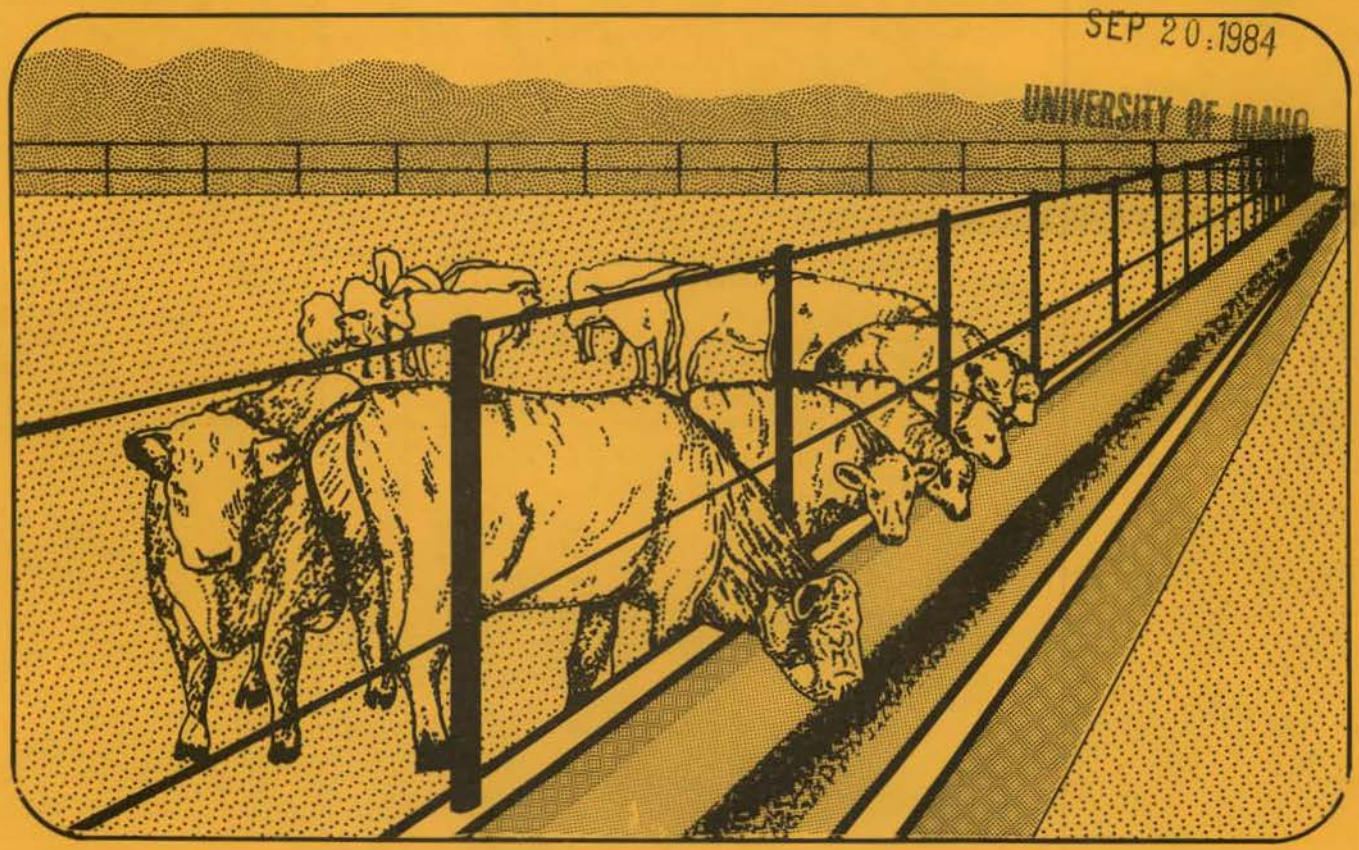
Bulletin No. 623

Costs of Producing Fed Cattle in Idaho



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Published and distributed by the Idaho Agricultural Experiment Station R. J. Miller, Director

University of Idaho College of Agriculture Moscow 83843

IM 12-83

$1.00 per copy

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Foreword

This report records the first phase of a larger study entitled "Comparative Advantage in the Production and Marketing of Idaho and Pacific Northwest Beef." The project's overall objectives are:

1. To determine the costs and returns for cattle feeding in Idaho.
2. To compare the competitive position of the Pacific Northwest fed cattle industry with other major production areas of the United States.
3. To assess the economic potential for developing expanded export markets for Pacific Northwest beef products, especially in Asian Pacific Rim countries.

Reports on the second and third objectives will be published as the research is completed.

Acknowledgment

Numerous individuals within and outside the state of Idaho contributed to this study. The authors especially appreciate the cooperation of the feedlot operators who provided data from which the budgets were constructed. Staff members of the Idaho Crop and Livestock Reporting Service, the Idaho Livestock Production Credit Association and the University of Idaho Cooperative Extension Service volunteered information and made valuable suggestions. The authors acknowledge the assistance of these and others whom they contacted while making the study.

Summary

This research examined the economics of producing fed cattle in Idaho. The specific objectives were:

1. To determine costs and returns for cattle feeding operations in Idaho for 1980 by representative size groups, feed ingredients fed and weight class of feeder cattle purchased.
2. To examine the optimum combination of feeds and feeding program within a given size feedlot when various input costs and the price of slaughter cattle are varied.

A personal interview survey of 25 Idaho cattle feeders during the summer and fall of 1981 gathered the information on costs and returns for Idaho feedlots in 1980. Three feedlot sizes — 1,000, 4,000 and 10,000 head capacity — were chosen as representative sizes for which costs and returns were estimated. Within each size feedlot, feeding programs and combinations of feed ingredients used to produce fed cattle were specified. Average daily gains, death loss rates and feed intake were estimated for each combination of feedlot size, feeding program and combination of feed ingredients.

Estimation of costs and returns and budget construction were completed following, as closely as possible, procedures used by the Economic Research Service of the USDA for estimating costs and returns for producing fed cattle in other areas. Survey data and several other sources were used to estimate investment levels and replacement costs for each size feedlot. Variable costs were estimated primarily from survey data except for some feed prices and feeder cattle prices which were from published USDA price series applicable to Idaho.

Twelve budgets were developed for producing fed cattle in Idaho; four for the 1,000-head capacity feedlot, six for the 4,000-head capacity feedlot and two for the 10,000-head capacity feedlot. Each budget in-

cludes an investment summary and sections listing receipts, variable costs and fixed costs. Actual quantities and per unit prices are shown wherever possible.

Budget results indicate that producing fed cattle in the 1,000-head capacity feedlot during 1980 was unprofitable. None of the budgets in this size group showed a positive return above even variable costs. In the 4,000-head capacity feedlot, only one budget showed a positive return above total costs. This budget was for the feeding of yearlings to slaughter with rations using potato waste. The highest returns above variable and total costs were in the budgets for the 10,000-head capacity feedlot. Overall budget results indicated that the least profitable methods of producing fed cattle in 1980 were for operations feeding calves to slaughter weights. The most profitable methods were the feeding of yearlings to slaughter on rations using beet pulp, potato waste or both.

Linear programming analysis was used for shortrun* evaluation of optimum production methods within each feedlot size. A linear programming model was developed to represent each size using budget information as input. Within each model, cattle prices, alfalfa hay price, barley price and the interest rates on operating capital were varied one at a time. As each of these factors was varied within a feasible range, the effect on the optimum combination of feeding program and combination of feeds was examined.

Results of the linear programming models indicated that in each size feedlot, feeding yearlings to slaughter on rations using byproduct feeds was the most profitable method of producing fed cattle. Feeding calves to slaughter was never the most profitable method of producing fed cattle.

*Shortrun is defined in this study as 1 year or less.

Conclusions

The conclusions drawn from this study relate to the profitability of feeding cattle to slaughter weights in Idaho during 1980 and under varying levels of input costs and the price of slaughter cattle. Also, the use of linear programming as an analytical tool for making shortrun planning decisions in a feedlot is discussed.

Cattle feeding in Idaho is a diverse industry. The budgets for cost and returns in 1980 are indicative of general cattle feeding conditions in each feedlot size. Budgeted results only represent individual enterprises for which the standardized assumptions would apply. Actual feedlot results would be expected to vary, positively or negatively, from those presented in the budgets.

Results of both the budgeting process and the linear programming analysis indicate that the availability of food processing wastes for feeding cattle in Idaho favorably affects the profitability of producing fed cattle. This situation could be a source of any comparative advantage Idaho might have over other cattle feeding areas in the production of fed beef.

Using linear programming to analyze optimum production methods within a single enterprise is a variation of the usual application of this analytical technique in agricultural production research. This application allows many more combinations of input costs and output prices to be considered. In cattle feeding, the variability of feed and cattle prices necessitates evaluating effects of changing price levels on resource allocation decisions. Linear programming, as demonstrated in this study, is a tool feedlot operators can use to determine maximum profit potential.

Introduction — Purpose and Objectives

Beef cattle are a crucial part of Idaho's agricultural economy. In 1978, cattle and calves accounted for 28 percent of the cash receipts from farm marketings ($407 million) in the state. Cattle and calves were the most important source of income in 20 of Idaho's 44 counties (Idaho Agricultural Statistics 1980). An integral part of Idaho's beef cattle industry is the cattle feeding sector. In 1978, 62 percent of all cattle marketed in the state were fed cattle (Cattle on Feed 1979).

Cattle feeding has been growing steadily in Idaho. The number of fed cattle marketings in Idaho increased from about 400,000 head annually during 1971-76 to 568,000 in 1980. Idaho ranked fourth among the western states in cattle feeding in 1980, after Texas, Colorado and California (Cattle on Feed 1981). The growth of cattle feeding in Idaho is demonstrated by the volume of fed cattle marketings in the last one-half of the 1970 decade as compared with the first 5 years of the 1970s. Cattle feeding in Idaho has increased 22 percent since 1976 as compared with the previous 5 years. Idaho had the largest increase among the nine western cattle feeding states (Table 1).

Table 1. Fed cattle marketings in 1976-80 as a percentage of 1971-75 by selected states and regions.

Area	Percent
Arizona	76
California	78
Colorado	107
Texas	112
Idaho	122
Oregon	111
Washington	114
PNW (Idaho, Oregon, Washington)	117
West (7 states listed above, plus Montana and New Mexico)	100
U.S. (includes 23 cattle feeding states)	102

Source: Cattle on Feed, January issues, 1971-80.

Cattle feeding is a dynamic industry. Since World War II, the industry has experienced significant developments characterized by differential growth rates among areas. Also, within the industry, a shift in size of operation has been seen from primarily farmer-feeders feeding less than 500 head to large scale feedlots with capacities of more than 100,000 head. Only 1 to 2 percent of the feedlots in the 23 major cattle feeding states have capacities of 1,000 head or more, yet these businesses marketed 58 percent of the total U.S. 1977 fed beef production (Gee, VanArsdall and Gustafson 1979).

Idaho's cattle feeding industry has experienced a similar trend. In 1961-62, 75 percent of the cattle on feed were in feedlots marketing more than 500 head annually (Marousek and Summers 1964). During the period 1962-67, the number of feedlots marketing 1,000 head and more annually increased 38 percent, and the number of cattle fed in these lots increased 108 percent (Araji 1971). In the first quarter of 1981, about 72 percent of the cattle on feed were in lots of 8,000 and more in head capacity (Idaho Crop and Livestock Reporting Service 1981).

