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# Beef Cattle— At What Weight Should They Be Sold?

by

Franz Schwartz

J. B. Hassler

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University of Nebraska – Lincoln College of Agriculture
E. F. Frolik, Dean; H. W. Ottoson, Director

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# FOREWORD

This study, based on imputed data for 1962–70, was completed in August, 1972. Budgetary and processing problems delayed publication action and a problem of being up-to-date was created. The reader should realize that the length of beef feeding programs causes a maximum 10–12 month lag in computed data using current slaughter cattle prices. Consequently, nearly a year lag is required in computed data based on these prices. The analyses presented in this report are developed from price interrelationships which are somewhat independent of general cattle price levels.

No significant changes in conclusions would have resulted from the inclusion of one more year of recent data. The write-up revision would have been a major job requiring consistent modifications on nearly every page.

The authors concluded that the reader should have the most recent basic data for Tables 1, 3, 4, 6 and 7. These extensions have been computed (using higher feeding costs of about 20% for 1971, 1972 and 1973) and are given in Appendix C.

# Beef Cattle—At What Weight Should They Be Sold?

Franz Schwarz, J. B. Hassler[1]

## INTRODUCTION

Meat is basic in the modern diet and meat animals are a mainstay of modern agriculture. Cash receipts from sale of meat animals was $22.73 billion in 1972.[2]

Beef cattle are either raised or fed in virtually every part of the United States. On January 1, 1973, there were about 121.9 million cattle and calves on U.S. farms. Except for minor decreases, the general trend of cattle and calf inventories has been increasing. Cattle and calves on farms increased from 91 million on January 1, 1958 to 121.9 million on January 1, 1973.[3] The number of cattle slaughtered in December 1972 was 2.9 million head.[4]

### Nature of the Problem

There have been notable changes in the beef industry in recent years. Formerly, farm operators produced and fattened many of their own calves. Now the beef industry is generally divided into two distinct stages of production. Primary production specializes in producing calves and feeders on the basis of grazing or other roughage processes and limited concentrate usage. Secondary production encompasses the intensive feeding process using higher energy rations and usually feedlot confinement. The latter process results in finished animals for the slaughtering stage of meat production.

Characteristically, the beef sector has experienced large fluctuations in price levels between years as well as within years for all classes, weights and production stages.

For instance, the largest annual range between monthly average prices for 1100–1300 lb Choice slaughter steers at Omaha reached $10.82 a cwt and the average month to month fluctuations amounted

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[1] Franz Schwarz is a graduate student, Department of Agricultural Economics, J. B. Hassler is Professor, Marketing and Price Analysis, Department of Agricultural Economics.

[2] "Farm Income Situation," Economic Research Service, February, 1973, United States Department of Agriculture.

[3] "Livestock and Meat Situation," Economic Research Service, March, 1973, United States Department of Agriculture.

[4] "Livestock Slaughter," Statistical Reporting Service, December, 1972, United States Department of Agriculture, Washington, D.C. 20250.

to $3.74 a cwt between March, 1972 and March, 1973. The difference in monthly average prices for 550–750 lb Choice feeder steers was $13.29 a cwt between March, 1972 and March, 1973 and was averaging $7.53 a cwt in the same period. The extreme price level difference for 300–550 lb Choice steer calves was $16.95 a cwt between March, 1972 and March, 1973 with an average price level difference of $10.72 a cwt.

Within-year or seasonal price fluctuations amounted to $8.57 a cwt for 1100–1300 lb Choice slaughter steers between December, 1972 and March, 1973, $5.91 a cwt for 550–750 lb Choice feeder steers between January, 1973 and March, 1973, and $9.30 a cwt for 300–550 lb Choice steer calves between November, 1972 and March, 1973.

The largest magnitude of "Feeders' Margin" variation was $10.06 a cwt in October, 1972 (Choice 700 lb feeder steers—Choice 1130 lb slaughter steers) and $15.64 a cwt in November, 1972 (Choice 440 lb steer calf—Choice 1130 lb slaughter steer).[5] In general, the large variations in animal prices over the period have not been consistent with relatively stable costs of production and a condition of continual equilibrium performance in production and marketing. Most of the erratic price variation results from general disorderly rates of primary production and marketing in the industry.

Uncertainty about the level of future product prices in the beef industry has resulted in alternate periods of overproduction and underproduction. Price uncertainty has existed because of biological and economic factors. Physiologically, it requires 18 months to more than two years from the time a calf is born until it eventually is slaughtered. Gestation adds an additional nine months to the production period.

A second factor contributing to price uncertainty is seasonal variation in consumption.

A third factor facing the beef producer is an inelastic demand for meat and meat products.

The result is that small changes in quantity supplied produce large variations in product prices.

Exaggerated price variation over time suggests disorderly production and marketing. If production and marketing were orderly, the additional cost of alternative activities between possible choices would equal the extra returns. Generally, with rising product prices it is profitable for an individual producer to carry animals to heavier weights because the added value from the increased weight exceeds carrying cost. Conversely, during periods of falling product prices a producer should find it more profitable to market lighter weights

[5] "Livestock and Meat Statistics," Agricultural Marketing Service, Statistical Reporting Service, Economic Research Service, United States Department of Agriculture, Washington, D.C., Statistical Bulletin No. 333 and Supplements, Table 166.

because carrying costs exceed the added return of carrying to heavier weights. The issue is that in aggregate the "right" number of producers should make these responses such that resulting price patterns provide equality between marginal returns and costs.

## Study Objectives

Specific objectives of this study are:

1. To evaluate the recent historical price relationships of the beef sector indicative of profit and loss conditions caused by disorderly aggregate performance in production and marketing.

2. To analyze the risks involved at various positions in the chain of production and marketing activities.

3. To suggest information and action programs which could reduce the amount of disorderly production and marketing.

## Analytic Methods

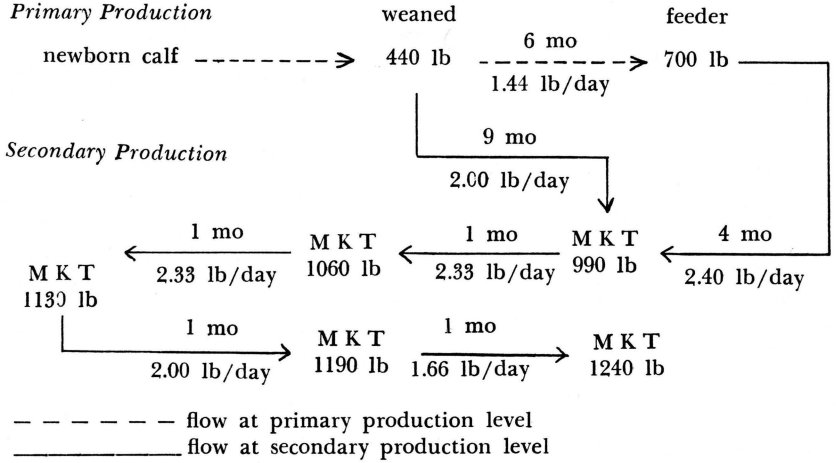
The procedure involved is one of price relationships in a purely competitive market and centers on marginal returns and marginal costs of carrying a calf after it is weaned through alternative processes to a slaughter animal.

An initial imputed price is defined as the value of an animal at the later time when it was sold minus production costs and divided by the initial weight to express it in dollars per cwt. In an ex-post sense, imputed prices reflect derived net values in use, whereas actual prices are the realized prices in the market at that earlier time. Economic theory for a competitive industry indicates that actual and imputed prices should be equated when performance is in equilibrium.

Price differences between different grades of beef cattle should be related to differences in meat quality and yield and to the efficient level of transformation costs between grades, if possible. Demand utility forces and yields should bear on same-time price relationships. The cost of weight and grade transformations should bear on grade price comparisons between consistent time points in the production cycle. A two variable linear regression model will be used to show the price relationships between grades and consistency with demand utility forces and yields.

Price relationships between different weight classes should be related to the price which should be paid to induce a producer to carry cattle from light to heavier weights, reflecting changes in quality, yield and efficient level of transformation costs between grades when a change in grade is associated. Deviations from this condition can be expressed by opportunity gains or losses in dollars per animal, whereby

**Figure 1. Flow Diagram for Steers from Primary Production to Slaughter**



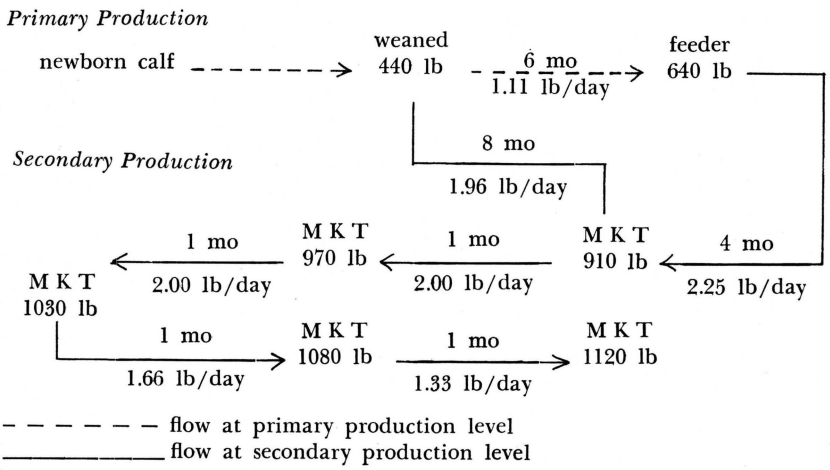

the opportunity gain or loss is computed as additional revenue minus additional cost.

At various positions in the chain of production and marketing activities, alternatives exist between which a decision must be made such as selling calves now or feeders later, purchasing calves or feeders and selling light now or heavier slaughter animals later. The riskiness of a project (in terms of this study: the riskiness of a decision made) is defined in terms of the likely variability of returns on the project.[6] The risk of a specific decision in this study will refer only to price variations of slaughter prices and cattle input prices because of the assumption that transformation costs were under constant factor prices. Therefore, the risk associated with the variation of the other input prices is eliminated. Second, the risk caused by the environment such as diseases and weather hazards is assumed to be about the same at corresponding stages of production. The risk will be measured as the probability of losing money, that is, the probability that extra profit will be equal to or less than zero.

To get a clearer picture of the issues and problems involved, flow diagrams for steers and heifers will be given (Figures 1 and 2). Calves are weaned at 440 lb regardless of sex. Two options remain for the primary producer, selling calves immediately or carrying them to the feeder level. The secondary producer is faced with two buying options,

[6] J. Fred Weston and Eugene F. Brigham, "Managerial Finance," Holt, Rinehart and Winston, Third Edition, p. 215.

**Figure 2. Flow Diagram for Heifers from Primary Production to Slaughter**




buying calves or buying feeders, and by five different alternatives for steers and heifers on the selling side. Herd replacement is not considered in this analysis.

In the evaluation of market performance the decision alternatives under consideration are the selling decision of the primary production, buying and selling decision of the secondary production and the pricing performance between different grades.

## MARKET PERFORMANCE

The first part involves the evaluation of the market performance from 1962 to 1971, using monthly average prices at Omaha. The evaluation of market performance centers on marginal returns and marginal costs of alternative decisions as an animal goes through growth stages to a slaughter animal. This evaluation is only appropriate for opportunities for a given producer or a relatively small number of producers whose total supply reallocation would not significantly affect price levels over time. However, if significant disequilibrium (excessive profit or loss evidence) is indicated, then the aggregated market is responsible for such results.

The second part provides an evaluation of price relationships between different grades of beef cattle. For assumptions and calculations about production cost, see Appendix A.

The direct analysis involves Choice grade only, but as the last part, *Pricing Performance Between Different Grades,* will show, there

are strong indications of nearly linear relationships between Choice and Good grade cattle prices. A special analysis will be presented in Appendix B, to suggest that comparable conclusions can be deduced for the Good grade situation as have been developed for Choice grade.

The reason the study ends in December 1970 was the need for nine months of growth time in 1971 to get the imputed prices for December 1970.

## Primary Production

As mentioned earlier, primary production specializes in producing calves and feeders on the basis of grazing or other roughage processes and limited concentrate usage.

To evaluate the pricing and allocation performance of the primary animals (calves and heavier feeders), actual and imputed prices are used as decision criteria (Table 1). Disequilibrium performance is indicated when these prices differ excessively. A negative price difference (actual minus imputed) indicates that calves were priced too low in comparison to their value as feeders at a later time point, and that the individual producer would have been better off by carrying calves to the feeder level. The reverse is true when the price difference is positive.

During years with continuously falling prices and an oversupply of calves and feeders, such as in 1963 and 1964, the individual primary producer would have been better off by selling calves instead of feeders, imputed prices were less than actual prices.

For instance, the average loss per animal with respect to point of selling time in 1963 was $22.48 per animal for steers and $26.48 per animal for heifers, and in 1964 $15.66 per animal for steers and $22.48 per animal for heifers when calves were carried to the feeder level.

During years with relatively stable prices, when demand and supply are in equilibrium, such as in 1966, 1967 and 1970, the price difference deviated around zero for steers and was positive for heifers. The average loss of carrying steer calves to the feeder level was $3.66 per animal in 1966 and carrying heifer calves to the feeder level the average loss per animal was $11.13. In 1967 carrying steer calves to the feeder level returned an extra profit of $0.52 per animal, whereas heifer feeders incurred a loss of $9.37 per animal and in 1970 carrying steer calves to feeder steers brought an average extra profit of $4.93 per animal and carrying heifer calves to heifer feeders incurred an average loss of $6.20 per animal.

During years with increasing prices and short supply relative to demand, such as in 1962, 1965, 1968 and 1969, a negative price difference occurred on the average for both steers and heifers, with the exception of 1962 where the average price difference was positive, because the prices declined relatively faster at the beginning of 1963

**Table 1. Historical comparison of monthly average prices of steer and heifer calves to imputed prices based on sale as feeder animals in dollars per cwt.[a]**

| Month and year | Steers | | | Heifers | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual calf price | Imputed calf price | Price difference |
| | (Dollars per cwt) | | | | | |
| —1962 | | | | | | |
| Jan. | 28.50 | 28.87 | – .37 | 26.20 | 23.95 | 2.25 |
| Feb. | 28.69 | 29.94 | –1.25 | 26.00 | 24.86 | 1.14 |
| Mar. | 28.69 | 31.61 | –2.92 | 26.00 | 25.70 | .30 |
| Apr. | 29.52 | 31.08 | –1.56 | 26.00 | 25.95 | .05 |
| May | 29.49 | 31.86 | –2.37 | 26.00 | 26.17 | – .17 |
| June | 29.12 | 31.86 | –2.76 | 26.00 | 26.57 | – .57 |
| July | 29.06 | 30.38 | –1.32 | 26.00 | 25.82 | .18 |
| Aug. | 29.55 | 28.60 | .95 | 27.09 | 24.32 | 2.77 |
| Sep. | 30.69 | 27.23 | 3.46 | 27.75 | 22.98 | 4.77 |
| Oct. | 31.61 | 28.22 | 3.39 | 28.15 | 23.53 | 4.62 |
| Nov. | 33.12 | 26.95 | 6.17 | 29.38 | 23.42 | 5.96 |
| Dec. | 33.12 | 26.58 | 6.54 | 29.25 | 23.26 | 5.99 |
| —1963 | | | | | | |
| Jan. | 32.30 | 27.95 | 4.35 | 28.60 | 23.77 | 4.83 |
| Feb. | 30.98 | 27.73 | 3.25 | 27.65 | 23.98 | 3.67 |
| Mar. | 29.75 | 26.63 | 3.12 | 27.12 | 22.85 | 4.27 |
| Apr. | 29.57 | 26.21 | 3.36 | 27.22 | 22.68 | 4.54 |
| May | 29.30 | 25.78 | 3.52 | 26.71 | 22.20 | 4.51 |
| June | 29.25 | 24.45 | 4.80 | 26.50 | 20.76 | 5.74 |
| July | 29.79 | 24.08 | 5.71 | 27.40 | 19.98 | 7.42 |
| Aug. | 29.69 | 24.29 | 5.40 | 27.38 | 20.26 | 7.12 |
| Sep. | 29.06 | 23.70 | 5.36 | 26.31 | 20.28 | 6.03 |
| Oct. | 28.95 | 21.93 | 7.02 | 26.22 | 18.38 | 7.84 |
| Nov. | 28.50 | 20.74 | 7.76 | 25.75 | 17.51 | 8.24 |
| Dec. | 27.82 | 20.18 | 7.64 | 24.78 | 16.94 | 7.84 |
| —1964 | | | | | | |
| Jan. | 27.25 | 20.84 | 6.41 | 24.60 | 16.86 | 7.74 |
| Feb. | 27.19 | 20.66 | 6.53 | 24.84 | 16.17 | 8.67 |
| Mar. | 27.00 | 21.66 | 5.34 | 24.25 | 17.44 | 6.81 |
| Apr. | 25.65 | 20.65 | 5.00 | 22.88 | 17.16 | 5.72 |
| May | 25.19 | 20.44 | 4.75 | 22.44 | 16.52 | 5.92 |
| June | 24.75 | 19.90 | 4.85 | 22.25 | 16.22 | 6.03 |
| July | 24.53 | 20.12 | 4.41 | 22.11 | 16.06 | 6.05 |
| Aug. | 24.30 | 20.42 | 3.88 | 21.62 | 16.35 | 5.27 |
| Sep. | 24.35 | 21.19 | 3.16 | 22.00 | 16.78 | 5.22 |
| Oct. | 23.92 | 22.51 | 1.41 | 21.51 | 17.88 | 3.63 |
| Nov. | 24.16 | 24.56 | – .40 | 21.00 | 20.07 | .93 |
| Dec. | 23.56 | 26.20 | –2.64 | 20.37 | 21.08 | – .71 |
| —1965 | | | | | | |
| Jan. | 23.74 | 26.88 | –3.14 | 20.25 | 21.44 | –1.19 |
| Feb. | 23.52 | 26.88 | –3.36 | 20.25 | 21.44 | –1.19 |
| Mar. | 23.40 | 26.88 | –3.48 | 20.55 | 21.88 | –1.33 |
| Apr. | 24.61 | 26.56 | –1.95 | 21.22 | 21.89 | – .67 |
| May | 26.45 | 26.13 | .32 | 22.69 | 21.35 | 1.34 |
| June | 27.65 | 27.44 | .21 | 24.08 | 21.88 | 2.20 |
| July | 27.75 | 28.17 | – .42 | 24.50 | 22.17 | 2.33 |

