the 42 operators included in this study reported any death loss. The remaining 25 ranchers indicated there was no incidence of death associated with the calves that were on the backgrounding program.

The relative importance of each of the individual cost items is illustrated in Figure 5. Figure 5 includes a summary of the costs per 100 pounds of gain and also a summary of annual production costs expressed as a percentage of total annual costs of production. The high ratio of variable cost to total cost is illustrated clearly by this diagram. Variable costs per 100 pounds of gain amounted to $22.63 or 83.6 percent of the total annual costs of production. Fixed costs per 100 pounds of gain, however, comprised only $4.43 or 16.4 percent of total costs.

An enterprise such as a calf backgrounding program, which requires a relatively low level of fixed costs compared to variable costs, is one which ranchers can more easily initiate and discontinue in response to economic conditions. When the price of calves relative to the price of feed is favorable, ranchers can retain their weaning calves for backgrounding. When calf prices are low relative to feeding costs (below that necessary to cover total variable costs) ranchers can terminate the backgrounding program and suffer only minor losses from the ownership of fixed resources.

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[28]Represents total labor required including that provided by the ranch manager.

Interest Depreciation
Death on Invest- $1.71
Loss ment in (6.3%)
$.81 Variable
Misc. (3.0%) Resources Interest on
$1.40 $1.49 Investments in
(5.2%) (5.5%) Fixed Resources
$2.27 (10.15%)

Labor $3.19 (11.8%)

Feed $15.74 (58.1%)

Total Variable Costs = $22.63 (83.6%)
Total Fixed Costs = $4.43 (16.4%)
Total Costs = $27.06 (100%)

☐ Variable Costs

▨ Fixed Costs
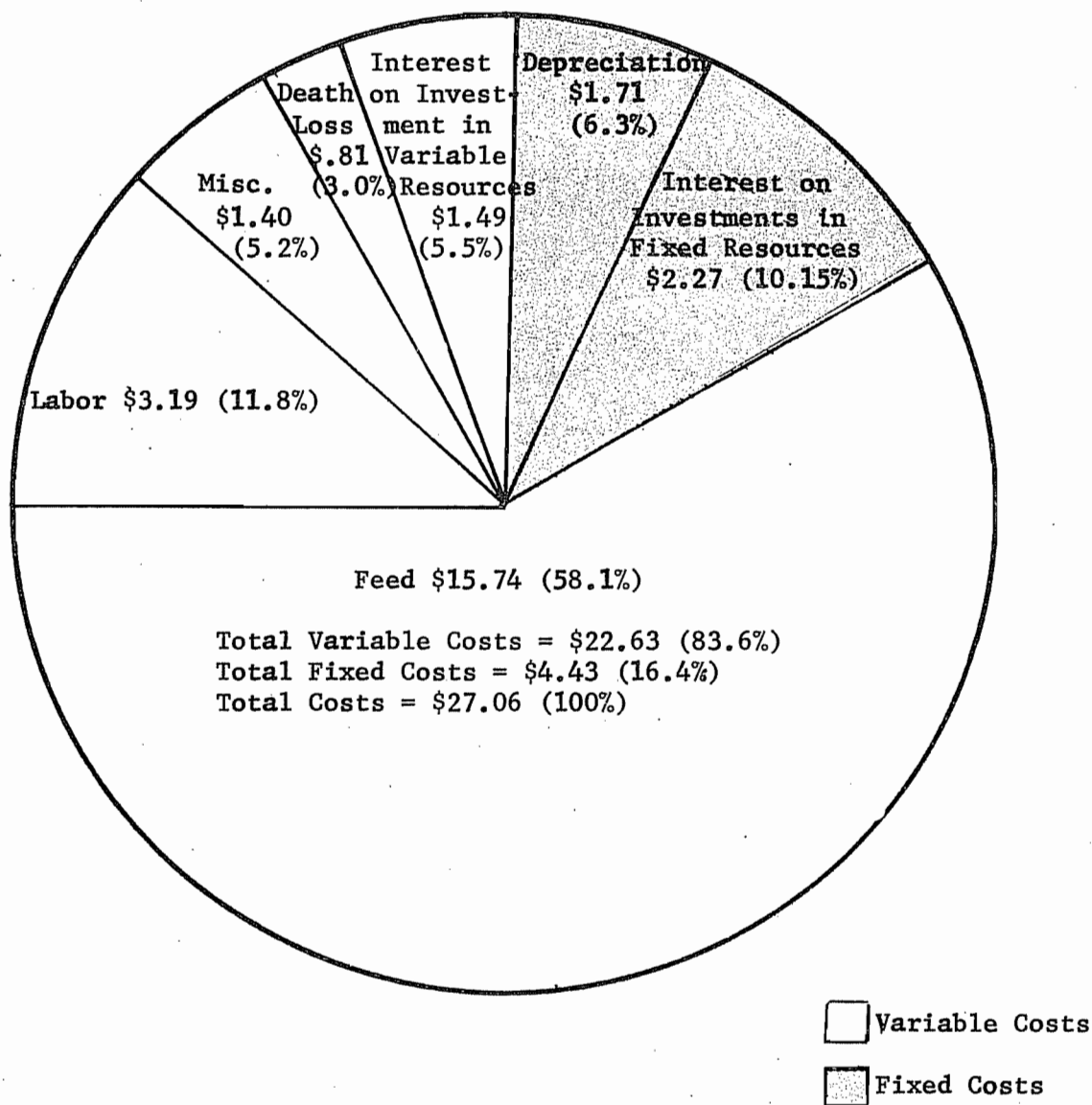
Figure 5. Average Costs Per 100 Pounds of Gain and Average Cost Percentages for Backgrounding 90 Calves for 116 Days, North Dakota, 1970.