Along with the shift in size of cattle feeding operations in Idaho, a reduction in the number of feedlots has also occurred. The largest reduction has been in feedlots of less than 1,000-head capacity which decreased by nearly one-half during the period 1970-79. At the same time, the number of feedlots with 8,000-head capacity or greater has more than doubled. These data indicate a structural change has occurred in the cattle feeding industry in Idaho (Table 2).

The growth and structural change in the cattle feeding industry was the result of many factors. One factor was the rapidly increasing consumer demand for fed beef after World War II. Differential rates of

Table 2. Number of cattle feedlots in Idaho by size and capacity, 1970 and 1979.

Year	Less than 1,000 head capacity	1,000 Head and more capacity				
		1,000-1,999	2,000-3,999	4,000-7,999	8,000+	Total
1970	546	36	23	19	7	631
1979	281	16	23	15	15	350

Source: Idaho Agricultural Statistics, 1972 and 1980.

growth among regions in population and per capita income altered the regional distribution of meat consumption and changed the level and character of demand (Williams and Dietrich 1966). Also, greater feed supplies brought about by irrigation development have enhanced the growth of cattle feeding in Idaho. The growth of food processing plants in Idaho has increased cattle feed supplies by providing waste byproducts that can be used to feed cattle. Also, technological and organizational innovations have encouraged a shift in size of operations. The development of specialized equipment and machinery for feed processing and distribution have made the feeding of larger numbers of cattle at one location more economical.

Current information on costs of production are essential for making sound management and policy decisions affecting cattle feeding operations. The effect on costs of using byproduct feeds, such as potato waste and beet pulp, needs to be analyzed. This study provides information on the costs of producing fed cattle in Idaho. The specific objectives are:

1. To determine costs and returns for cattle feeding operations in Idaho for 1980 by representative size groups, feed ingredients fed and weight classes of feeder cattle purchased.
2. To examine the optimum combination of feeds and weight class of feeder cattle purchased within a given size feedlot when various input costs and the price of slaughter cattle are varied.

Data Sources and Budgets

Survey of Idaho Feedlot Operations

A survey of Idaho feedlot operators provided the primary source of data from estimating the costs of producing fed cattle in Idaho. The number of usable questionnaires completed in the 0-999, 1,000-7,999 and 8,000 head and more capacity feedlots was 11, 11 and 3, respectively.

To estimate production costs for different size feedlot operations, three sizes were specified for which budgets were constructed. Feedlot size was defined in terms of per head capacity or space to feed animals. The selected feedlot sizes represent the maximum number of animals (average weight of 850 pounds) that could be on feed at any one time. The feedlot sizes specified were 1,000-head capacity, 4,000-head capacity and 10,000-head capacity. These particular sizes were suggested by the results of the sample survey. The 1,000- and 4,000-head capacity feedlots are generally found as one enterprise in a diversified farming operation which is family-owned and operated. The 10,000-head capacity feedlot is usually a single enterprise business which is organized primarily to produce fed cattle.

Operating Conditions and Specifications of Cattle and Feed

Feeding Programs

In this publication, the term "cattle feeding program" specifies the sex, starting weight, finishing weight and grade of the finished animal. Based on information gathered in the survey, four feeding programs were developed (Table 3).

For budgeting purposes, steers and heifers were combined so that two primary feeding programs resulted — calves to slaughter and yearlings to slaughter. Both primary feeding programs were used in budgeting costs and returns for the 1,000- and 4,000-head capacity feedlots. Only the yearlings to slaughter program was judged to be applicable to the 10,000-head capacity feedlot. Estimates of the percentage of steers to heifers placed on feed in each size feedlot were obtained through the Idaho Crop and Livestock Reporting Service (1982). Using this information, the assumption was made that the 1,000- and 4,000-head capacity feedlots placed 65 percent steers and 35 percent heifers on feed in 1980. The 10,000-head capacity feedlot was assumed to place 90 percent steers and 10 percent heifers on feed.

Capacity Utilization and Turnover Rates

Capacity utilization and turnover rates were determined separately for each size group from the survey data. For the 1,000-head capacity feedlot, the assumption was made that only one group of cattle

Table 3. Cattle feeding programs for Idaho cost of production study, 1980.

Feeding program	Starting weight	Finishing weight	Grade*
	(lb)	(lb)	
1. Steer calves to slaughter	550	1,100	choice
2. Heifer calves to slaughter	450	950	choice
3. Yearling steers to slaughter	700	1,100	choice
4. Yearling heifers to slaughter	650	950	choice

*The study assumed that at least 60 percent of the cattle marketed from each feeding program graded USDA choice.

was fed regardless of feeding program. The percentage capacity used in this size feedlot represents the utilization only for the period of time cattle were on feed. In the 4,000- and 10,000-head capacity feedlots, the study assumed that cattle were fed continuously throughout the year. The percentage capacity utilized in these size feedlots is defined by the following formula:

$$\text{percent capacity used} = \frac{\text{Number of cattle fed} \times \text{number of days on feed} \times 100}{\text{Feedlot capacity} \times 365 \text{ days}}$$

The turnover rates for the 4,000- and 10,000-head capacity feedlots are determined using the following formula:

$$\text{Turnover rate} = \frac{\text{Number of cattle fed}}{\text{percent capacity used} \times \text{feedlot capacity}}$$

Table 4 shows the percentage of capacity used and turnover rate for each combination of feedlot size and feeding program.

Cattle Performance

Based on survey data, average daily gains and death loss rate were estimated. The estimates were made for each combination of feeding program and feedlot size (Table 5).

Feed Inputs

Major feed ingredients and rations fed, as reported by cattle feeders, provided the basis for specifying rations and estimating feed intake for use in budget construction. Combinations of major feeding ingredients comprising rations were specified for each size feedlot (Table 6).

The consumption of feed for each combination of feedlot size, feeding program and combination of feed ingredients was estimated using the following assumptions:

1. Average daily gains and death loss rates for each feeding program did not vary by the combination of feed ingredients fed.
2. Heifers required 10 percent more feed per pound gain than steers.
3. Individual feed ingredients were the same, physically and nutritionally, regardless of feedlot size.
4. Feed ingredients possessed the same dry matter content and net energy values as those referenced from published sources.
5. Alfalfa hay was chopped before being fed to cattle.
6. Barley was processed through a grain roller mill.
7. Beet pulp was dried and molasses added.
8. The supplement portion of the ration was 60 percent sugarbeet molasses, as-fed, or provided net energy for maintenance and gain equivalent to that amount molasses.
9. A salt and minerals mixture was consumed by cattle at a rate of .5 percent of the total dry matter amount of feed fed per day.

Feed intake in the 1,000- and 4,000-head capacity feedlots was estimated directly from the survey data. Feed fed per day and per hundred-weight gain, as re-

Table 4. Capacity used and turnover rate by feedlot size and feeding program for Idaho production cost study, 1980.

Feedlot size and feeding program	% Capacity utilized*	Turnover rate
1,000-head capacity		
calves to slaughter	60	1
yearlings to slaughter	60	1
4,000-head capacity		
calves to slaughter	65	1.64
yearlings to slaughter	65	2.60
10,000-head capacity		
yearlings to slaughter	65	2.73

*Percent capacity used in the 1,000-head capacity feedlot represents utilization only during time needed to feed one group of cattle.

Table 5. Average daily gain and death loss rate of cattle by feedlot size and feeding program for Idaho production cost study, 1980.

Feedlot size and feeding program	Average daily gain	Death loss*
	(lb)	(%)
1,000-head capacity		
1. steer calves to slaughter	2.30	1.20
2. heifer calves to slaughter	2.10	1.20
3. yearling steers to slaughter	2.60	.65
4. yearling heifers to slaughter	2.30	.65
4,000-head capacity		
1. steer calves to slaughter	2.50	1.14
2. heifer calves to slaughter	2.20	1.14
3. yearling steers to slaughter	2.65	.91
4. yearling heifers to slaughter	2.50	.91
10,000-head capacity		
3. yearling steers to slaughter	2.95	.55
4. yearling heifers to slaughter	2.65	.55

*The study assumed that the death loss rate was the same for both steers and heifers for a specified feeding program and feedlot size.

Table 6. Combinations of major feed ingredients and feedlot size, Idaho production cost study, 1980.

Feed combination No.	Major feed ingredients*	Feedlot size in head capacity
1	alfalfa hay, corn silage, barley	1,000 and 4,000
2	alfalfa hay, corn silage, barley, beet pulp	1,000, 4,000 and 10,000
3	alfalfa hay, corn silage, barley, potato waste	4,000
4	alfalfa hay, corn silage, barley, beet pulp, potato waste	10,000

*Although other feed ingredients were reported fed, these feed combinations were judged to be the most commonly used by the cattle feeders surveyed. See Appendix A for feed intake and ration composition.

ported by cattle feeders, was the basis for this estimating process. The survey data were not sufficient to estimate feed intake directly for feeding cattle in the 10,000-head capacity feedlot. The decision was made to estimate feed intake for this size feedlot in the following manner.

For each of the two combinations of feed ingredients fed in the 10,000-head capacity feedlot, the ration composition was estimated on the percentage weight (dry matter basis) of each ingredient. Feed intake was based on the assumption that each animal would consume 2.5 percent of its body weight per day of a ration on a dry matter basis. Under this assumption, the average weight of the animal in each feeding program was used to estimate the average total pounds of feed consumed per day. Using the estimated ration composition and pounds of feed consumed per day, the amount of each major feed ingredient consumed per day was determined. Feed intake per day was multiplied by the number of days on feed to arrive at total feed intake.

As a check of the estimated feed intake figures, the average net energy supplied per day was calculated and compared to the net energy required per day to produce the specified average daily gain. To calculate the net energy supplied per day, net energy values for individual feed ingredients were obtained from the *Atlas of Nutritional Data on United States and Canadian Feeds* (National Academy of Sciences 1971) and *Nutritional Requirements of Beef Cattle* (National Research Council 1976). Table 7 shows the list of feed ingredients supplying energy in the rations and their NRC reference numbers, percent dry matter and net energy values for maintenance and gain.

To determine the net energy supplied for maintenance and gain, the average amount of each feed ingredient fed per day was multiplied by its dry matter percentage and converted to kilograms of dry matter. One exception to this procedure was the supplement portion of each ration. Since the study assumed that 60 percent, as-fed, of the supplement portion was sugarbeet molasses or provided net energy equivalent to that amount, only 60 percent of the supplement portion was used to calculate net energy supplied. This was accomplished by using the table values for sugarbeet molasses. Once the kilograms of dry matter fed per day were calculated, the average weight of the animal, sex and specified gain were used to arrive at the appropriate amount of net energy required for maintenance and net energy available for gain (National Research Council 1976). The kilograms of dry matter fed per day and net energy values were used to determine how much feed was needed for maintenance and if enough feed were left to produce the specified gain. If the total feed intake were inadequate, it was adjusted upward until the net energy available for gain was sufficient. Using this procedure, all estimated feed intake figures were checked and adjusted upward as needed.

The total feed intake per animal for each combination of feedlot size, feeding program and combination of feed ingredients was estimated and compiled (Appendix A). To determine total feed intake for an individual budget, account was taken of feed consumed by animals that die during the feed period. The study assumed that animals that died during feeding consumed half the amount of feed required to feed an animal to slaughter weight. The estimates of feed intake and cattle performance combined with the specifications of operating conditions in 1980 provided the information needed to estimate the production of fed cattle and inputs of feeder cattle and feed for individual budgets.