**Table 1. (continued)**

| Month and year | Steers | | | Heifers | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual calf price | Imputed calf price | Price difference |
| Aug. | 27.75 | 30.46 | –2.71 | 24.50 | 23.17 | 1.33 |
| Sep. | 27.70 | 32.77 | –5.07 | 24.75 | 26.12 | –1.37 |
| Oct. | 27.70 | 32.24 | –4.54 | 24.75 | 25.72 | – .97 |
| Nov. | 27.89 | 31.88 | –3.99 | 24.16 | 25.63 | –1.47 |
| Dec. | 28.50 | 31.65 | –3.15 | 24.40 | 25.44 | –1.04 |
| —1966 | | | | | | |
| Jan. | 28.81 | 31.26 | –2.45 | 24.75 | 25.08 | – .33 |
| Feb. | 29.98 | 31.02 | –1.04 | 26.20 | 25.26 | .94 |
| Mar. | 31.46 | 31.40 | .06 | 27.86 | 25.44 | 2.42 |
| Apr. | 30.88 | 30.08 | .80 | 27.44 | 24.63 | 2.81 |
| May | 30.30 | 28.55 | 1.75 | 27.25 | 24.35 | 2.90 |
| June | 29.75 | 28.47 | 1.28 | 27.00 | 24.35 | 2.65 |
| July | 29.75 | 28.47 | 1.28 | 26.75 | 24.35 | 2.40 |
| Aug. | 29.95 | 28.08 | 1.87 | 26.80 | 24.86 | 2.54 |
| Sep. | 30.69 | 28.00 | 2.69 | 28.25 | 23.98 | 4.27 |
| Oct. | 30.38 | 28.08 | 2.30 | 27.81 | 23.98 | 3.83 |
| Nov. | 30.25 | 28.55 | 1.70 | 27.52 | 24.20 | 3.32 |
| Dec. | 30.06 | 30.37 | – .31 | 27.28 | 24.63 | 2.65 |
| —1967 | | | | | | |
| Jan. | 30.00 | 32.05 | –2.05 | 27.25 | 25.08 | 2.17 |
| Feb. | 29.50 | 32.45 | –2.95 | 26.50 | 25.44 | 1.06 |
| Mar. | 29.00 | 32.05 | –3.05 | 26.00 | 25.44 | .56 |
| Apr. | 29.00 | 29.78 | – .78 | 26.00 | 25.44 | .56 |
| May | 29.45 | 28.76 | .69 | 26.15 | 24.20 | 1.95 |
| June | 30.38 | 28.60 | 1.78 | 26.69 | 23.98 | 2.71 |
| July | 31.00 | 27.68 | 3.32 | 26.38 | 23.33 | 3.05 |
| Aug. | 31.25 | 28.47 | 2.78 | 27.00 | 23.23 | 3.77 |
| Sep. | 31.12 | 29.97 | 1.15 | 26.88 | 23.26 | 3.62 |
| Oct. | 30.38 | 30.37 | .01 | 26.31 | 23.53 | 2.78 |
| Nov. | 29.95 | 30.94 | – .99 | 26.40 | 24.13 | 2.27 |
| Dec. | 30.25 | 31.61 | –1.36 | 26.50 | 25.44 | 1.06 |
| —1968 | | | | | | |
| Jan. | 29.15 | 32.05 | –2.90 | 25.75 | 25.44 | .31 |
| Feb. | 29.19 | 32.05 | –2.86 | 25.50 | 25.44 | .06 |
| Mar. | 29.62 | 31.45 | –1.83 | 25.88 | 25.44 | .44 |
| Apr. | 29.94 | 30.86 | – .92 | 26.38 | 25.44 | .94 |
| May | 30.15 | 31.16 | –1.01 | 26.65 | 25.44 | 1.21 |
| June | 30.48 | 31.45 | – .97 | 27.25 | 25.44 | 1.81 |
| July | 30.75 | 31.65 | – .90 | 27.25 | 25.22 | 2.03 |
| Aug. | 30.75 | 32.05 | –1.30 | 27.25 | 25.25 | 2.00 |
| Sep. | 30.62 | 33.64 | –3.02 | 27.25 | 26.44 | .81 |
| Oct. | 30.35 | 36.27 | –5.92 | 27.10 | 28.64 | –1.54 |
| Nov. | 30.50 | 40.40 | –9.90 | 27.12 | 30.62 | –3.50 |
| Dec. | 30.75 | 42.20 | –11.45 | 27.00 | 32.67 | –5.67 |
| —1969 | | | | | | |
| Jan. | 30.36 | 40.80 | –10.44 | 26.65 | 31.91 | –5.26 |
| Feb. | 30.25 | 39.21 | –8.85 | 26.81 | 30.53 | –3.72 |
| Mar. | 31.38 | 39.21 | –7.83 | 27.94 | 30.53 | –2.59 |
| Apr. | 33.64 | 38.73 | –5.09 | 29.60 | 30.53 | – .93 |
| May | 36.19 | 37.62 | –1.43 | 31.51 | 30.53 | .98 |
| June | 37.38 | 38.26 | – .88 | 33.12 | 31.11 | 2.01 |

**Table 1. (continued)**

| Month and year | Steers | | | Heifers | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual calf price | Imputed calf price | Price difference |
| July | 36.70 | 38.69 | –1.99 | 32.70 | 31.48 | 1.22 |
| Aug. | 35.81 | 39.50 | –3.69 | 32.00 | 31.62 | .38 |
| Sep. | 35.69 | 40.18 | –4.49 | 32.00 | 31.90 | .10 |
| Oct. | 35.30 | 41.80 | –6.50 | 32.00 | 34.44 | –2.44 |
| Nov. | 35.25 | 40.88 | –5.63 | 32.00 | 34.53 | –2.53 |
| Dec. | 35.80 | 40.96 | –5.16 | 32.00 | 34.53 | –2.53 |
| —1970 | | | | | | |
| Jan. | 36.20 | 40.67 | –4.47 | 32.30 | 34.53 | –2.23 |
| Feb. | 36.38 | 39.86 | –3.48 | 33.18 | 34.53 | –1.35 |
| Mar. | 37.19 | 39.76 | –2.57 | 33.31 | 34.53 | –1.22 |
| Apr. | 38.68 | 39.18 | – .50 | 35.00 | 34.53 | .47 |
| May | 38.94 | 37.39 | 1.55 | 35.12 | 31.97 | 3.15 |
| June | 38.81 | 35.87 | 2.94 | 34.75 | 30.12 | 4.63 |
| July | 39.00 | 36.55 | 2.45 | 34.75 | 30.35 | 4.40 |
| Aug. | 38.50 | 39.56 | –1.06 | 34.75 | 31.98 | 2.77 |
| Sep. | 38.65 | 40.32 | –1.67 | 34.60 | 32.38 | 2.32 |
| Oct. | 38.08 | 40.80 | –2.72 | 34.50 | 32.71 | 1.79 |
| Nov. | 37.19 | 39.97 | –2.78 | 33.53 | 32.71 | .82 |
| Dec. | 36.00 | 40.61 | –4.61 | 32.80 | 32.39 | .41 |

[a] A calf weight of 440 lb, steer feeder weight of 700 lb and a heifer feeder weight of 640 lb were used. The growth time difference was 6 months.

than were increasing at the end of 1962. Steers were profitably sold as feeders the first seven months and as calves the last five months of 1962. Heifer calves were preferable to feeders by the average amount of $9.48 per animal. The profit picture was improved when steer calves were carried to the feeder level in 1965 by $11.48 per animal, in 1968 by $15.40 per animal and in 1969 by $22.75 per animal. Heifers brought an extra profit, when they were carried to the feeder level, of $0.75 per animal in 1965, $0.40 per animal in 1968 and $5.63 per animal in 1969.

A difference is observable with respect to sex. On the average of the nine years under consideration, steer calves carried to feeders returned an extra profit of $1.14 per animal, whereas heifers carried to the feeder level brought a loss of $8.75 per animal. As mentioned earlier, there was no difference between steers and heifers when prices were increasing or declining, but a difference was observable with regard to the absolute amount. At the time of relatively stable prices, it was preferable to sell heifer calves, whereas the profit picture of steers was indifferent with respect to weight levels.

Seasonal differences are indicated by price fluctuations within the year. Average extra profits per animal by quarters were computed over the nine years to compare the relative advantage of selling calves or feeders by quarters (Table 2).

Table 2. Average extra profits when feeder animals instead of calves were sold, in dollars per animal by quarters.

| Quarters | Steers | Heifers |
|---|---|---|
| | Average extra profit | Average extra profit |
| | (Dollars per animal) | |
| Winter | 6.86 | - 4.44 |
| Spring | -2.82 | -10.16 |
| Summer | -3.30 | -13.60 |
| Fall | 3.98 | - 6.95 |

It was more profitable to sell steer feeders during the winter and fall quarters, whereas selling steer calves had the advantage during the spring and summer quarters. Heifer calves should have been sold during all four quarters, but during the winter and fall quarters a lesser advantage existed than during the spring and summer quarters.

## Secondary Production

Secondary production usually takes place in feedlot confinement and results in slaughter animals. Two marketing decisions (buying feeders or calves and selling slaughter animals) are the determinants of profit or loss results under the assumption that production costs remained fairly stable over the nine years which are under consideration.

## The Buying Decision

The buying decision that the secondary producer has to make is whether to buy calves or feeders for the fattening process in his feedlot. He has little influence on the general price level of either one. Because of the difference in the length of the alternative feeding programs, the producer not only needs to know current feeder and calf prices but meaningful estimates of forward slaughter prices at proper times.

Comparisons between actual and imputed price are used to pinpoint market imperfections in pricing these inputs and the risk inherent in the production decision with respect to these inputs (Tables 3, 4).

Generally speaking, a price difference greater or less than zero is indicative of market-wide pricing and production disorder. A positive price difference means that inputs were overpriced and a negative price difference indicates that inputs were underpriced with respect to their contribution to the value of the total product by hindsight evaluation. For the individual secondary producer under the restrictions mentioned earlier, the aim should be to achieve the greatest absolute amount of a negative price difference or the smallest possible

amount of a positive price difference (if avoidance of production would be even more costly).

The relative advantage of one input over the other (calves versus feeders) is determined by two factors.

First, the relative prices of the inputs when they are purchased determines a significant part of the supply cost (excluding feed and labor).

Second, the relative slaughter prices at the times when the animals are sold is related to gross returns.

A time difference of five months occurs between the selling point of feeders purchased and the selling point of calves purchased.

During years with continuously falling input prices and falling or slightly increasing slaughter prices at the time when the animals were ready to be sold, there was no clear picture of the relative advantage of one or the other. Buying feeder steers was more profitable than buying steer calves on the average by $7.26 per animal in 1963 and buying steer calves was more profitable in 1964 by $2.13 per animal. Buying heifer calves had a relative advantage to purchasing feeder heifers of $5.36 per animal in 1963 and $11.11 per animal in 1964.

During years of relatively high and stable input prices and increasing slaughter prices at the time when the animals were sold, such as in 1966, 1967 and 1970, purchasing calves was more profitable than purchasing feeders. In 1966, steer calves and heifer calves had a relative advantage over feeders by $11.40 and $16.61 per animal, respectively. In 1967 and 1970, steer and heifer calves returned an average extra profit of $1.32 and $13.60 per animal in 1967, and $18.08 and $14.93 per animal in 1970. Feeder steers and heifers compared to calves produced relative average losses of $6.16 and $2.75 per animal in 1967, and $9.73 and $13.44 per animal in 1970.

**Table 3. Historical comparison of monthly average prices of choice steer calves and choice steer feeders to imputed prices based on sale as 1060 lb choice steers.[a]**

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| | (Dollars per cwt) | | | | | |
| —1962 | | | | | | |
| Jan. | 28.50 | 36.74 | −8.24 | 26.02 | 25.03 | .99 |
| Feb. | 28.69 | 34.33 | −5.64 | 26.59 | 25.95 | .64 |
| Mar. | 28.69 | 30.40 | −1.71 | 26.75 | 28.57 | −1.82 |
| Apr. | 29.52 | 25.53 | 3.99 | 27.40 | 30.73 | −3.33 |
| May | 29.49 | 21.70 | 7.79 | 27.31 | 30.16 | −2.85 |
| June | 29.12 | 22.23 | 6.89 | 26.88 | 31.16 | −4.28 |
| July | 29.06 | 20.23 | 8.83 | 27.00 | 29.65 | −2.65 |

**Table 3. (continued)**

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Aug. | 29.55 | 20.84 | 8.71 | 27.67 | 27.18 | .49 |
| Sep. | 30.69 | 25.78 | 4.91 | 28.72 | 24.12 | 4.60 |
| Oct. | 31.61 | 25.37 | 6.24 | 28.39 | 21.71 | 6.68 |
| Nov. | 33.12 | 24.35 | 8.77 | 28.88 | 22.05 | 6.83 |
| Dec. | 33.12 | 23.78 | 9.34 | 28.88 | 20.79 | 8.09 |
| —1963 | | | | | | |
| Jan. | 32.30 | 21.80 | 10.50 | 27.95 | 21.17 | 6.78 |
| Feb. | 30.98 | 18.72 | 12.26 | 26.83 | 24.27 | 2.56 |
| Mar. | 29.75 | 20.07 | 9.68 | 25.97 | 24.02 | 1.95 |
| Apr. | 29.57 | 18.04 | 11.53 | 26.59 | 23.38 | 3.21 |
| May | 29.30 | 18.09 | 11.21 | 25.79 | 23.02 | 2.77 |
| June | 29.25 | 16.89 | 12.36 | 25.56 | 21.77 | 3.79 |
| July | 29.79 | 15.44 | 14.37 | 26.42 | 19.84 | 6.58 |
| Aug. | 29.69 | 17.78 | 11.91 | 26.28 | 20.68 | 5.60 |
| Sep. | 29.06 | 21.25 | 7.81 | 25.59 | 19.41 | 6.18 |
| Oct. | 28.95 | 24.96 | 3.99 | 25.33 | 19.44 | 5.89 |
| Nov. | 28.50 | 26.21 | 2.29 | 25.06 | 18.69 | 6.37 |
| Dec. | 27.82 | 23.58 | 4.24 | 24.22 | 17.78 | 6.44 |
| —1964 | | | | | | |
| Jan. | 27.25 | 23.08 | 4.17 | 23.99 | 19.25 | 4.74 |
| Feb. | 27.19 | 21.39 | 5.80 | 24.12 | 21.43 | 2.69 |
| Mar. | 27.00 | 21.95 | 5.05 | 23.75 | 23.76 | –.01 |
| Apr. | 25.65 | 20.86 | 4.79 | 22.64 | 24.55 | –1.91 |
| May | 25.19 | 22.40 | 2.79 | 21.89 | 22.90 | –1.01 |
| June | 24.75 | 25.32 | – .57 | 21.54 | 22.58 | –1.04 |
| July | 24.53 | 29.22 | –4.69 | 21.95 | 21.52 | .43 |
| Aug. | 24.30 | 30.88 | –6.58 | 21.84 | 21.87 | – .03 |
| Sep. | 24.35 | 29.34 | –4.99 | 22.47 | 21.18 | 1.29 |
| Oct. | 23.92 | 29.90 | –5.98 | 21.83 | 22.15 | – .32 |
| Nov. | 24.16 | 29.68 | –5.52 | 21.70 | 23.98 | –2.28 |
| Dec. | 23.56 | 27.61 | –4.05 | 21.36 | 26.44 | –5.08 |
| —1965 | | | | | | |
| Jan. | 23.74 | 26.64 | –2.90 | 21.50 | 27.48 | –5.98 |
| Feb. | 23.52 | 27.73 | –4.21 | 21.69 | 26.51 | –4.82 |
| Mar. | 23.40 | 29.00 | –5.60 | 22.17 | 26.86 | –4.69 |
| Apr. | 24.61 | 32.02 | –7.41 | 23.00 | 26.73 | –3.73 |
| May | 26.25 | 36.09 | –9.84 | 24.29 | 25.42 | –1.13 |
| June | 27.65 | 31.48 | –3.83 | 25.32 | 24.82 | .50 |
| July | 27.75 | 29.08 | –1.33 | 25.75 | 25.50 | .25 |
| Aug. | 27.75 | 27.41 | .34 | 25.75 | 26.30 | – .55 |
| Sep. | 27.70 | 27.46 | .24 | 25.75 | 28.20 | –2.45 |
| Oct. | 27.70 | 28.64 | – .94 | 25.55 | 29.85 | –4.30 |
| Nov. | 27.89 | 28.11 | – .22 | 25.28 | 27.86 | –2.58 |
| Dec. | 28.50 | 26.09 | 2.41 | 26.10 | 26.35 | – .25 |
| —1966 | | | | | | |
| Jan. | 28.81 | 24.21 | 4.60 | 26.56 | 25.30 | 1.26 |
| Feb. | 29.98 | 24.21 | 5.77 | 28.00 | 25.33 | 2.67 |
| Mar. | 31.46 | 26.67 | 4.79 | 29.45 | 26.08 | 3.37 |
| Apr. | 30.88 | 25.17 | 5.71 | 29.12 | 25.74 | 3.38 |
| May | 30.30 | 24.21 | 6.09 | 28.99 | 24.47 | 4.52 |
| June | 29.75 | 24.14 | 5.61 | 28.75 | 23.29 | 5.46 |

**Table 3. (continued)**

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| July | 29.75 | 26.21 | 3.54 | 28.50 | 23.29 | 5.21 |
| Aug. | 29.95 | 27.90 | 2.05 | 28.35 | 24.83 | 3.52 |
| Sep. | 30.69 | 29.65 | 1.04 | 28.59 | 23.89 | 4.70 |
| Oct. | 30.38 | 30.59 | - .21 | 27.76 | 23.29 | 4.47 |
| Nov. | 30.25 | 30.74 | - .49 | 26.80 | 23.24 | 3.56 |
| Dec. | 30.06 | 29.17 | .89 | 26.75 | 24.55 | 2.20 |
| —1967 | | | | | | |
| Jan. | 30.00 | 27.63 | 2.37 | 26.75 | 25.61 | 1.14 |
| Feb. | 29.50 | 27.97 | 1.53 | 26.50 | 26.71 | - .21 |
| Mar. | 29.00 | 28.47 | .53 | 26.45 | 27.30 | - .85 |
| Apr. | 29.00 | 30.11 | -1.11 | 26.50 | 27.39 | - .89 |
| May | 29.45 | 30.67 | -1.22 | 26.80 | 26.41 | .39 |
| June | 30.38 | 30.43 | - .05 | 27.94 | 25.44 | 2.50 |
| July | 31.00 | 29.94 | 1.06 | 29.00 | 25.65 | 3.35 |
| Aug. | 31.25 | 30.16 | 1.09 | 29.25 | 25.97 | 3.28 |
| Sep. | 31.12 | 32.52 | -1.40 | 29.00 | 27.00 | 2.00 |
| Oct. | 30.38 | 32.93 | -2.55 | 27.57 | 27.35 | .22 |
| Nov. | 29.95 | 32.28 | -2.33 | 26.93 | 27.20 | - .22 |
| Dec. | 30.25 | 31.75 | -1.50 | 26.83 | 26.89 | - .06 |
| —1968 | | | | | | |
| Jan. | 29.15 | 32.55 | -3.40 | 26.25 | 27.03 | - .78 |
| Feb. | 29.19 | 33.89 | -4.70 | 26.75 | 28.51 | -1.76 |
| Mar. | 29.62 | 33.41 | -3.79 | 27.69 | 28.77 | -1.08 |
| Apr. | 29.94 | 32.83 | -2.89 | 27.94 | 28.36 | - .42 |
| May | 30.15 | 35.99 | -5.84 | 28.30 | 28.03 | .27 |
| June | 30.48 | 39.19 | -8.71 | 28.72 | 28.53 | .19 |
| July | 30.75 | 45.58 | -14.83 | 29.00 | 29.38 | - .38 |
| Aug. | 30.75 | 47.75 | -17.00 | 29.00 | 29.07 | - .07 |
| Sep. | 30.62 | 41.96 | -11.34 | 28.62 | 28.71 | - .09 |
| Oct. | 30.35 | 38.95 | - 8.60 | 28.25 | 30.69 | -2.44 |
| Nov. | 30.50 | 35.63 | - 5.13 | 28.44 | 32.71 | -4.27 |
| Dec. | 30.75 | 33.08 | - 2.33 | 28.62 | 36.72 | -8.10 |
| —1969 | | | | | | |
| Jan. | 30.36 | 32.69 | -2.33 | 28.75 | 37.99 | -9.24 |
| Feb. | 30.25 | 33.39 | -3.14 | 29.00 | 34.45 | -5.45 |
| Mar. | 31.38 | 34.55 | -3.17 | 30.00 | 32.56 | -2.56 |
| Apr. | 33.64 | 37.20 | -3.56 | 31.65 | 30.47 | 1.18 |
| May | 36.19 | 41.24 | -5.05 | 34.25 | 28.86 | 5.39 |
| June | 37.38 | 40.21 | -2.83 | 35.38 | 28.62 | 6.76 |
| July | 36.70 | 37.82 | -1.12 | 34.50 | 29.06 | 5.44 |
| Aug. | 35.81 | 39.73 | -3.92 | 33.50 | 29.79 | 3.71 |
| Sep. | 35.69 | 41.55 | -5.86 | 33.50 | 31.44 | 2.06 |
| Oct. | 35.30 | 39.07 | -3.77 | 33.20 | 33.99 | - .79 |
| Nov. | 35.25 | 36.95 | -1.70 | 32.50 | 33.34 | - .84 |
| Dec. | 35.80 | 35.17 | .63 | 32.90 | 31.84 | 1.06 |
| —1970 | | | | | | |
| Jan. | 36.20 | 32.16 | 4.04 | 33.17 | 33.04 | .13 |
| Feb. | 36.38 | 31.20 | 5.18 | 33.68 | 34.19 | - .51 |
| Mar. | 37.19 | 36.69 | .50 | 34.44 | 32.63 | 1.81 |
| Apr. | 38.68 | 44.11 | -5.43 | 35.56 | 31.30 | 4.26 |
| May | 38.94 | 43.41 | -4.47 | 35.00 | 30.18 | 4.82 |
| June | 38.81 | 44.69 | -5.88 | 35.06 | 28.29 | 6.77 |
| July | 39.00 | 45.75 | -6.75 | 35.07 | 27.68 | 7.39 |

Table 3. (continued)

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Aug. | 38.50 | 44.52 | -6.02 | 34.56 | 31.13 | 3.43 |
| Sep. | 38.65 | 44.81 | -6.16 | 34.50 | 35.80 | -1.30 |
| Oct. | 38.08 | 46.35 | -8.27 | 34.13 | 35.36 | -1.23 |
| Nov. | 37.19 | 45.07 | -7.88 | 33.01 | 36.17 | -3.16 |
| Dec. | 36.00 | 44.23 | -8.23 | 32.05 | 36.83 | -4.78 |

[a] Steer calves of 440 lb and steer feeders of 700 lb were used. The growth time for calves was ten months; for feeders, five months.

