

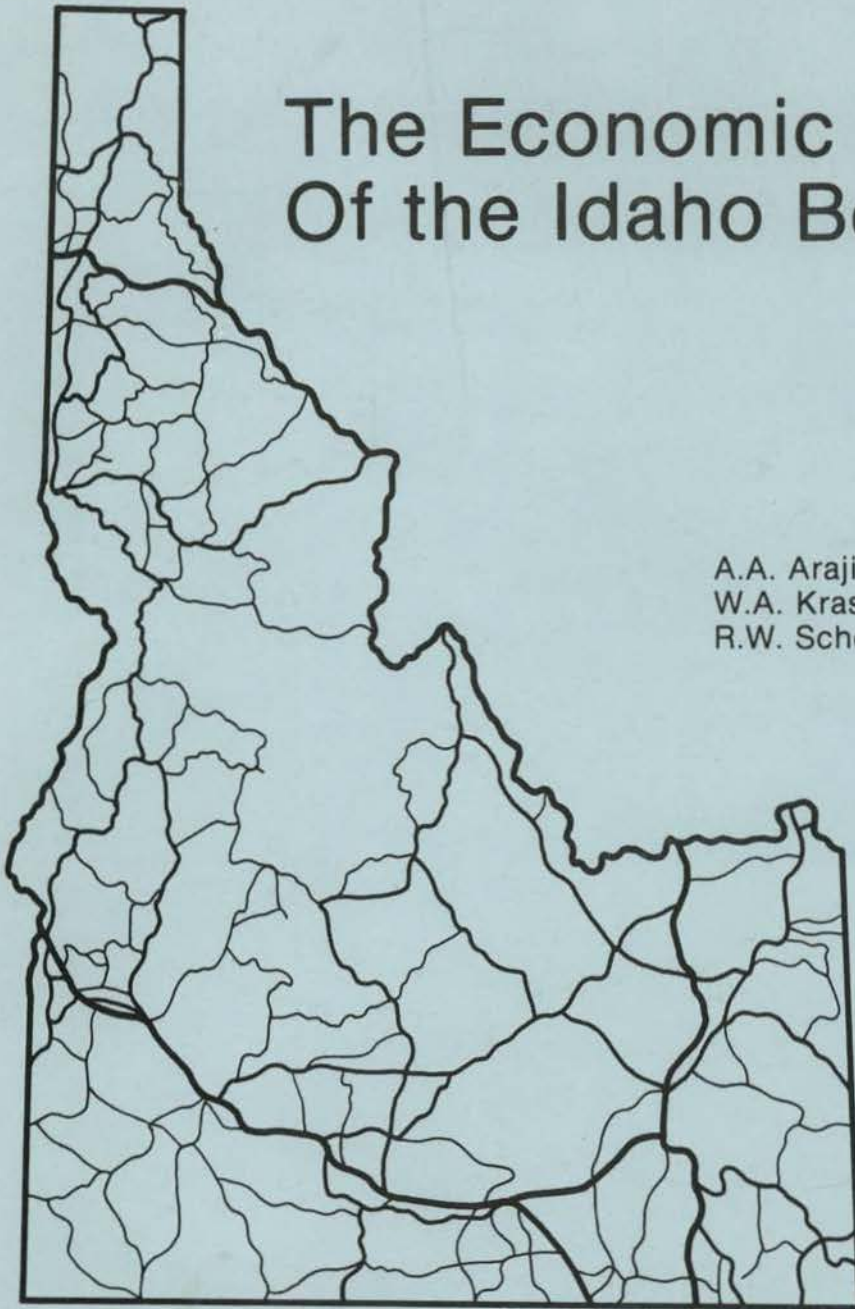
# The Economic Impact Of the Idaho Beef Industry

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## About This Research

This bulletin is the third in a series of four research reports evaluating the economic impact of the beef industry on the economy of Idaho.

The first publication in the series evaluated the movement of beef and beef products between Idaho and other states. The second report evaluated the movement of beef and beef products within Idaho. The final report in the series evaluates and presents alternatives to improve the economic efficiency of the present pattern of beef and beef product movements.

The four reports are:

Bulletin No. 557: The Interstate Movement of Beef and Beef Products.

Bulletin No. 559: The Movement of Cattle and Calves Within Idaho.

Bulletin No. 563: The Economic Impact of the Idaho Beef Industry.

Bulletin No. 583: Cost of Transporting Idaho's Beef and Beef Products.

## The Authors

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# Economic Impact of the Idaho Beef Industry On the State's Growth and Development

A. A. Araji, W. A. Krasselt, R. W. Schermerhorn

Agriculture is the principal component of the Idaho economy and the beef industry is the major segment of Idaho's agriculture. While information on total sales of cattle and calves is reported annually and compared to other agricultural commodities, the total economic impact of the Idaho beef industry on the state's economy has not been evaluated. The economic impact of the beef industry or any of its sectors can be measured by its direct and indirect contributions to the economic growth of the state.

The Idaho beef industry is composed of three major sectors — ranching, feeding, and processing. Economic analysis of these three sectors provides insight into their present contribution and an assessment of their potential contribution for policy formulation relevant to the growth and development of the state.

This study was set up with the following objectives:

1. To estimate the cash receipts from the ranching, feeding, and processing sectors of the Idaho beef industry.
2. To estimate the value added from the ranching, feeding, and processing sectors of the Idaho beef industry.
3. To estimate the total economic impact of the Idaho beef industry on state growth and development.