Cost Estimation

Costs and returns for producing fed cattle in Idaho were estimated following the general procedures used by the Economic Research Service (ERS) of the U.S. Department of Agriculture. The ERS estimates production costs and returns with the Firm Enterprise Data System (FEDS). The FEDS is a system of computerized budgets and cost estimating procedures operated by ERS staff at Oklahoma State University, Stillwater. Cost estimates for this study were made following the general procedures used in the FEDS, unless otherwise

Table 7. Composition of feed ingredients for use in evaluating rations for Idaho production cost study, 1980.

Feed ingredient	NRC reference number	Dry matter (D.M.)	Net energy for maintenance	Net energy for gain
		(%)	(Mcal/Kg.D.M.)	(Mcal/Kg.D.M.)
Alfalfa hay	1-00-063	89	1.17	.48
Corn silage	3-02-820	28	1.56	.99
Barley	4-07-939	88	1.93	1.29
Beet pulp	4-80-672	92	2.68	2.03
Potato waste*	2-03-777	13	2.12	1.39
Sugarbeet molasses	4-00-668	77	2.15	1.42

*Net energy values for maintenance and gain were calculated from the referenced value for digestible energy.
Sources: National Academy of Sciences. Atlas of Nutritional Data on U.S. and Canadian Feeds. Washington, D.C., 1971.
National Research Council. Nutrient Requirements of Beef Cattle. 5th edition, 1976.

stated. One major exception involved the estimation of hours use of machinery and equipment as a basis to estimate costs. The available data in this study were not adequate to estimate these costs by the FEDS method. The general procedure and source of data for cost categories are explained in the following discussion.

Investment and Fixed Cost Categories

Investment and ownership costs are considered in two general categories:

1. Buildings and facilities.
2. Machinery and equipment.

A list of items in the two categories was formed after analyzing the survey data (Appendix B). The common elements for feedlot operators surveyed within each size group formed the basis for specifying investment items.

Two investment levels were calculated for buildings and facilities and for machinery and equipment. One was the estimated replacement cost in 1980. The other was the estimated cost at the time of original acquisition or construction. Replacement cost estimates for machinery and equipment were obtained through personal correspondence or telephone conversations with farm and construction equipment dealers in the state. Estimates for buildings and facilities were based on conversations with construction companies, a personal interview with an Extension agricultural engineer[1] and from the *1980 Boeckh Building Cost Guide* for agricultural facilities (E.H. Boeckh Co. 1980). Original acquisition or construction costs were estimated from the survey data. Appendix B shows the estimated replacement and acquisition costs.

Note that no changes in investment in buildings and facilities or in machinery and equipment were assumed when different feeds were fed. Specifically, the feeding of potato waste was assumed to require no additional investment in storage facilities or handling equipment. The survey data did not indicate that investment levels would vary according to the feed ingredients fed.

Ownership costs related to these investments include replacement reserve charges (in lieu of depreciation), interest, taxes and insurance. Replacement reserve charges are based on the replacement investments for 1980. They represent the funds that would have to be set aside annually to replace all assets at the end of their useful lives at current costs. Replacement reserve charges were estimated by the following formula:

$$\text{Annual Replacement reserve charge} = \frac{\text{Replacement cost - salvage value}}{\text{Years owned}}$$

[1]Roy Taylor, Extension agricultural engineer, University of Idaho, Moscow.

Salvage value was estimated by multiplying a salvage proportion times the cost of the investment item. A 10 percent salvage proportion was assumed. Buildings and facilities were assumed to have a useful life of 15 years. Machinery and equipment were assumed to have a useful life of 4 years. These assumptions apply to all ownership costs where these factors are used.

The cost of insurance was based on current replacement cost using the same insurance rates as that used by the ERS in its studies. Insurance agents interviewed in Idaho recommended that this rate be used since insurance rates on farm businesses are comparable throughout the U.S. Also, the rate estimated by the ERS was from a larger base and would tend to average out differences in rates because of location and level of management in feedlots. Insurance cost was calculated by the formula:

$$\text{Insurance per year} = \frac{\text{Replacement cost + salvage value}}{2} \times \text{insurance rate}$$

Interest and taxes were based on original investments as reported by feedlot operators. The interest charge was computed using 1980 rates obtained from the Idaho Livestock Production Credit Association (1982). The interest formula is:

$$\text{Interest per year} = \frac{\text{Purchase price + salvage value}}{2} \times \text{interest rate}$$

The tax cost was estimated by multiplying the average investment times the 1980 Idaho tax rate applicable to feedlot operations. Thus,

$$\text{Annual tax charge} = \frac{\text{Purchase price + salvage price}}{2} \times \text{tax rate}$$

The procedures presented here were used to estimate ownership costs for buildings and facilities and for machinery and equipment. The procedure used to estimate purchase price (or acquisition cost) differs from the ERS's procedure in that the ERS estimates purchase price by lagging replacement cost by years owned instead of using actual reported figures. The rates used for estimating the ownership costs were:

Insurance rate	=	.6%
Interest rate (buildings and facilities)	=	12.0%
Interest rate (machinery and equipment)	=	15.5%
Tax rate	=	.5%

Land — The land requirement for fed cattle production was limited to the area occupied by buildings and facilities. Land investment was based on the 1980 market value as estimated by the feedlot operators surveyed. Taxes on land were estimated using the 1980 market value so that:

$$\text{Land taxes} = \text{1980 market value} \times \text{tax rate (tax rate = .5 percent)}$$

Also, a charge for the investment in land was calculated so that:

Land charge =
1980 market value × interest rate
(interest rate = 12 percent)

Overhead Charge — The 1,000- and 4,000-head capacity feedlots that were described as being part of a multiple enterprise business must account for part of the expenses not associated with any particular enterprise. These expenses include legal fees, subscriptions and memberships, telephone and utilities. The amount estimated to cover the portion of these costs chargeable to the feedlot enterprise was taken from the survey information. For the 10,000-head capacity feedlot, which was assumed to be a single enterprise business, the items considered in the overhead costs for the farm feedlots were included in variable cost categories.

Management Charge — The 1,000- and 4,000-head capacity feedlots were assessed a management charge in addition to operating labor. The management charge represents a return to the operator for managing the feedlot. The 1,000-head capacity feedlot incurs a management charge of 7 percent of total costs excluding land costs and purchases of feeder cattle. The 4,000-head capacity feedlot incurs a management charge of 1.5 percent of total costs excluding land costs and purchases of feeder cattle. In the 10,000-head capacity feedlot, the study assumed that the manager was hired and received a salary paid in cash like other labor inputs.

Variable Cost Categories

Cattle Prices — To determine appropriate prices for feeder cattle purchases and fed cattle marketings by feedlot operators, the timing of purchases and marketings was specified. For the 4,000- and 10,000-head capacity feedlots, purchases and marketings were assumed to occur on a continuous basis. Feeder cattle prices are an average of the 12 month period from Aug. 1, 1979, through July 31, 1980. Fed cattle prices are an annual average for the 1980 calendar year. This procedure was used to account for the time lag between purchases of feeder cattle and when those same cattle are marketed. Cattle prices for purchases and marketings in the 1,000-head capacity feedlot are averages of the months when feeder cattle were purchased and fed cattle marketed. Actual price quotations are from Idaho, Utah and eastern Nevada feedlot and range sales in 1979-80 (USDA 1982). Table 8 shows feeder and slaughter cattle prices.

Feed prices — Prices for feed ingredients are averages of prices reported by feedlot operators except for hay, barley and salt. For these three ingredients, published prices for Idaho were used (USDA 1979-80.) In the 1,000-head capacity feedlot, 1979 fall harvest prices were used for barley and hay. In the 4,000- and 10,000-head capacity feedlots, hay and barley prices are averages of reported monthly prices from August 1979 through July 1980. The reported average price for stock salt from August 1979 through July 1980 was used in all size groups. Other than the differences in published prices used for hay and barley, the study assumed that the price of individual feed ingredients did not vary by feedlot size. Table 9 lists feed ingredient prices by sources.

Labor — Labor costs were estimated from survey data. All labor, whether hired or supplied by the operator and family, was charged at rates for hired labor as reported. The labor charge for the 10,000-head capacity feedlot includes the cost of hired management.

Interest on Operating Capital — The interest on operating capital was calculated at 12.5 percent, the 1980 Production Credit Association rate applicable

Table 8. Prices for feeder and slaughter cattle for Idaho cost of production study, 1980.

Feedlot size	Feeder cattle[1]				Slaughter cattle[1]			
	1	2	3	4	1	2	3	4
	(dollars per hundredweight)							
1,000 head[2]	86.12	91.25	74.83	67.62	67.84	65.39	67.69	65.27
4,000 head[3]	86.12	91.25	71.16	64.44	67.58	65.12	67.58	65.12
10,000 head[3]	NA	NA	71.16	64.44	NA	NA	67.58	65.12

[1]The numerals refer to starting weight, finishing weight and sex by feeding program as presented in Table 3.

[2]Prices for calves are averages of reported monthly prices October through December 1979. Prices for yearlings are averages of reported monthly prices October through December 1979 and February through April 1980. Slaughter prices for feeding programs 1 and 2 (calves to slaughter) are averages of reported monthly prices from May through July 1980. Slaughter prices for feeding programs 3 and 4 (yearlings to slaughter) are averages of reported monthly prices April through August 1980.

[3]Prices for feeder cattle are averages of monthly prices from August 1979 through July 1980. Slaughter prices are averages of reported monthly prices from January through December 1980.

Source: Idaho-Utah-Eastern Nevada Feedlot and Range Sales, Composite of 1979-80 Price Quotations. Obtained through personal correspondence with Livestock, Meat, Grain and Seed Division, Agricultural Marketing Service, USDA, Washington, D.C., April 1982.

to feedlots in Idaho. The study made the assumption that interest is charged on 20 percent of the total operating capital when feeding yearlings to slaughter and 36 percent of the total operating capital when feeding calves to slaughter. The average time that inputs were employed in fed cattle production was used to determine the interest charge.

Manure Credit — The 1,000- and 4,000-head capacity feedlots were assumed to use the manure produced in the feedlot on associated cropland. For the 10,000-head capacity feedlot, information was limited on the disposition and value of manure production. The study assumed that values accrued to all feedlots and that they are treated as a credit in estimating costs of production. The production of manure was estimated on the assumption that 2 tons of manure per animal per year are produced (Sweeten 1979). One ton of manure at 40 to 45 percent moisture is assumed to contain 10 pounds of potassium readily available to plants as fertilizer (Graber 1974). Based on this assumption and applying 1980 Idaho costs of these fertilizer ingredients, the manure produced by feedlots was valued at $5.30 per ton. Although a manure value was credited for all feedlots, the cost of manure removal was also accounted for in each feedlot size.

Other Operating Costs — Other operating costs in fed cattle production include veterinary service and supplies, utilities, fuel and lubrication, marketing expenses, repairs and machine hire for manure removal. The estimation of these costs was primarily from survey data. The veterinary service and supplies includes the cost of implants to promote growth in the cattle fed. The estimation of fuel costs was from the survey data; lubrication was assumed to be 15 percent of the fuel cost. The machine hire for manure removal applies only to the 10,000-head capacity feedlot. The cost of manure removal was accounted for through other expense categories in the 1,000- and 4,000-head capacity feedlots. Also, the 10,000-head capacity feedlot was the only size feedlot that had utilities and miscellaneous expense categories. These categories accounted for costs that were charged under general farm overhead to the 1,000- and 4,000-head capacity feedlots.

The estimates of variable costs are listed separately in each budget developed for feedlot operations in Idaho (Appendix C). The format for constructing the budgets and discussion of the budget results are included in the following sections.

Table 9. Feed prices by source, Idaho cost of production study, 1980.