**Table 4. Historical comparison of monthly average prices of choice heifer calves and choice heifer feeders to imputed prices based on sale as 970 lb choice heifers.[a]**

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| | | | (Dollars per cwt) | | | |
| —1962 | | | | | | |
| Jan. | 26.20 | 32.80 | -6.60 | 24.20 | 23.95 | .25 |
| Feb. | 26.00 | 34.65 | -8.65 | 24.50 | 24.70 | - .20 |
| Mar. | 26.00 | 34.10 | -8.10 | 24.50 | 25.86 | -1.36 |
| Apr. | 26.00 | 30.77 | -4.77 | 24.88 | 27.27 | -2.39 |
| May | 26.00 | 26.16 | - .16 | 24.88 | 27.20 | -2.32 |
| June | 26.00 | 22.64 | 3.36 | 24.75 | 28.48 | -3.73 |
| July | 26.00 | 23.45 | 2.55 | 24.73 | 28.10 | -3.37 |
| Aug. | 27.09 | 21.84 | 5.25 | 25.35 | 25.81 | - .46 |
| Sep. | 27.75 | 22.51 | 5.24 | 25.92 | 22.64 | 3.28 |
| Oct. | 28.15 | 26.19 | 1.96 | 26.10 | 20.22 | 5.88 |
| Nov. | 29.38 | 25.75 | 3.63 | 26.25 | 20.78 | 5.47 |
| Dec. | 29.25 | 24.23 | 5.02 | 26.53 | 19.67 | 6.86 |
| —1963 | | | | | | |
| Jan. | 28.60 | 23.32 | 5.28 | 26.01 | 20.13 | 5.88 |
| Feb. | 27.65 | 22.11 | 5.54 | 24.98 | 22.66 | 2.32 |
| Mar. | 27.12 | 19.60 | 7.52 | 24.06 | 22.35 | 1.71 |
| Apr. | 27.22 | 20.72 | 6.50 | 24.44 | 21.31 | 3.13 |
| May | 26.71 | 19.33 | 7.38 | 24.36 | 20.69 | 3.67 |
| June | 26.50 | 19.20 | 7.30 | 24.25 | 19.85 | 4.40 |
| July | 27.40 | 18.45 | 8.95 | 24.60 | 18.13 | 6.47 |
| Aug. | 27.38 | 17.57 | 9.81 | 24.75 | 18.90 | 5.85 |
| Sep. | 26.31 | 19.20 | 7.11 | 23.97 | 17.94 | 6.03 |
| Oct. | 26.22 | 22.64 | 3.58 | 23.85 | 17.85 | 6.00 |
| Nov. | 25.75 | 25.13 | .62 | 23.51 | 17.34 | 6.17 |
| Dec. | 24.78 | 25.39 | - .61 | 22.53 | 16.73 | 5.80 |
| —1964 | | | | | | |
| Jan. | 24.60 | 23.87 | .73 | 22.00 | 17.85 | 4.15 |
| Feb. | 24.84 | 23.39 | 1.45 | 22.19 | 20.22 | 1.97 |
| Mar. | 24.25 | 22.55 | 1.70 | 22.20 | 21.93 | .27 |
| Apr. | 22.88 | 22.73 | .15 | 20.90 | 22.11 | -1.21 |
| May | 22.44 | 21.75 | .69 | 20.30 | 21.07 | - .77 |
| June | 22.25 | 22.44 | - .19 | 19.91 | 20.73 | - .82 |
| July | 22.11 | 25.50 | -3.25 | 19.85 | 20.16 | - .31 |
| Aug. | 21.62 | 29.32 | -7.70 | 19.38 | 20.28 | - .90 |
| Sep. | 22.00 | 31.12 | -9.12 | 20.25 | 19.61 | .64 |
| Oct. | 21.51 | 29.27 | -7.76 | 20.06 | 20.08 | - .02 |

Table 4. (continued)

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Nov. | 21.00 | 27.91 | -6.91 | 19.62 | 22.19 | -2.57 |
| Dec. | 20.37 | 27.62 | -7.25 | 19.41 | 24.81 | -5.40 |
| —1965 | | | | | | |
| Jan. | 20.25 | 25.97 | -5.72 | 19.30 | 26.05 | -6.75 |
| Feb. | 20.25 | 25.81 | -5.56 | 19.50 | 24.78 | -5.28 |
| Mar. | 20.55 | 27.02 | -6.47 | 19.80 | 23.85 | -4.05 |
| Apr. | 21.22 | 28.35 | -7.13 | 20.55 | 23.64 | -3.09 |
| May | 22.69 | 31.10 | -8.41 | 22.06 | 22.51 | - .45 |
| June | 24.08 | 33.24 | -9.16 | 22.75 | 22.40 | .35 |
| July | 24.50 | 31.01 | -6.51 | 23.00 | 23.23 | - .23 |
| Aug. | 24.50 | 28.81 | -4.31 | 23.00 | 24.14 | -1.14 |
| Sep. | 24.75 | 27.07 | -2.32 | 23.30 | 26.03 | -2.73 |
| Oct. | 24.75 | 27.09 | -2.34 | 23.31 | 27.51 | -4.20 |
| Nov. | 24.16 | 27.38 | -3.22 | 22.94 | 25.98 | -3.04 |
| Dec. | 24.40 | 27.20 | -2.80 | 23.30 | 24.46 | -1.16 |
| —1966 | | | | | | |
| Jan. | 24.75 | 25.59 | - .84 | 23.50 | 23.26 | .24 |
| Feb. | 26.20 | 24.49 | 1.71 | 24.19 | 23.28 | .94 |
| Mar. | 27.86 | 24.18 | 3.68 | 26.22 | 23.48 | 2.74 |
| Apr. | 27.44 | 26.16 | 1.28 | 25.94 | 23.35 | 2.59 |
| May | 27.25 | 25.59 | 1.66 | 25.88 | 22.25 | 3.63 |
| June | 27.00 | 24.73 | 2.27 | 25.75 | 21.49 | 4.26 |
| July | 26.75 | 24.40 | 2.35 | 25.50 | 21.28 | 4.22 |
| Aug. | 26.80 | 26.69 | .11 | 25.63 | 22.64 | 2.99 |
| Sep. | 28.25 | 28.57 | - .32 | 25.75 | 22.25 | 3.50 |
| Oct. | 27.81 | 29.80 | -1.99 | 25.19 | 21.66 | 3.53 |
| Nov. | 27.52 | 30.02 | -2.50 | 25.00 | 21.43 | 3.57 |
| Dec. | 27.28 | 30.31 | -3.03 | 25.00 | 23.01 | 1.99 |
| —1967 | | | | | | |
| Jan. | 27.25 | 28.62 | -1.37 | 25.00 | 24.30 | .70 |
| Feb. | 26.50 | 27.74 | -1.24 | 24.94 | 25.14 | - .20 |
| Mar. | 26.00 | 27.74 | -1.74 | 24.75 | 25.30 | - .55 |
| Apr. | 26.00 | 28.55 | -2.55 | 24.75 | 25.49 | - .74 |
| May | 26.15 | 29.63 | -3.48 | 24.90 | 24.17 | .73 |
| June | 26.69 | 30.00 | -3.31 | 25.19 | 23.57 | 1.62 |
| July | 26.38 | 29.78 | -3.40 | 25.50 | 23.58 | 1.92 |
| Aug. | 27.00 | 29.76 | -2.76 | 25.75 | 24.13 | 1.62 |
| Sep. | 26.88 | 30.40 | -3.52 | 25.75 | 25.02 | .73 |
| Oct. | 26.31 | 31.37 | -5.06 | 25.25 | 25.28 | - .03 |
| Nov. | 26.40 | 31.06 | -4.66 | 24.90 | 25.13 | - .23 |
| Dec. | 26.50 | 30.53 | -4.03 | 24.75 | 25.11 | - .36 |
| —1968 | | | | | | |
| Jan. | 25.75 | 30.15 | -4.40 | 24.30 | 25.55 | -1.25 |
| Feb. | 25.50 | 31.23 | -5.73 | 24.23 | 26.22 | -1.99 |
| Mar. | 25.88 | 33.23 | -7.35 | 24.25 | 26.01 | -1.76 |
| Apr. | 26.38 | 32.67 | -6.29 | 24.44 | 25.64 | -1.20 |
| May | 26.65 | 31.68 | -5.03 | 24.85 | 25.39 | - .54 |
| June | 27.25 | 34.43 | -7.18 | 25.75 | 26.13 | - .38 |
| July | 27.25 | 37.45 | -10.20 | 25.75 | 27.52 | -1.77 |
| Aug. | 27.25 | 43.40 | -16.15 | 25.75 | 27.11 | -1.36 |
| Sep. | 27.25 | 45.52 | -18.25 | 25.75 | 26.43 | - .68 |

Table 4. (continued)

| Month and year | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Oct. | 27.10 | 41.31 | -14.21 | 25.75 | 28.33 | -2.58 |
| Nov. | 27.12 | 37.05 | -9.93 | 25.75 | 30.40 | -4.65 |
| Dec. | 27.00 | 33.75 | -6.75 | 25.75 | 34.50 | -8.75 |
| —1969 | | | | | | |
| Jan. | 26.65 | 31.72 | -5.07 | 25.60 | 35.95 | -10.35 |
| Feb. | 26.81 | 31.72 | -4.91 | 25.62 | 33.05 | -7.43 |
| Mar. | 27.94 | 32.67 | -4.73 | 26.44 | 30.13 | -3.69 |
| Apr. | 29.60 | 33.41 | -3.81 | 27.95 | 27.86 | .09 |
| May | 31.56 | 35.91 | -4.35 | 29.31 | 26.46 | 2.85 |
| June | 33.12 | 38.02 | -4.90 | 30.72 | 26.46 | 4.26 |
| July | 32.70 | 37.94 | -5.24 | 30.20 | 27.11 | 3.09 |
| Aug. | 32.00 | 35.90 | -3.90 | 29.25 | 27.86 | 1.39 |
| Sep. | 32.00 | 36.44 | -4.44 | 29.25 | 29.50 | - .25 |
| Oct. | 32.00 | 37.34 | -5.34 | 29.25 | 30.87 | -1.62 |
| Nov. | 32.00 | 35.29 | -3.29 | 29.25 | 30.72 | -1.47 |
| Dec. | 32.00 | 32.04 | - .04 | 29.65 | 29.24 | .41 |
| —1970 | | | | | | |
| Jan. | 32.30 | 31.20 | 1.10 | 29.90 | 29.54 | .36 |
| Feb. | 33.18 | 28.20 | 4.98 | 30.00 | 30.39 | - .39 |
| Mar. | 33.31 | 26.95 | 6.36 | 30.19 | 28.98 | 1.21 |
| Apr. | 35.00 | 31.84 | 3.16 | 31.91 | 27.20 | 4.71 |
| May | 35.12 | 38.85 | -3.73 | 32.00 | 26.61 | 5.38 |
| June | 34.75 | 38.80 | -4.05 | 32.00 | 24.55 | 7.45 |
| July | 34.75 | 39.99 | -5.24 | 32.00 | 23.70 | 8.30 |
| Aug. | 34.75 | 40.62 | -5.87 | 32.00 | 27.05 | 4.95 |
| Sep. | 34.60 | 43.11 | -8.51 | 32.00 | 31.87 | .13 |
| Oct. | 34.50 | 43.35 | -8.85 | 32.00 | 31.99 | .01 |
| Nov. | 33.53 | 43.95 | -10.42 | 30.24 | 32.81 | -2.57 |
| Dec. | 32.80 | 42.56 | -9.76 | 28.95 | 33.25 | -4.30 |

[a] Heifer calves of 440 lb and heifer feeders of 640 lb were used. The growth time for calves was nine months; for feeders, five months.

In 1962 and 1965 input prices were increasing, but at the time when the animals were ready to be sold slaughter prices were decreasing. Feeder steers produced a relative advantage over steer calves of $10.46 per animal in 1962 and $5.10 per animal in 1965. During the same time period, heifer calves had a relative advantage over heifer feeders of $4.70 and $6.49 per animal, respectively. During the years of 1968 and 1969 with increasing input prices and relatively stable or increasing slaughter prices, calves were more profitable than feeders. The relative advantage of steer calves over feeders averaged $21.41 per animal in 1968 and $17.08 per animal in 1969. Heifer calves had a relative advantage over feeders averaging $34.54 per animal in 1968 and $11.57 per animal in 1969.

Excessive losses occurred from steer calves purchased during late 1962 and from January through September of 1963. The maximum loss experienced was for July 1963, amounting to $63.23 per animal.

Excessive losses for feeder steers were experienced from purchases made during the last three months of 1962, the last half of 1963, from April through October of 1966, and from April through August of 1970. The maximum loss was for December 1962 amounting to $56.63 per animal. Heifer calf purchases resulted in excessive losses from January through March of 1970, with the greatest amount being $43.16 per animal in August 1963. Heifer feeder purchases produced excessive losses during the last three months of 1962, the last half of 1963, and from April through August of 1970, with the greatest loss being $53.12 per animal in July 1970.

Steer calf purchases produced excessive profits during the first half of 1965, from May through October of 1968, and from June through December of 1970, with the greatest amount being $74.80 per animal in August 1968. Feeder steer purchases returned excessive profits from January through April of 1965 and from November through February 1969, with the most profit being $64.68 per animal in January 1969. Heifer calf purchases netted excessive profits from August 1964 through July 1965, from June through December 1968 and from September through December 1970, with the maximum profit of $80.30 per animal in September 1968. Excessive profits from the purchase of heifer feeders occurred from December 1964 through March 1965 and from November 1968 through February 1969, with the greatest profit being $66.24 per animal in January 1969.

A sex difference was observable with respect to the profit picture. Buying heifer calves had a simple average extra profit of $10.31 per animal over the nine years and was preferable to buying steer calves with an average extra profit of $0.79 per animal over the nine years, except that in 1970 when buying steer calves was more profitable than heifer calves by $3.15 per animal. Buying heifer feeders was preferable to buying steer feeders with an average loss of $3.20 and $6.44 per animal, respectively. During certain individual years, steer feeders were preferable to heifer feeders by an average amount per animal of $0.33 in 1965 and $3.71 in 1970. Perhaps a more complete analysis of the sex differentials which should check on possible condemnation loss differences, greater feeding risk and smaller supply volumes would lead to equivalence or reversal in the sex choice indications.

Seasonality differences in the profit picture were studied. Average extra profits per animal by quarters were computed to compare the relative advantage of buying steer calves, feeder steers, heifer calves or heifer feeders with respect to quarters. Since the sex differentials were considered in previous paragraphs, we will evaluate the steer and heifer data for general seasonality evidence at this point.

The evidence in Table 5 suggests that purchasing calves has been more profitable during spring, summer and fall quarters, while feeder purchases have been preferable during the winter quarter. Note that

Table 5. Average extra profits for different feedlot inputs in dollars per animal, by quarters (1962–1970).

| Quarter | Steer calves | Steer feeders | Heifer calves | Heifer feeders |
|---|---|---|---|---|
| | | (Dollars per animal) | | |
| Winter | –4.53 | 2.31 | 6.25 | 5.18 |
| Spring | –1.63 | –9.17 | 7.30 | –7.48 |
| Summer | 4.00 | –16.03 | 12.06 | –9.92 |
| Fall | 5.28 | –2.87 | 14.08 | –0.62 |

the positive or negative averages are partly the results of the specific time period used.

## The Selling Decision

On the selling side of the secondary production (intensive feeding) we consider five possible alternative marketing weights, namely 990, 1060, 1130, 1190 and 1240 lb for steers, and 910, 970, 1030, 1080 and 1120 lb for heifers. At each of the first four weight classes the producer has to make the decision between selling now or later until the heaviest weight class of 1240 lb for steers and 1120 lb for heifers is reached.

Between the weight classes of 990 lb and 1060 lb for steers, and 910 lb and 970 lb for heifers a change in grade from Good to Choice grade is assumed and the heaviest weight class of each, 1240 lb and 1120 lb, respectively, is assumed to be graded Prime.

Opportunity gains and losses were computed in evaluating the optimum marketing weight by months from 1962 to 1970. Whenever, in the marketing chain for slaughter animals, the value of the opportunity gain or loss was positive, it would have been profitable to carry the animal to the heavier weight.

In Tables 6 and 7, entries under the column headings 1060–1240 lb for steers and 970–1120 lb for heifers represent the additional returns (positive) or losses (negative) that would have been realized on a single animal if it had been sold at the specific heavier weight one month later than the previous weight class. The last column indicates the additional amount that could have been realized by selling at the best economic weight (*) instead of 1060 lb or 970 lb respectively.

The largest opportunity gains were realized when steers were carried from 990 lb to 1060 lb and heifers from 910 lb to 970 lb. This large increase is ascribable to the grade change from Good to Choice grade. On the average for the nine years, the additional returns for steers were $21.94 and for heifers, $19.85 per animal. It is also apparent that large opportunity gains occurred when steers were carried from 1190 lb to 1240 lb and heifers from 1080 lb to 1120 lb.

On the average, these opportunity gains amounted to $9.66 per animal for steers and $10.63 per animal for heifers. This opportunity gain might also be attributable to the assumed change in grade from Choice to Prime grade. One point is worth mentioning here. The demand for Prime grade is highly inelastic with respect to price. A small change in quantity supplied could cause a large change in the price differential over Choice grade and reduce the opportunity gain considerably. Such gains have high risk.