## Method

Data on the number of animals marketed by class were obtained from brand inspectors' district offices. Average price for each class was used to calculate total receipts. Data on number and class of beef animals slaughtered in Idaho were obtained from Idaho slaughtering plants. Average price for carcass by grade was used to calculate total receipts. Value added for each sector of the beef industry was calculated as payment for taxes, interest, rent, profit, reserve for depreciation, and compensation for management and other employees, including social security. Multiplier coefficient was applied to the value added estimates to determine the economic impact of the various sectors of the beef industry to Idaho's economy.

Part I of the study analyzes total receipts, value added, and the economic impact of the state beef industry on Idaho economic growth and development. Total receipts were estimated for the ranching sector, feeding sector, and

processing sector of the Idaho beef industry. Value added for each sector was estimated and multiplier coefficients were applied to estimate the economic impact of each sector on the State's economy.

## Total Receipts

### Ranching Sector

This sector of the Idaho beef industry sells three classes of animals: feeder cattle, cows, and bulls. No information is available on the number and price of beef animals sold for breeding purposes. Number of animals sold and average price received for each class were used to estimate total receipts.

**Feeder Cattle** — Total receipts from the sales of feeder cattle ( $Y_1$ ) is estimated by the following identity equation:

$$(1) \quad Y_1 = (X_1 \cdot X_2 \cdot X_3)$$

where:

- $X_1$  = Number of feeder cattle produced excluding heifer and bull replacement.
- $X_2$  = Average weight of feeder cattle (600 lb.)
- $X_3$  = Average price received for feeder cattle<sup>1</sup>

**Cull Cows** — Total receipts from the sales of cull cows ( $Y_2$ ) were estimated by the following equation:

$$(2) \quad Y_2 = (X_4 \cdot X_5 \cdot X_6)$$

where:

- $X_4$  = Number of cull cows marketed from Idaho's ranches
- $X_5$  = Average weight per cow (1000 lb.)
- $X_6$  = Average price per cwt received by ranchers for cull cows<sup>2</sup>

<sup>1</sup>Average prices were \$31.10 per cwt for 1971 and \$43.30 for 1973 (9,10).

<sup>2</sup>Average prices were \$20.70 per cwt for 1971 and \$32 for 1973 (9,10).



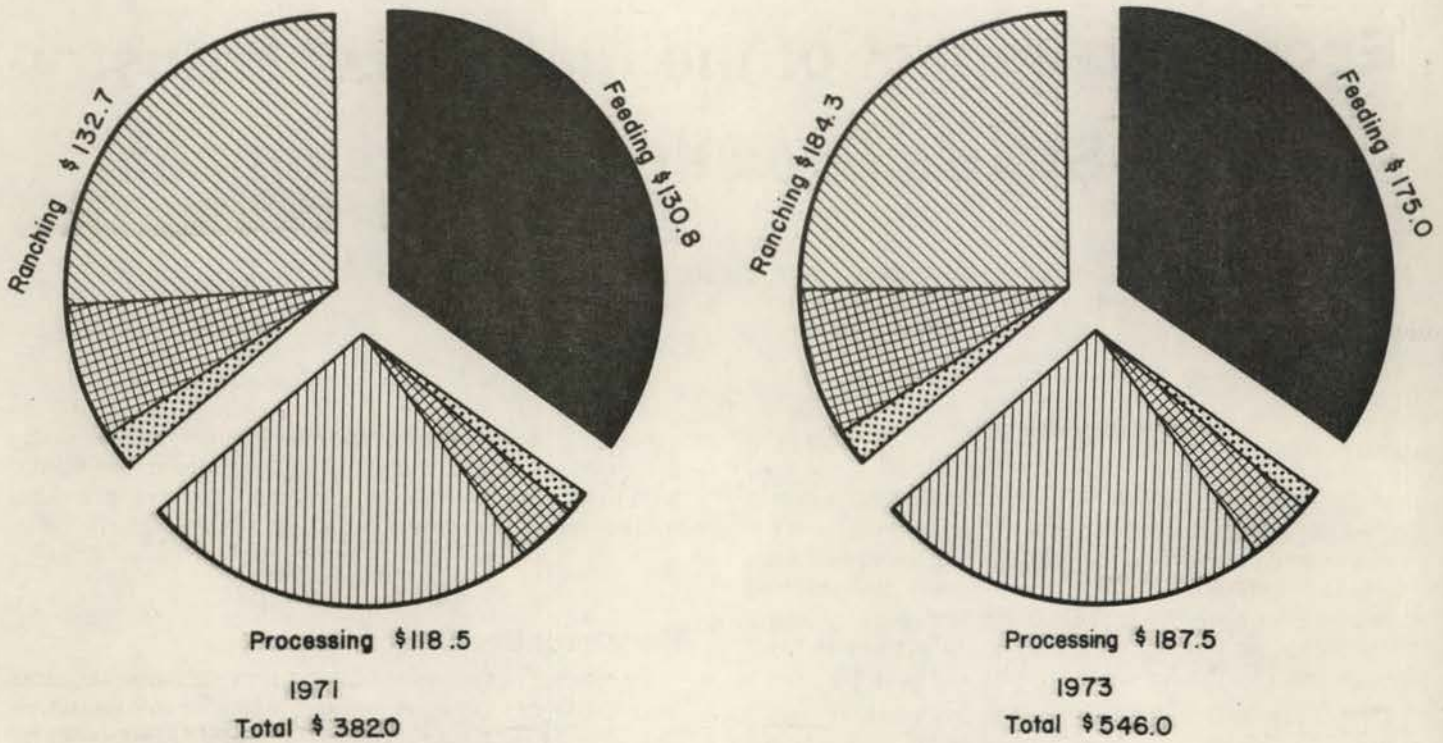


FIGURE - 1 Total Receipts

Table 1. Fed cattle marketed from Idaho feedlots by quarter, 1965-73.