BEST FIT TOTAL COST CURVES

A straight line equation is often used in expressing a relationship between two variables. However, observation of the plotted data may indicate that an equation which forms a curved line will better represent the relationship between two variables. Specifically, a curvilinear equation may minimize the variation between the observed value and the value estimated by a mathematical equation. Various equations may be tested to determine which equation best describes the relationship between the variables being tested. Those equations resulting in the highest R^2 values provided the best estimate of the relationship between the two variables being tested. The equation having the highest R^2 value provides the highest explained variation in the dependent variable which is due to the variation in the independent variable.

The equations tested for selecting the best fit total cost curves in this study were as follows:

1. $Y = a + bX$

2. $\text{Log } Y = a + b \log X$

3. $Y = a + \dfrac{b}{X}$

4. $\text{Log } e\, Y = a + b \log e\, X$

5. $Y = a + b \log X$

Regression results indicated that no significant relationship existed between total cost per pound of gain and either the number of calves fed or the length of the feeding period. For this reason, finding best fit total cost curves was attempted with the above equations by regressing total cost per pound of gain with only the following three variables:

1. Total pounds gained per calf

2. Total pounds gained by all calves

3. Average daily gain

Cost Per Pound in Relation to Total Pounds Gained Per Calf

Equation 3 gave the highest explained variation ($R^2 = .42$) between the dependent variable, total cost, and the independent variable, total pounds gained per calf. The estimated total costs per pound and the various levels of total pounds gained per calf are presented in Table 4. The estimated total cost per pound of gain ranges from 45.7 for calves gaining a total of 50 pounds to 21.7 for calves that gain 275 pounds.

TABLE 4.   ESTIMATED TOTAL COST PER POUND OF GAIN IN RELATION TO VARIOUS
LEVELS OF TOTAL POUNDS GAINED PER CALF[a]

Total Pounds Gained Per Calf	Total Cost Per Pound
	(cents/lb)
50	45.7
75	35.9
100	31.0
125	28.1
150	26.1
175	24.7
200	23.7
225	22.8
250	22.2
275	21.7

[a]These costs per pound were estimated with the regression equation
$Y = a + \frac{b}{X}$.   The parameters in the equation are: $Y = .16332 + \frac{14.67674}{X}$.

The observations plotted in Figure 6 represent the actual costs that
were incurred by each of the 42 operators included in this study. A line
of regression plotted from the estimates in Table 4 was fitted to these
observations.

The cost per pound estimates in Table 4 and the regression line in
Figure 6 support the hypothesis that an inverse relationship exists between
these two variables.   This means that as the calves gain in weight the costs
per pound associated with these gains will decrease.

Cost Per Pound in Relation to Total Pounds Gained

The highest explained variation in total costs in this regression
analysis was explained by total pounds gained. Approximately 25 percent
of the variation in total costs was explained by the independent variable,
total pounds gained, when equation 5 was used. Table 5 contains the esti-
mated total costs for corresponding levels of total pounds gained per calf.
The regression line in Figure 7 depicts how total costs decrease as the
total number of pounds gained increases. It is evident in both Table 5
and Figure 7 that total costs decrease more rapidly initially and then
level off somewhat as the total pounds gained approaches the 50,000-pound
level.

Cost Per Pound in Relation to Average Daily Gain

Approximately 54 percent of the variation in total cost was explained
by the variation in average daily gain when the relationship between the two
variables was represented by equation 5. The selected range in average

Figure 6. Scatter Diagram of Total Cost Per Pound of Beef Produced and Fitted Regression
Curve for Various Levels of Total Pounds Gained Per Calf.

Figure 7. Scatter Diagram of Total Cost Per Pound of Beef Produced and Fitted Regression Curve for Various Levels of Total Pounds Gained by All Calves Being Fed.

TABLE 5.   ESTIMATED TOTAL COST PER POUND OF GAIN IN RELATION TO VARIOUS
LEVELS OF TOTAL POUNDS GAINED BY ALL CALVES FED[a]

Total Pounds Gained by all Calves in the Lot	Total Cost Per Pound
	(cents/1b)
5,000	34.0
10,000	29.2
15,000	26.4
20,000	24.4
25,000	22.9
30,000	21.6
35,000	20.6
40,000	19.6
45,000	18.8
50,000	18.1

[a]These costs per pound were estimated with the regression equation
$Y = a + b \log X$.   The parameters in the equation are $Y = .61165 + (-.1596) \log X$.

daily gain in Table 6 is from 0.4 to 1.8 pounds per day, while the corre-
sponding estimates of total costs range from 44.0 to 23.1 cents per pound.
The line of regression fitted to the actual plotted observation in Figure 8
illustrates the relationship which exists between total costs per pound and
average daily gain. Total costs decrease at all levels as the rate of gain
increases; however, the costs decrease at a much slower rate at higher levels
of gain than at low levels of gain.