Feed ingredients	Survey data for all feedlot sizes	Published source 1,000-head feedlot	Published source 4,000- and 10,000-head feedlots
	(dollars per ton)		
Alfalfa hay[1]		51.00	64.21
Corn silage	21.00		
Barley[2]		95.60	102.40
Beet pulp	111.00		
Potato waste	7.00		
Supplement	167.79		
Salt and minerals[3]		70.80	70.80

[1]The average of reported monthly prices per ton of alfalfa hay in Idaho from July through September 1979 was used in the 1,000-head capacity feedlot. The average of reported monthly prices per ton of alfalfa hay in Idaho from August 1979 through July 1980 was used in the 4,000- and 10,000-head capacity feedlots.

[2]The average of reported monthly prices per bushel of barley in Idaho from August through October 1979 was used in the 1,000-head capacity feedlot. The average of reported monthly prices per bushel of barley in Idaho from August 1979 through July 1980 was used for the 4,000- and 10,000-head capacity feedlots. Barley was assumed to weigh 50 pounds per bushel.

[3]The average of reported monthly prices per ton of stock salt from August 1979 through July 1980 was used for all feedlot sizes.

Sources: Agricultural Prices. Crop Reporting Board, SRS, USDA, Washington, D.C., 1979 and 1980.
Survey of Idaho Cattle Feeders, Department of Agricultural Economics, University of Idaho, Moscow, 1981.

Budget Construction

Using the procedures and information presented previously, budgets were constructed following the general format used by the Economic Research Service of the USDA. The budget format includes an investment summary followed by a listing of fed cattle production and receipts, variable costs, ownership costs, other costs and returns. Physical quantities and prices per unit are included where applicable. Costs and returns are expressed in terms of total dollars and dollars per hundred pounds of liveweight slaughter beef. The various combinations of feedlot size, feeding program and combination of feed ingredients resulted in four budgets for the 1,000-head capacity feedlot, six budgets for the 4,000-head capacity feedlot and two budgets for the 10,000-head capacity feedlot. The individual budgets — titled by feedlot size, feeding program and combination of feed ingredients — are presented in Appendix C.

Budget Results

Table 10 summarizes the budgeting process results. Total cost and return figures are shown for each budget developed. Also, each cost and return is shown as dollars per hundredweight of live, fed beef produced.

Examination of Table 10 yields some interesting insights about the economics of feeding cattle in Idaho during 1980. The budgeted costs and returns indicate feeding cattle in the 1,000-head capacity feedlot in 1980 was unprofitable. Only one budget (C-4) yielded a positive return above variable costs. In the 4,000-head capacity feedlot, the income from feeding calves to slaughter did not cover variable costs. Yearlings-to-slaughter feeding programs all

Table 10. Summary of costs and returns from budgets for Idaho feedlots, Idaho production cost study, 1980.

Budget[1]	Receipts[2]		Variable costs		Income above variable costs		Fixed costs		Total costs		Receipts less total costs	
	Total $	$/cwt	Total $	$/cwt	Total $	$/cwt	Total $	$/cwt	Total $	$/cwt	Total $	$/cwt
C-1	415,890.80	67.06	454,486.01	73.21	(38,595.21)[3]	(6.22)	74,374.02	11.99	528,860.03	85.19	(112,969.23)	(18.21)
C-2	415,890.80	67.06	443,526.41	71.44	(27,635.61)	(4.45)	73,606.85	11.87	517,133.26	83.38	(101,242.46)	(16.32)
C-3	417,748.87	66.92	418,218.06	66.99	(469.19)	(.07)	70,056.68	11.22	488,274.74	78.22	(70,525.87)	(11.30)
C-4	417,748.87	66.92	411,478.81	65.91	6,270.06	1.00	69,793.68	11.18	481,063.74	77.06	(63,314.87)	(10.14)
C-5	2,950,717.20	66.80	3,290,676.91	74.50	(339,959.71)	(7.70)	153,324.74	3.47	3,444,001.65	77.96	(493,284.45)	(11.17)
C-6	2,950,717.20	66.80	3,140,375.22	71.09	(189,658.02)	(4.29)	151,070.21	3.42	3,291,445.43	74.51	(340,728.23)	(7.71)
C-7	2,950,717.20	66.80	3,168,125.49	71.72	(217,408.29)	(4.92)	151,486.47	3.43	3,319,611.96	75.15	(368,894.76)	(8.35)
C-8	4,694,446.90	66.80	4,607,016.01	65.56	87,430.89	1.24	158,119.24	2.25	4,765,135.25	67.81	(70,688.35)	(1.01)
C-9	4,694,446.90	66.80	4,605,680.35	65.54	88,766.55	1.26	158,099.20	2.25	4,763,779.55	67.79	(69,332.65)	(.99)
C-10	4,694,446.90	66.80	4,514,085.55	64.23	180,361.35	2.57	156,725.28	2.23	4,670,810.83	66.46	23,636.07	.34
C-11	12,898,260.60	67.36	12,293,397.58	54.21	604,683.02	3.16	196,188.04	1.02	12,489,585.62	65.23	408,647.98	2.13
C-12	12,898,260.60	67.36	12,010,529.73	62.73	887,730.87	4.64	196,188.04	1.02	12,206,717.77	63.75	691,542.83	3.61

[1]C-1 ..12 refers to table number of the budget in Appendix C.
[2]$/cwt represents cost or return per hundredweight of live, fed beef produced.
[3]( ) indicates a negative figure or loss.

had a positive return above variable costs, but only budget C-10 had a positive net revenue above total costs. This budget was for the feeding of yearlings using potato waste in the feed rations. The 10,000-head capacity feedlot had a positive net revenue above total costs for both budgets (C-11, C-12). Both of these budgets are for yearlings with rations using byproduct feeds.

From Table 10, some comparisons of costs and returns between sizes can be made. Variable costs per unit of production are similar between the 1,000- and 4,000-head capacity feedlots. The primary difference in per unit costs is in the fixed costs figures. Fixed costs per unit of production were substantially lower in the 4,000-head capacity feedlot than in the 1,000-head capacity feedlot. This difference can be attributed to the existence of economies of size in the larger feedlot caused by a higher rate of utilization and larger volume of production. The 10,000-head capacity feedlot has lower variable and fixed costs per unit of production than either the 1,000- or 4,000-head capacity feedlots. Economies of size appear to exist especially when fixed costs per unit of production are examined. Two important factors that affect these results are the higher turnover rate and use of different feed combinations by the 10,000-head capacity feedlot.

Results from the budgeting process indicate that calves-to-slaughter feeding programs were the most unprofitable in 1980. The most profitable conditions in each size feedlot were the feeding of yearlings on rations including either beet pulp, potato waste or both. Comparisons between size groups suggest that economies of size exist as size increases for the feedlots budgeted.

Model Analysis and Results

Analytical Procedure

The profit maximization, linear programming model was used to determine the feeding activity that results in shortrun maximization of net income above variable costs. The model selected the most profitable feeding activity and indicated the income above total variable costs (TVC). After determining the solution using 1980 input costs and output prices, the model was used to measure the effects of varying feeder and fat cattle prices, alfalfa hay price, barley price and interest rate on operating capital.

The prices for slaughter cattle, yearlings and calves were varied together in fixed ratios to one another to represent different market conditions. Under each fixed ratio, the level of cattle prices was varied, and optimum solutions were determined. This procedure allowed the break-even point and range of the most profitable feeding activity to be determined as cattle prices varied under the given fixed ratio. After analyzing the effects of varying cattle prices, the cattle prices were returned to their original levels before varying other input prices. Barley and alfalfa hay price were varied, one at a time, and the effect on optimum feeding activity and break-even point was examined. The last procedure held all prices at their original levels except the interest rate on operating capital. The interest rate was allowed to vary upward from zero until no profitable solution existed. The analytical results follow discussion of the cattle and feed price variations.

Prices

The price ratios among feeder calves (500 to 600 pounds), feeder steers (600 to 700 pounds) and slaughter steers (900 to 1,100 pounds) from 1963-1980 were examine (USDA 1981). Ratios across the range were selected for use in the models (Table 11). The upper limit for varying the level of cattle prices under each fixed ratio was assumed to be $80.00 per hundredweight for slaughter cattle.

To select a feasible range in price for alfalfa hay and barley, Idaho monthly prices for these crops were examined for 1979 and 1980. These prices were taken from the monthly issue of *Agricultural Prices* (USDA 1979-80). The feasible range in price assumed for alfalfa hay was $30.00 to $90.00 per ton. The feasible range in price assumed for barley was $70.00 to $140.00 per ton.

Results of Linear Programming Analysis

1,000-Head Capacity Feedlot Model

The initial computer run, using 1980 input costs and output prices, did not result in a profitable solution for the 1,000-head capacity feedlot model. None of the feeding activities produced a positive return above variable costs. When cattle prices were varied, holding all other costs constant, feeding yearlings on rations using alfalfa hay, corn silage, barley and beet pulp was the most profitable feeding activity. Table 12 gives results of varying cattle prices.

Before varying the alfalfa hay price, all cattle prices were set at their 1980 levels. Varying the price

Table 11. Cattle price ratios used in the linear programming analysis.

Year	Feedlot size*	Price ratio		
		Slaughter cattle	Yearlings	Calves
1980	1,000-head capacity feedlot	1.0	1.08	1.3
1980	4,000-head capacity feedlot	1.0	1.03	1.3
1980	10,000-head capacity feedlot	1.0	1.05	N.A.
1980	All sizes	1.0	1.10	1.2
1979	All sizes	1.0	1.20	1.3
1975	All sizes	1.0	.60	.7

*The first three ratios are derived from cattle prices used in the 1980 Idaho cattle feedlot budgets. The other ratios are derived from USDA price series for nationally recognized cattle markets. Feedlot size indicates in which model or models the ratio was used.

Table 12. Results of varying cattle prices in the 1,000-head capacity feedlot model.[1]

Price ratio				Break-even price above TVC		
Slaughter cattle	Yearlings	Calves	Feeding activity[2]	Slaughter cattle	Yearlings	Calves
				(dollars per hundredweight)		
1.0	1.08	1.30	3 and 4 — 2	69.82	75.41	90.76
1.0	1.10	1.20	3 and 4 — 2	73.04	80.35	87.65
1.0	1.20	1.30	No profitable solution	—	—	—
1.0	.70	.60	3 and 4 — 2	37.98	26.59	22.79
1.0	1.00	1.00	3 and 4 — 2	59.35	59.35	59.35

[1]These results are for varying cattle prices while all other costs were held constant at their 1980 levels. Cattle prices in 1980 were: slaughter cattle, $66.92/cwt; yearling feeders, $72.30/cwt; feeder calves, $87.90/cwt.

[2]The most profitable feeding activity is given for each price ratio by feeding program number from Table 3 and feed combination from Table 6.

of hay did not result in any profitable solution in this model. When varying the price of barley upward from zero, with all other costs and prices at 1980 levels, feeding yearlings on rations using alfalfa hay, corn silage and barley became the most profitable. This activity remained the most profitable until barley reached a price of $55.68 per ton. At this point, feeding yearlings on rations using alfalfa hay, corn silage, barley and beet pulp became the most profitable. This activity remained profitable until barley reached $84.59 per ton. Above a barley price of $84.59 per ton, no feeding activities were profitable.

When varying the interest rate upward from zero, with all other costs and prices at 1980 levels, feeding yearlings on rations using alfalfa hay, corn silage, barley and beet pulp was the most profitable. This activity remained profitable until an annual interest rate of 9.05 percent was reached. Above this point, no profitable solutions existed.