Year	Quarter				Total
	1	2	3	4	
	(1,000 head)				
1965	74	71	62	64	271
1966	81	89	64	71	305
1967	104	98	76	87	365
1968	108	104	102	98	412
1969	112	116	114	98	440
1970	100	103	131	100	434
1971	95	107	124	106	432
1972	112	111	100	105	428
1973	103	100	90	102	395

Source: (5, 9,10).

Table 2. Cattle and calves slaughtered in Idaho, 1965-73.

Year	Number slaughtered (1,000 head)	Year	Number slaughtered (1,000 head)
1965	286.7	1970	385.3
1966	312.7	1971	406.3
1967	335.4	1972	416.5
1968	357.7	1973	452.3
1969	386.7		

Source: 5, 9,10.



**Cull Bulls** — Total receipts from the sales of cull bulls ( $Y_3$ ) were estimated by the following equation:

$$(3) \quad Y_3 = (X_7 \cdot X_8 \cdot X_9)$$

where:

$X_7$  = Number of cull bulls marketed from Idaho ranches

$X_8$  = Average weight per bull (1500 lb.)

$X_9$  = Average price per cwt<sup>3</sup>

## Feeding Sector

Total receipts from the feeding sector of the Idaho beef industry ( $Y_4$ ) were estimated by the following equation:

$$(4) \quad Y_4 = (X_{10} \cdot X_{11} \cdot X_{12})$$

where:

$X_{10}$  = Number of fed cattle marketed from Idaho's feedlots

$X_{11}$  = Average weight of fed cattle marketed (1050 lb.)

$X_{12}$  = Average price received per cwt for fed slaughter cattle<sup>4</sup>

## Processing Sector

Receipts from the processing sector of the Idaho beef industry are composed of the sales of fed beef and cull beef carcasses and hides and by-products.

**Fed Beef** — Total receipts from the slaughtering and processing of fed beef ( $Y_5$ ) were estimated by the following equation:

$$(5) \quad Y_5 = [(X_{13} \cdot X_{14} \cdot X_{15}) + X_{16}]$$

where:

$X_{13}$  = Number of fed steers and heifers slaughtered and processed by Idaho's slaughtering plants

$X_{14}$  = Average carcass weight (600 lb.)

$X_{15}$  = Average price per cwt received by packers for choice grade carcass<sup>5</sup>

$X_{16}$  = By-product value per 1050 lb. steer

**Cull Cows** — Total receipts from the slaughter and processing of cull cows ( $Y_6$ ) were estimated by the following equation:

$$(6) \quad Y_6 = [(X_{17} \cdot X_{18} \cdot X_{19}) + X_{20}]$$

where:

$X_{17}$  = Number of cull cows processed by the Idaho slaughtering plant

$X_{18}$  = Average carcass weight of cull cows (540 lb.)

$X_{19}$  = Average price per cwt received by packer for cull cow beef<sup>6</sup>

$X_{20}$  = By-product value

**Cull Bulls** — Total receipts from the slaughter and processing of cull bulls ( $Y_7$ ) were estimated by the following equation:

$$(7) \quad Y_7 = [(X_{21} \cdot X_{22} \cdot X_{23}) + X_{24}]$$

where:

$X_{21}$  = Number of cull bulls slaughtered in Idaho

$X_{22}$  = Average carcass weight of cull bulls (810 lb.)

$X_{23}$  = Average price per cwt received by packers for carcass bulls<sup>7</sup>

$X_{24}$  = By-product value

Data on feeder cattle production, cattle marketing and Idaho slaughtering plant processing were obtained in companion studies to this report (2, 3, 6). Estimated by-product value was obtained from the National Provisioner (8).

Total receipts estimated by sectors for 1971 and 1973 are shown in Fig. 1. Total 1971 receipts from the sale of beef and beef products were \$382 million, with \$263.5 million from the sale of cattle and calves and \$118.5 million from the sale of carcass, processed beef and by-products. The ranching sector accounted for \$132.7 million (35%) of total sales, the feeding sector \$130.8 million (32%) and the processing sector \$118.5 million (31%).

In 1973, total receipts from the sale of beef and beef products were estimated at \$546.8 million — 43% higher than 1971. This increase was caused primarily by higher beef prices in all sectors and an increased number of animals marketed from the ranching sector. Sales of cattle and calves were \$395.5 million, an increase of 50% over 1971. Sales of carcass, processed beef and by-products were \$187.5 million, an increase of 58% over 1971. The ranching sector accounted for 34% of total sales, the feeding sector 32% and the processing sector 34%.