**Table 6. Opportunity gains or losses per animal at successive marketing weights, beginning with a 990 lb steer.**

| Month and year | Successive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 1060 lb | 1130 lb | 1190 lb | 1240 lb | |
| | | | (Dollars per animal) | | |
| —1962 | | | | | |
| Jan. | 25.15 | 4.61 | 3.10* | -2.47 | 7.71 |
| Feb. | 27.42 | 5.34* | -16.37 | 2.00 | 5.34 |
| Mar | 32.38* | -14.22 | - 8.47 | 17.46 | 0.00 |
| Apr. | 14.84 | - 5.20 | 5.91 | 37.45* | 38.16 |
| May | 18.40 | 6.25 | 22.68 | 39.31* | 68.24 |
| June | 28.13 | 19.33 | 23.02 | 10.02* | 52.37 |
| July | 40.53 | 17.04 | 0.67 | 22.02* | 39.73 |
| Aug. | 44.30 | - 2.19 | 11.87* | - 0.37 | 9.68 |
| Sep. | 28.60 | 9.18* | -10.10 | -12.76 | 9.18 |
| Oct. | 33.70* | - 9.10 | -20.59 | -16.97 | 0.00 |
| Nov. | 17.86* | -16.92 | -26.22 | -13.69 | 0.00 |
| Dec. | 9.19* | -22.47 | -24.08 | 9.24 | 0.00 |
| —1963 | | | | | |
| Jan. | 3.03* | -19.03 | - 4.21 | - 6.54 | 0.00 |
| Feb. | 1.52 | 0.31* | -35.33 | 24.56 | 0.31 |
| Mar. | 16.92 | -11.40 | - 5.77 | 32.66* | 15.49 |
| Apr. | 6.93 | 0.23 | 17.34 | 3.99* | 21.56 |
| May | 17.20 | 20.74* | - 7.01 | - 1.02 | 20.74 |
| June | 35.57* | - 2.91 | -10.44 | 1.97 | 0.00 |
| July | 15.85* | - 5.96 | - 7.59 | - 6.29 | 0.00 |
| Aug. | 11.20* | - 4.12 | -16.19 | -11.48 | 0.00 |
| Sep. | 10.93* | -10.83 | -23.83 | 11.75 | 0.00 |
| Oct. | 5.60* | -16.61 | - 4.12 | - 8.25 | 0.00 |
| Nov. | 3.42 | 3.29* | -24.61 | 8.02 | 3.29 |
| Dec. | 24.79* | -12.13 | -11.08 | - 1.72 | 0.00 |
| —1964 | | | | | |
| Jan. | 9.57* | - 3.02 | -15.58 | - 1.54 | 0.00 |
| Feb. | 17.20* | - 8.88 | -14.33 | 18.50 | 0.00 |
| Mar. | 11.31 | -10.36 | 5.77 | 27.36* | 22.77 |
| Apr. | 9.01 | 6.96 | 15.64 | 29.72* | 52.32 |
| May | 27.01 | 12.96 | 20.89 | 16.38* | 50.23 |
| June | 34.94 | 15.10 | 8.97* | - 4.48 | 24.07 |
| July | 37.12 | 4.64* | -10.70 | 3.61 | 4.64 |
| Aug. | 27.48* | -13.18 | - 2.68 | - 1.27 | 0.00 |
| Sep. | 9.30* | - 4.00 | - 8.64 | 8.30 | 0.00 |
| Oct. | 17.86* | - 9.68 | 0.35 | - 0.47 | 0.00 |
| Nov. | 15.59 | 0.33 | - 9.50 | 19.56* | 10.39 |
| Dec. | 26.34 | - 7.14 | 6.36 | 29.81* | 29.03 |

Table 6. (continued)

| Month and year | Successive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 1060 lb | 1130 lb | 1190 lb | 1240 lb | |
| | | | (Dollars per animal) | | |
| —1965 | | | | | |
| Jan. | 18.21 | 4.81 | 17.74 | 27.74* | 50.29 |
| Feb. | 27.86 | 11.70 | 19.78 | 19.35* | 50.83 |
| Mar. | 36.23 | 17.18 | 8.96 | 4.67* | 30.81 |
| Apr. | 41.72 | 7.81 | – 4.55 | 16.46* | 19.72 |
| May | 36.36 | – 6.74 | 7.10 | 11.67* | 12.03 |
| June | 20.57 | 2.64 | 2.35* | – 0.56 | 4.99 |
| July | 26.08* | – 0.81 | – 8.42 | 6.26 | 0.00 |
| Aug. | 21.55* | – 9.57 | – 2.74 | 10.67 | 0.00 |
| Sep. | 15.81 | – 4.98 | 2.73 | 12.45* | 10.20 |
| Oct. | 19.49 | 4.34 | 0.86 | 24.86* | 30.06 |
| Nov. | 26.83 | 5.56 | 10.70 | 28.63* | 44.89 |
| Dec. | 29.29 | 14.07 | 9.30* | – 0.72 | 23.37 |
| —1966 | | | | | |
| Jan. | 36.40 | 13.14* | –17.18 | – 1.07 | 13.14 |
| Feb. | 34.68* | –13.22 | –14.03 | – 2.55 | 0.00 |
| Mar. | 12.18* | –10.63 | –11.40 | 6.61 | 0.00 |
| Apr. | 11.08 | – 7.82 | – 3.63 | 15.31* | 3.86 |
| May | 12.78 | – 0.29 | 4.48 | 5.62* | 9.81 |
| June | 16.85 | 5.04* | – 2.61 | – 6.72 | 5.04 |
| July | 21.26* | – 2.65 | –12.61 | – 6.38 | 0.00 |
| Aug. | 15.85* | – 9.80 | –13.24 | – 1.47 | 0.00 |
| Sep. | 6.75* | – 9.71 | – 8.00 | 16.24 | 0.00 |
| Oct. | 3.53 | – 1.46 | 4.88* | – 4.56 | 3.42 |
| Nov. | 10.46 | 10.08* | –13.57 | – 0.38 | 10.08 |
| Dec. | 21.97* | – 7.73 | –10.73 | 6.14 | 0.00 |
| —1967 | | | | | |
| Jan. | 8.86 | – 5.68 | – 6.21 | 17.05* | 5.16 |
| Feb. | 8.48 | – 1.78 | 4.60 | 14.27* | 17.09 |
| Mar. | 12.42 | 8.26 | 3.33 | 16.61* | 28.20 |
| Apr. | 20.75 | 7.05 | 4.23 | 16.73* | 28.01 |
| May | 24.11 | 7.87 | 4.44 | 10.51* | 22.85 |
| June | 22.64 | 4.54 | 2.05* | – 2.05 | 6.59 |
| July | 18.26 | 1.14* | – 7.84 | – 1.32 | 1.14 |
| Aug. | 14.61* | – 6.90 | – 9.14 | 7.13 | 0.00 |
| Sep. | 10.32* | – 7.21 | – 3.09 | 10.29 | 0.00 |
| Oct. | 9.38 | 1.13 | – 2.77 | 17.94* | 16.30 |
| Nov. | 20.86 | 2.02 | 4.13 | 15.11* | 20.26 |
| Dec. | 24.07 | 7.48 | 1.57 | 7.88* | 16.93 |
| —1968 | | | | | |
| Jan. | 32.37 | 2.87 | – 3.41 | 6.05* | 5.51 |
| Feb. | 26.20 | – 0.70 | – 4.54 | 6.07* | 0.83 |
| Mar. | 21.08 | – 1.90 | – 2.16 | 22.82* | 18.76 |
| Apr. | 19.95 | 1.24 | 9.43 | 15.79* | 26.46 |
| May | 20.70 | 11.36 | 2.29 | 9.62* | 23.27 |
| June | 29.31 | 2.89 | 0.85 | 3.19* | 6.93 |
| July | 22.60 | – 1.96 | – 0.74 | 9.32* | 6.62 |
| Aug. | 16.87 | – 1.59 | 5.08 | 17.27* | 20.76 |
| Sep. | 18.20 | 4.47 | 7.65 | 9.98* | 22.10 |
| Oct. | 26.95 | 7.30 | – 2.37 | 11.07* | 16.00 |
| Nov. | 30.20 | – 0.89 | – 3.79 | 34.22* | 29.54 |
| Dec. | 25.11 | – 1.48 | 17.72 | 30.79* | 47.03 |

Table 6. (continued)

| Month and year | Successive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 1060 lb | 1130 lb | 1190 lb | 1240 lb | |
| | (Dollars per animal) | | | | |
| —1969 | | | | | |
| Jan. | 25.44 | 15.86 | 21.00 | 44.82* | 81.68 |
| Feb. | 38.05 | 17.00 | 36.68 | 23.79* | 77.47 |
| Mar. | 41.05 | 32.86 | 16.25* | –18.09 | 49.11 |
| Apr. | 58.55 | 14.25* | –22.51 | 0.15 | 14.25 |
| May | 43.80* | –21.09 | – 9.64 | – 5.76 | 0.00 |
| June | 8.59* | –10.41 | –13.12 | – 5.26 | 0.00 |
| July | 10.88* | –12.75 | –10.98 | 5.34 | 0.00 |
| Aug. | 9.53* | –10.91 | – 1.18 | 8.69 | 0.00 |
| Sep. | 14.92 | – 0.68 | 0.55 | 10.33* | 10.20 |
| Oct. | 21.19 | 4.31 | 2.02 | 20.69* | 27.02 |
| Nov. | 23.13 | 6.64 | 8.27 | 32.00* | 46.91 |
| Dec. | 25.75 | 13.98 | 16.78 | 7.19* | 37.95 |
| —1970 | | | | | |
| Jan. | 37.00 | 21.42* | – 7.80 | – 3.84 | 21.42 |
| Feb. | 43.53 | – 1.35 | –14.72 | 17.24* | 1.17 |
| Mar. | 27.10 | – 7.99 | 4.92 | 20.70* | 17.63 |
| Apr. | 15.80 | 11.44 | 6.70* | – 0.56 | 18.14 |
| May | 33.69 | 11.65* | –12.72 | 3.21 | 11.65 |
| June | 37.88* | – 8.04 | – 7.98 | 0.44 | 0.00 |
| July | 19.83* | – 7.07 | – 6.12 | –13.67 | 0.00 |
| Aug. | 19.32* | – 6.11 | –17.40 | – 3.08 | 0.00 |
| Sep. | 20.18 | –12.38 | – 9.82 | 37.56* | 15.36 |
| Oct. | 11.19 | – 3.65 | 22.19 | 52.11* | 70.65 |
| Nov. | 14.47 | 26.35 | 32.84 | 11.60* | 70.79 |
| Dec. | 44.58 | 36.98 | – 4.46 | 18.32 | 50.84 |

* Starred values represent optimum marketing weights. The optimum gain is the difference between the optimum gain and the gain if marketed at 1060 lb.

**Table 7. Opportunity gains or losses per animal at successive marketing weights, beginning with a 910 lb heifer.**

| Month and year | Successive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 970 lb | 1030 lb | 1080 lb | 1120 lb | |
| | (Dollars per animal) | | | | |
| —1962 | | | | | |
| Jan. | 22.76 | 1.85 | 4.45* | – 3.46 | 6.30 |
| Feb. | 23.98 | 6.31* | –13.37 | 1.50 | 6.31 |
| Mar. | 31.46* | –10.62 | – 8.16 | 10.26 | 0.00 |
| Apr. | 18.82 | – 5.78 | 2.49 | 15.16* | 11.87 |
| May | 17.88 | 4.32 | 5.55 | 18.38* | 28.25 |
| June | 24.83 | 7.29 | 7.77 | 7.99* | 23.05 |
| July | 28.38 | 9.50 | – 2.25 | 18.96* | 26.21 |
| Aug. | 30.48 | 0.06 | 7.25 | 5.29* | 12.60 |
| Sep. | 23.27 | 9.11* | – 4.12 | – 9.03 | 9.11 |
| Oct. | 31.14* | – 1.62 | –17.84 | –15.24 | 0.00 |
| Nov. | 23.89* | –14.74 | –24.86 | –10.92 | 0.00 |
| Dec. | 11.79* | –21.61 | –20.62 | 8.93 | 0.00 |
| —1963 | | | | | |
| Jan. | 2.89* | –17.82 | – 0.22 | – 3.61 | 0.00 |

Table 7. (continued)

| Month and year | Successive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 970 lb | 1030 lb | 1080 lb | 1120 lb | |
| | (Dollars per animal) | | | | |
| Feb. | – 2.52 | 4.51* | –11.84 | 7.78 | 7.03 |
| Mar. | 16.45 | – 9.60 | – 1.08 | 22.24* | 11.56 |
| Apr. | 7.18 | 0.57 | 13.86 | 2.19* | 16.62 |
| May | 16.10 | 14.86* | – 5.50 | – 2.93 | 14.86 |
| June | 29.57* | – 3.40 | –10.89 | – 0.07 | 0.00 |
| July | 13.53* | – 8.57 | – 8.21 | – 2.25 | 0.00 |
| Aug. | 7.10* | – 6.10 | – 9.93 | – 9.75 | 0.00 |
| Sep. | 7.86* | – 7.79 | –16.57 | 9.73 | 0.00 |
| Oct. | 8.53* | –14.20 | 0.68 | – 3.62 | 0.00 |
| Nov. | 2.11 | 2.12* | –11.38 | 1.95 | 2.12 |
| Dec. | 19.07* | – 9.31 | – 5.54 | – 1.32 | 0.00 |
| —1964 | | | | | |
| Jan. | 8.77* | – 3.82 | – 8.59 | – 2.02 | 0.00 |
| Feb. | 12.10* | – 6.76 | – 9.41 | 13.95 | 0.00 |
| Mar. | 9.26 | – 7.56 | 2.70 | 26.15* | 16.89 |
| Apr. | 8.84 | 3.94 | 11.93 | 18.90* | 34.77 |
| May | 23.66 | 12.83 | 8.06 | 6.02* | 26.91 |
| June | 33.33 | 9.34* | – 2.28 | – 2.33 | 9.34 |
| July | 30.29* | – 0.40 | –10.97 | 3.00 | 0.00 |
| Aug. | 21.44* | – 8.67 | – 6.23 | 1.57 | 0.00 |
| Sep. | 13.84* | – 4.24 | – 8.08 | 6.91 | 0.00 |
| Oct. | 19.79* | – 6.02 | – 3.29 | – 0.46 | 0.00 |
| Nov. | 19.48* | – 1.51 | – 8.87 | 8.44 | 0.00 |
| Dec. | 22.71 | – 6.81 | – 1.00 | 21.22* | 13.41 |
| —1965 | | | | | |
| Jan. | 17.80 | 0.65 | 10.83 | 25.92* | 37.40 |
| Feb. | 22.09 | 11.96 | 15.19 | 17.54* | 44.69 |
| Mar. | 33.84 | 16.29 | 6.24* | – 1.62 | 22.53 |
| Apr. | 40.70 | 7.96* | –11.29 | 0.96 | 7.96 |
| May | 34.37* | – 8.65 | – 9.22 | 4.18 | 0.00 |
| June | 16.94* | – 6.78 | – 4.46 | – 1.02 | 0.00 |
| July | 15.20* | – 2.31 | –11.11 | 5.17 | 0.00 |
| Aug. | 19.04 | – 8.68 | – 4.14 | 12.87* | 0.05 |
| Sep. | 12.67 | – 2.12 | 2.52 | 13.76* | 14.16 |
| Oct. | 17.45 | 4.22 | 3.34 | 20.72* | 28.28 |
| Nov. | 23.06 | 5.06 | 10.66 | 19.43* | 35.15 |
| Dec. | 25.70 | 12.12 | 8.25* | – 2.91 | 20.37 |
| —1966 | | | | | |
| Jan. | 33.09 | 9.99* | –12.64 | – 3.77 | 9.99 |
| Feb. | 30.85* | – 9.52 | –13.04 | – 2.27 | 0.00 |
| Mar. | 14.13* | –10.32 | –11.28 | 5.15 | 0.00 |
| Apr. | 12.08* | – 8.26 | – 3.53 | 8.51 | 0.00 |
| May | 10.97 | – 1.00 | – 1.72 | 4.42* | 1.70 |
| June | 15.07 | 0.21* | – 3.93 | – 4.35 | 0.21 |
| July | 17.24* | – 1.84 | –10.99 | – 3.31 | 0.00 |
| Aug. | 16.65* | – 8.58 | – 8.87 | 1.32 | 0.00 |
| Sep. | 11.39 | – 6.65 | – 5.24 | 14.04* | 2.15 |
| Oct. | 10.90 | – 3.24 | 5.93 | 1.17* | 3.86 |
| Nov. | 13.73 | 7.39* | – 6.15 | – 1.51 | 7.39 |
| Dec. | 21.46* | – 4.02 | – 7.68 | 1.70 | 0.00 |
| —1967 | | | | | |
| Jan. | 12.30 | – 5.52 | – 5.28 | 15.64* | 4.84 |
| Feb. | 11.25 | – 3.28 | 7.49 | 14.04* | 18.25 |

Table 7. (continued)

| Month and year | Succcessive marketing weights | | | | Optimum gain |
|---|---|---|---|---|---|
| | 970 lb | 1030 lb | 1080 lb | 1120 lb | |
| | (Dollars per animal) | | | | |
| Mar. | 11.79 | 8.89 | 5.96 | 11.35* | 26.20 |
| Apr. | 24.61 | 7.55 | 3.26 | 6.65* | 17.46 |
| May | 23.30 | 5.07 | - 1.43 | 7.25* | 10.89 |
| June | 22.64 | 0.67* | - 1.06 | - 5.91 | 0.67 |
| July | 18.33 | 1.04* | -11.80 | - 2.34 | 1.04 |
| Aug. | 18.31* | - 9.18 | - 7.16 | 4.22 | 0.00 |
| Sep. | 12.69 | - 4.86 | - 2.93 | 9.15* | 1.36 |
| Oct. | 14.27 | - 0.35 | 0.33 | 13.44* | 13.42 |
| Nov. | 16.47 | 2.73 | 3.52 | 9.98* | 16.23 |
| Dec. | 19.78 | 5.32 | - 1.26 | 6.22* | 10.28 |
| —1968 | | | | | |
| Jan. | 25.94 | 0.83 | - 3.03 | 6.53* | 4.33 |
| Feb. | 23.03 | - 0.85 | - 2.63 | 8.10* | 4.62 |
| Mar. | 19.71 | - 0.46 | 0.60 | 10.79* | 10.93 |
| Apr. | 19.53 | 2.61 | 2.37 | 6.38* | 11.36 |
| May | 12.10 | 14.03 | - 3.67 | 3.86* | 14.22 |
| June | 23.16* | - 1.38 | - 4.82 | 2.09 | 0.00 |
| July | 16.61 | - 2.49 | - 4.19 | 9.97* | 3.29 |
| Aug. | 14.73 | - 1.91 | 2.86 | 17.55* | 18.50 |
| Sep. | 14.90 | 4.79 | 7.74 | 6.50* | 19.03 |
| Oct. | 22.75 | 9.51* | - 4.64 | 4.59 | 9.51 |
| Nov. | 29.58 | - 2.20 | - 6.72 | 21.10* | 12.18 |
| Dec. | 22.41 | - 4.21 | 11.41 | 24.74* | 31.94 |
| —1969 | | | | | |
| Jan. | 20.14 | 13.03 | 13.33 | 40.86* | 67.22 |
| Feb. | 32.90 | 15.01 | 28.38 | 22.11* | 65.50 |
| Mar. | 38.49 | 29.50 | 10.94* | -10.99 | 40.44 |
| Apr. | 56.10 | 13.23* | -19.58 | -10.51 | 13.23 |
| May | 41.02* | -15.75 | -20.75 | 9.84 | 0.00 |
| June | 14.48* | -17.10 | -17.07 | - 5.63 | 0.00 |
| July | 9.50* | -13.83 | -11.56 | 5.10 | 0.00 |
| Aug. | 8.24* | - 8.76 | - 2.08 | 9.91 | 0.00 |
| Sep. | 11.69 | - 0.16 | 2.57 | 13.55*[a] | 15.96 |
| Oct. | 17.14 | 4.59 | 4.43 | 22.16* | 31.18 |
| Nov. | 21.31 | 5.47 | 12.31 | 22.11* | 40.19 |
| Dec. | 22.80 | 14.01 | 11.01 | 11.35* | 36.37 |
| —1970 | | | | | |
| Jan. | 32.86 | 12.92 | 0.77 | 1.31* | 15.00 |
| Feb. | 35.88 | 3.29 | - 8.68 | 14.22* | 8.83 |
| Mar. | 25.85 | - 5.77 | 3.57 | 16.28* | 14.08 |
| Apr. | 17.02 | 5.88 | 5.50* | - 0.41 | 11.38 |
| May | 24.81 | 7.77* | -10.32 | - 4.02 | 7.77 |
| June | 29.06* | - 7.24 | -13.48 | 4.36 | 0.00 |
| July | 16.94* | -10.37 | - 5.43 | - 7.22 | 0.00 |
| Aug. | 12.78* | - 2.85 | -16.22 | 0.88 | 0.00 |
| Sep. | 19.61 | -13.17 | - 8.40 | 32.67* | 11.10 |
| Oct. | 5.09 | - 5.85 | 21.50 | 45.31* | 60.96 |
| Nov. | 8.57 | 22.55 | 32.97 | 11.98* | 67.50 |
| Dec. | 34.84 | 33.77 | 0.89 | 17.27* | 51.93 |

* Starred values represent optimum marketing weights. The optimum gain is the difference between the optimum gain and the gain if marketed at 970 lb.

[a] Estimated prices according to $X_3 = 0.23 + 1.03\ X_n$ (two variable regression analysis from 1962 to August 1969 with $r^2 = 0.99$), where $X_n$ represents price of Prime Grade and $X_3$ the price of Choice Grade, 900 to 1100 lb slaughter heifer.

During years when slaughter prices were low, such as in 1963, 1964 and 1966, the best marketing weight on the average was 1060 lb for steers and 970 lb for heifers. The average additional gains when carrying the animals to heavier weights were negative with the exception of when they were carried to Prime grade. However, the positive opportunity gains were less than the losses incurred by going through the previous weight classes with the exception of heifers in 1964, when the opportunity gain of the Prime grade weight class offset the previous losses.

For instance, in 1963 the average opportunity gain for steers by going from 1060 to 1130 lb was $–4.97, from 1130 to 1190 lb $–11.07, and from 1190 to 1240 lb $3.97 per animal.

During years with relatively stable and fairly high prices such as in 1967, 1969 and 1970, all weight classes showed positive opportunity gains on the average, with the exception of weight class 1190 lb for steers in 1967 and 1970, and weight class 1080 lb for heifers in 1967 which incurred losses of $0.39, $1.20 and $0.86 per animal, respectively. The best marketing weight was distributed between the lightest and the heaviest weight class most of the time.

During years with increasing slaughter prices, such as in 1962, 1965 and 1968, the best marketing weight was almost always the heaviest weight class. All weight classes realized positive opportunity gains with the exception of weight class 1130 lb and 1190 lb for steers in 1962, which experienced a loss of $0.70 per animal, on the average, but these losses were offset when the animal was carried to Prime grade by an opportunity gain of $7.60 per animal. Heifers realized losses in 1962 at weight classes of 1030 lb and 1080 lb, but these losses were not offset when the animal was carried to the Prime grade class. In 1968 the heifer weight class 1080 lb incurred a loss of $0.39 per animal, but this loss was avoidable, if the animal was carried to Prime grade with an opportunity gain of $10.18 per animal.