4,000-Head Capacity Feedlot Model

The result of using the initial model for the 4,000-head capacity was that feeding yearlings on rations using alfalfa hay, corn silage, barley and potato waste was the most profitable feeding activity. Under 1980 price levels, this activity resulted in a net income above variable costs of $97,013 when the feedlot was operated at 80 percent of capacity. The fixed costs from the 1980 budget for this feeding activity were $156,725.28. Subtracting the fixed costs from the net income above variable costs results in a return above total costs of -$59,712.28.

As cattle prices were varied, feeding yearlings on rations using alfalfa hay, corn silage, barley and potato waste was the most profitable feeding activity. Table 13 gives results of varying cattle prices.

Before varying the price of hay, all cattle prices were set at their original levels in the model. As the price of alfalfa hay was varied, feeding yearlings on rations using alfalfa hay, corn silage, barley and potato waste was the most profitable feeding activity throughout the feasibile price range. When varying the price of barley, with all other costs and prices at 1980 levels, the first feeding activity to become the most profitable was feeding yearlings on rations using alfalfa hay, corn silage and barley. This activity remained the most profitable until barley reached a price per ton of $54.25. At this point, feeding yearlings on rations using alfalfa hay, corn silage, barley and potato waste became the most profitable. This activity was profitable until barley reached a price of $114.15 per ton. Above $114.15 per ton for barley, no profitable solutions existed.

When the interest rate was varied upward from zero, with all other costs and prices held constant at their original levels, feeding yearlings on rations using alfalfa hay, corn silage, barley and potato waste became the most profitable feeding activity. This activity remained the most profitable until an annual interest rate of 17.26 percent was reached. Above an interest rate of 17.26 percent, there were no profitable solutions.

Table 13. Results of varying cattle prices in the 4,000-head capacity feedlot model.[1]

Price ratio				Break-even price above TVC		
Slaughter cattle	Yearlings	Calves	Feeding activity[2]	Slaughter cattle	Yearlings	Calves
				(dollars per hundredweight)		
1.0	1.08	1.30	3 and 4 — 3	66.14	69.44	85.97
1.0	1.10	1.20	3 and 4 — 3	73.82	81.20	88.59
1.0	1.20	1.30	No profitable solution	—	—	—
1.0	.70	.60	3 and 4 — 3	38.25	26.78	22.95
1.0	1.00	1.00	3 and 4 — 3	59.89	59.89	59.89

[1]These results are for varying cattle prices while all other costs were held constant at their 1980 levels. Cattle prices in 1980 were: slaughter cattle, $66.80/cwt; yearling feeders, $68.81/cwt; feeder calves, $87.90/cwt.

[2]The most profitable feeding activity is given for each price ratio by feeding program number from Table 3 and feed combination from Table 6.

Table 14. Results of varying cattle prices in the 10,000-head capacity feedlot model.[1]

Price ratio			Break-even price above TVC	
Slaughter cattle	Yearlings	Feeding activity[2]	Slaughter cattle	Yearlings
			(dollars per hundredweight)	
1.0	1.05	3 and 4 — 4	58.79	61.73
1.0	1.10	3 and 4 — 4	65.29	71.82
1.0	1.20	No profitable solution	—	—
1.0	.70	3 and 4 — 4	34.63	24.24
1.0	1.00	3 and 4 — 4	53.46	53.46

[1]These results are for varying cattle prices while all other costs were held constant at their 1980 levels. Cattle prices in 1980 were: slaughter cattle, $67.36/cwt; yearling feeders, $70.48/cwt.

[2]The most profitable feeding activity is given for each price ratio by feeding program number from Table 3 and feed combination number from Table 6.

10,000-Head Capacity Feedlot Model

The initial computer run using 1980 input costs and output prices resulted in a net income above variable costs of $690,454. This amount of income was generated by feeding yearlings rations using alfalfa hay, corn silage, barley, beet pulp and potato waste while operating the feedlot at 80 percent of capacity. The fixed costs taken from the 1980 budgets for the 10,000-head capacity feedlot were $196,118. Subtracting fixed costs from the net income above variable costs resulted in a net income above total costs of $454,336.

The most profitable feeding activity when cattle prices were varied was feeding yearlings on rations using alfalfa hay, corn silage, barley, beet pulp and potato waste. The results of varying cattle prices in the 10,000-head capacity feedlot are presented in Table 14.

Before varying other costs, cattle prices were set at their original levels in the model. When either the price of alfalfa hay or barley was varied, one at a time, feeding yearlings on rations using alfalfa hay, corn silage, barley, beet pulp and potato waste was the most profitable feeding activity. This activity entered and remained the most profitable throughout the entire range of price for each of the two feeds (alfalfa hay $30 to $90 per ton; barley $70 to $140 per ton).

When the interest rate was allowed to vary from zero upward, with all other costs and prices at 1980 levels, feeding yearlings on rations using alfalfa hay, corn silage, barley, beet pulp and potato waste was the most profitable feeding activity. This feeding activity remained profitable until an annual interest rate of 25.80 percent was reached. Above an interest rate of 25.80 percent there were no profitable solutions.

Interpretation of Results

The models developed for this analysis examined the feeding activities for a given size feedlot to determine which feeding activity maximizes the net income above variable costs. Solutions were determined for each of the three feedlot sizes based on 1980 budgeted costs. Solutions were also determined when costs and prices were allowed to vary, separately, with everything else held constant. The variable factors were cattle prices, alfalfa hay price, barley price and the interest rate on operating capital.

The results are accurate only under the assumption made in the analysis. Other factors, besides maximization of profit, that may affect decisions regarding operation of a feedlot were not considered. The use of idle labor or the availability of feeds that do not have a ready market are examples of factors which could affect the decision to feed cattle in farmer-feedlots. Also, the models developed occur in a static time period. Recognition of these factors is necessary when examining the results. This section summarizes what the results of the linear programming analysis indicated about the profitability of producing fed cattle in Idaho.

The results of the initial models indicated that the 10,000-head capacity feedlot was the only feedlot size to generate a positive return above total costs in 1980. The 1,000-head capacity feedlot was in such an unprofitable position that no feeding activity generated a return above varible costs.

In each of the three models, one feeding activity was stable as the most profitable for all cattle price ratios used. This was the feeding of yearlings on rations using byproduct feed ingredients. In the 1,000- and 4,000-head capacity feedlot models, feeding calves to slaughter weights was never the most profitable. This was true even when the cattle price ratio was such that calves cost less per hundredweight than yearlings.

Although the optimum feeding activity was stable in each model when varying cattle price ratios, the break-even price was sensitive to a change in the price ratio. Changes in the price relationships between weight classes of cattle greatly affected the level of cattle prices needed to generate a profit.

Varying the price of alfalfa hay did not change the optimum solutions from those determined in the initial models. The cost of alfalfa hay, by itself, was not great enough to affect the choice of feeding activity. The 1,000-head capacity feedlot was in such an unprofitable position that even when the price of alfalfa hay was zero, no profitable solution occurred.

The other feed price varied was the price of barley. In the 1,000- and 4,000-head capacity feedlot models, varying the price of barley caused changes in the optimum feeding activities. In both models, the feeding activity that was entered first dropped out before the price of barley reached a feasible level. The feeding activities that were profitable with a feasible market price for barley were those for feeding yearlings on rations using byproduct feeds. These were the same feeding activities found to be stable when varying cattle prices. In each of these two models, the break-even price at which all activities were unprofitable was reached before the price of barley had risen to its upper limit.

In the 10,000-head capacity feedlot model, one feeding activity was stable and produced a profit for all barley prices. This was feeding yearlings on rations using alfalfa hay, corn silage, barley, beet pulp and potato waste. This same feeding activity was found to be stable as the most profitable when varying cattle prices.

The last part of the analysis examined how the profitability of feeding cattle was affected by changes in the interest rate on operating capital. Varying the interest rate did not affect which feeding

activity was the most profitable but only the level of profit generated. In the 1,000-head capacity feedlot model, no profitable solution was found above an interest rate of 9.05 percent. Since the interest rate on operating capital for 1980 was assumed to be 12.5 percent, a positive return could not be produced in the 1,000-head capacity feedlot in 1980. In the 4,000- and 10,000-head capacity feedlots, the interest rate had to rise to 17.26 percent and 25.80 percent, respectively, before the break-even point for returns above variable costs was reached.

Implications of Analysis Results

Caution must be exercised when interpreting the linear programming analysis results. The models developed were intended to represent typical methods and costs associated with producing fed cattle in Idaho. Type of feed ingredients, feeding programs and costs associated with an individual feedlot may vary widely from the conditions assumed in the models.

Results of the linear programming analysis indicated that feeding calves to slaughter weights was less profitable than feeding yearlings during 1980. This was true even when cattle prices would seem to favor buying calves. Feeding yearlings on rations using byproduct feeds was the most profitable method for producing cattle throughout the analysis. This concurs with the fact that many of the cattle feeders surveyed in 1981 used byproduct feeds in their rations when those feeds were available.

Linear programming is a useful tool in making shortrun planning decisions in feedlot enterprises. The effects of changes in prices or production methods on profitability can be evaluated more efficiently than through normal budgeting procedures. Also, the effects on production method and profitability can be evaluated through a varying range of costs and prices.

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Appendix A

Feed Intake for Feed Combinations by Feeding Program and Feedlot Size

Table A-1. Feed intake for feed combination 1 by feeding program, 1,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 1. Steers 550-1,100	2. Heifers 450-950	3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)	(lb)	(lb)
Alfalfa hay	935.0	940	436.0	363
Corn silage	5,335.0	5,385	2,372.0	1,977
Barley	2,915.0	2,940	2,608.0	2,173
Supplements	360.0	325	231.0	190
Salt and minerals	24.5	25	16.7	14

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average daily gain	Feed conversion ratio
	(%)		(lb)	(dry-matter basis)
1	1.20	240	2.3	8.89
2	1.20	238	2.1	9.88
3	.65	154	2.6	8.37
4	.65	130	2.3	9.30

Table A-2. Feed intake, feed combination 2 by feeding program, 1,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 1. Steers 550-1,100	2. Heifers 450-950	3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)	(lb)	(lb)
Alfalfa hay	808.0	817.0	590.0	489.0
Corn silage	2,997.0	3,028.0	1,650.0	1,374.0
Barley	2,354.0	2,378.0	1,920.0	1,599.0
Beet pulp	737.0	744.0	540.0	450.0
Supplements	242.0	244.0	154.0	127.0
Salt and minerals	21.5	21.7	15.8	13.2

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
1	1.20	240	2.3	7.81
2	1.20	238	2.1	8.68
3	.65	154	2.6	7.89
4	.65	130	2.3	8.78

Table A-3. Feed intake, feed combination 1 by feeding program, 4,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 1. Steers 550-1,100	2. Heifers 450-950	3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)	(lb)	(lb)
Alfalfa hay	874.0	885.0	448.0	373.0
Corn silage	3,223.0	3,255.0	1,528.0	1,273.0
Barley	3,278.0	3,310.0	2,660.0	2,217.0
Supplements	401.0	365.0	240.0	180.0
Salt and minerals	22.8	23.1	15.8	13.2

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
1	1.14	220	2.50	8.31
2	1.14	227	2.20	9.23
3	.91	151	2.65	7.92
4	.91	120	2.50	8.80

Table A-4. Feed intake, feed combination 2 by feeding program, 4,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 1. Steers 550-1,100	2. Heifers 450-950	3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)	(lb)	(lb)
Alfalfa hay	687.0	695.0	428.0	357.0
Corn silage	2,216.0	2,240.0	1,284.0	1,070.0
Barley	2,282.0	2,305.0	2,096.0	1,747.0
Beet pulp	698.0	705.0	592.0	493.0
Supplements	418.0	380.0	228.0	171.0
Salt and minerals	19.3	19.5	15.6	13.0