The decrease in the feeding sector's relative position in 1973 was caused by a decline in the number of fed beef marketed — from 432,000 head in 1971 to 395,000 in 1973 (Table 1). The increase in the processing sector's relative position reflects an increase in number of beef animals processed in Idaho's slaughtering plants and a significant increase in value of by-products. The number of beef

<sup>3</sup>Average prices were \$21.21 per cwt in 1971 and \$32.90 in 1973 (9,10).

<sup>4</sup>Average prices were \$32.42 per cwt in 1971 and \$43.90 in 1973 (9,10).

<sup>5</sup>Average prices were \$51.33 per cwt for 1971 and \$66.61 for 1973 (9,10).

<sup>6</sup>Average prices were \$39.25 per cwt in 1971 and \$58.38 in 1973 (9,10).

<sup>7</sup>Average prices were \$39.25 per cwt in 1971 and \$58.38 in 1973 (9,10).



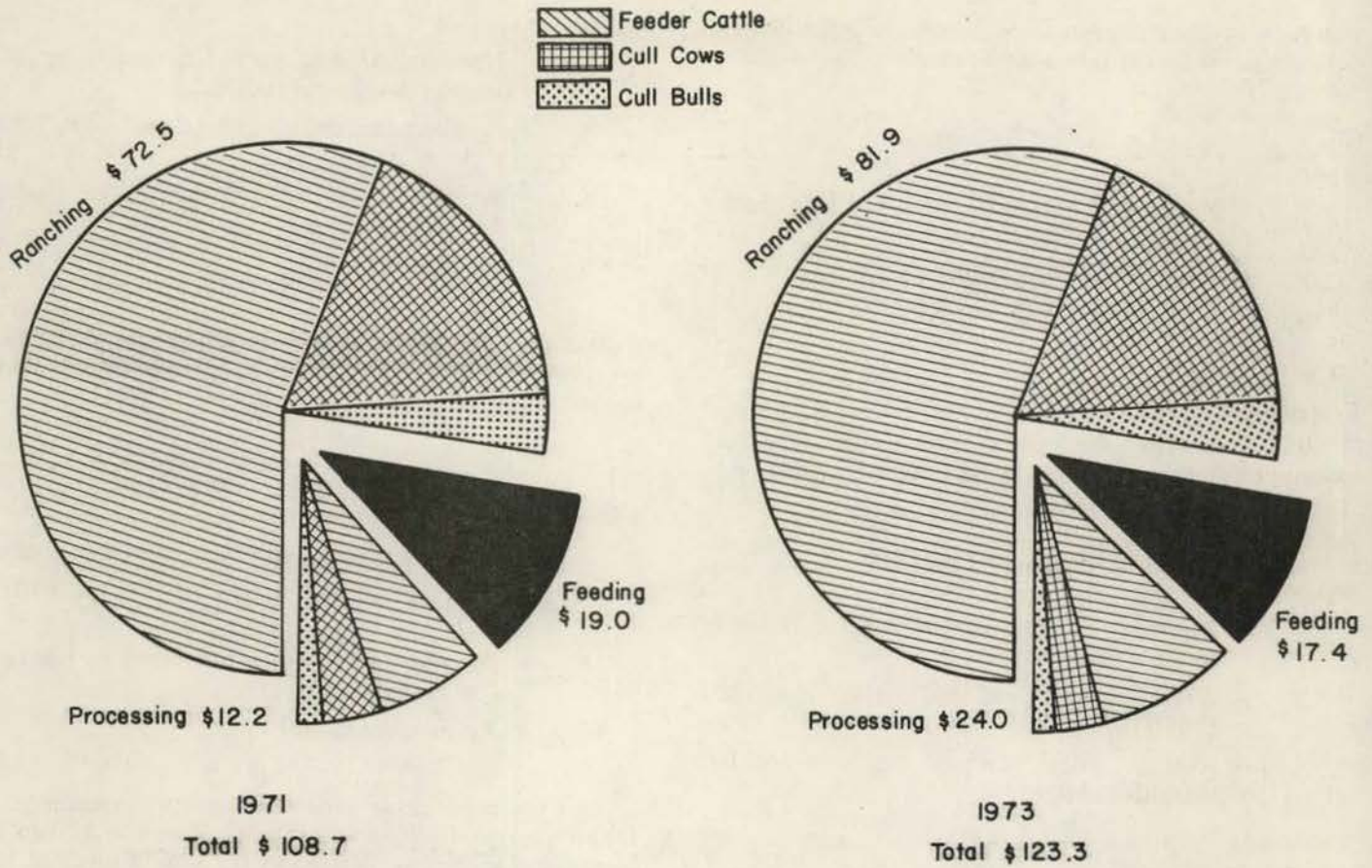


FIGURE - 2 Value Added

Table 3. Estimated feed and miscellaneous cost for feeder cattle.

Feeder ingredient <sup>a</sup>	Wt. lb.	Barley equiv. lb.	Cost \$/Head <sup>b</sup>	
			1971	1973
Alfalfa hay	1000	709	15.17	34.67
Corn silage	2400	615	13.16	30.07
Barley	451	451	9.65	22.053
Total cost		1775	37.98	86.97
Feed cost/lb. gain			12.66	28.99
Salt and minerals			.70	.70
Variable costs for power and equipment			1.40	1.40
Medicine <sup>c</sup>			3.00	3.00

<sup>a</sup>Feed does not include forage from range.

<sup>b</sup>\$42.80 average price per ton of barley paid by Idaho farmers in 1971 and \$97.80 per ton in 1973 were used.