TABLE 6.   ESTIMATED TOTAL COST PER POUND OF GAIN IN RELATION TO VARIOUS
LEVELS OF AVERAGE DAILY GAIN[a]

Average Daily Gain	Total Cost Per Pound
(pounds)	(cents/1b)
0.4	44.0
0.6	38.3
0.8	34.3
1.0	31.2
1.2	28.7
1.4	26.6
1.6	24.7
1.8	23.1

[a]These costs per pound were estimated with the regression equation
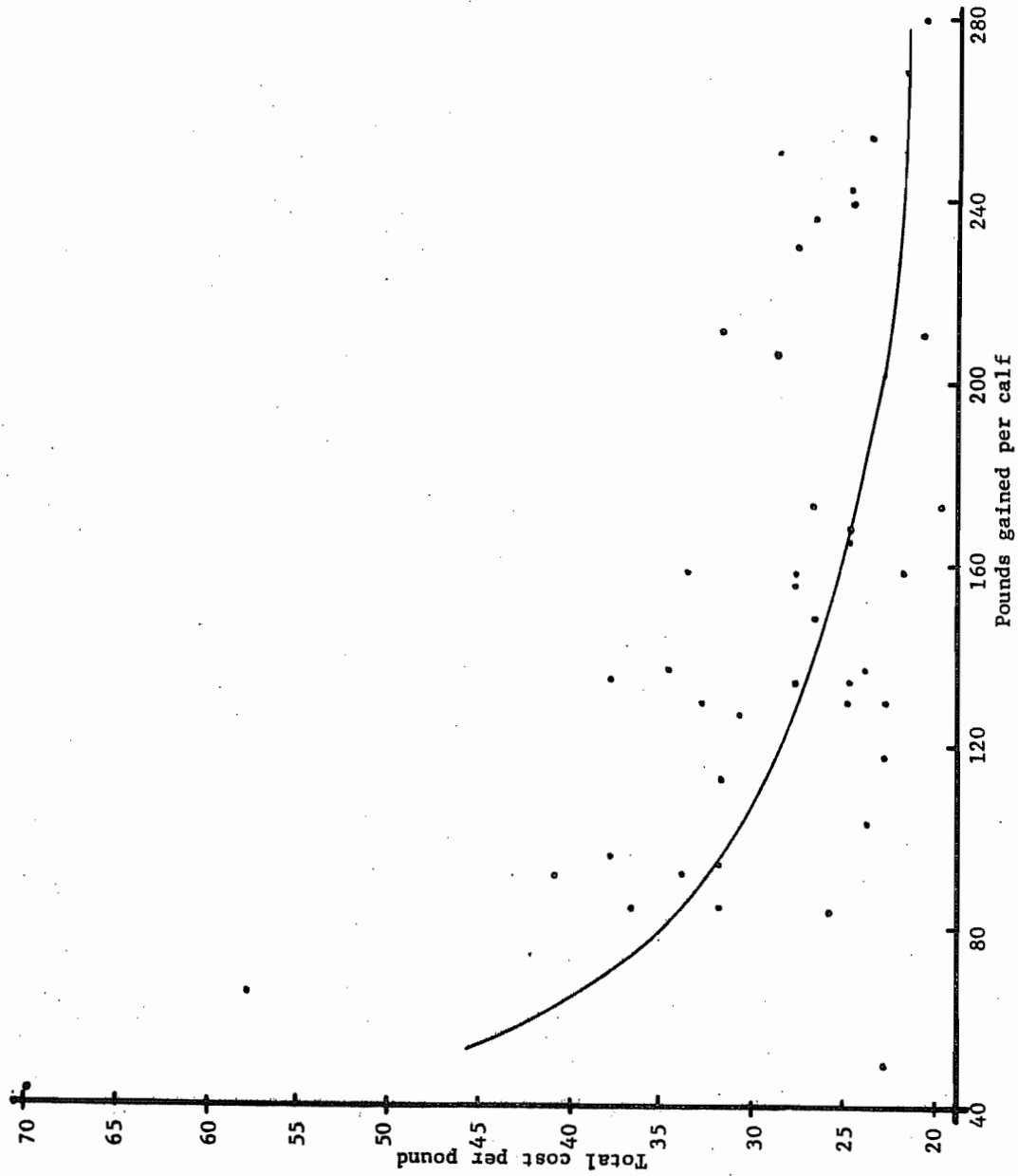$Y = a + b \log X$.   The parameters in the equation are $Y = .31236 + (-.31971) \log X$.