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average Daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
1	1.14	220	2.50	7.12
2	1.14	227	2.20	7.91
3	.91	151	2.65	7.79
4	.91	120	2.50	8.65

Table A-5. Feed intake, feed combination 3 by feeding program, 4,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 1. Steers 550-1,100	2. Heifers 450-950	3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)	(lb)	(lb)
Alfalfa hay	1,600.0	1,615.0	760.0	633.0
Corn silage	1,400.0	1,410.0	1,028.0	855.0
Barley	2,640.0	2,665.0	2,036.0	1,695.0
Potato waste	3,400.0	3,425.0	3,232.0	2,694.0
Supplements	330.0	335.0	260.0	195.0
Salt and minerals	23.6	27.1	15.9	13.2

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average Daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
1	1.14	220	2.50	8.59
2	1.14	227	2.20	9.55
3	.91	151	2.65	7.94
4	.91	120	2.50	8.83

Table A-6. Feed intake, feed combination 2 by feeding program, 10,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed ingredients	Feeding program[2] 3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)
Alfalfa hay	408.0	339.0
Corn silage	1,628.0	1,356.0
Barley	1,384.0	1,152.0
Beet pulp	1,016.0	846.0
Supplements	164.0	135.0
Salt and minerals	14.8	12.3

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
3	.55	136	2.95	7.38
4	.55	113	2.65	8.21

Table A-7. Feed intake, feed combination 4 by feeding program, 10,000-head capacity feedlot, Idaho production cost study, 1980.[1]

Feed Ingredients	Feeding programs[2] 3. Steers 700-1,100	4. Heifers 650-950
	(lb)	(lb)
Alfalfa hay	408.0	339.0
Corn silage	1,628.0	1,359.0
Barley	1,384.0	1,155.0
Beet pulp	508.0	423.0
Potato waste	3,508.0	2,931.0
Supplements	164.0	135.0
Salt and minerals	14.8	12.3

[1]Feed intake is on an as-fed basis for one animal.
[2]Specifications:

Feeding program	Death loss	Days on feed	Average daily gain	Feed conversion ratio
	(%)		(lb)	(dry matter basis)
3	.55	136	2.95	7.38
4	.55	113	2.65	8.21

Appendix B

Investment Summaries by Feedlot Size

Table B-1. Investment summary, 1,000-head capacity feedlot, Idaho production cost study, 1980.

Investment summary	Acquisition cost	Replacement cost
Buildings and facilities	$ 69,740	$135,727
Machinery and equipment	61,560	152,000
Total	$131,300	$287,727

(Full Investment cost; items may serve enterprises)

Buildings and facilities	Replacement cost
Pens and lots	
1,500 foot feed bunk space (concrete bunks w/8 foot concrete apron)	$ 22,500
1,833 foot fence (includes sick pens)	13,197
water system (1 well, 6-inch diameter, 100 feet deep w/pump)	2,400
Working facilities	
Squeeze chute	1,045
Sorting alleys	1,505
Loading chute	1,055
Livestock scale (single animal)	2,750
Feed processing and storage facilities	
Hay shed (pole shed w/sheet metal roof)	9,062
Trench silos (1,500 tons)	14,857
Grain bins (10,000 bushels)	10,620
Feed storage and roller mill (40×100 foot metal building)	27,776
Truck scales (30 ton)	14,800
Shop and machinery storage (40 × 60 foot metal building)	14,160
Total	$135,727

Machinery and equipment complement	Replacement cost
Hay chopper	$4,500
Front end-loader (4-wheel, (4-wheel, articulating, 1½ yd bucket)	60,000
Feed truck w/mixer box	31,500
Pickup truck (½ ton)	6,700
Truck (2 ton w/livestock racks)	23,800
Tractor (diesel, 50 hp, front-end loader)	19,000
Manure spreader (pull-type)	6,500
Total	$152,000

Table B-2. Investment summary, 4,000-head capacity feedlot, Idaho production cost study, 1980.

Investment summary	Acquisition cost	Replacement cost
Buildings and facilities	$248,480	$397,249
Machinery and equipment	172,320	239,700
Total	$420,800	$636,949

(Full Investment cost; items may serve multiple enterprises)

Buildings and facilities	Replacement cost
Pens and lots	
6,000 foot feed bunk space (concrete bunk w/8 foot concrete apron)	$ 90,000
8,925 foot fence (includes sick pens)	64,260
Water system (2 wells, 6-inch diameter, 100 feet deep w/pump)	4,800
Working facilities	
Hydraulic squeeze chute	1,545
Sorting alleys	1,505
Loading chute	1,300
Livestock scales (14 × 8 foot)	5,000
Feed processing and storage facilities	
Feed mill building (includes milling equipment)	87,915
Feed storage building (metal 50 × 100 foot)	25,665
Grain bins (20,000 bushels)	21,240
Trench silos (4,000 ton storage)	39,619
2 hay sheds (pole shed w/metal roof, 32 × 96 foot)	18,124
Truck scales (30 ton)	14,800
Shop and machinery storage (40 × 100 foot metal building)	21,476
Total	$397,249

Machinery and equipment complement	Replacement cost
Feed processing equipment (included in cost of feed mill facility)	—
2 feed trucks w/mixer boxes	$ 63,000
2 front-end loaders (4-wheel, articulating, 1½ yd bucket)	120,000
2 trucks with spreader boxes (used for spreading manure)	50,000
Pickup truck (½ ton)	6,700
Total	$239,700

Table B-3. Investment summary, 10,000-head capacity feedlot, Idaho production cost study, 1980.

Investment summary	Acquisition cost	Replacement cost
Buildings and facilities	$645,500	$ 977,328
Machinery and equipment	188,100	246,900
Total	$833,600	$1,224,228

Buildings and facilities	Replacement cost
Pens and lots	
15,000 foot feed bunk space (concrete bunk w/8 foot concrete aprons)	$225,000
22,300 foot fence (includes sick pens)	160,560
Water system (3 wells, 8-inch diameter, 100 feet deep w/pump)	21,600
Working facilities	
Squeeze chutes	3,090
Sorting alleys	4,500
Loading chutes	3,900
Livestock scales	15,000
Feed processing and storage facilities	
Feed mill building (includes milling equipment)	181,700
Trench silos (10,000 ton)	99,050
Hay sheds (1,000 ton, pole shed w/metal roof)	100,800
Grain storage (60,000 bushels)	45,700
Truck scales (70 foot in length)	24,000
Shop and machinery storage (40 × 100 foot, metal building)	21,476
Office	70,952
Total	$977,328

Machinery and equipment complement	Replacement cost
Feed processing equipment (included in cost of feed mill facility)	—
3 feed trucks w/mixer boxes	$ 94,500
2 front end-loaders (4-wheel, articulating, 1½ yd bucket)	120,000
Tractor (diesel 50 hp, front-end loader)	19,000
2 pickup trucks (½ ton)	13,400
Total	$246,900

Appendix C
Budgeted Costs and Returns

Table C-1. Idaho cattle feedlot, 1,000-head capacity, calves to slaughter, feed combination 1, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$135,727.00	21.89	$ 69,740.00	11.25
Machinery and equipment	152,000.00	24.51	61,560.00	9.93
Total	287,727.00	46.40	131,300.00	21.18

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	385	11.00	$67.84	746.24	$287,302.40	
Slaughter heifers	207	9.50	65.39	621.20	128,588.40	
Total receipts					415,890.80	67.06

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	2,145.0	86.12	184,727.40	29.79
Feeder heifers	cwt	945.0	91.25	86,231.25	13.90
Alfalfa hay	tons	279.2	51.00	14,239.20	2.30
Corn silage	tons	1,595.0	21.00	33,495.00	5.40
Barley	tons	871.3	95.60	83,296.28	13.43
Supplements	tons	103.6	167.79	17,383.04	2.80
Salt and minerals	tons	7.3	70.80	516.84	.08
Veterinary service and supplies	$			2,046.49	.33
Marketing expenses	$			3,596.87	.58
Manure credit	$			-4,165.80	-.67
Labor	$			8,620.08	1.39
Machinery fuel and lube	$			2,139.52	.34
Repairs	$			2,788.66	.44
Interest on operating capital	$	156,569.34	.125	19,571.17	3.15
Total variable costs				454,486.01	73.21
4. Income above variable costs				-38,595.21	-6.22
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				13,386.14	2.16
Machinery and equipment				40,118.88	6.47
Land taxes and interest				2,956.25	.48
Total ownership costs				56,461.27	9.11
6. Other costs					
General farm overhead				1,234.10	.20
Management charge				16,678.65	2.69
Total other costs				17,912.75	2.89
7. Total of above costs				528,860.03	85.19
8. Return to risk				-112,969.23	-18.21

Notes: Deathloss 1.2%; steers 240 days; 2.3 lb gain/day; feed conversion 8.89; feedlot capacity used 60%; heifers 238 days; 2.10 lb gain/day; feed conversion 9.88; steers 65% of marketings; turnover rate = 1.

*Value or cost per hundredweight of finished beef produced.

Table C-2. Idaho cattle feedlot, 1,000-head capacity, calves to slaughter, feed combination 2, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$135,727.00	21.89	$ 69,740.00	11.25
Machinery and equipment	152,000.00	24.51	61,560.00	9.93
Total	287,727.00	46.40	131,300.00	21.18

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	385	11.00	$67.84	746.24	$287,302.40	
Slaughter heifers	207	9.50	65.39	621.20	128,588.40	
Total receipts					415,890.80	67.06

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	2,145.0	86.12	184,727.40	29.79
Feeder heifers	cwt	945.0	91.25	86,231.25	13.90
Alfalfa hay	tons	241.7	51.00	12,326.70	1.99
Corn silage	tons	896.3	21.00	18,822.30	3.03
Barley	tons	704.0	95.60	67,302.40	10.85
Beet pulp	tons	220.4	111.00	24,464.40	3.94
Supplements	tons	72.3	167.79	12,131.22	1.96
Salt and minerals	tons	6.4	70.80	453.12	.07
Veterinary service and supplies	$			2,046.49	.33
Marketing expenses	$			3,596.87	.58
Manure credit	$			-4,165.80	-.67
Labor	$			8,620.08	1.39
Machinery fuel and lube	$			2,139.52	.34
Repairs	$			2,788.66	.44
Interest on operating capital	$	152,793.79	.125	19,099.22	3.08
Total variable costs				443,526.41	71.44
4. Income above variable costs				-27,635.61	-4.45
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				13,386.14	2.16
Machinery and equipment				40,118.88	6.47
Land taxes and interest				2,956.25	.48
Total ownership costs				56,461.27	9.11
6. Other costs					
General farm overhead				1,234.10	.20
Management charge				15,911.48	2.57
Total other costs				17,145.58	2.76
7. Total of above costs				517,133.26	83.39
8. Return to risk				-101,242.46	-16.33

Notes: Deathloss 1.2%; steers 240 days; 2.3 lb gain/day; feed conversion 7.81; feedlot capacity used 60%; heifers 238 days; 2.10 lb gain/day; feed conversion 8.68; steers 65% of marketings; turnover rate = 1.

*Value or cost per hundredweight of finished beef produced.