<sup>c</sup>Does not include veterinary fee. Veterinary fee was considered a contribution to labor.



animals slaughtered in Idaho increased from 406,300 head in 1971 to 452,300 head in 1973 (Table 2). By-product value increased from \$22.79 in 1971 to \$45.15 in 1973, representing a 98 percent increase (8).

### Value Added

Value added includes payment for taxes, interest, rent, profits, reserve for depreciation, and compensation to management and other employees, including social security. The procedure for estimating value added by the various sectors of the beef industry is described in following sections.

### Ranching Sector

The ranching sector markets three classes of beef animals — feeder cattle, cull cows and cull bulls.

**Feeder Cattle** — Value added by the feeder cattle subsector ( $V_1$ ) was estimated by the following equation:

$$(8) \quad V_1 = Y_1 - (a_1 + a_2 + a_3)$$

where:

$Y_1$  = Total receipts from the sale of feeder cattle (see equation 1)

$a_1$  = Feed costs excluding AUM cost<sup>8</sup> (calculated from Table 3)

$a_2$  = Vet and medicine (Table 3)

$a_3$  = Miscellaneous cash items (Table 3)

**Cull Cows** — The following equation was used to calculate value added from the sale of cull cows ( $V_2$ ):

$$(9) \quad V_2 = Y_2 - (a_4)$$

where:

$Y_2$  = Total receipts from the sales of cull cows (see equation 2)

$a_4$  = Feed and miscellaneous costs per cull cow<sup>9</sup>

**Cull Bulls** — Value added from the sale of cull bulls ( $V_3$ ) was estimated by the following equation:

$$(10) \quad V_3 = Y_3 - (a_5)$$

where:

$Y_3$  = Total receipts from the sale of cull bulls

$a_5$  = Feed and miscellaneous cost per cull bull<sup>10</sup>

<sup>8</sup>AUM cost was considered as rent and allocated to value added.

<sup>9</sup>Feed cost for cull cows was calculated as the quantity of alfalfa hay consumed per year (1,800 lb.) during the 4-year productive life of the animal times price of alfalfa for the respective year. Feed cost does not include AUM cost. Cost of AUM is considered as rent and thus part of the value added. Miscellaneous costs for minerals and medicine were estimated at \$2 per year for 4 years life of the animal.

<sup>10</sup>An average bull will consume 4,500 lb. of alfalfa hay per year. The productive life of an average bull is estimated at 4 years. Total feed cost, not including AUM, is the product of alfalfa consumed per animal and price of alfalfa for each respective year. Miscellaneous costs were estimated at \$2 per animal per year for 4 years productive life of the animal.

### Feeding Sector

Value added by this sector of the beef industry ( $V_4$ ) is calculated by the following equation:

$$(11) \quad V_4 = Y_4 - [(X_{25} \cdot X_{26} \cdot X_{27}) + (a_6 + a_7)]$$

where:

$Y_4$  = Total receipts from the sales of fed cattle from Idaho's feedlots (see equation 4)

$X_{25}$  = Number of feeder cattle placed on feed

$X_{26}$  = Average weight of feeder cattle (600 lb.)

$X_{27}$  = Average price per cwt paid for feeder cattle

$a_6$  = Feed cost (calculated from Table 4)

$a_7$  = Miscellaneous cost (calculated from Table 4)

### Processing Sector

**Fed Slaughter Beef** — Value added by the processing sector from the slaughter and processing of fed beef ( $V_5$ ) was calculated by the following equation:

$$(12) \quad V_5 = Y_5 - (X_{28} \cdot X_{29} \cdot X_{30})$$

where:

$Y_5$  = Total receipts by the processing sector (see equation 5)

$X_{28}$  = Number of fed slaughter beef processed by Idaho's slaughtering plants

$X_{29}$  = Average liveweight of fed slaughter beef (1050 lb.)

$X_{30}$  = Average price per cwt paid for liveweight fed beef by packers

**Cull Animals** — Value added for the cull animals subsector ( $V_6$ ) was calculated by the following equation:

$$(13) \quad V_6 = X_{31} \cdot \frac{V_5}{X_{28}}$$

where:

$X_{31}$  = Number of cull cows and bulls slaughtered in Idaho

$\frac{V_5}{X_{28}}$  = Value added per processed fed beef<sup>11</sup>

The additional new value the Idaho beef industry pumped into the state's economy was estimated \$108.7 million in 1971 (Fig. 2). The ranching sector contributed 71% of this total new value, the feeding sector 18% and the processing sector 11%.

In 1973, the total new value created by the Idaho beef industry was estimated at \$123.3 million, 14% more than the 1971 estimate (Fig. 2). Value added by the ranching sector represented 66% of the total new value. While the relative share of the ranching sector declined in 1973 from 1971, the absolute contribution of this sector increased by \$4.4 million.

<sup>11</sup>The value added per animal in processing was assumed to be the same for all classes of cattle.