Over the nine years under consideration, an additional average return of $24.22 for steers and $18.76 for heifers per animal could have been realized if the animals had been marketed at their optimum marketing weight in comparison to having been marketed at the lightest weight class of 1060 lb and 970 lb, respectively.

Difference between steers and heifers was minimal with respect to the profit picture. The largest opportunity gains were realized, for both steers and heifers, when the change in grade occurred from Good to Choice grade as mentioned earlier. The next heavier weight class had small opportunity gains of $0.72 for steers and $0.09 for heifers per animal. The weight class 1190 lb for steers and 1080 lb for heifers incurred average losses of $1.46 and $2.12 per animal, respectively. Carrying the animals to Prime grade was profitable in both cases.

Table 8. Opportunity gains or losses per animal, by quarters for steers (1962–1970).

| Quarter | Marketing weight classes one month later | | | |
|---|---|---|---|---|
| | 1060 lb | 1130 lb | 1190 lb | 1240 lb |
| | (Dollars per animal) | | | |
| Winter | 23.39 | 1.68 | –1.47 | 12.38 |
| Spring | 24.71 | 3.96 | 2.38 | 8.19 |
| Summer | 19.56 | –3.27 | –6.81 | 5.52 |
| Fall | 20.10 | 1.28 | –0.74 | 12.53 |

Steers had a larger opportunity gain of $9.66 than heifers with $7.18 per animal on the average.

Seasonality was studied with respect to the best marketing weight. Opportunity gains or losses per animal by quarters were computed to get an indication of seasonality with regard to the different marketing weights. Quarter refers to the originating three months (for each weight class group to be marketed at the next weight class group one month later) within a quarter for which averaging is computed across the years.

Table 8 suggests that the best marketing weight was 1240 lb during winter, spring and fall quarters and 1060 lb during the summer quarter. Leaving out Prime grade with its highly inelastic demand, then the best marketing weight was 1060 lb if one overlooks the small positive increments for the 1130 and 1190 lb classes. Generally, one might state that feeding to heavier weights had some possible gains during the fall, winter and spring but lighter weights should be marketed during the summer.

The evidence of Table 9 indicates that the optimum marketing weight was 1120 lb during the fall and winter quarters, and 970 lb during the spring and summer quarters. Leaving out the Prime grade, the optimum marketing weight was 970 lb when one ignores the small positive gains indicated for the 1030 and 1080 lb classes.

## Price Relationships Between Different Grades

Price differences between live grades of slaughter animals are caused by differences in meat quality, yield and the different levels

Table 9. Opportunity gains or losses per animal, by quarters for heifers (1962–1970).

| Quarter | Marketing weight classes one month later | | | |
|---|---|---|---|---|
| | 970 lb | 1030 lb | 1080 lb | 1120 lb |
| | (Dollars per animal) | | | |
| Winter | 21.00 | 1.59 | 0.04 | 9.61 |
| Spring | 22.90 | 1.58 | –3.12 | 3.33 |
| Summer | 16.40 | –4.04 | –5.69 | 6.23 |
| Fall | 18.73 | 1.23 | 0.27 | 9.55 |

of transformation costs. Using the "same-time" price relationship in a two variable linear regression model, the price relationship between Good grade and Choice grade can be interpreted as a reflection of these forces in an effectively competitive market.

Using monthly average prices at Omaha from 1962 through 1970, the following price relationships expressed in equation form were estimated. The symbols $X_1$ and $X_2$ stand for Good and Choice grades, respectively.

The slope coefficient can be interpreted as the ratio in yields for the two grades in question and should be near unity. The constant term is a summation of many different forces, such as quality differences (which should be negative considering Good grade as the dependent variable and Choice grade as the independent variable), processing cost differences, and economic structure and trends, where each of these two can direct their forces in either direction. The numerical value should be near zero if no significant quality differentials exist in the market.

Price relationships between Good and Choice grade slaughter steer animals (900–1100 lb) were

(1) $X_1 = 0.13 + 0.92\ X_2\ r^2 = 0.97$

and Good and Choice grade slaughter heifer animals (900–1100 lb)

(2) $X_1 = 0.01 + 0.92\ X_2\ r^2 = 0.98$.

The results of the t-test show that the regression coefficients are significantly different from one ($t = -5.42$ and $t = -6.76$ respectively) and that the constant terms are not significantly different from zero ($t = 0.35$ and $t = 0.031$ respectively).

Price relationships between Good and Choice grade calves or feeders should reflect quality differences in final slaughter animal products and differences in feeding efficiency. Using monthly average price data at Omaha for the period 1962 through 1970, the following results were estimated.

Price relationships between Good and Choice grade steer calves (300–500 lb) were

(3) $X_1 = 0.60 + 0.83\ X_2\ r^2 = 0.91$

and Good and Choice heifer calves (300–500 lb)

(4) $X_1 = 0.88 + 0.84\ X_2\ r^2 = 0.97$.

Results of the t-test indicate that the slope coefficients are significantly different from unity ($t = -6.69$ and $t = -12.30$, respectively) and that the t-values for the constant terms being significantly different from zero are $t = 0.79$ and $t = 2.38$, respectively.

Price relationships between Good and Choice grade feeder steers (500–800 lb) were

(5) $X_1 = 2.13 + 0.82\ X_2\ r^2 = 0.98$

and Good and Choice grade heifer feeders (500–750 lb)

(6) $X_1 = -0.26 + 0.90\ X_2\ r^2 = 0.97$.

Applying the t-test for the slope coefficients being equal to unity, the resulting t-values are $t = -15.38$ and $t = -6.26$ and for the constant terms being equal to zero, the t-values are $t = 6.77$ and $t = 0.63$, respectively.

One explanation for the constant term not being near zero or opposite from the expected sign lies in the model chosen. Only the dependent variable in this model is assumed to be a random variable, whereas the independent variable is assumed to be a non-random variable. This causes the regression line to tip slightly clockwise. To avoid this, the "Error in Variable Model" might be more appropriate (but more difficult to compute), where both variables are treated as random variables. However, when $r^2$ is near 1.00, the estimated differences would be small.

The $r^2$ values are extremely high in all six equations, indicating a strong linear relationship between the prices of the two grades in question. The $r^2$ values indicate that the prices of Choice grade animals explain 97, 98, 91, 97, 98 and 97%, respectively, of the variations in the prices of Good grade.

The strong and competitively consistent relationships which appear to exist in the beef cattle market make it possible to deduce that comparable (to Choice grade analysis) analytic results would have resulted from a direct appraisal of the Good grade production and marketing structure.

## PRIMARY AND SECONDARY LEVEL DECISION PROCESS

Rational decision-making must evaluate the consequences of some act before undertaking it. Whenever a decision is made there is usually an end to be accomplished and several means of doing so. The decision process requires both the choosing of the end to be sought and the means of achieving it.

The goal for the beef producer is to maximize profits or to minimize losses and the ways to do these are the alternative production and marketing opportunities under his control.

With the background given earlier on historical evidence of the economic magnitudes involved in the "marketing-weight" problem, a procedure to aid in deciding on the alternative means for reaching the goal will be developed.

Using established cost and weight gain data, it is possible to develop simple "break-even" price relationships between alternative possible marketing weights. Break-even analysis is a formal profit planning approach based on established relations between costs and revenues. It is a device for determining the point at which additional revenues will just cover additional cost.

In general form, a break-even relationship for an animal can be stated as follows:

(1) $P_s\ W_s = P_f\ W_f + C$

where $P_s$ price of finished animal in dollars per cwt at the time when it is sold

$W_s$ weight of finished animal in cwt

$P_f$ purchase price of cattle input in dollars per cwt

$W_f$ weight of purchased animal for feeding purpose in cwt

C production cost for the relevant time period

The variable of interest is $P_s$, whereby a time difference between $P_s$ and $P_f$ of so many months is involved as it is required to produce the weight difference of $W_s$ minus $W_f$. To solve for $P_s$, break-even forward price, equation (1) is divided by $W_s$ which results in the following equation:

(2) $P_s = W_f\ P_f(1/W_s) + C(1/W_s)$

These break-even forward prices are such that a zero net return would be realized by selling at the computed price. Any price above this would produce a positive gain in net returns and lower prices would result in a loss.

This break-even price relationship can be drawn on graph paper and called a break-even chart, with the break-even forward price on the vertical and the base price on the horizontal.[7]

The following general points can be made about these break-even charts.

*First,* the slope of any given line is equal to the ratio of the weight when the animal was purchased to the weight when it is sold.

*Second,* the intercepts represent the carrying cost of gain per cwt of final weight.

*Third,* a change in production cost would shift the line upward or downward along the ordinate according to an increase or decrease in production cost.

## Primary Level Decision Process

The primary level sale decision process involves the determination of the optimum marketing weight for the sale of feeder animals (650, 700, 750 and 810 lb for steers and 590, 640 and 700 lb for heifers) when the weight of 440 lb for each has been reached. Using the assumed cost and weight gain data (see Appendix A) break-even price relationships between alternative selling times on steers and heifers are developed, which can be employed for marketing weight decisions.

[7] Break-even charts are presented only as a visual picture of the shifting light- or-heavy cattle comparative advantage at prices below or above "cost of gain." Break-even analyses should use equations given in relevant tables for the desired evaluation.

The break-even price relationships are given in Tables 10 and 11 for steers and heifers and are stated in terms of prices for 440 lb steer calves and 440 lb heifer calves, and include allowances for weight differences and carrying cost.

As an example, consider a producer with some 440 lb steer calves with $P_{c0}$ equal to \$28.00 a cwt, which he could get at that time. The break-even price sequence up to eight months would be \$26.80 at five months (650 lb feeder steers), \$26.48 at six months (700 lb feeder steers), \$26.33 at seven months (750 lb feeder steers), and \$25.71 at eight months (810 lb feeder steers).

If the expected future price level of feeder animals is above at least one or more of these values the sale of calves should be deferred until later.

Figures 3 and 4 provide a visual guide for these break-even relationships. The general points mentioned earlier about the break-even charts hold true. Further evaluations of the market weight problem also become more evident from these graphs.

First, increasing prices are necessary when initial prices are below carrying cost.

Second, heavier animals have an advantage over lighter ones (longer deferments in sale) for higher prices. The reverse is true when prices are low. Lighter animals have an advantage over heavier ones as can be seen on the two figures. With a steer calf price of \$18.00 a cwt, the break-even sequence would be \$20.10, \$20.16, \$20.43 and \$20.31 a cwt. Steers have an advantage over heifers when they are brought to the same weight because the constant term in the break-even relationship

**Table 10. Break-even price relationship for steers.**

| Alternative selling times | Break-even prices[a] (\$/cwt) |
|---|---|
| 0 month | $P_{c0}$ |
| 5 mo | $P_{s5} = 7.99 + 0.68\ P_{c0}$ |
| 6 mo | $P_{s6} = 8.82 + 0.63\ P_{c0}$ |
| 7 mo | $P_{s7} = 9.68 + 0.59\ P_{c0}$ |
| 8 mo | $P_{s8} = 10.52 + 0.54\ P_{c0}$ |

[a] All future break-even prices are expressed relative to the base price $P_{c0}$, which is the price in the market for 440 lb steer calves at time 0.

**Table 11. Break-even price relationship for heifers.**

| Alternative selling times | Break-even prices[a] (\$/cwt) |
|---|---|
| 0 month | $P_{c0}$ |
| 5 mo | $P_{s5} = 7.31 + 0.75\ P_{c0}$ |
| 6 mo | $P_{s6} = 8.38 + 0.69\ P_{c0}$ |
| 7 mo | $P_{s7} = 9.29 + 0.63\ P_{c0}$ |

[a] All future break-even prices are expressed relative to the base price $P_{c0}$, which is the price in the market for 440 lb heifers calves at time 0.

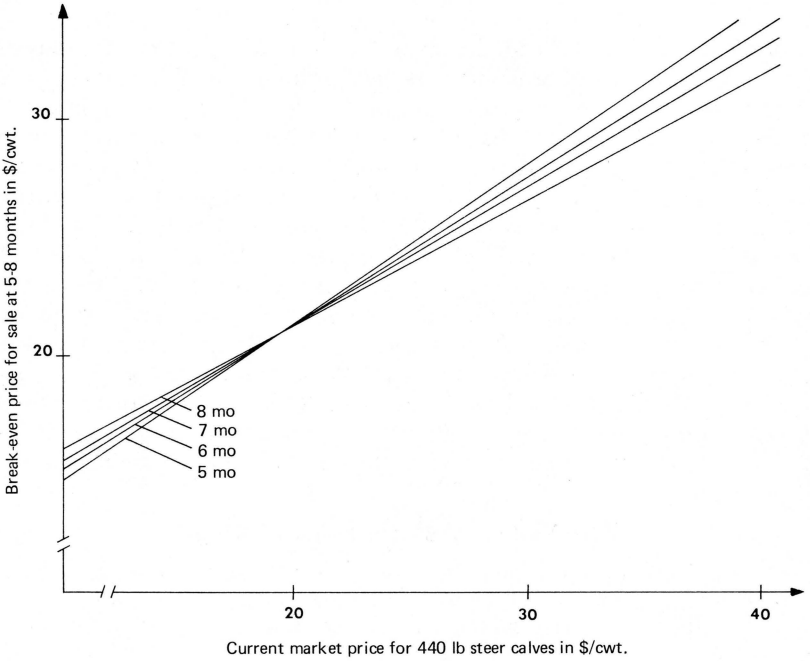



**Figure 3. Break-even price relationship for steers (feeders).**

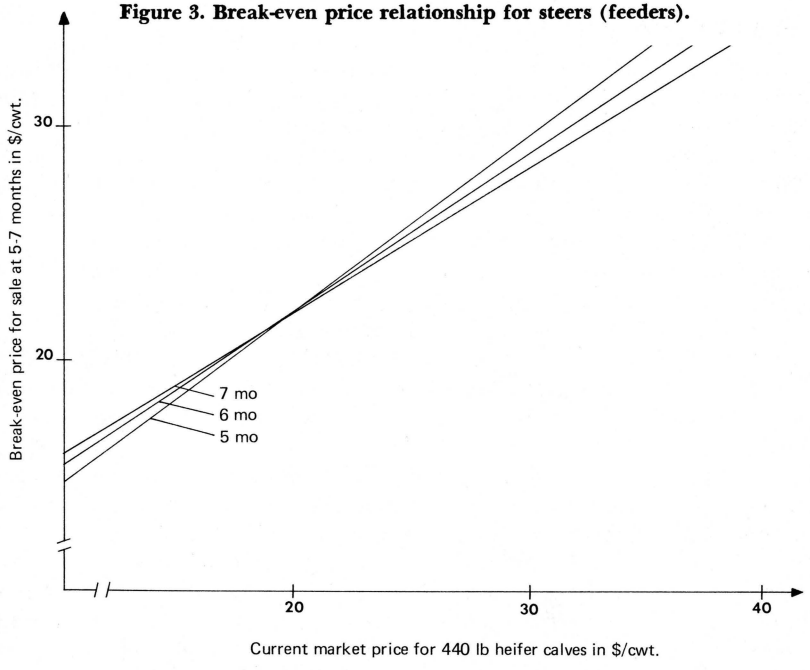



**Figure 4. Break-even price relationship for heifers (feeders).**

for heifers is larger than for steers at the same weight. On the basis of the expected future prices for feeder animals in the market and the break-even prices, a producer can decide to sell now or later. It is also possible, once it has been established that selling later is more profitable (expected future market prices for feeders are greater than break-even prices) to reassess at each decision point, five months, six months, seven months or eight months, the circumstances by a similar process using the relevant base price at the decision point. A new base price will be computed at each decision point and using the new base price will give the break-even price for the next period.

For instance, a steer calf was carried up to five months (650 lb). The market price for feeder steers is $28.00, which results in a new base price of $29.79 ($28 = 8.04 + 0.67\ P_{c0}$). This new base price is then used to compute the break-even price for the next month or for a feeder steer of 700 lb ($P_{s6} = 8.82 + (0.63)\ (27.79)$ ) which is $26.32.

## Secondary Level Decision Process

The secondary level decisions are directed at the optimum purchasing of inputs and selling at the optimum slaughter weights. For both decisions, the break-even price relationships can be of help.

### The Buying Decision

The secondary level purchasing decision is concerned with whether calves and/or feeders are being sold at prices such that a positive profit margin can be expected and which of the two classes of animals would be preferable for current placement. On the basis of expected future slaughter prices and anticipated production costs, the individual producer can compare them with going market prices on both classes of animals. Next, a comparison of the implied profits (or losses) per animal could provide the basis for choice between the two input classes. Differences in "turnover" rates should be considered.

The break-even price relationships are given in Tables 12, 13, 14 and 15 (also Figures 5, 6 7 and 8) for purchases of steer calves, heifer calves, steer feeders and heifer feeders. They are all stated in terms of expected future slaughter prices with respect to the relevant weight class.

Assuming that future slaughter prices can be predicted with useful accuracy, the producer can determine whether he can afford to pay current calf and feeder prices and which class has the greater expected profit benefits. Any break-even price above the current market price of inputs will result in a positive gain. To decide on the particular input, the difference between the break-even price and the current market price multiplied by the weight of the input (net gain per animal) can be used as the decision criterion.

**Table 12. Break-even price relationships for steer calf purchases.**

| Alternative selling times for finished animals | Break-even price[a] ($/cwt) |
|---|---|
| 9 mo ( 990 lb) | $P_{c0} = -29.50 + 2.25\ P_{s9}$ |
| 10 mo (1060 lb) | $P_{c0} = -33.42 + 2.41\ P_{s10}$ |
| 11 mo (1130 lb) | $P_{c0} = -37.55 + 2.57\ P_{s11}$ |
| 12 mo (1190 lb) | $P_{c0} = -41.68 + 2.70\ P_{s12}$ |
| 13 mo (1240 lb) | $P_{c0} = -45.87 + 2.82\ P_{s13}$ |

[a] All break-even prices are expressed relative to the base prices $P_{s1}$, which are the expected prices in the market for slaughter animals at the $i^{th}$ month from time 0 (time of purchase).

**Table 13. Break-even price relationships for steer feeder purchases.**

| Alternative selling times for finished animals | Break-even price[a] ($/cwt) |
|---|---|
| 4 mo ( 990 lb) | $P_{c0} = -10.47 + 1.41\ P_{s4}$ |
| 5 mo (1060 lb) | $P_{c0} = -12.93 + 1.51\ P_{s5}$ |
| 6 mo (1130 lb) | $P_{c0} = -15.53 + 1.61\ P_{s6}$ |
| 7 mo (1190 lb) | $P_{c0} = -18.14 + 1.70\ P_{s7}$ |
| 8 mo (1240 lb) | $P_{c0} = -20.76 + 1.77\ P_{s8}$ |

[a] All break-even prices are expressed relative to the base prices $P_{s1}$, which are the expected prices in the market for slaughter animals at the $i^{th}$ month from time 0 (time of purchase).

**Table 14. Break-even price relationships for heifer calf purchases.**

| Alternative selling times for finished animals | Break-even price[a] ($/cwt) |
|---|---|
| 8 mo ( 910 lb) | $P_{c0} = -23.10 + 2.07\ P_{s8}$ |
| 9 mo ( 970 lb) | $P_{c0} = -26.47 + 2.20\ P_{s9}$ |
| 10 mo (1030 lb) | $P_{c0} = -30.06 + 2.34\ P_{s10}$ |
| 11 mo (1080 lb) | $P_{c0} = -33.63 + 2.45\ P_{s11}$ |
| 12 mo (1120 lb) | $P_{c0} = -37.12 + 2.55\ P_{s12}$ |

[a] All break-even prices are expressed relative to the base prices $P_{s1}$, which are the expected prices in the market for slaughter animals at the $i^{th}$ month from time 0 (time of purchase).

**Table 15. Break-even price relationships for heifer feeder purchases.**

| Alternative selling times for finished animals | Break-even price[a] ($/cwt) |
|---|---|
| 4 mo ( 910 lb) | $P_{c0} = -10.25 + 1.42\ P_{s4}$ |
| 5 mo ( 970 lb) | $P_{c0} = -12.45 + 1.52\ P_{s5}$ |
| 6 mo (1030 lb) | $P_{c0} = -15.05 + 1.61\ P_{s6}$ |
| 7 mo (1080 lb) | $P_{c0} = -17.50 + 1.69\ P_{s7}$ |
| 8 mo (1120 lb) | $P_{c0} = -19.90 + 1.75\ P_{s8}$ |

[a] All break-even prices are expressed relative to the base prices $P_{s1}$, which are the expected prices in the market for slaughter animals at the $i^{th}$ month from time 0 (time of purchase).