Table C-3. Idaho cattle feedlot, 1,000-head capacity, yearlings to slaughter, feed combination 1, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$135,727.00	21.74	$ 69,740.00	$11.17
Machinery and equipment	152,000.00	24.35	61,560.00	9.86
Total	287,727.00	46.09	131,300.00	21.03

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	387	11.00	$67.69	744.59	$288,156.33	
Slaughter heifers	209	9.50	65.27	620.06	129,592.54	
Total receipts					417,748.87	66.92

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	2,730.0	74.83	204,285.90	32.72
Feeder heifers	cwt	1,365.0	67.62	92,301.30	14.78
Alfalfa hay	tons	122.7	51.00	6,257.70	1.00
Corn silage	tons	667.8	21.00	14,023.80	2.25
Barley	tons	726.9	95.60	69,491.64	11.13
Supplements	tons	64.8	167.79	10,872.79	1.74
Salt and minerals	tons	4.7	70.80	332.76	.05
Veterinary service and supplies	$			1,810.32	.29
Marketing expenses	$			3,620.65	.58
Manure credit	$			-2,544.00	-.41
Labor	$			6,180.07	.99
Machinery fuel and lube	$			2,153.66	.34
Repairs	$			2,746.70	.44
Interest on operating capital	$	82,815.46	.125	4,140.77	.66
Total variable costs				418,218.06	66.99
4. Income above variable costs				-469.19	-.07
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				13,386.14	2.14
Machinery and equipment				40,118.88	6.43
Land taxes and interest				2,956.25	.47
Total ownership costs				56,461.27	9.04
6. Other costs					
General farm overhead				1,248.50	.20
Management charge				12,346.91	1.98
Total other costs				13,595.41	2.18
7. Total of above costs				488,274.74	78.22
8. Return to risk				-70,525.87	-11.30

Notes: Deathloss .65%; steers 154 days; 2.6 lb gain/day; feed conversion 8.37; feedlot capacity used 60%; heifers 130 days; 2.3 lb gain/day; feed conversion 9.3; steers 65% of marketings; turnover rate = 1.

*Value or cost per hundredweight of finished beef produced.

Table C-4. Idaho cattle feedlot, 1,000-head capacity, yearlings to slaughter, feed combination 2, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$135,727.00	21.74	$ 69,740.00	11.17
Machinery and equipment	152,000.00	24.35	61,560.00	9.86
Total	287,727.00	46.09	131,300.00	21.03

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	387	11.00	$67.69	744.59	$288,156.33	
Slaughter heifers	209	9.50	65.27	620.06	129,592.54	
Total receipts					417,748.87	66.92

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	2,730.0	74.83	204,285.90	32.72
Feeder heifers	cwt	1,365.0	67.62	92,301.30	14.78
Alfalfa hay	tons	165.8	51.00	8,455.80	1.35
Corn silage	tons	464.4	21.00	9,752.40	1.56
Barley	tons	540.4	95.60	51,662.24	8.28
Beet pulp	tons	152.0	111.00	16,872.00	2.70
Supplements	tons	43.2	167.79	7,248.53	1.16
Salt and minerals	tons	4.4	70.80	315.19	.05
Veterinary service and supplies	$			1,810.32	.29
Marketing expenses	$			3,620.65	.58
Manure credit	$			-2,544.00	-.41
Labor	$			6,180.07	.99
Machinery fuel and lube	$			2,153.66	.34
Repairs	$			2,746.70	.44
Interest on operating capital	$	81,480.95	.125	4,074.05	.65
Total variable costs				411,478.81	65.91
4. Income above variable costs				6,270.06	1.00
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				13,386.14	2.14
Machinery and equipment				40,118.88	6.43
Land taxes and interest				2,956.25	.47
Total ownership costs				56,461.27	9.04
6. Other costs					
General farm overhead				1,248.50	.20
Management charge				11,875.16	1.90
Total other costs				13,123.66	2.10
7. Total of above costs				481,063.74	77.06
8. Return to risk				-63,314.87	-10.14

Notes: Deathloss .65%; steers 154 days; 2.6 lb gain/day; feed conversion 7.89; feedlot capacity used 60%; heifers 130 days; 2.3 lb gain/day; feed conversion 8.78; steers 65% of marketings; turnover rate = 1.

*Value or cost per hundredweight of finished beef produced.

Table C-5 Idaho cattle feedlot, 4,000-head capacity, calves to slaughter, feed combination 1, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	8.99	$248,480.00	5.62
Machinery and equipment	239,700.00	5.43	172,320.00	3.90
Total	636,949.00	14.42	420,800.00	9.53

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	2,741	11.00	$67.58	743.38	$2,037,604.60	
Slaughter heifers	1,476	9.50	65.12	618.64	913,112.64	
Total receipts					2,950,717.20	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	15,251.5	86.12	1,313,459.20	29.73
Feeder heifers	cwt	6,718.5	91.25	613,063.13	13.88
Alfalfa hay	tons	1,861.7	64.21	119,539.76	2.71
Corn silage	tons	6,858.9	21.00	144,036.90	3.26
Barley	tons	6,975.6	102.40	714,301.44	16.17
Supplements	tons	823.7	167.79	138,208.62	3.13
Salt and minerals	tons	48.6	70.80	3,440.88	.08
Veterinary service and supplies	$			22,528.33	.51
Marketing expenses	$			7,509.41	.17
Manure credit	$			-26,474.46	-.60
Labor	$			35,338.40	.80
Machinery fuel and lube	$			16,344.01	.37
Repairs	$			21,203.04	.48
Interest on operating capital	$	1,133,630.32	.125	141,703.79	3.21
Total variable costs				3,290,676.91	74.50
4. Income above variable costs				-339,959.71	-7.70
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				42,168.86	.95
Machinery and equipment				69,887.67	1.58
Land taxes and interest				11,637.50	.26
Total ownership costs				123,694.03	2.80
6. Other costs					
General farm overhead				7,376.89	.16
Management charge				22,253.82	.50
Total other costs				29,630.71	.67
7. Total of above costs				3,444,001.65	77.96
8. Return to risk				-493,284.45	-11.17

Notes: Deathloss 1.14%; steers 220 days; 2.5 lb gain/day; feed conversion 8.31; feedlot capacity used 65%; heifers 238 days; 2.2 lb gain/day; feed conversion 9.23; steers 65% of marketings; turnover rate = 1.64.

*Value or cost per hundredweight of finished beef produced.

Table C-6. Idaho cattle feedlot, 4,000-head capacity, calves to slaughter, feed combination 2, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	8.99	$248,480.00	5.62
Machinery and equipment	239,700.00	5.43	172,320.00	3.90
Total	636,949.00	14.42	420,800.00	9.53

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	2,741	11.00	$67.58	743.38	$2,037,604.60	
Slaughter heifers	1,476	9.50	65.12	618.64	913,112.64	
Total receipts					2,950,717.20	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	15,251.5	86.12	1,313,459.20	29.73
Feeder heifers	cwt	6,718.5	91.25	613,063.13	13.88
Alfalfa hay	tons	1,462.9	64.21	93,932.81	2.13
Corn silage	tons	4,719.5	21.00	99,109.50	2.24
Barley	tons	4,856.6	102.40	497,315.84	11.26
Beet pulp	tons	1,485.5	111.00	164,890.50	3.73
Supplements	tons	858.3	167.79	144,014.16	3.26
Salt and minerals	tons	41.1	70.80	2,909.88	.06
Veterinary service and supplies	$			22,528.33	.51
Marketing expenses	$			7,509.41	.17
Manure credit	$			-26,474.46	-.60
Labor	$			35,338.40	.80
Machinery fuel and lube	$			16,344.01	.37
Repairs	$			21,203.04	.48
Interest on operating capital	$	1,081,851.75	.125	135,231.47	3.06
Total variable costs				3,140,375.22	71.09
4. Income above variable costs				-189,658.02	-4.29
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				42,168.86	.95
Machinery and equipment				69,887.67	1.58
Land taxes and interest				11,637.50	.26
Total ownership costs				123,694.03	2.80
6. Other costs					
General farm overhead				7,376.89	.16
Management charge				19,999.29	.45
Total other costs				27,376.18	.62
7. Total of above costs				3,291,445.43	74.15
8. Return to risk				-340,728.23	-7.71

Notes: Deathloss 1.14%; steers 220 days; 2.5 lb gain/day; feed conversion 7.12; feedlot capacity used 65%; heifers 238 days; 2.2 lb gain/day; feed conversion 7.91; steers 65% of marketings; turnover rate = 1.64.

*Value or cost per hundredweight of finished beef produced.

Table C-7. Idaho cattle feedlot, 4,000-head capacity, calves to slaughter, feed combination 3, 1980.

1. Investment summary[1]	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	8.99	$248,480.00	5.62
Machinery and equipment	239,700.00	5.43	172,320.00	3.90
Total	636,949.00	14.42	420,800.00	9.53

(Full investment cost; items may serve mutliple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	2,741	11.00	$67.58	743.38	$2,037,604.60	
Slaughter heifers	1,476	9.50	65.12	618.64	913,112.64	
Total receipts					2,950,717.20	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	15,251.5	86.12	1,313,459.20	29.73
Feeder heifers	cwt	6,718.5	91.25	613,063.13	13.88
Alfalfa hay	tons	3,404.3	64.21	218,590.10	4.94
Corn silage	tons	2,976.5	21.00	62,506.50	1.41
Barley	tons	5,617.3	102.40	575,211.52	13.02
Potato waste	tons	7,236.5	7.00	50,655.50	1.15
Supplements	tons	703.5	167.79	118,040.27	2.67
Salt and minerals	tons	52.6	70.80	3,724.08	.08
Veterinary service and supplies	$			22,528.33	.51
Marketing expenses	$			7,509.41	.17
Manure credit	$			-26,474.46	-.60
Labor	$			35,338.40	.80
Machinery fuel and lube	$			16,344.01	.37
Repairs	$			21,203.04	.48
Interest on operating capital	$	1,091,411.65	.125	136,426.46	1.73
Total variable costs				3,168,125.49	71.72
4. Income above variable costs				-217,408.29	-4.92
5. Ownership costs (replacement, taxes, interest insurance)					
Buildings and facilities				42,168.86	.95
Machinery and equipment				69,887.67	1.58
Land taxes and interest				11,637.50	.26
Total ownership costs				123,694.03	2.80
6. Other costs					
General farm overhead				7,376.89	.16
Management charge				20,145.55	.46
Total other costs				27,792.86	.63
7. Total of above costs				3,319,611.96	75.15
8. Return to risk				-368,894.76	-8.35

Notes: Deathloss 1.14%; steers 220 days; 2.5 lb gain/day; feed conversion 8.59; feedlot capacity used 65%; heifers 238 days; 2.2 lb gain/day; feed conversion 9.55; steers 65% of marketings; turnover rate = 1.64.

[1]Additional investments in buildings, facilities, machinery and equipment that may be needed to feed potato waste were not included in this budget.

*Value or cost per hundredweight of finished beef produced.