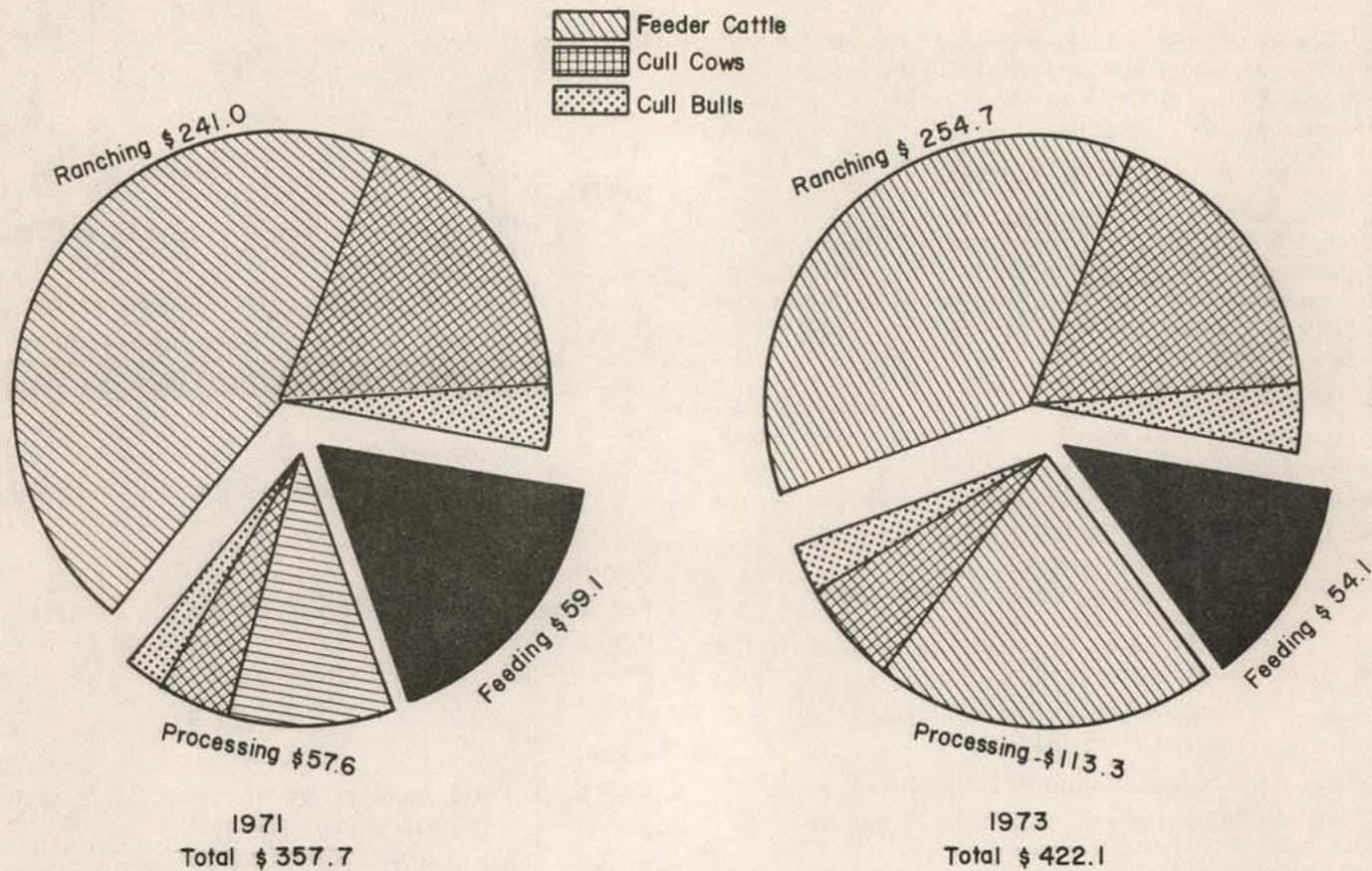


FIGURE -3 Direct & Indirect Impact

Table 4. Estimated feed and miscellaneous cost for finishing beef.

Feed ingredient per ton	Wt. lb.	Barley equiv. lb.	Feed Cost (\$) <sup>a</sup>	
			1971	1973
Barley	1196	1196.0	25.59	58.48
Alfalfa	100	70.9	1.51	3.46
Beet pulp	168	147.5	3.15	7.21
Corn silage	452	115.9	2.48	5.66
Supplement	84	82.0	1.75	4.00
Total	2000	1612.3	34.50	78.84
Feed consumed per animal	2496	2011.3	43.04	98.35
Feed cost/lb. gained	8.63	6.95	14.89	34.03
Salt and minerals			.70	.70
Variable cost for power and equipment			1.78	1.78
Medicine <sup>b</sup>			1.20	1.20

<sup>a</sup>Feed cost is based on barley price of \$42.80 per ton in 1971 and \$97.80 per ton in 1973.

<sup>b</sup>Does not include veterinary fee. Veterinary fee was considered a contribution to labor.



The feeding sector added \$17.4 million of new value in 1973, accounting for 14% of the total value added. Both the relative share and absolute contribution of this sector declined in 1973, basically because of a decrease in number of cattle fed and an increase in feeding costs.

The processing sector contributed \$24 million or 19.5% of the total value added by the beef industry in 1973. This was a 96% increase over 1971, primarily caused by a large increase in the value of hides and fat products.

In summary, the ranching sector accounts for the major part of the value added by the Idaho beef industry, basically because:

1. Larger quantities of beef are marketed by this sector than by the feeding and processing sectors.
2. The cost of feed from range resources is considered as rent and thus allocated to value added.
3. Animals are kept on the ranch longer than in feedlot, causing larger rent and interest payments.