For example, assume that a prospective cattle feeder wants to produce slaughter steers. The expected slaughter prices for the next ten months for simplicity will be $28.00 a cwt for 900–1100 lb Good slaughter steers, $30.00 a cwt for 900–1300 lb Choice slaughter steers, and $31.50 a cwt for Prime grade slaughter steers.

The break-even sequence for steer calves would be $33.50 for sale at 990 lb, $38.87 at 1060 lb, $39.51 at 1130 lb, $39.46 at 1190 lb, and $42.88 at 1240 lb.

The break-even sequence for purchasing feeder steers would be $29.13 for sale at 990 lb, $32.50 at 1060 lb, $32.90 at 1130 lb, $32.85 at 1190 lb, and $35.04 at 1240 lb.

The current market price is assumed to be $36.00 a cwt for calves and $32.00 a cwt for feeders. All animals sold at heavier weights than 990 lb produce a positive differential between break-even price and current market price (both inputs produce a positive gain).

Assuming that the finished animals are sold at 1060 lb, the expected net gain if calves were purchased would be $12.63 (38.87 minus 36.00 times 4.4) per animal for the ten-month period. If feeders were purchased, the net gain for the first five-month period would be $3.50 (32.50 minus 32.00 times 7.00). We will assume that calf and feeder prices will have adjusted to break-even levels for the second five-month period. Purchasing steer calves would have an advantage of $9.13 over purchasing feeders during the selected time period. This procedure can be simultaneously applied to include all four inputs, but was omitted for simplicity reasons.

The four break-even charts in Figures 5, 6, 7 and 8 have been drawn to provide a visual guide for these break-even price relationships. The following general points can be made.

First, both calf and feeder prices must be below expected slaughter prices when the latter are below "cost of gain." All figures imply a "cost of gain" of about $26.00–$28.00 per cwt. The opposite statement would hold true when expected slaughter prices are above "cost of gain."

Second, the sale of lighter slaughter animals has an advantage when all price levels are below "cost of gain." Again, the opposite would be true at high price levels.

Third, break-even prices are more responsive to changes in expected slaughter prices when calves are purchased instead of feeders.

## The Selling Decision

The decisions on the selling side of secondary production are concerned with finding the optimum marketing weight. Using the established cost and weight gain data, break-even price relationships between months on 920 lb steers and 910 lb heifers were developed to be employed for marketing weight decisions. The resulting break-even prices are the indicators for selling now or one month later. If it is expected that the market price will be above the break-even price, a positive gain will result by selling later. A net loss results when the future market price turns out to be below the break-even price.

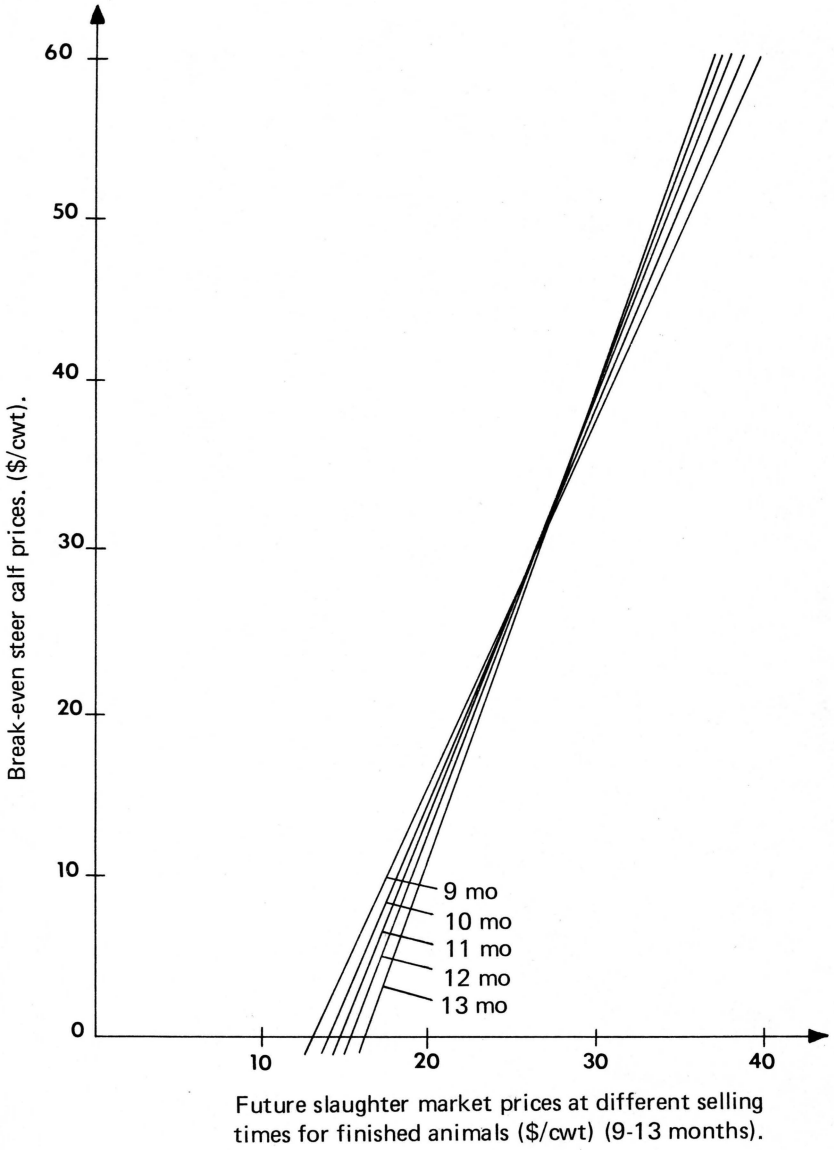



**Figure 5. Break-even price relationships for steer calf purchases.**

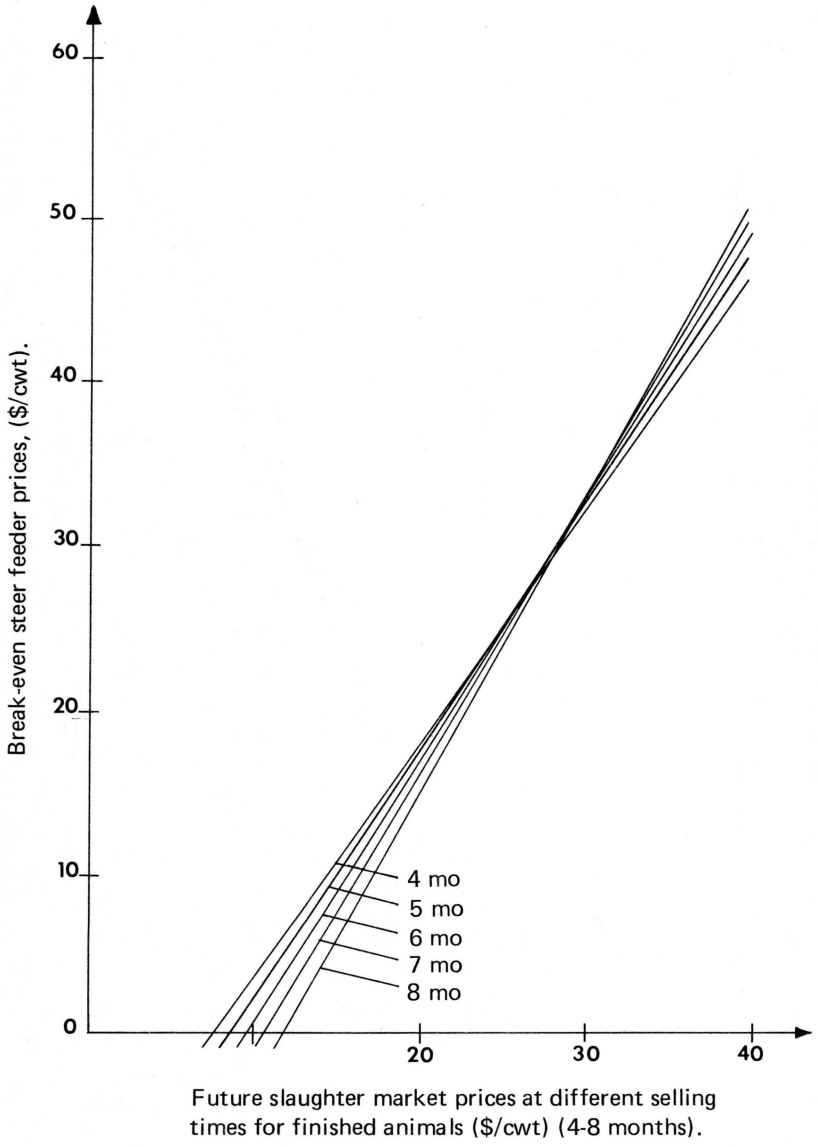



**Figure 6. Break-even price relationships for steer feeder purchases.**

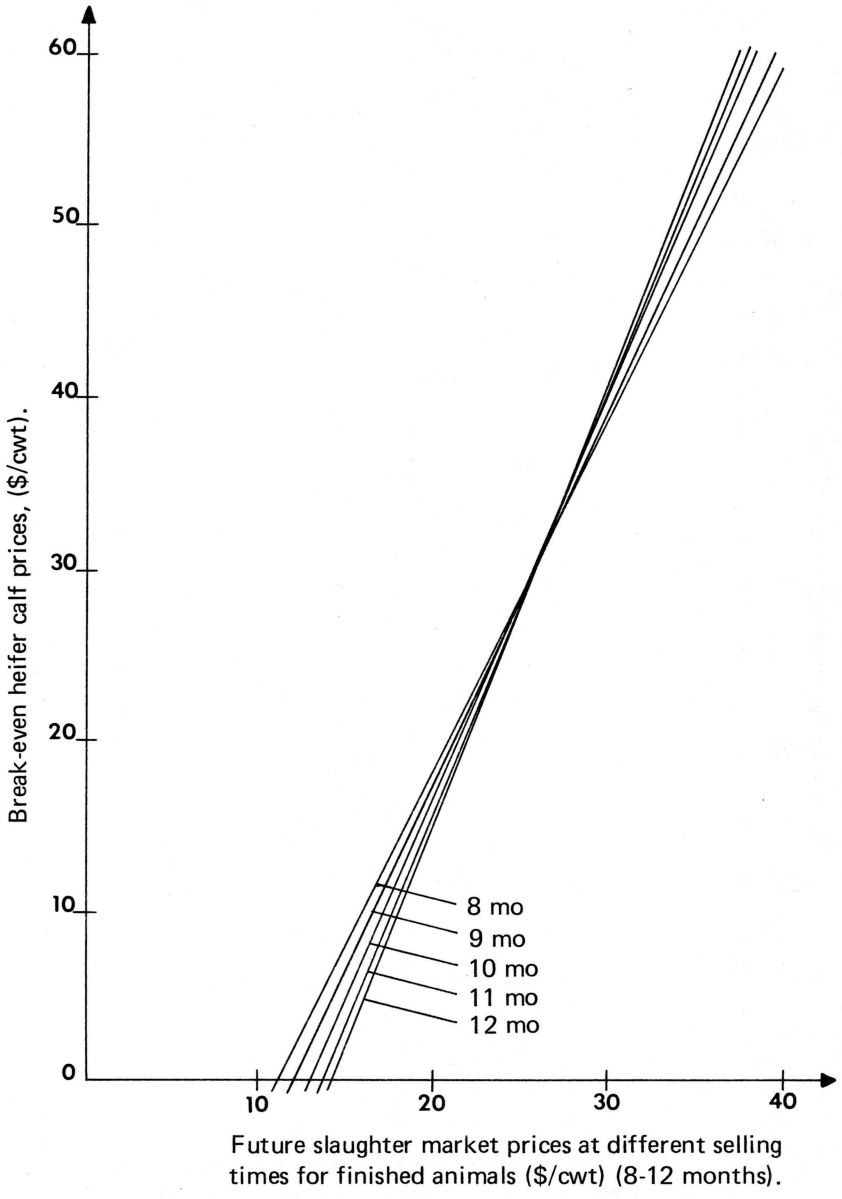



**Figure 7. Break-even price relationships for heifer calf purchases.**

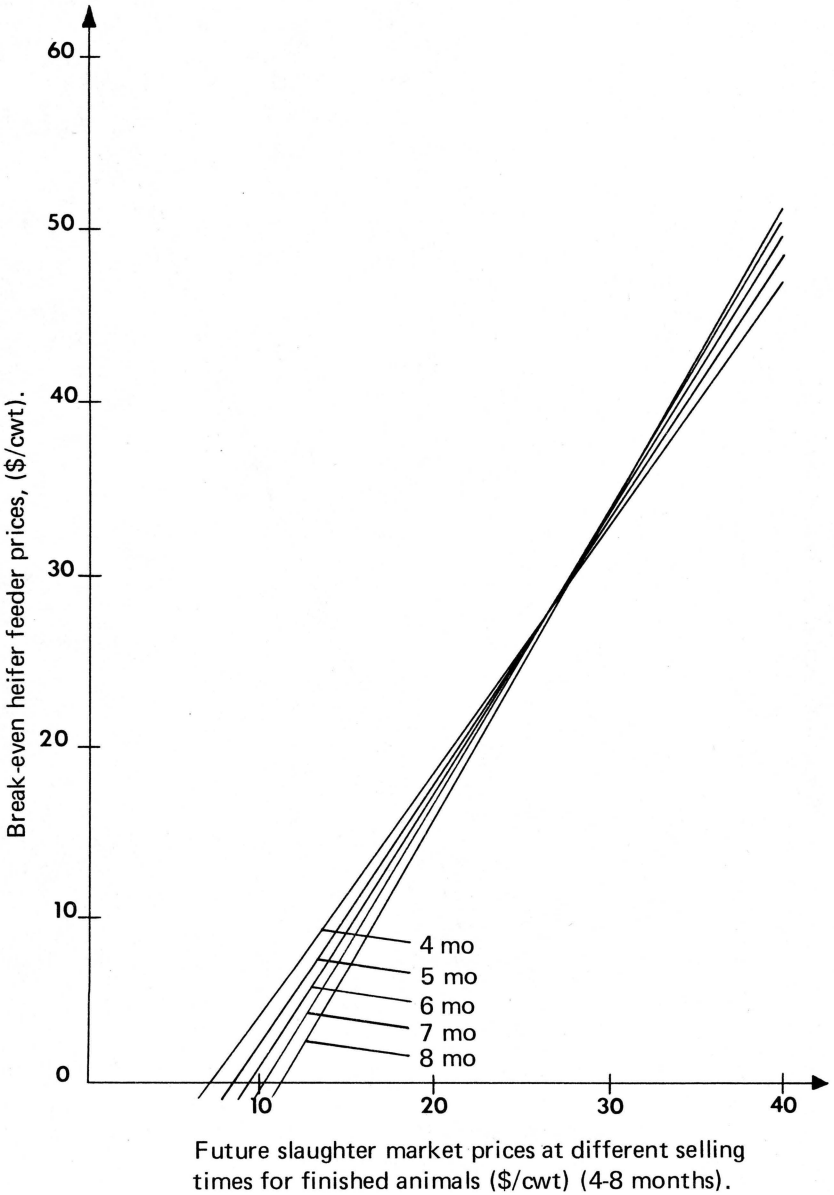



**Figure 8. Break-even price relationships for heifer feeder purchases.**

**Table 16. Break-even price relationships for slaughter steers.**

| Alternative selling times | Break-even price[a] ($/cwt) |
|---|---|
| 0 month | $P_{c0}$ |
| 1 mo | $P_{s1} = 1.62 + 0.93\ P_{c0}$ |
| 2 mo | $P_{s2} = 3.14 + 0.87\ P_{c0}$ |
| 3 mo | $P_{s3} = 4.56 + 0.81\ P_{c0}$ |
| 4 mo | $P_{s4} = 5.86 + 0.77\ P_{c0}$ |
| 5 mo | $P_{s5} = 7.11 + 0.74\ P_{c0}$ |

[a] All future break-even prices are expressed relative to the base price $P_{c0}$, which is the price in the market for 920 lb slaughter steers at time 0.

**Table 17. Break-even price relationships for slaughter heifers.**

| Alternative selling times | Break-even price[a] ($/cwt) |
|---|---|
| 0 month | $P_{c0}$ |
| 1 mo | $P_{s1} = 1.54 + 0.94\ P_{c0}$ |
| 2 mo | $P_{s2} = 2.98 + 0.88\ P_{c0}$ |
| 3 mo | $P_{s3} = 4.29 + 0.84\ P_{c0}$ |
| 4 mo | $P_{s4} = 5.51 + 0.81\ P_{c0}$ |

[a] All future break-even prices are expressed relative to the base price $P_{c0}$, which is the price in the market for 910 lb slaughter heifers at time 0.

The break-even price relationships are stated in terms of prices for 920 lb slaughter steers and 910 lb slaughter heifers.

For instance, consider a producer with some 920 lb steers with a current market price ($P_{co}$) of $25.00 a cwt. The break-even price sequence up to five months would be $24.85 at one month, $24.85 at two months, $24.91 at three months, $25.19 at four months and $25.66 at five months. If the expected future price level of slaughter animals is above at least one or more of these values the sale should be deferred until later.

Once the producer has decided that selling later is more profitable, he can reassess the decision at each successive point by a similar process using the relevant base price, $P_{c0}$, at each decision point.

For example, a producer has carried steers to 1130 lb (3 months). The current market price for 1130 lb steers is $30.00 a cwt. The new base price, $P_{co}$, for 1130 lb steers is $31.25 ($30 = 4.56 + 0.81\ P_{co}$). This new base price is now used to compute the break-even price for the next month (1190 lb steers) which is $30.02 a cwt ($P_s = 5.86 + (0.77)(31.25)$).

Break-even charts for steers and heifers were drawn to give a visual guide. It is obvious from Figures 9 and 10 that at low prices, lighter animals should be sold. At high prices, heavier animals have the advantage. However, in the most common price range, $25.00 to $35.00 a cwt, the differences in break-even forward prices with respect to weight classes is small at a given current price level.

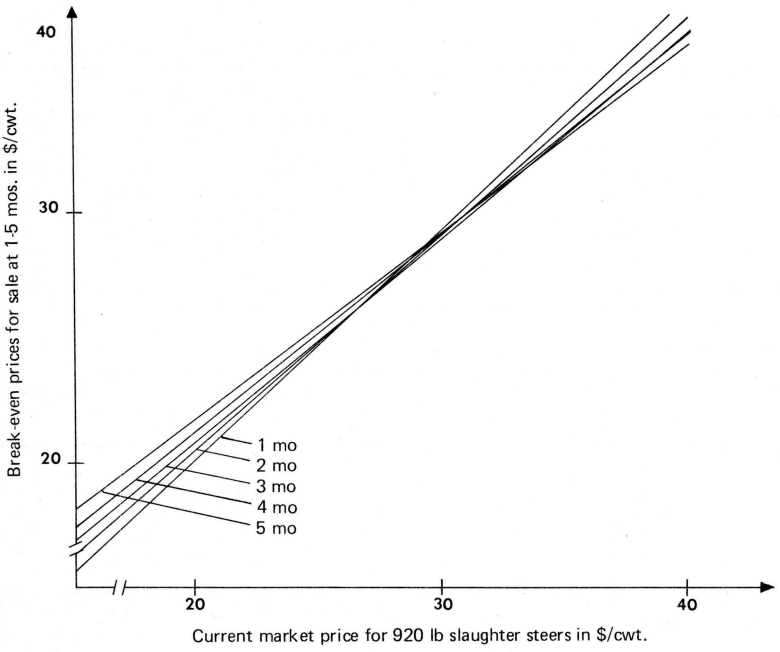



**Figure 9. Break-even price relationships for slaughter steers.**

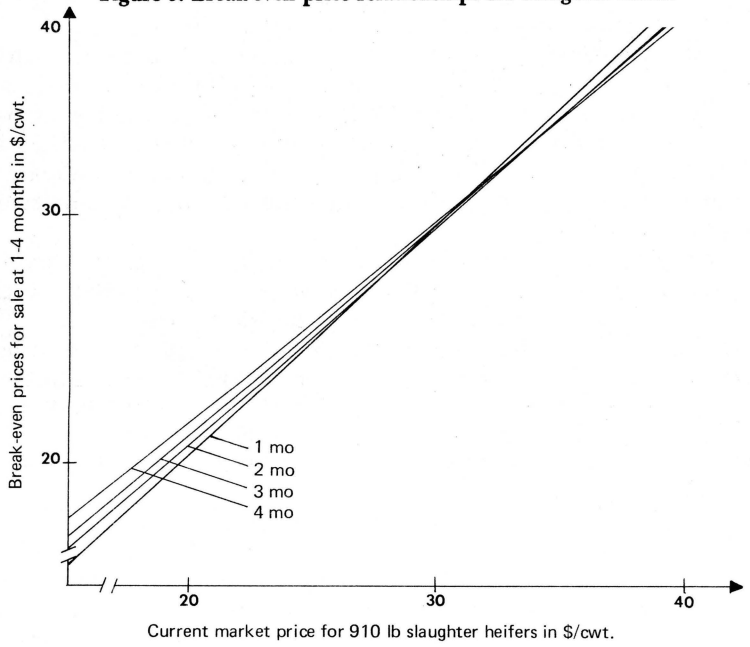



**Figure 10. Break-even price relationships for slaughter heifers.**

# MARKETING RISK—ESTIMATES AND EVALUATION

Risk and uncertainty are dominant characteristics of cattle raising. Many of the production and marketing decisions made by the primary producer and the cattle feeder are clouded by uncertainty about production performance and future cattle prices. Because of the before-stated assumptions about constant transformation costs and exogenous influences, the risk in this study (probability of losing money) refers only to those results caused by variations in feeder and slaughter cattle prices.