Table C-8. Idaho cattle feedlot, 4,000-head capacity, yearlings to slaughter, feed combination 1, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	5.65	$248,480	3.53
Machinery and equipment	239,700.00	3.41	$172,320.00	2.45
Total	636,949.00	9.06	420,800.00	5.99
(Full investment cost; items may serve multiple enterprises)				

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	4,361	11.00	$67.58	743.38	$3,241,880.20	
Slaughter heifers	2,348	9.50	65.12	618.64	1,452,566.70	
Total receipts					4,694,446.90	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	30,807.0	71.16	2,192,226.10	31.19
Feeder heifers	cwt	15,405.0	64.44	992,698.20	14.12
Alfalfa hay	tons	1,421.3	64.21	91,261.67	1.30
Corn silage	tons	4,848.6	21.00	101,820.60	1.45
Barley	tons	8,441.7	102.40	864,430.08	12.30
Supplements	tons	738.0	167.79	123,829.02	1.76
Salt and minerals	tons	50.2	70.80	3,554.16	.05
Veterinary service and supplies	$			26,002.49	.37
Marketing expenses	$			11,947.09	.17
Manure credit	$			-27,273.59	-.39
Labor	$			54,113.29	.77
Machinery fuel and lube	$			26,002.49	.37
Repairs	$			33,372.96	.48
Interest on operating capital	$	904,251.60	.125	113,031.45	1.61
Total variable costs				4,607,016.01	65.56
4. Income above variable costs				87,430.89	1.24
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				42,168.96	.60
Machinery and equipment				69,887.67	.99
Land taxes and interest				11,637.50	.17
Total ownership costs				123,694.03	1.76
6. Other costs					
General farm overhead				11,244.32	.16
Management charge				23,180.89	.33
Total other costs				34,425.21	.49
7. Total of above costs				4,765,135.25	67.81
8. Return to risk				-70,688.35	-1.01

Notes: Deathloss .91%; steers 151 days; 2.65 lb gain/day; feed conversion 7.92; feedlot capacity used 65% heifers 120 days; 2.5 lb gain/day; feed conversion 8.80; steers 65% of marketings; turnover rate = 2.60.

*Value or cost per hundredweight of finished beef produced.

Table C-9. Idaho cattle feedlot, 4,000-head capacity, yearlings to slaughter, feed combination 2, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	5.65	$248,480.00	3.53
Machinery and equipment	239,700.00	3.41	172,320.00	2.45
Total	636,949.00	9.06	420,800.00	5.99

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	4,361	11.00	$67.58	743.38	$3,241,880.20	
Slaughter heifers	2,348	9.50	65.12	618.64	1,452,566.70	
Total receipts					4,694,446.90	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	30,807.0	71.16	2,192,226.10	31.19
Feeder heifers	cwt	15,405.0	64.44	992,698.20	14.12
Alfalfa hay	tons	1,358.6	64.21	87,235.71	1.24
Corn silage	tons	4,074.7	21.00	85,568.70	1.22
Barley	tons	6,651.9	102.40	681,154.56	9.69
Beet pulp	tons	1,878.3	111.00	208,491.30	2.97
Supplements	tons	701.1	167.79	117,637.57	1.67
Salt and minerals	tons	49.5	70.80	3,504.60	.05
Veterinary service and supplies	$			26,002.49	.37
Marketing expenses	$			11,947.09	.17
Manure credit	$			-27,273.59	-.39
Labor	$			54,113.29	.77
Machinery fuel and lube	$			26,002.49	.37
Repairs	$			33,372.96	.48
Interest on operating capital	$	903,991.01	.125	112,998.88	1.61
Total variable costs				4,605,680.35	65.54
4. Income above variable costs				88,766.55	1.26
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				42,168.96	.60
Machinery and equipment				69,887.67	.99
Land taxes and interest				11,637.50	.17
Total ownership costs				123,694.03	1.76
6. Other costs					
General farm overhead				11,244.32	.16
Management charge				23,160.85	.33
Total other costs				34,405.17	
7. Total of above costs				4,763,779.55	67.79
8. Return to risk				-69,332.65	-.99

Notes: Deathloss .91%; steers 151 days; 2.65 lb gain/day; feed conversion 7.79; feedlot capacity used 65%; heifers 120 days; 2.5 lb gain/day; feed conversion 8.65; steers 65% of marketings; turnover rate = 2.60.

*Value or cost per hundredweight of finished beef produced.

Table C-10. Idaho cattle feedlot, 4,000-head capacity, yearlings to slaughter, feed combination 3, 1980.

1. Investment summary[1]	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$397,249.00	5.65	$248.480.00	3.53
Machinery and equipment	239,700.00	3.41	172,320.00	2.45
Total	636,949.00	9.06	420,800.00	5.99

(Full investment cost; items may serve multiple enterprises)

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	4,361	11.00	$67.58	743.38	$3,241,880.20	
Slaughter heifers	2,348	9.50	65.12	618.64	1,452,566.70	
Total receipts					4,694,446.90	66.80

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	30,807.0	71.16	2,192,226.10	31.19
Feeder heifers	cwt	15,405.0	64.44	992,698.20	14.12
Alfalfa hay	tons	2,411.4	64.21	154,835.99	2.20
Corn silage	tons	3,260.3	21.00	68,466.30	.97
Barley	tons	6,459.1	102.40	661,411.84	9.41
Potato waste	tons	10,257.3	7.00	71,801.10	1.02
Supplements	tons	799.5	167.79	134,148.11	1.91
Salt and minerals	tons	50.4	70.80	3,568.32	.05
Veterinary service and supplies	$			26,002.49	.37
Marketing expenses	$			11,947.09	.17
Manure credit	$			-27,273.59	-.39
Labor	$			54,113.29	.77
Machinery fuel and lube	$			26,002.49	.37
Repairs	$			33,372.96	.48
Interest on operating capital	$	886,118.86	.125	110,754.86	1.58
Total variable costs				4,514,085.55	64.23
4. Income above variable costs				180,361.35	2.57
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				42,168.96	.60
Machinery and equipment				69,887.67	.99
Land taxes and interest				11,637.50	.17
Total ownership costs				123,694.03	1.76
6. Other costs					
General farm overhead				11,244.32	.16
Management charge				21,786.93	.31
Total other costs				33,031.25	.47
7. Total of above costs				4,670,810.83	66.46
8. Return to risk				23,636.07	.34

Notes: Deathloss .91%; steers 151 days; 2.65 lb gain/day; feed conversion 7.94; feedlot capacity used 65%; heifers 120 days; 2.5 lb gain/day; feed conversion 8.83; steers 65% of marketings; turnover rate = 2.60.

[1]Additional investments in buildings, facilities, machinery and equipment that may be needed to feed potato waste were not included in this budget.

*Value or cost per hundredweight of finished beef produced.

Table C-11. Idaho cattle feedlot, 10,000-head capacity, yearlings to slaughter, feed combination 2, 1980.

1. Investment summary	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$ 977,328.00	5.10	$645,500.00	3.37
Machinery and equipment	246,900.00	1.29	188,100.00	.98
Total	1,224,228.00	6.39	833,600.00	4.35

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	15,882	11.00	$67.58	743.38	$11,806,361.00	
Slaughter heifers	1,765	9.50	65.12	618.64	1,091,899.60	
Total receipts					12,898,260.16	67.36

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	111,790.0	71.16	7,954,976.40	41.55
Feeder heifers	cwt	11,537.5	64.44	743,476.50	3.88
Alfalfa hay	tons	3,549.1	64.21	227,887.71	1.19
Corn silage	tons	14,164.3	21.00	297,450.30	1.55
Barley	tons	12,040.3	102.40	1,232,926.72	6.44
Beet pulp	tons	8,839.0	111.00	981,129.00	5.12
Supplements	tons	1,425.7	167.79	239,218.20	1.25
Salt and minerals	tons	128.7	70.80	9,111.96	.05
Veterinary service and supplies	$			97,649.45	.51
Machine hire	$			3,402.87	.07
Marketing expenses	$			32,549.82	.17
Utilities	$			38,293.90	.20
Miscellaneous expense	$			7,658.78	.04
Manure credit	$			-69,595.89	-.36
Labor	$			93,820.06	.49
Machinery fuel and lube	$			13,402.87	.07
Repairs	$			78,502.50	.41
Interest on operating capital	$	2,412,291.41	.125	301,536.43	1.57
Total variable costs				12,293,397.58	64.21
4. Income above variable costs				604,863.02	3.16
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				106,242.98	.55
Machinery and equipment				72,920.06	.38
Land taxes and interest				17,025.00	.09
Total ownership costs				196,188.04	1.02
6. Other costs[1]					
General farm overhead				0.00	.00
Management charge				0.00	.00
Total other costs				0.00	.00
7. Total of above costs				12,489,585.62	65.23
8. Return to risk				408,674.98	2.13

Notes: Deathloss .55%; steers 136 days; 2.95 lb gain/day; feed conversion 7.38; feedlot capacity used 65%; heifers 113 days; 2.65 lb gain/day; feed conversion 8.21; steers 90% of marketings; turnover rate = 2.73.

[1]The costs associated with these categories in the budgets for the 1,000 and 4,000-head capacity feedlots are included in the labor and miscellaneous expense categories in this budget.

*Value or cost per hundredweight of finished beef produced.

Table C-12. Idaho cattle feedlot, 10,000-head capacity, yearlings to slaughter, feed combination 4, 1980.

1. Investment summary[1]	1980 replacement (total)	1980 replacement ($/cwt*)	Average acquisition (total)	Average acquisition ($/cwt*)
Buildings and facilities	$ 977,328.00	5.10	$645,500.00	3.37
Machinery and equipment	246,900.00	1.29	188,100.00	.98
Total	1,224,228.00	6.39	833,600.00	4.35

2. Production	No. head	Cwt/head	Price	$/head	Value	$/cwt*
Slaughter steers	15,882	11.00	$67.58	743.58	$11,806,361.00	
Slaughter heifers	1,765	9.50	65.12	618.64	1,091,899.60	
Total receipts					12,898,260.60	67.36

3. Variable costs	Unit	No. units	$/unit	Value	$/cwt*
Feeder steers	cwt	111,790.0	71.16	7,954,976.40	41.55
Feeder heifers	cwt	11,537.5	64.44	743,476.50	3.88
Alfalfa hay	tons	3,558.7	64.21	228,504.13	1.19
Corn silage	tons	14,166.5	21.00	297,496.50	1.55
Barley	tons	12,043.0	102.40	1,233,203.20	6.44
Beet pulp	tons	4,419.6	111.00	490,575.60	2.56
Potato waste	tons	30,528.0	7.00	213,696.00	1.12
Supplements	tons	1,425.4	167.79	239,167.88	1.25
Salt and minerals	tons	128.7	70.80	9,111.96	.05
Veterinary service and supplies	$			97,649.45	.51
Machine hire	$			13,402.87	.07
Marketing expenses	$			32,549.82	.17
Utilities	$			38,293.90	.20
Miscellaneous expense	$			7,658.78	.04
Manure credit	$			-69,595.89	-.36
Labor	$			93,820.06	.49
Machinery fuel and lube	$			13,402.87	.07
Repairs	$			78,502.50	.41
Interest on operating capital	$	2,357,097.68	.125	294,637.21	1.54
Total variable costs				12,010,529.73	62.73
4. Income above variable costs				887,730.87	4.64
5. Ownership costs (replacement, taxes, interest, insurance)					
Buildings and facilities				106,242.98	.55
Machinery and equipment				72,920.06	.38
Land taxes and interest				17,025.00	.09
Total ownership costs				196,188.04	1.02
6. Other costs[2]					
General farm overhead				0.00	.00
Management charge				0.00	.00
Total other costs				0.00	.00
7. Total of above costs				12,206,717.77	63.75
8. Return to risk				691,542.83	3.61

Notes: Deathloss .55%; steers 136 days; 2.95 lb gain/day; feed conversion 7.38; feedlot capacity used 65%; heifers 113 days; 2.65 lb gain/day; feed conversion 8.21; steers 90% of marketings; turnover rate = 2.73.

[1]Additional investments in buildings, facilities, machinery and equipment that may be needed to feed potato waste were not included in this budget.

[2]The costs associated with these categories in the budgets for the 1,000 and 4,000-head capacity feedlots are included in the labor and miscellaneous expense categories in this budget.

*Value or cost per hundredweight of finished beef produced.

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