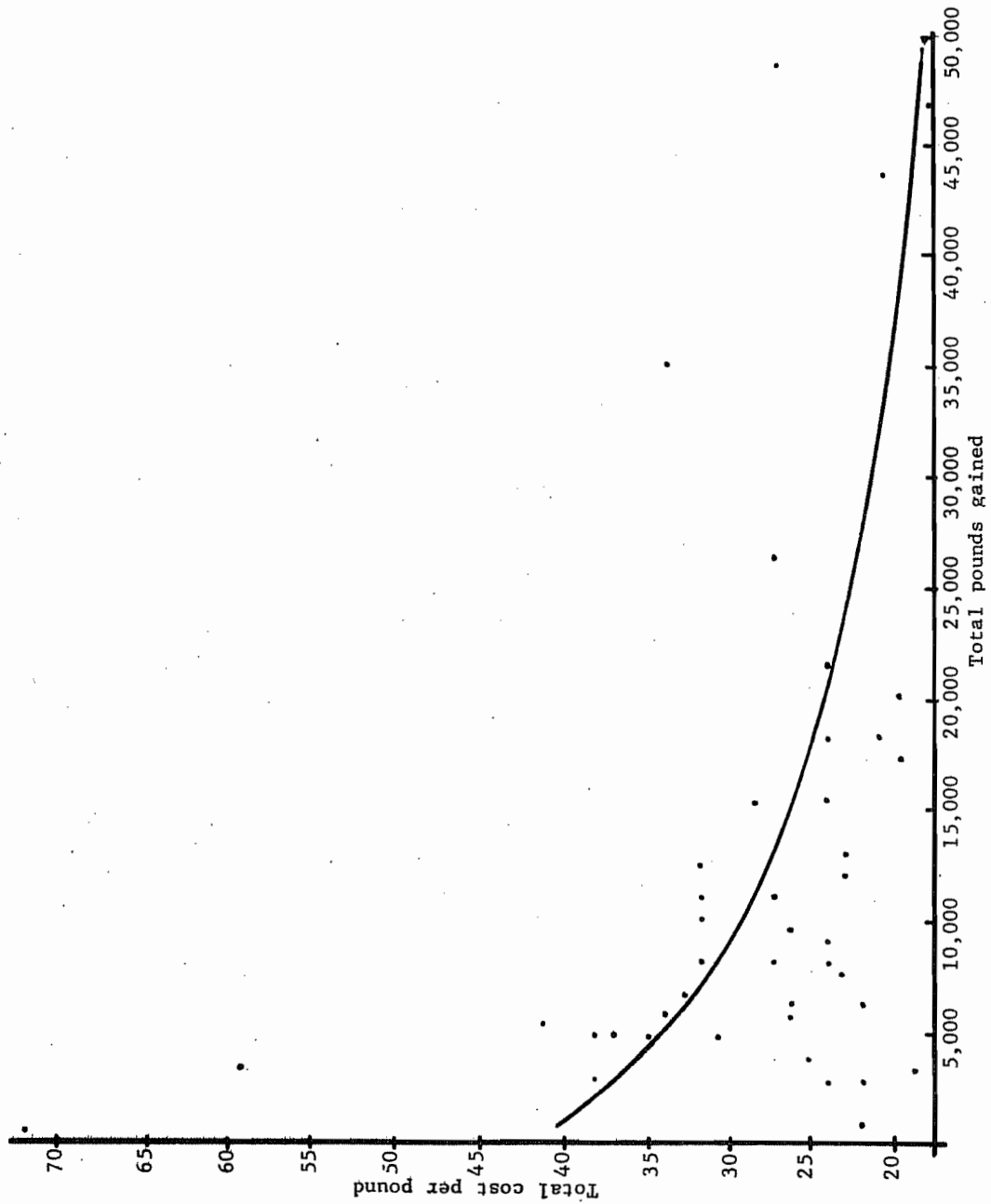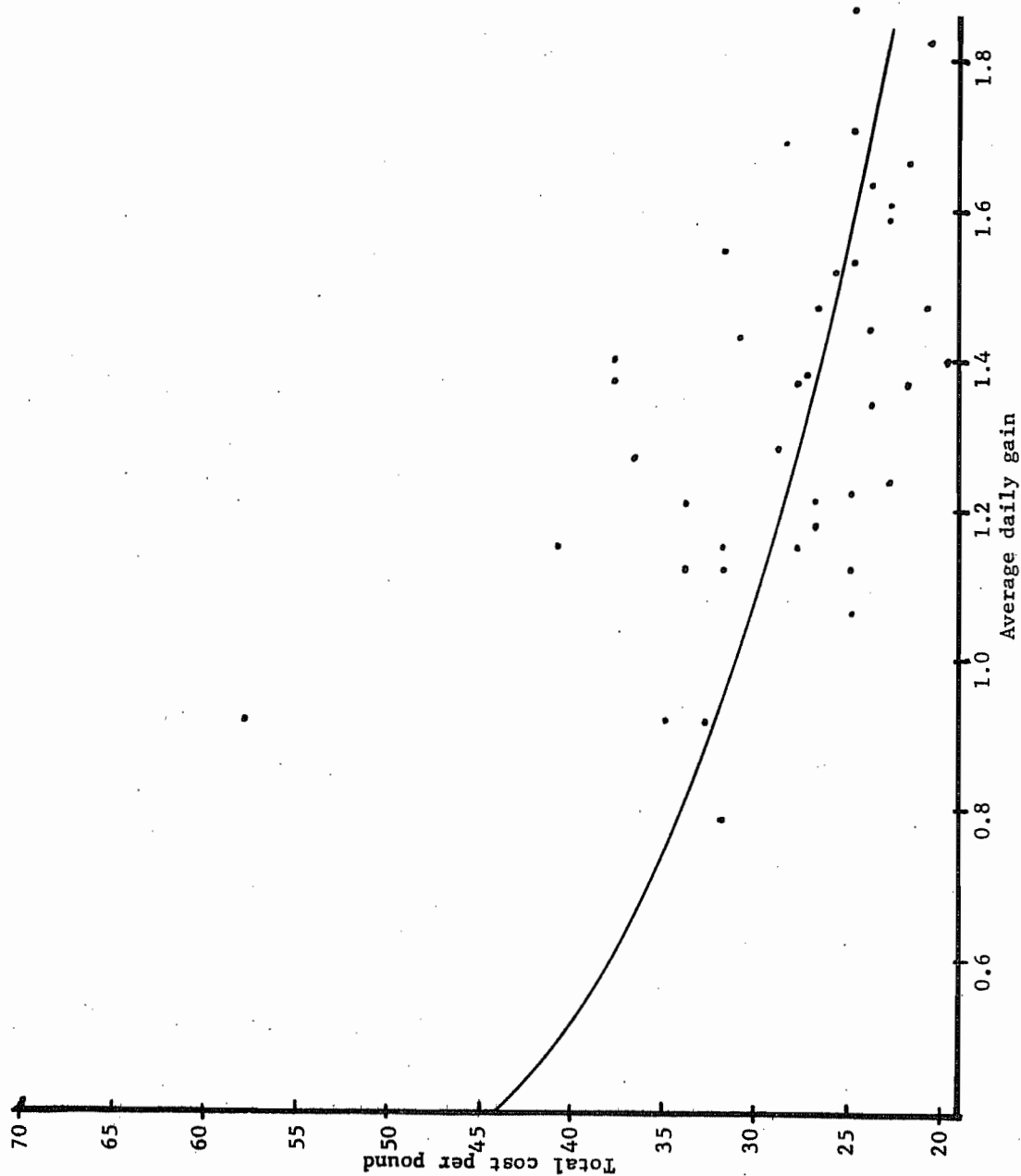Figure 8. Scatter Diagram of Total Cost Per Pound of Beef Produced and Fitted Regression Curve for Various Levels of Average Daily Gain.