The overall risk estimates (based on the 1962–1970 period, using monthly average prices at Omaha), which assume that a producer ignores the current price trends as indicators of future cattle prices, will be compared with estimates for periods of fairly high or rising prices and for periods of low or falling prices. Differential risk with respect to seasons will also be considered.

## Primary Production

The typical primary producer (or at least a sufficient marginal number of producers) has the facilities available to produce either calves or heavier feeders. The analysis focuses on the risk involved when the decision is to be made to sell calves now or feeders later. Using standardized production costs (assumed constant for the period and ignoring some indirect cow stocking rate adjustments), a probability distribution of additional profits or losses was estimated from the relative frequency of such occurrences during the study period.

The results presented in Table 18 indicate that the probabilities of a loss by deferring sale until later were smaller when prices were high or rising. At low or falling prices, these probabilities increased

**Table 18. Risk involved in the decision of carrying calves to heavier feeders (1962–1970).[a]**

| Price level[b] | Probability of losing money | |
|---|---|---|
| | Steers | Heifers |
| | (Percent) | |
| High or rising prices[c] | 29.46 | 62.17 |
| Overall[d] | 47.30 | 74.50 |
| Low or falling prices[e] | 72.91 | 90.66 |

[a] Weights used were: calves 440 lb, steer feeders 700 lb and heifer feeders 640 lb. A growth time of six months was used.

[b] Price level refers to the time point when the decision on calves is to be made.

[c] High or rising prices prevailed during the months from January 1962 through December 1962, from March 1965 through September 1966, and from February 1968 through July 1971. Probabilities are based on 63 observations.

[d] Probabilities are based on 108 observations.

[e] Low or falling prices occurred from January 1963 through February 1965 and from October 1966 through January 1968. Probabilities are based on 45 observations.

very sharply. However, the decision to carry heifer calves to heifer feeders was associated with high risk regardless of the price level or movement of the prices.

With respect to season, the decisions made during the winter and fall quarters of selling steer or heifer feeders was less risky than the same decisions made during the spring or summer quarters. Probabilities of losing money were in percent 35.60 and 61.70 during the winter quarter, 59.80 during the spring quarter, 62.90 and 94.50 during the summer quarter, and 43.30 and 66.28 during the fall quarter, respectively.[8]

## Secondary Production

### The Buying Decision

The risk involved in the buying decision (buying calves or buying feeders) is a reflection of the inconsistent variability of cattle input prices and cattle slaughter prices over time. Monthly average prices at Omaha and the established production costs were used to construct a probability distribution of additional profits or losses when calves or feeders were purchased and the finished animals sold at 1060 lb for steers and 970 lb for heifers.

The probabilities in Table 19 suggest that purchasing steer calves was less risky than purchasing feeders with high or rising prices, but with low or falling prices there seems to have been no significant difference. Purchasing heifer calves instead of heavier feeders tended to be less risky in all cases.

Great differences in risk with respect to seasons was not observable during the time period studied. Purchasing steer and heifer calves was less risky during the summer and fall quarters than during the winter and spring quarters. Steer and heifer feeders purchased during the winter and fall quarters experienced less risk than during the spring and summer quarters.

### The Selling Decision

The selling decision involves the decision to sell later instead of now. The risk at each decision point will be expressed as the probability of losing money. Historical data from 1962 through 1970 are used to show the risk (under the earlier stated assumptions) at each decision point (990, 1060, 1130 and 1190 lb for steers and 910, 970, 1030 and 1080 lb for heifers) which would have been involved if it was decided to sell one month later instead of now.

[8] Each probability is based on 27 observations.

**Table 19. Risk involved in the decision of purchasing calves or feeders (1962–1970).[a]**

| Price level[b] | Probability of losing money | | | |
|---|---|---|---|---|
| | Steer calves | Steer feeders | Heifer calves | Heifer feeders |
| | (Percent) | | | |
| High or rising prices[c] | 37.07 | 52.39 | 23.89 | 48.40 |
| Overall[d] | 48.01 | 59.87 | 34.46 | 55.57 |
| Low or falling prices[e] | 66.28 | 72.24 | 44.04 | 66.28 |

[a] Weights used were: calves 440 lb, steer feeders 700 lb and heifer feeders 640 lb. The growth time for steer calves was eleven months, steer feeders five months, heifer calves nine months and heifer feeders five months.

[b] Price level refers to slaughter prices of 1060 lb steers and 970 lb heifers at the time when the decision of purchasing either calves or feeders is to be made.

[c] High or rising prices were from January 1962 through December 1962, from March 1965 through May 1966, and from January 1968 through November 1971. Probabilities are based on 63 observations.

[d] Probabilities are based on 108 observations.

[e] Low or falling prices prevailed from January 1963 through April 1965 and from June 1966 through December 1967. Probabilities are based on 45 observations.

**Table 20. Risk of purchasing calves or feeders by quarters (1962–1970).[a]**

| Quarter | Probability of losing money[b] | | | |
|---|---|---|---|---|
| | Steer calves | Steer feeders | Heifer calves | Heifer feeders |
| | (Percent) | | | |
| Winter | 57.93 | 46.41 | 38.59 | 40.90 |
| Spring | 52.39 | 65.17 | 36.32 | 65.54 |
| Summer | 44.83 | 78.81 | 34.46 | 69.50 |
| Fall | 40.90 | 53.59 | 24.20 | 50.95 |

[a] Weights used were: calves 440 lb, steer feeders 700 lb and heifer feeders 640 lb. The growth time for steer calves was eleven months, steer feeders five months, heifer calves nine months and heifer feeders five months.

[b] Each probability is based on 27 observations.

The results of Table 21 indicate that during the nine years under consideration the probability of losing money was almost zero when steers were carried from 990 to 1060 lb and heifers from 910 to 970 lb (assumed grade change from Good to Choice grade). The decision of carrying steers from 1060 to 1130 lb and from 1130 to 1190 lb, and heifers from 970 to 1030 and from 1030 to 1080 lb was associated with high risk even with high or rising prices. Carrying animals from 1190 (steers) and 1080 (heifers) lb, respectively, to Prime grade level was associated with lower risk regardless of the price level. This might be attributable to the assumed change in grade and the average price differential.[9]

Considering the relative risks, the optimum marketing weights are 1060 lb for steers and 970 lb for heifers. The evidence also implies

[9] As stated earlier, the demand for Prime grade is inelastic. Relatively small increases in supply could reduce the assumed Prime-over-Choice price differential.

**Table 21. Risk involved in selling one month later instead of now (1962–1970).**

| Price level[b] | Successive marketing weights[a] 990–1060 lb / 910– 970 lb | 1130 lb / 1030 lb | 1190 lb / 1080 lb | 1240 lb / 1120 lb | Steers / Heifers |
|---|---|---|---|---|---|
| | (Probability of Losing Money in Percent) | | | | |
| High or rising | 0.80 | 41.29 | 45.22 | 19.49 | Steers |
| prices[c] | 0.87 | 42.86 | 51.60 | 20.25 | Heifers |
| Overall[d] | 2.39 | 47.29 | 54.38 | 24.20 | Steers |
| | 1.50 | 49.60 | 58.32 | 24.83 | Heifers |
| Low or falling | 3.56 | 59.48 | 67.36 | 30.85 | Steers |
| prices[e] | 1.70 | 62.93 | 71.90 | 32.64 | Heifers |

[a] Growth period between the different weight classes is one month.

[b] Price level refers to slaughter prices at the decision point.

[c] High or rising prices prevailed from January 1962 through December 1962, from March 1965 through May 1966, and from January 1968 through May 1971. Probabilities are based on 63 observations.

[d] Probabilities are based on 108 observations.

[e] Low or falling prices were from January 1963 through April 1965 and from June 1966 through December 1967. Probabilities are based on 45 observations.

that once the decision is made to go to heavier weights, it is less risky to go all the way to Prime grade animals.

Risk with respect to marketing by seasons was studied. Table 22 shows the estimated probabilities of losing money by quarter periods of the year.

The results of Table 22 suggest that the decision of going to heavier weights was relatively riskier during the summer and fall quarters. However, the differential is minimal with the exception for heifers during the summer where the highest risk of 72.24 and 81.33 percent was reached. Otherwise, the same holds true as it was said for Table 21.

## SUMMARY AND CONCLUSIONS

The livestock sector has characteristically experienced large variations in cattle prices. Generally, variations in cattle prices have not reflected changes in the cost of production. Price variations have

**Table 22. Risk by quarters, selling one month later instead of now (1962–1970).**

| Quarter[b] | Successive marketing weights[a] 990–1060 lb / 910– 970 lb | 1130 lb / 1030 lb | 1190 lb / 1080 lb | 1240 lb / 1120 lb | Steers / Heifers |
|---|---|---|---|---|---|
| | (Probability of losing money in percent) | | | | |
| Winter | 2.74 | 42.47 | 52.79 | 21.77 | Steers |
| | 2.50 | 43.25 | 50.40 | 22.96 | Heifers |
| Spring | 2.33 | 40.52 | 50.00 | 19.22 | Steers |
| | 1.97 | 40.13 | 49.20 | 20.05 | Heifers |
| Summer | 2.02 | 56.36 | 53.98 | 26.11 | Steers |
| | 0.44 | 72.24 | 81.33 | 32.64 | Heifers |
| Fall | 1.92 | 53.59 | 64.06 | 31.21 | Steers |
| | 0.73 | 51.99 | 61.41 | 25.14 | Heifers |

[a] Growth time between the different weight classes is one month.

[b] Quarter refers to the time point when the decision is to be made.

occurred because of a number of biological and economic factors which have led to alternate periods of over-and-under production. The objectives of the study were to evaluate the recent historical price relationships of the beef sector indicative of profit and loss conditions caused by disorderly aggregate performance in production and marketing, to analyze the risk involved at various positions in the chain of production and marketing activities, and to suggest information and action programs which could reduce the amount of disorderly production and marketing.

In evaluating the recent historical price relationships from primary production on the ranch to secondary production in the feedlot, indications of persistent inconsistencies implying disorderly production and marketing performance at both production levels were disclosed, having resulted in windfall profits or extraordinary losses for the individual producer as well as for the livestock industry as a whole. Furthermore, it is indicative that cattle prices do not consistently reflect production costs but tend to be either too low or too high most of the time. Slight seasonality evidence with respect to profit and loss conditions were observable at both production levels. Steers tended to have a slight comparative advantage over heifers with the exception of purchasing heifers calves for secondary production. The "optimum marketing" weight was found to be either the lightest Choice grade or Prime grade weight class, but predominantly the former.

The evaluation of the relationships between Good and Choice grade prices indicated a strong linear relationship between the two.

Special attention was given to the risk involved at certain decision points along the chain of production and marketing decisions. Overall risk was compared to the risk of the decision made at high or rising prices and at low or falling prices. The risks for decisions made at high or rising prices were generally lower than the overall risks, but still fairly high. The reverse was experienced at low or falling prices. Selling decisions in secondary production were associated with almost no risk when the animals were carried to the first Choice grade class. Going to the next heavier weight classes increased the probability of losing money tremendously, with the exception of carrying to Prime grade. Risk differences with respect to seasons were minimal with the exception of steer feeders and slaughter heifers which showed a greater variability.

The historical record indicates that the beef industry has experienced production and pricing disorder. Economic efficiency, on the part of the producers, would imply that they should react to price signals in production and marketing decisions so as to achieve continuous equilibrium conditions in production, marketings and prices. As with most economic decisions which depend on the correctness of

estimates of conditions relating to the decision, losses as well as increased profits can result.

A part of this study has been committed to help individual producers in evaluating the alternatives in their marketing and production programs. A greater awareness of these problems by a larger number of producers should result in some improvements in production and supply allocations and industrywide performance. However, it is very unlikely to be a perfect cure for the production and supply variabilities of the industry.

First, individual decisions are made without having knowledge of what others have decided to do.

Second, the beef industry has the property of a subdivided competitive industry with rather lengthy production and marketing time periods. To provide such an industry with proper information and outlook to secure continuous equilibrium from the decision process of the numerous firms is rather difficult.

Third, the disorderly production and marketing problems of the beef industry are more industrywide problems than individual firm problems.

Several possible action programs which could be suggested to reduce production and marketing disorders are as follows:

1. Using appropriate projective demands for beef (and pork), national inventory data on animals, and estimated time-form cost transformations in growth and reproduction activities, it would be possible to estimate equilibrium allocation patterns for the entire industry. Improved information services (with more timely recommended targets against which actual allocations could be monitored by short-period data coverage) with effective producer support could correct misallocations before they degenerate into disorderly production and marketing cycles. An active, positive information service of this type could be provided by ERS-SRS cooperation in USDA and industry support.

2. If an intensified positive data program failed to provide adequate order control in the open market (possibly resulting from insufficient producer support or other operational problems), it would suggest that a national marketing order with sufficient management analysis capability and legal authority to establish the proper marketing and reproduction adjustment quotas to maintain consistent growth with projective demand could be a second alternative action program. This production and marketing control unit could be administered by an industry board of directors and USDA cooperating services.

3. Private-sector, long-term integrative contracts between ranchers and feedlots and between feedlots and packers with effective adjustment conditions written in could provide order stability. However,

to avoid unnecessary production or marketing security stresses (inherent in block confrontation or contracting), it would be essential that USDA act as reviewer in the public interest of all contract provisions and their execution performance.

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# APPENDIX A

# ASSUMPTIONS AND CALCULATIONS FOR FEEDING COSTS

## Assumptions

A corn price of $1.15 per bushel was used, except for 1970 when $1.40 per bushel was used. Alfalfa hay was priced at $20.00 per ton, corn silage at $9.00 per ton and protein supplement (soybean meal) at $5.00 per cwt. A price of $3.00 per cwt for salt and minerals was used. Labor cost was assumed to be $2.00 per hour. The interest rate on investments in equipment, operating expense, cattle inputs and feed inputs was assumed to be 7% and 6% for investments in buildings. Depreciation rates of 4% on buildings and 10% on equipment were used.

The labor requirement was assumed to be 0.016 hours per day per head. Nutrients, maintenance and production energy requirements for cattle are taken from the "National Academy of Sciences."[10] A Kansas State study was used to estimate the cost of taxes, insurance and death losses.[11]

## Calculations

### Estimated Costs at the Primary Level [12]

The following production cost data are appropriate for feeding during the winter months.

a. Feeding Costs for Steer and Heifer Feeders:

| | *Steers* | *Heifers* |
|---|---|---|
| Initial weight in lb | 440 | 440 |
| End weight in lb | 700 | 640 |
| Average daily gain in lb | 1.44 | 1.11 |
| Number of days | 180 | 180 |
| *Feed Cost:* | | |
| Alfalfa hay | 0.5 ton $10.00 | 0.5 ton $10.00 |

[10] "Nutrients Requirements of Domestic Animals," National Academy of Sciences, Fourth Revised Edition of Nutrients Requirements of Beef Cattle, Washington, D.C., 1970.

[11] "Economies of Scale in Commercial Cattle Feedlots—An Analysis of Nonfeed Cost," John H. McCoy and Calvin C. Hausman, Agricultural Experiment Station, Kansas State University of Agriculture and Applied Science, Manhattan, Kansas, Technical Bulletin 151, April 1967.

[12] Source: Dr. Philip A. Henderson, Extension Economist, University of Nebraska, personal interview.

| | | | | | |
|---|---|---|---|---|---|
| Corn silage | 1.7 | ton | 15.30 | 1.7 | ton | 15.30 |
| Corn | 13.28 | bu | 15.27 | 7.72 | bu | 8.87 |
| Salt and minerals | | | 0.70 | | | 0.70 |
| *Nonfeed Cost:* | | | | | | |
| Equipment and building repairs | | | $ 0.39 | | | $ 0.39 |
| Taxes and insurance | | | 1.53 | | | 1.20 |
| Interest on equipment and bldgs., depreciation | | | 0.73 | | | 0.73 |
| Interest and operating expense and feed inputs | | | 1.41 | | | 1.07 |
| Interest on cattle inputs | | | 3.50 | | | 2.75 |
| Labor | | | 4.80 | | | 4.80 |
| Veterinary and medicine | | | 5.65 | | | 5.65 |
| Death loss | | | 1.20 | | | .91 |
| Miscellaneous | | | 1.26 | | | 1.26 |
| Total feeding cost | | | $61.74 | | | $53.63 |

b. Feeding Costs for Selected Weight Differentials:

| | *Steers* | | | *Heifers* | |
|---|---|---|---|---|---|
| Initial weight in lb | 650 | 700 | 750 | 590 | 640 |
| End weight in lb | 700 | 750 | 810 | 640 | 700 |
| Average daily gain in lb | 1.67 | 1.67 | 2.00 | 1.67 | 2.00 |
| Number of days | 30 | 30 | 30 | 30 | 30 |
| Feed cost | $ 6.54 | $ 7.65 | $ 9.38 | $ 7.59 | $ 8.48 |
| Nonfeed cost | $ 3.21 | $ 3.21 | $ 3.21 | $ 2.90 | $ 2.90 |
| Total feeding cost | $ 9.75 | $10.86 | $12.59 | $10.49 | $11.38 |

## Estimated Costs at Secondary Level

Feeding occurs in feedlot confinement with high concentrate rations.

a. Steers:

| | | | | | | |
|---|---|---|---|---|---|---|
| Initial weight in lb | 440 | | | 700 | | |
| Slaughter weight in lb | 1130 | | | 1130 | | |
| Average daily gain in lb | 2.09 | | | 2.39 | | |
| Number of days | 330 | | | 180 | | |
| *Feed Cost:* | | | | | | |
| Corn | 79.00 | bu | $90.85 | 53.49 | bu | $61.51 |
| Corn silage | 1.48 | ton | 11.84 | 0.8 | ton | 7.20 |
| Protein | 440 | lb | 21.50 | 299 | lb | 14.95 |
| Salt and minerals | 19.0 | lb | 0.57 | 10.7 | lb | 0.32 |

| | | | | |
|---|---|---|---|---|
| *Nonfeed Cost:* | | | | |
| Equipment and building repairs | | 0.99 | | 0.54 |
| Taxes and insurance | | 3.86 | | 2.80 |
| Interest on equipment and bldgs., depreciation | | 1.87 | | 1.02 |
| Interest on operating expense and feed inputs | | 8.70 | | 3.86 |
| Interest on cattle inputs | | 9.75 | | 6.62 |
| Labor | | 10.56 | | 5.76 |
| Veterinary and medicine | | 1.25 | | 1.25 |
| Miscellaneous | | 1.65 | | 1.08 |
| Death loss | | 1.81 | | 1.81 |
| Total feeding cost | | $165.22 | | $108.72 |

b. Heifers:

| | | | | |
|---|---|---|---|---|
| Initial weight in lb | 440 | | 640 | |
| Slaughter weight in lb | 970 | | 970 | |
| Average daily gain in lb | 1.96 | | 2.20 | |
| Number of days | 270 | | 150 | |
| *Feed Cost:* | | | | |
| Corn | 55.00 bu | $63.25 | 43.20 bu | $49.68 |
| Corn silage | 1.32 ton | 11.88 | 0.8 ton | 7.20 |
| Protein | 250 lb | 12.50 | 115.2 lb | 5.76 |
| Salt and minerals | 13.25 lb | 0.40 | 10.0 lb | 0.30 |
| *Nonfeed Cost:* | | | | |
| Equipment and building repair | | 0.81 | | 0.45 |
| Taxes and insurance | | 2.82 | | 1.87 |
| Interest on equipment and bldgs., depreciation | | 1.53 | | 0.85 |
| Interest on operating expense and feed inputs | | 4.56 | | 1.64 |
| Interest on cattle inputs | | 5.98 | | 4.49 |
| Labor | | 8.64 | | 4.80 |
| Veterinary and medicine | | 1.50 | | 1.50 |
| Miscellaneous | | 1.16 | | 0.70 |
| Death loss | | 1.50 | | 1.30 |
| Total feeding cost | | $116.53 | | $80.54 |

c. Feeding Costs for Selected Weight Differentials:

| | *Steers* | | | | |
|---|---|---|---|---|---|
| Initial weight in lb | 920 | 990 | 1060 | 1103 | 1190 |
| End weight in lb | 990 | 1060 | 1130 | 1190 | 1240 |
| Average daily gain in lb | 2.33 | 2.33 | 2.33 | 2.00 | 1.67 |

| | | | | | |
|---|---|---|---|---|---|
| Feed cost | $12.04 | 12.88 | 13.68 | 13.60 | 13.73 |
| Nonfeed cost | $ 3.99 | 4.39 | 4.51 | 4.60 | 4.72 |
| Total feeding cost | $16.03 | 17.27 | 18.19 | 18.20 | 18.45 |
| | | | *Heifers* | | |
| Initial weight in lb | | 910 | 970 | 1030 | 1120 |
| End weight in lb | | 970 | 1030 | 1080 | 1120 |
| Average daily gain in lb | | 2.00 | 2.00 | 1.67 | 1.33 |
| Feed cost | | $11.28 | 12.05 | 11.80 | 11.43 |
| Nonfeed cost | | $ 3.63 | 3.71 | 3.88 | 3.95 |
| Total feeding cost | | $14.91 | 15.76 | 15.68 | 15.38 |

# APPENDIX B

# ANALYSES TO EXTEND CHOICE GRADE EVALUATION TO GOOD GRADE SITUATION

The basic analyses of the production and marketing structure were directed at the Choice grade situation. An indirect appraisal for the Good grade can be made, because of the strong linear relationship between Choice and Good grade prices.