## Economic Impact

What is the economic contribution of the Idaho beef industry to the state's economic growth and development? This section of the report will provide an answer to this question.

The economic impact of an industry or any sector of it is measured by direct, indirect, or induced changes in income. Direct income change is defined as the increased income resulting from each dollar increase in output. Indirect income change is the increase in income per dollar of output resulting from interindustry expansion. Induced income change is the increase in income per dollar of output resulting from increase in consumer spending.

Two pieces of information are needed to estimate the total economic contribution of the beef industry to Idaho's economy: (1) value added or the direct contribution to the state gross product, and (2) multiplier coefficient to estimate the total contribution of the beef industry to gross state product, e.g., the direct, indirect, and induced change in income.

Value added by sectors was estimated in the previous section. Multiplier coefficients for the various sectors of the Idaho economy are not available. These coefficients differ from one state to another depending on the structure of the economy and the relative importance of the various sectors

to the economy of the state. In this study, multiplier coefficients for beef were adopted from an input-output table for the South Saskatchewan River Basin of Alberta (7). Multiplier coefficients of 3.11 for cattle and 4.72 for meat processing were used to estimate the direct and indirect impact of the beef industry on the state economy.

In 1971, the direct and indirect impact of the Idaho beef industry on the state economy was estimated at \$357.7 million (Fig. 3). For every dollar of new value the beef industry added to the economy, \$3.29 of new income was generated directly or indirectly. This new income was used to support employment, investments, and other economic activities in the beef industry and allied industries which provide services for producing, processing, and marketing beef and beef products.

The ranching sector accounted for \$241 million or 67% of the beef industry's direct and indirect contribution to the state economy. The feeding sector accounted for 16.6% and the processing sector contributed 16.4%.

In 1973, the direct and indirect economic impact of the beef industry is estimated at \$422.1 million. This was an increase of \$64.4 million (18%) of new income over 1971. The ranching sector accounted for 60% of the industry's direct and indirect impact in 1973, and the feeding and processing sectors contributed 13% and 27%, respectively.

## Comparison of Total Receipts, Value Added and Direct and Indirect Economic Impact

Table 5 shows total receipts, value added, and direct and indirect economic impact of the Idaho beef industry by sectors in 1971 and 1973. For every \$1 sale by the beef industry, an additional 28.4 cents of new value was added to the Idaho economy in 1971, 22.5 cents in 1973.

In the ranching sector, each \$1 sale added an estimated 58 cents of new value in 1971, 44.4 cents in 1973. In the feeding sector, every \$1 sale created 14.5 cents of new value in 1971 and about 10 cents in 1973. For the processing sector, every \$1 sale created 10.3 cents of new value in 1971 and 12.8 cents in 1973.

The beef industry's direct and indirect economic impact per dollar of sales was 94 cents in 1971 and 77 cents in 1973. Each \$1 sale in the ranching sector contributed \$1.81 of direct and indirect income in 1971 and \$1.38 in 1973; in the feeding sector, 45 cents and 31 cents; and in the processing sector, 49 cents and 60 cents.

Table 5. Total receipts, value added, and economic impact by sectors. Idaho. 1971 and 1973.

Sector	Total Receipts		Value Added		Multiplier coefficient <sup>a</sup>	Direct and Indirect impact	
	1971	1973	1971	1973		1971	1973
Ranching	132.7	184.3	77.5	81.9	3.11	241.0	254.7
Feeding	130.8	175.0	19.0	17.4	3.11	59.1	54.1
Processing	118.5	187.5	12.1	24.0	4.72	57.6	113.3
Total	382.0	546.8	108.7	123.3		357.7	422.1

<sup>a</sup>Direct and indirect multiplier =  $\frac{\text{Direct and indirect income change}}{\text{Direct income change}}$

Source (7).



## Summary and Conclusion

The beef industry is one of the most important components of the Idaho economy. Total receipts from beef and beef products marketed by the three major sectors of the Idaho beef industry were \$382 million in 1971 and \$546.8 million in 1973.

Total receipts by the ranching sector were \$132.7 million in 1971 and \$184.3 million in 1973. Between 1971 and 1973 total receipts of this sector increased by 39%. The feeding sector had total cash receipts of \$130.8 million in 1971 and \$175 million in 1973, an increase of 34%. The processing sector's cash receipts were \$118.5 million in 1971 and \$187.5 million in 1973, an increase of 58%. Primary reason for the increase in total receipts of the three sectors between 1971 and 1973 was the increase in beef prices.

The Idaho beef industry added \$108.7 million of new value to the state's economy in 1971 and \$123.3 million in 1973. The ranching sector accounted for 71% of the value added in 1971 and 66% in 1973. The feeding sector accounted for 18% in 1971 and 14% in 1973. The processing sector contributed 11% of value added in 1971 and 20% in 1973.

The direct and indirect economic contribution made by the Idaho beef industry to the state's economy totaled \$357.7 million in 1971 and \$422.1 million in 1973. The ranching sector accounted for 67% of this total in 1971 and 60% in 1973. The feeding sector's direct and indirect economic contribution was 17% in 1971 and 13% in 1973, and the processing sector's contribution was 16% in 1971, and 27% in 1973.

## Conclusions

This analysis points to the economic viability of the Idaho beef industry and its significance to the growth and development of the Idaho economy. In 1971, the beef industry's direct and indirect contributions accounted for 14% of Idaho's total personal income. In 1973, the beef industry contributed 12% of the state's total personal income.