ANNUAL RETURNS

The price of the calves on the selling date is an all important factor in determining the profitability of backgrounding calves. Determining the value of calves at a future selling date involves two basic questions:

1. How much of a price change can be expected from the beginning of the feeding period until the selling date due to the seasonal variation in prices of feeder calves?

2. How much of a decrease in value on a per-pound basis can be expected over the course of the feeding period due to the additional weight gained per calf?

The price information obtained from the West Fargo terminal market and diagrammed in Figure 3 illustrates the seasonal movement in the prices of feeder calves. This information provides the basis for making adjustments in feeder calf prices at selling time due to the seasonal variation which occurs in feeder calf prices.

The demand functions diagrammed in Figure 4 illustrate the decrease in value of a feeder calf on a per-pound basis as the calf increases in weight. The demand functions are used in making adjustments in the selling prices used in the following sections of this study to account for the increase in weight of the individual animals which occurs over the course of the feeding period.

BREAK-EVEN PRICES AND PRICE MARGINS

When price levels of feeder calves are relatively high, it is logical that the probability of prices declining towards a level nearer the median are greater than the probability of prices rising to higher levels. Conversely, when price levels are relatively low, the probability will be greater for prices to increase rather than decrease to even lower levels. Production costs, however, do not necessarily increase as the price of feeder calves increases. As the value of the calves increases, production costs other than the cost of the calves become a smaller part of total cost. Thus, those resources for which the costs remain relatively stable are utilized in producing a more valuable product when the price of calves increases. Producers can therefore withstand a larger decrease in price per pound (over the course of the feeding period) at relatively higher price levels than at lower levels and still cover the costs of production.

The amount by which the selling price of feeder calves can decline from the initial price of the calves at the beginning of the feeding period and still provide a return sufficient to cover all costs is referred to in this analysis as the price margin (Table 7). The minimum price that may be received for the calves at the end of the feeding period and still cover all costs of production is referred to as the break-even price.

Based on the costs obtained in this study for backgrounding calves, if the November calf price is 45.0 cents (Table 7), the producer can withstand a 5.0-cent decline in price for calves sold in March and still cover all costs of production including a $2.00 per-hour charge for labor.

TABLE 7. BREAK-EVEN PRICES[a] AND PRICE MARGINS[b] FOR BACKGROUNDING 90 CALVES FOR 116 DAYS IN NORTH DAKOTA, 1970.

Value of Calves in November	Total Cost[c]	Break-Even Price	Price Margin
(cents/lb)	(dollars)	(cents/lb)	(cents/lb)
21	11,193	21.74	-0.74
22	11,584	22.50	-0.50
23	11,975	23.26	-0.26
24	12,366	24.02	-0.02
25	12,757	24.78	0.22
26	13,148	25.54	0.46
27	13,539	26.30	0.70
28	13,930	27.06	0.94
29	14,321	27.82	1.18
30	14,712	28.58	1.42
31	15,103	29.34	1.66
32	15,494	30.10	1.90
33	15,885	30.86	2.14
34	16,276	31.62	2.38
35	16,667	32.38	2.62
36	17,058	33.14	2.86
37	17,449	33.90	3.10
38	17,840	34.66	3.34
39	18,230	35.42	3.58
40	18,621	36.18	3.82
41	19,012	36.94	4.06
42	19,403	37.70	4.30
43	19,794	38.46	4.54
44	20,185	39.22	4.78
45	20,576	39.98	5.02

[a]Break-even price = $\dfrac{\text{Total cost}}{\text{Total pounds of beef sold}}$.

[b]Price margin refers to the amount by which the selling price can decline from the initial price and still provide a return sufficient to cover all costs.

[c]Total costs include a charge of $2.00 per hour for labor.

However, if the operator is to cover total costs when the November value of the calves is 21.0 cents, ths selling price must increase 0.74 cents. As the value of the calves in November increases from 21.0 to 45.0 cents, the corresponding price margins also increase. Thus, producers can withstand larger declines in price during periods of relatively higher prices than during periods of lower prices. The demand functions presented in Figure 4 indicate that larger price declines are associated with higher price levels. However, since producers can more easily cover their production costs during periods of relatively higher prices, a larger profit potential still exists during periods of higher prices.

PROFIT LEVELS FROM BACKGROUNDING CALVES

Profit is defined as the difference between total revenue and total cost. The annual total revenue received from backgrounding operations is the pounds of beef sold and the price received per pound. Total costs are those expenses incurred in organizing and carrying out the backgrounding process. Total revenue and total costs of backgrounding can then be combined to determine whether the backgrounding of feeder calves is a profitable management strategy for North Dakota ranchers.