## General Development

Using the earlier established relationships between Good and Choice prices, the following general model can be formulated.

$$P_G - P^*_G = A + BP_C - [W(a + bp_C) - C_G]\ 1/w$$
$$= P_C - P^*_C - (1\text{-}B)P_C - (W\ a)\ (1/w) - (Wbp_C)\ (1/w) + C_G(1/w) + (Wp_C)\ (1/w) - C_C(1/w) + A$$
$$= P_C - P_C^* - (1\text{-}B)P_C - (Wa)\ (1/w) - W(1\text{-}b)p_C(1/w) + (C_G\text{-}C_C)\ (1/w) + A$$

Assuming that the production cost for Good grade animals, $C_G$, equals that for Choice grade animals, $C_C$, and that the Choice slaughter price, $p_C$, is equal to the Choice feeder price, $P_C$, at a level of p, we secure a more simplified expression. The last assumption is based on previously established evidence that the price differentials did not vary significantly under moderate price level changes ($20.00–$40.00 per cwt). The simplified expression is:

$$\triangle P_G = \triangle P_C - p[\ (1\text{-}B) - W(1/w)\ (1\text{-}b)\ ] - Wa(1/w) + A$$

where: A Constant term of the price relationship equation between Good and Choice grade feeders.

a Constant term of the price relationship equation between Good and Choice grade slaughter animals.

B Slope coefficient of the price relationship equation between Good and Choice grade feeders.

b Slope coefficient of the price relationship equation between Good and Choice grade slaughter animals.

$C_C$ Production cost for Choice grade animals (range or feedlot as appropriate).

$C_G$ Production cost for Good grade animals (range or feedlot as appropriate).

$P_C$ Actual market price for Choice grade feeders.

$P_C^*$ Imputed price for Choice grade feeders.

$P_G$ Actual market price for Good grade feeders.

$P_G$* Imputed price for Good grade feeders.

$p_C$ Actual market price for Choice grade slaughter animals.

$P_G$ Imputed price for Good grade slaughter animals.

W Slaughter weight at which the animals are sold.

w Feeder weight of input animals.

p Hypothesized cattle price level (slaughter price = feeder price).

$\triangle P_C$ or $\triangle p_C$ Price difference, actual minus imputed, for Choice grade animals.

$\triangle P_G$ or $\triangle p_G$ Price difference, actual minus imputed, for Good grade animals.

## Primary Production Level

The price difference (actual minus imputed price) function for the Good grade derived from the Choice grade analyses are as follows for 440 lb steer calves sold as 700 lb steer feeders;

(1) $\triangle P_G = \triangle P_C + 0.08\ p - 2.79$

and for 440 lb heifer calves sold as 640 lb heifer feeders;

(2) $\triangle P_G = \triangle P_C - 0.01\ p + 1.26.$

Applying the two extreme price levels for p for \$20.00 and \$40.00 per cwt, $\triangle P_G$ is then equal to $\triangle P_C - 1.19$ and $\triangle P_C + 0.41$ for steers, and $\triangle P_C + 1.06$ and $\triangle P_C + 0.86$ for heifers, respectively. Considering that the estimated additions or subtractions to $\triangle P_C$ are nearly constant and/or near zero, then the implied evaluation for Good grade would parallel that for the Choice grade. Evaluation for Choice grade should also hold for Good grade.

## Secondary Production Level

1. The Buying Decision

The derived Good grade appraisal for 440 lb steer calves purchased and sold as 1060 lb slaughter steers would be

(3) $\triangle P_G = \triangle P_C + 0.04\ p + 0.29,$

and for 440 lb heifer calves purchased and sold as 970 lb slaughter heifers,

(4) $\triangle P_G = \triangle P_C + 0.02\ p + 0.86.$

Similarly, the relationships for 700 lb steer feeders purchased and sold as 1060 lb slaughter steers would be

(5) $\triangle P_G = \triangle P_C - 0.05\ p + 1.93,$

and for 640 lb heifer feeders purchased and sold as 970 lb slaughter heifers,

(6) $\triangle P_G = \triangle P_C + 0.02\ p + 1.27.$

**Table 23. Good grade price differences related to choice grade price differences.**

| Price level ($/cwt) for p | Steers | | Heifers | |
|---|---|---|---|---|
| | Calves | Feeders | Calves | Feeders |
| 20.00 | $\Delta P_C + 1.09$ | $\Delta P_C + 0.93$ | $\Delta P_C + 1.26$ | $\Delta P_C + 1.67$ |
| 40.00 | $\Delta P_C + 1.89$ | $\Delta P_C - 0.07$ | $\Delta P_C + 1.66$ | $\Delta P_C + 2.07$ |

Evaluated for the two different price levels for p, the following numerical relationships result.

$\Delta P_C$ is the price difference (actual minus imputed price) for Choice grade for the designated inputs.

Again, the evidence of constant and/or near zero addition to the Choice grade differences permits one to judge that evaluation for the Good grade would parallel that for the Choice grade.

2. The Selling Decision

The estimated Good grade relationship for 990 lb slaughter steers sold at 1060 lb would be:

(7) $\Delta p_G = \Delta p_C + 0.01\ p - 0.01,$

and for 910 lb slaughter heifers sold at 970 lb,

(8) $\Delta p_G = \Delta p_C + 0.01\ p.$

Using the two extreme price levels (p equal to \$20.00 and \$40.00), $\Delta P_G$ is then equal to $\Delta P_C + 0.19$ and $\Delta P_C + 0.39$ for steers, and $\Delta P_C + 0.20$ and $\Delta P_C + 0.40$ for heifers, respectively. The differentials between Good and Choice grade price differences appear to be small.

As the equations (1 through 8) show, the p-coefficient is near zero, which indicates that the price differences for Good grade are more dependent on the Choice grade price differences and a constant than on the price level. Therefore, statements and predictions made for Choice grade animals are also valid for Good grade animals with reasonable accuracy.

# APPENDIX C 1971-72 DATA EXTENSIONS

**Table 1. Historical comparison of monthly average prices of steer and heifer calves to imputed prices based on sale as feeder animals in $/cwt.**

| | Steers | | | Heifers | | |
|---|---|---|---|---|---|---|
| 1971 | Actual calf price | Imputed calf price | Price difference | Actual calf price | Imputed calf price | Price difference |
| Jan. | 35.61 | 36.14 | -.53 | 32.75 | 29.59 | 2.66 |
| Feb. | 36.30 | 36.74 | -.44 | 32.88 | 30.32 | 2.56 |
| Mar. | 37.00 | 38.25 | -1.25 | 33.45 | 32.06 | 1.39 |
| Apr. | 37.75 | 38.73 | -.98 | 33.63 | 32.69 | .94 |
| May | 37.75 | 39.70 | -1.95 | 33.50 | 33.68 | -.18 |
| June | 37.40 | 39.92 | -2.52 | 33.30 | 34.53 | -1.23 |
| July | 36.50 | 41.20 | -4.70 | 32.50 | 35.16 | -2.66 |
| Aug. | 36.75 | 44.39 | -7.64 | 32.94 | 36.05 | -3.11 |
| Sep. | 37.95 | 44.54 | -6.59 | 34.64 | 35.48 | -.84 |
| Oct. | 38.50 | 44.90 | -6.40 | 35.12 | 35.05 | .07 |
| Nov. | 35.31 | 45.33 | -6.02 | 35.44 | 36.93 | -1.49 |
| Dec. | 40.08 | 47.97 | -7.89 | 36.28 | 39.08 | -2.80 |
| 1972 | | | | | | |
| Jan. | 40.44 | 49.96 | -9.52 | 36.28 | 39.56 | -3.68 |
| Feb. | 42.13 | 49.23 | -7.10 | 37.94 | 39.41 | -1.97 |
| Mar. | 42.85 | 50.26 | -7.41 | 38.00 | 41.86 | -3.86 |
| Apr. | 43.25 | 53.54 | -10.29 | 38.00 | 44.68 | -6.68 |
| May | 44.20 | 51.47 | -7.27 | 38.70 | 42.51 | -3.81 |
| June | 46.50 | 52.03 | -5.53 | 40.31 | 41.59 | -1.28 |
| July | 48.06 | 56.64 | -8.58 | 41.13 | 43.77 | -2.64 |
| Aug. | 48.05 | 58.98 | -10.93 | 40.85 | 44.86 | -4.01 |
| Sep. | 48.81 | 66.05 | -17.24 | 42.69 | 49.22 | -6.53 |
| Oct. | 50.25 | | | 44.00 | | |
| Nov. | 50.00 | | | 43.55 | | |
| Dec. | 50.19 | | | 43.19 | | |

**Table 3. Historical comparison of monthly average prices of choice steer calves and choice steer feeders to imputed prices based on sale as 1060 lb choice steers.**

| | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| 1971 | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Jan. | 35.61 | 36.36 | –.75 | 32.48 | 30.15 | 2.18 |
| Feb. | 36.30 | 37.21 | –.91 | 34.37 | 31.11 | 3.11 |
| Mar. | 37.00 | 41.18 | –4.18 | 34.85 | 30.32 | 4.38 |
| Apr. | 37.75 | 38.55 | –.80 | 35.15 | 29.78 | 5.37 |
| May | 37.75 | 36.94 | .81 | 34.63 | 31.41 | 3.07 |
| June | 37.40 | 39.76 | –2.36 | 34.35 | 32.90 | 1.30 |
| July | 36.50 | 45.11 | –8.61 | 33.87 | 35.08 | –1.21 |
| Aug. | 36.75 | 46.26 | –9.49 | 34.25 | 36.07 | –1.82 |
| Sep. | 37.95 | 39.78 | –1.83 | 35.20 | 34.42 | .78 |
| Oct. | 38.50 | 37.35 | 1.15 | 35.50 | 33.40 | 2.10 |
| Nov. | 39.31 | 37.93 | 1.38 | 36.11 | 35.17 | .94 |
| Dec. | 40.08 | 34.70 | 5.38 | 36.25 | 38.54 | –2.29 |
| 1972 | | | | | | |
| Jan. | 40.44 | 42.53 | –2.09 | 37.00 | 39.25 | –2.25 |
| Feb. | 42.13 | 51.08 | –8.95 | 39.06 | 35.19 | 3.87 |
| Mar. | 42.85 | 57.18 | –14.33 | 39.15 | 33.80 | 5.35 |
| Apr. | 43.25 | 62.60 | –19.35 | 39.38 | 34.17 | 5.21 |
| May | | | | 39.65 | 32.14 | 7.51 |
| June | | | | 41.31 | 37.06 | 4.25 |
| July | | | | 42.56 | 42.43 | .13 |
| Aug. | | | | 42.10 | 46.27 | –4.17 |
| Sep. | | | | 42.75 | 49.96 | –7.21 |
| Oct. | | | | 44.81 | | |
| Nov. | | | | 43.51 | | |
| Dec. | | | | 43.86 | | |

**Table 4. Historical comparison of monthly average prices of choice heifer calves and choice heifer feeders to imputed prices based on sale as 970 lb choice heifers.**

| | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| 1971 | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| Jan. | 32.25 | 32.91 | –.66 | 29.13 | 31.15 | –2.02 |
| Feb. | 32.88 | 36.08 | –3.20 | 30.25 | 31.31 | –1.06 |
| Mar. | 33.45 | 38.22 | –4.77 | 30.45 | 31.72 | –1.27 |
| Apr. | 33.63 | 40.82 | –7.19 | 30.75 | 30.77 | –.02 |
| May | 33.50 | 42.27 | –8.77 | 30.75 | 30.33 | .42 |
| June | 33.30 | 40.04 | –6.74 | 30.65 | 32.51 | –1.86 |
| July | 32.50 | 38.07 | –5.57 | 30.25 | 33.98 | –3.73 |
| Aug. | 32.94 | 41.33 | –8.37 | 30.75 | 35.77 | –5.02 |
| Sep. | 34.60 | 44.92 | –10.32 | 31.95 | 36.92 | –4.97 |
| Oct. | 35.12 | 45.01 | –9.89 | 32.38 | 35.39 | –3.01 |
| Nov. | 35.44 | 39.44 | –4.00 | 33.06 | 34.19 | –1.13 |
| Dec. | 36.28 | 37.22 | –.94 | 33.65 | 36.59 | –2.94 |

Table 4. (continued)

| | Calf | | | Feeder | | |
|---|---|---|---|---|---|---|
| 1971 | Actual calf price | Imputed calf price | Price difference | Actual feeder price | Imputed feeder price | Price difference |
| 1972 | | | | | | |
| Jan. | 36.28 | 37.64 | -1.36 | 34.08 | 39.21 | -5.13 |
| Feb. | 37.94 | 35.44 | 2.50 | 34.69 | 39.27 | -4.58 |
| Mar. | 38.00 | 42.34 | -4.34 | 34.30 | 35.38 | -1.08 |
| Apr. | 38.00 | 47.75 | -9.75 | 34.00 | 33.92 | .08 |
| May | 38.70 | 54.93 | -16.23 | 35.30 | 34.21 | 1.09 |
| June | 40.31 | 60.41 | -20.10 | 36.78 | 32.69 | 4.09 |
| July | 41.13 | | | 37.38 | 37.44 | -.06 |
| Aug. | 40.85 | | | 37.00 | 41.32 | -4.32 |
| Sep. | | | | 38.69 | 46.41 | -7.72 |
| Oct. | | | | 40.63 | 50.11 | -9.48 |
| Nov. | | | | | | |
| Dec. | | | | | | |

Table 6. Opportunity gains or losses per animal at successive marketing weights, beginning with a 990 lb steer.

| | 990-1060 | -1130 | -1190 | -1240 | Optimum gain |
|---|---|---|---|---|---|
| 1971 | | | | | |
| Jan. | 56.88 | -5.64 | 3.05 | 12.66* | 10.07 |
| Feb. | 25.09 | 3.88 | 1.49 | 1.09* | 6.46 |
| Mar. | 32.59 | 2.89 | -4.33 | 11.37* | 4.93 |
| Apr. | 32.01 | -7.65 | 1.90 | 17.79* | 12.04 |
| May | 27.10 | 2.84 | 5.74 | 3.78* | 12.36 |
| June | 30.95 | 10.04* | -7.62 | .11 | 10.04 |
| July | 39.41 | -1.27 | -8.93 | 19.08* | 8.88 |
| Aug. | 27.96 | -1.40 | 10.05 | 13.68* | 22.33 |
| Sep. | 26.52 | 15.07 | 4.29 | 24.52* | 43.88 |
| Oct. | 37.86 | 10.17 | 12.97 | 18.71* | 41.85 |
| Nov. | 38.25 | 14.25 | 7.19* | -6.97 | 21.44 |
| Dec. | 44.74 | 8.19* | -14.62 | -2.45 | 8.19 |
| 1972 | | | | | |
| Jan. | 40.05* | -11.59 | -10.07 | 21.01 | 0.00 |
| Feb. | 21.17 | - 7.94 | 11.76 | 36.10* | 39.92 |
| Mar. | 23.17 | 12.38 | 25.20 | 14.15* | 51.73 |
| Apr. | 36.56 | 25.29 | 5.83* | -23.79 | 31.12 |
| May | 51.68 | 7.41* | -32.42 | -3.83 | 7.41 |
| June | 41.42* | -27.74 | -12.76 | 3.01 | 0.00 |
| July | 7.17* | -10.86 | .12 | -15.25 | 0.00 |
| Aug. | 14.48 | 1.88 | -6.20 | 32.81* | 28.49 |
| Sep. | 23.16 | -4.73 | 24.16 | 53.25* | 72.68 |
| Oct. | 4.50 | 34.44 | 42.03 | 44.26* | 120.73 |
| Nov. | 48.85 | 40.67 | 31.10 | 45.44* | 117.21 |
| Dec. | 63.02 | 31.29 | 32.24 | | |
| 1973 | | | | | |
| Jan. | 63.50 | 32.39 | | | |
| Feb. | 66.89 | | | | |

**Table 7. Opportunity gains or losses per animal at successive marketing weights, beginning with a 910 lb heifer.**

| | 910–970 | –1030 | –1080 | –1120 | Optimum gain |
|---|---|---|---|---|---|
| 1971 | | | | | |
| Jan. | 48.10 | –.20 | 1.84 | 10.05* | 11.69 |
| Feb. | 27.91 | 4.59* | –.59 | –.36 | 4.59 |
| Mar. | 31.27 | 2.34* | –8.76 | 6.61 | 2.34 |
| Apr. | 28.08 | –5.42 | –2.63 | 11.58* | 3.53 |
| May | 23.06 | .37* | –.84 | –.40 | .37 |
| June | 27.95 | 2.08* | –10.43 | 2.37 | 2.08 |
| July | 32.66 | –7.02 | –7.07 | 21.63* | 7.54 |
| Aug. | 23.45 | –3.90 | 11.96 | 14.70* | 22.26 |
| Sep. | 24.46 | 13.75 | 7.11 | 21.47* | 42.33 |
| Oct. | 40.71 | 9.77 | 9.86 | 17.57* | 37.20 |
| Nov. | 38.10 | 12.52 | 5.92* | –2.28 | 18.44 |
| Dec. | 43.91 | 8.90* | –12.82 | –.56 | 8.90 |
| 1972 | | | | | |
| Jan. | 44.73 | –8.87 | –10.95 | 26.23* | 6.41 |
| Feb. | 26.65 | –7.21 | 14.25 | 29.10* | 36.14 |
| Mar. | 22.72 | 16.72 | 16.66 | 10 87* | 44 25 |
| Apr. | 43.68 | 19.21* | –.73 | –19.13 | 19.21 |
| May | 48.82 | 2.85* | –28.90 | –2.47 | 2.85 |
| June | 34.74* | –24.02 | –12.79 | 10.03 | 0.00 |
| July | 4.07 | –8.57 | –.85 | 41.24* | 31.42 |
| Aug. | 17.06 | 2.29 | –13.60 | 43.42* | 32.11 |
| Sep. | 19.17 | –9.85 | 30.49 | 39.07* | 59.71 |
| Oct. | 8.93 | 32.09 | 25.91 | 50.17* | 108.17 |
| Nov. | 49.75 | 28.10 | 35.82 | 44.35* | 108.27 |
| Dec. | 49.92 | 37.87 | 29.84 | | |
| 1973 | | | | | |
| Jan. | 60.49 | 32.52 | | | |
| Feb. | 66.45 | | | | |