The Idaho beef industry can significantly increase its contribution to the state's economy. Idaho's range resources have the potential to support substantially more livestock. However, present range conditions cannot economically support any significant increase in livestock. Increased public investment in range improvements will substantially increase the productive capacity of Idaho range resources and thus the economic contribution of the ranching sector to the state's economy.

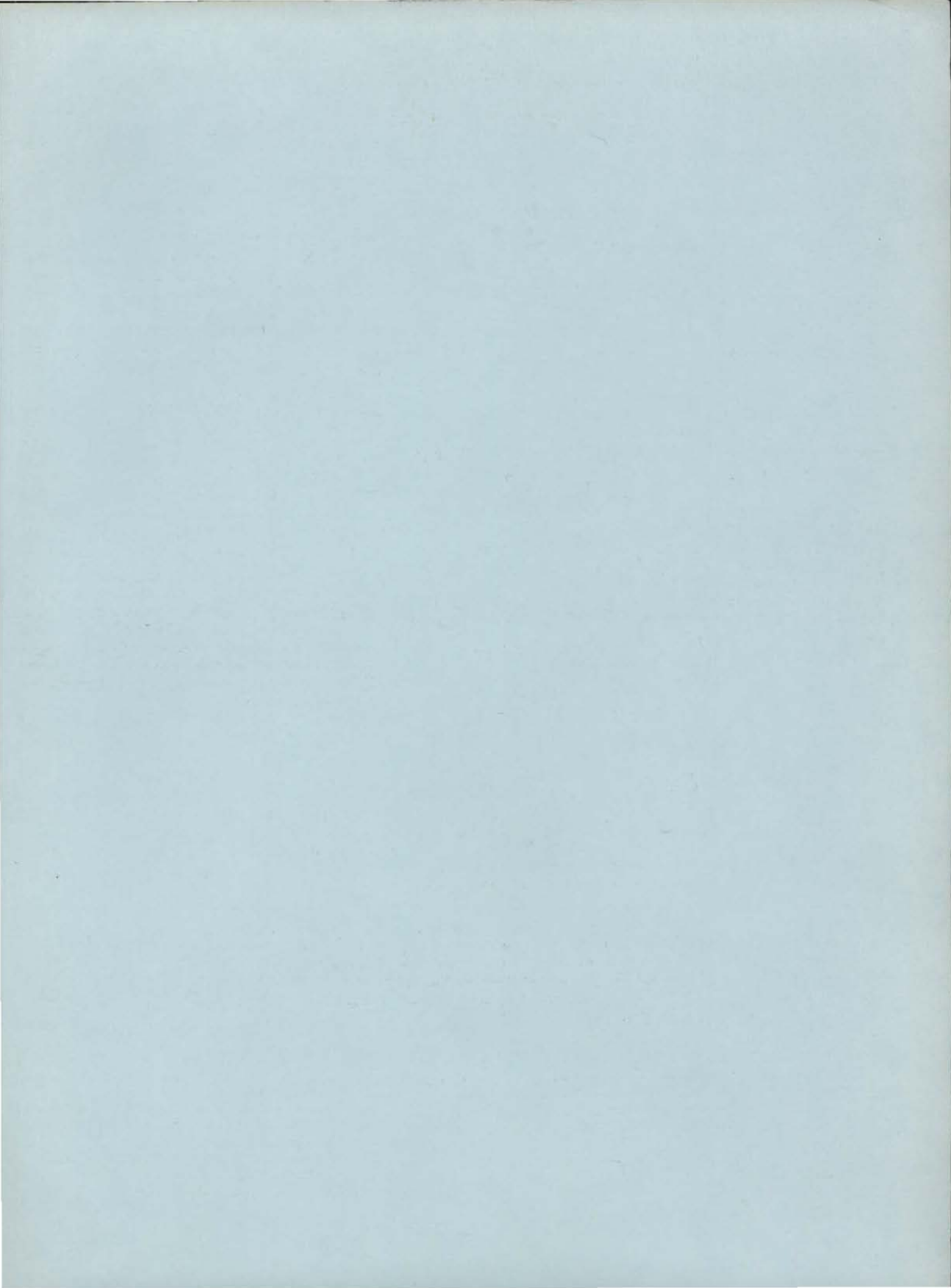
California constitutes the major market for Idaho's beef. In 1971, California had a deficit of 1.2 billion pounds of beef, providing Idaho with a great marketing potential (1). However, significant portions of Idaho's feeder cattle are shipped out for feeding in other states. Idaho's land and water resources have the potential to increase feed grain and hay production and to support additional feeding at competitive cost, thereby, increasing the economic contribution of the feeding sector to the state's economy.

Approximately 55% of Idaho's fed beef is shipped out for slaughter in other states (2). Economic efficiency would be greater if live beef were processed near the source of supply, with the processed products moving to sources of demand (4). Marketing Idaho's fed beef in processed form not only would improve the marketing efficiency of the beef industry but would significantly increase the economic contributions of the processing sector.

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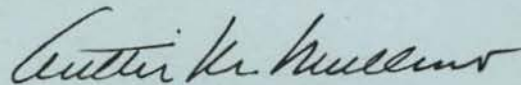
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Auttis M. Mullins  
Dean, College of Agriculture  
University of Idaho



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