It is highly unlikely that production costs for cattle producers will decrease in future years. However, from the historic price data diagrammed in Figure 2 (which illustrates the wide variation in price levels of feeder calves which have occurred over a number of years), it does seem possible that prices could decrease to levels as low as those which occurred during the 1963-1965 period. For this reason, costs of production obtained in this study for the year 1969 are combined with different time periods within the past eight years to determine the returns to labor and management which would result from various price levels. The November and March prices for feeder calves marketed at the Union Stockyards in West Fargo (presented in the Appendix) provide the basis for determining the value of the calves at the beginning and end of the feeding period.

The year 1970 (Table 8) was the most profitable of all time periods considered. Calves weighing 300-550 pounds were valued at 33.0 cents per pound in November, 1969, at the beginning of the winter feeding period and sold for 33.8 cents per pound in March, 1970. Based on the costs obtained in this study, the returns to labor and management in that particular year for feeding 90 head of calves for 116 days were $1,967 or $21.85 per head. On an hourly basis, the returns to labor and management for 1970 were $9.13. (An average of 215.4 hours was required per ranch for backgrounding 90 calves for 116 days.)

The unusually high returns to labor and management which occurred in 1970 are attributed to a larger than normal upward price movement from November, 1969, to March, 1970. The other time periods considered in which the November and March prices were averaged over two or three years present a more realistic description of seasonal price movements, since the upward movement in price from November to March is normally quite small (approximately 1 percent of the total value of the animal) for calves of the same weight and grade.

TABLE 8. PROFIT LEVELS FOR BACKGROUNDING 90 CALVES FOR 116 DAYS IN NORTH
DAKOTA FOR VARIOUS TIME PERIODS, 1963-1970

Time Period	Total Costs (Excluding Labor)	Gross Returns	Returns to Labor and Management	Returns to Labor and Management	
				Per Hour	Per Head
			(dollars)		
1963-1965	11,699	11,526	-1,71	-0.79	-1.89
1966-1968	13,257	13,663	406	1.88	4.51
1969-1970	15,665	16,438	772	3.59	8.58
1970	15,454	17,421	1,967	9.13	21.85
8-yr. average	13,304	13,565	261	1.21	2.90

Using average price levels for November and March of 1969 and 1970
resulted in a total return to labor and management of $772.00 or $8.59
per calf. During this time period the calves were valued at 33.5 cents
per pound at the beginning of the feeding period in November and were
sold in March for 31.9 cents per pound. This represents a decrease in
value of the calves of 1.6 cents per pound over the 116-day feeding
period.

Applying the costs obtained in this study to the average price
levels during the 1966-1968 time period resulted in a return to labor and
management of $4.51 per calf or $1.88 per hour. Total returns to labor
and management for feeding 90 calves 116 days were $406. The value of
the calves on a per-pound basis decreased 0.9 cents over the course of
the backgrounding period in 1966-1968, going from 27.4 cents in November
to 26.5 cents in March.

Price levels during the 1963-1965 period (a period of relatively
lower prices) yielded a negative return to labor and management of $-0.79
per hour or $-1.89 per head. Total returns to labor and management were
$-171. During this time period the calves were valued at 23.4 cents
per pound at the beginning of the feeding period in November and were
sold in March for 22.4 cents per pound.

Averaging the November and March prices for the entire eight-year
period (1963-1970) resulted in a return to labor and management of $261.
This means that given the same level of costs as has been determined for
producers in this analysis, a producer would have received an average
return to labor and management of $1.21 per hour or $2.90 per head over
the entire eight-year period. The average value of the calves during the
entire eight-year period was 27.5 cents per pound in November and 26.3
cents in March. This represents an average decrease in price of 1.2 cents
per pound during the November to March feeding periods.

Larger profit potentials exist during periods of higher price
levels such as in 1969-1970 than during low levels such as in 1963-1964.
This is particularly true for operators who background their own calves

and therefore do not have to purchase calves for feeding. If prices were to revert back to the lower levels which prevailed during the 1963-1965 period, losses to the producer from backgrounding would likely be incurred. It should be noted, however, that an interest rate of 7.5 percent on capital investment is included in the cost of production in this analysis. Thus, a producer who is employing his own capital entirely, and who is able to cover all costs of production, is realizing a 7.5 percent return on investment. Gross returns above total costs are expressed as returns to labor and management.

COSTS AND EXPECTED RETURNS FOR BACKGROUNDING CALVES AT VARIOUS PRICE LEVELS

A range in possible prices of calves at the beginning and end of the 116-day feeding period is analyzed in combination with the costs of production (Table 9) to determine the level of prices at which backgrounding enterprises cease to become a profitable venture for North Dakota ranchers. The feeding period is assumed to begin in November and end in March. The expected March value is determined by adjusting the preceding November price to account for the increase in weight per calf which occurs during the feeding period and also for the seasonal movement in prices which occurs from November to March.

The figures in Table 9 indicate (as did those in Table 8) that a much greater profit potential exists during periods of higher price levels than during periods of low levels. Based on the costs in this study, the expected return to labor and management for backgrounding 90 calves for 116 days is $1,427 when the November value of the calves is 40 cents per pound. However, when the November value of the calves is only 21 cents per pound, the expected return to labor and management is $-537. On a per-hour basis, the expected return to labor and management ranged from $6.62 (when the November value of the calves was 40 cents per pound) to $-2.49 (when the calves were valued at 21 cents). The expected return to labor and management per head ranged from $15.85 to $-5.96 over the same range in prices. The return to labor and management is negative when the November price is below 27 cents per pound and is positive when the November value is at or above 27 cents per pound.

Backgrounding programs have additional advantages which make this enterprise desirable even during periods of somewhat lower prices. Feeder calf backgrounding programs provide North Dakota beef cattle producers with greater versatility in their livestock operations. Ranchers who are prepared to feed their calves can market them when prices are more favorable. These producers will not be forced to market their calves in the fall at weaning time, a period during which the heaviest marketings in North Dakota occur and when prices are generally lower. Backgrounding programs also provide a market for homegrown feeds, such as hay, which are not readily sold for cash. In addition, excess labor which often occurs during the winter months for many beef cattle producers can be more fully utilized by a winter calf feeding enterprise.

TABLE 9. COSTS AND EXPECTED RETURNS FOR BACKGROUNDING 90 CALVES FOR 116 DAYS IN NORTH DAKOTA WHEN PRICES IN NOVEMBER ARE AT VARIOUS LEVELS, 1970

Value of Calves in November (cents/lb)	Expected Value in March[a] (cents/lb)	Expected Gross Returns (dollars)	Total Cost[b] (Excluding Labor) (dollars)	Expected Returns to Labor and Management (dollars)	Expected Returns to Labor and Management	
					Per Hour (dollars)	Per Head (dollars)
21	19.86	10,226	10,763	-537	-2.49	-5.96
22	20.82	10,720	11,154	-434	-2.01	-4.82
23	21.78	11,214	11,544	-330	-1.53	-3.67
24	22.74	11,709	11,935	-227	-1.05	-2.52
25	23.70	12,203	12,326	-123	-0.57	-1.37
26	24.66	12,697	12,717	-20	-0.09	-0.22
27	25.62	13,191	13,108	83	.39	.92
28	26.58	13,686	13,499	187	.87	2.07
29	27.54	14,180	13,890	290	1.34	3.22
30	28.50	14,674	14,281	393	1.82	4.37
31	29.46	15,169	14,672	497	2.30	5.52
32	30.42	15,663	15,063	600	2.78	6.66
33	31.38	16,157	15,454	703	3.26	7.81
34	32.34	16,652	15,845	807	3.74	8.96
35	33.30	17,146	16,236	910	4.22	10.11
36	34.26	17,640	16,627	1,013	4.70	11.26
37	35.22	18,134	17,018	1,117	5.18	12.41
38	36.18	18,629	17,409	1,220	5.66	13.55
39	37.14	19,123	17,800	1,323	6.14	14.70
40	38.10	19,617	18,191	1,427	6.62	15.85

[a]Adjusted for change in price due to the increase in the weight of the calves and also for the seasonal movement in prices from November to March.

[b]Total cost of production including interest applied to the value of the calves in November.

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APPENDIX

APPENDIX TABLE 1.   MONTHLY AVERAGE PRICES RECEIVED FOR CHOICE 300-550
POUND STEER CALVES AND CHOICE 300-500 POUND HEIFER CALVES AT WEST FARGO
TERMINAL MARKET, 1963-1970

Year	Jan.	Feb.	March	April	May	June
			(cents per pound)			
Steers						
1963	29.15	28.57	27.96	29.41	28.31	28.50
1964	25.04	25.45	25.06	23.20	22.50	21.94
1965	21.44	21.62	22.20	22.88	25.19	25.95
1963-1965 Average	25.21	25.31	25.07	25.16	25.33	25.46
1966	27.25	28.58	29.30	28.00	27.81	29.05
1967	28.68	28.06	28.00	28.00	28.61	29.00
1968	27.57	28.81	29.51	29.83	30.11	30.08
1966-1968 Average	27.83	28.48	28.94	28.61	28.84	29.38
1969	29.11	29.86	31.82	33.77	37.36	38.40
1970	36.42	37.81	38.50	38.16	37.42	37.44
1969-1970 Average	32.76	33.83	35.16	35.96	37.39	37.92
1963-1970 Average	28.08	28.59	29.04	29.16	29.66	30.04
Heifers						
1963	27.04	25.75	24.85	26.45	25.74	26.50
1964	22.96	23.45	23.44	23.03	21.38	20.25
1965	18.56	18.82	19.10	19.25	21.88	23.45
1963-1965 Average	22.85	22.67	22.46	22.58	23.00	23.40
1966	24.25	25.74	26.65	25.18	24.81	25.50
1967	24.74	24.50	24.45	24.48	25.12	25.86
1968	24.05	25.30	25.69	27.02	27.00	27.15
1966-1968 Average	24.35	25.18	25.60	25.56	25.64	26.17
1969	25.60	26.00	28.41	29.90	33.40	33.74
1970	33.11	31.89	35.89	34.95	34.18	34.25
1969-1970 Average	29.35	28.94	31.65	32.42	33.79	34.00
1963-1970 Average	25.04	25.18	26.08	26.16	26.69	27.09

APPENDIX TABLE 1. MONTHLY AVERAGE PRICES RECEIVED FOR CHOICE 300-550
POUND STEER CALVES AND CHOICE 300-500 POUND HEIFER CALVES AT WEST FARGO
TERMINAL MARKET, 1963-1970 (CONTINUED)

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.
			(cents per pound)			
Steers						
1963	28.40	27.92	27.18	27.12	26.50	25.43
1964	22.73	21.79	22.34	21.20	21.43	21.05
1965	25.56	25.69	25.83	26.13	25.50	26.90
1963-1965 Average	25.56	25.13	25.12	24.82	24.48	24.46
1966	28.54	29.02	30.50	28.75	28.13	28.60
1967	29.38	30.91	30.50	29.51	29.01	28.39
1968	30.44	30.38	29.93	29.41	29.40	30.15
1966-1968 Average	29.45	30.10	30.31	29.22	28.85	29.05
1969	37.63	36.55	35.01	33.85	34.56	35.66
1970	37.49	37.24	32.94	36.64	36.00	35.63
1969-1970 Average	37.56	36.89	33.97	35.25	35.28	35.64
1963-1970 Average	30.02	29.94	29.28	29.08	28.82	28.98
Heifers						
1963	26.30	25.62	25.37	25.16	24.15	25.43
1964	20.86	20.56	20.57	19.72	19.10	18.65
1965	23.44	23.38	22.82	21.56	22.02	23.61
1963-1965 Average	23.53	23.19	22.92	22.15	21.76	22.56
1966	25.38	26.02	27.50	25.89	25.13	25.52
1967	26.68	27.43	27.40	25.85	24.66	24.35
1968	28.06	27.84	26.88	25.67	25.34	26.09
1966-1968 Average	26.71	27.10	27.26	25.80	25.04	25.32
1969	32.53	31.75	31.60	30.68	30.68	32.48
1970	34.01	33.50	33.28	32.88	31.18	30.73
1969-1970 Average	33.27	32.62	32.44	31.78	30.93	31.60
1963-1970 Average	27.16	26.89	26.93	25.93	25.28	25.86

APPENDIX TABLE 2. MONTHLY AVERAGE PRICES RECEIVED FOR CHOICE 550-750
POUND FEEDER STEERS AND CHOICE 500-750 POUND FEEDER HEIFERS AT WEST FARGO
TERMINAL MARKET, 1963-1970

Year	Jan.	Feb.	March	April	May	June
			(cents per pound)			
Steers						
1963	27.54	26.61	24.94	25.93	25.25	25.36
1964	23.07	23.09	22.51	21.18	20.50	20.39
1965	20.13	20.63	20.75	21.36	23.88	24.95
1963-1965 Average	23.58	23.44	22.73	22.82	23.21	23.57
1966	25.75	27.20	28.20	27.01	26.50	27.00
1967	27.46	26.50	26.35	25.78	26.58	26.94
1968	25.55	26.60	27.05	27.35	28.09	28.00
1966-1968 Average	26.25	26.77	27.20	26.71	27.06	27.31
1969	27.54	28.59	29.93	31.56	34.70	35.30
1970	33.60	34.52	34.68	34.30	33.77	33.56
1969-1970 Average	30.57	31.55	32.30	32.93	34.23	34.43
1963-1970 Average	26.33	26.72	26.80	26.81	27.41	27.69
Heifers						
1963	25.39	24.11	22.64	23.31	23.13	23.11
1964	21.08	21.09	21.19	20.08	19.25	18.66
1965	17.31	17.50	18.10	18.44	20.75	22.15
1963-1965 Average	21.26	20.90	20.64	20.61	21.04	21.31
1966	22.75	24.14	25.45	24.29	23.81	24.00
1967	23.88	23.50	23.70	23.66	24.09	25.05
1968	23.05	24.08	24.45	24.91	25.00	25.51
1966-1968 Average	23.23	23.91	24.53	24.29	24.30	24.85
1969	24.55	25.11	26.70	28.52	31.68	31.68
1970	29.92	30.87	32.05	31.20	31.01	31.38
1969-1970 Average	27.24	27.99	29.38	29.86	31.34	31.53
1963-1970 Average	23.49	23.80	24.28	24.30	24.84	25.19

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APPENDIX TABLE 2. MONTHLY AVERAGE PRICES RECEIVED FOR CHOICE 550-750
POUND FEEDER STEERS AND CHOICE 500-750 POUND FEEDER HEIFERS AT WEST FARGO
TERMINAL MARKET, 1963-1970 (CONTINUED)

Year	July	Aug.	Sept.	Oct.	Nov.	Dec.
			(cents per pound)			
Steers						
1963	25.78	26.00	25.75	24.95	24.19	23.18
1964	21.08	20.79	21.13	19.74	19.76	19.85
1965	24.88	24.81	24.27	24.44	23.69	25.42
1963-1965 Average	23.91	23.87	23.72	23.04	22.55	22.82
1966	27.14	27.90	23.01	26.96	26.32	27.30
1967	23.31	27.81	27.09	26.05	26.12	26.26
1968	28.31	27.61	27.11	26.41	27.66	28.60
1966-1968 Average	27.55	27.77	25.74	26.47	26.70	27.39
1969	32.56	31.10	30.90	30.68	31.78	33.06
1970	33.56	32.81	31.66	31.68	31.50	31.14
1969-1970 Average	33.06	31.95	31.28	31.18	31.64	32.10
1963-1970 Average	27.57	27.35	26.37	26.36	26.38	26.85
Heifers						
1963	23.60	23.09	22.30	22.11	21.65	20.72
1964	19.35	18.99	19.12	17.78	17.12	17.25
1965	22.56	22.38	21.91	20.50	20.38	21.98
1963-1965 Average	21.87	21.49	21.11	20.13	19.72	19.98
1966	24.00	24.92	25.26	23.92	23.09	23.30
1967	25.39	25.17	24.91	23.94	23.18	23.05
1968	25.88	25.35	24.94	24.27	24.34	25.31
1966-1968 Average	25.09	25.15	25.04	24.04	23.54	23.89
1969	30.09	29.01	28.45	27.52	28.64	29.46
1970	31.04	29.85	29.31	29.15	28.69	27.66
1969-1970 Average	30.56	29.43	28.88	28.34	28.66	28.56
1963-1970 Average	25.24	24.84	24.52	23.65	23.39	23.59