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# Idaho Cattle Feeders — How Well Can They Compete?

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## AGRICULTURAL EXPERIMENT STATION

*This study emphasizes factors relating to the production and marketing of beef in the western states. The primary purpose of this report is to evaluate Idaho's competitive position, relative to other western states, in producing and marketing finished beef.*

## Highlights

Cattle feeding is a dynamic industry. Since World War II, the industry has sustained significant developments characterized by a differential growth rate among areas. These growth rates have not always responded to a region's potential for producing agricultural resources basic for finishing cattle. Some areas with a surplus supply of these resources have shown a slow to moderate growth, while others with a deficit supply of these resources have shown a high growth rate. Demand potential, economic structure, and market organization have affected the industry's regional growth pattern.

- Beef production is the major agricultural enterprise in Idaho, representing over 26% of the state's cash farm income receipts. Most of this income has been from fed cattle and calves. Idaho ranks 4th in the western region in the production of fed cattle and 15th among the nation's major cattle feeding states. The growth rate of Idaho's cattle feeding industry has exceeded the regional average during the past 4 years.
- Cattle feeding in Idaho is characterized by a relatively few specialized large feedlots that account for most of the production and large number of farmer-feeders that represent a small part of the production. Cattle feeding is concentrated in the southern part of the state, primarily in the southcentral district.
- The numbers of small feedlots and fed cattle marketed from these lots have substantially declined, while the number and feeding capacity of the large feedlots have increased. The growth of the large feedlots has more than offset the decline in fed cattle produced by the small feeders. In fact, the number of feedlots marketing 1000-head and over increased by 38% and cattle fed by these lots increased by 108% during the 1962-67 period.

- Large feedlots in the western states market about 88% of the region's fed cattle, while large feedlots in the United States account for only 44% of the nation's fed cattle marketings. Although marketings from large feedlots have been increasing in Idaho, the proportion of fed cattle marketed by these lots is below the regional average by about 7%.

- Feedlot ownership in Idaho varies according to size of operation. In general, corporate arrangement is common among the large feedlots while single proprietorships predominate in the smaller feeding operations. Meat packers' ownership of cattle fed in Idaho reached the peak in 1963 and represented about 38% of the state's fed cattle marketings — the highest in the nation. However, both the absolute number and the proportion of fed cattle owned by packers have declined more in Idaho than in other western states and the nation's leading cattle feeding states.

- Demand conditions suggest an expanding total market for beef. This prospect arises from an expanding population, increasing per capita disposable income, uptrend in per capita beef consumption, and decreasing per capita consumption of red meat other than beef.

- Potential supplies of feed grains and roughages from Idaho are large relative to the western region and can be adequate to meet future expansion in the state's cattle feeding industry.

- The rate of growth in the production of beef breed feeder animals in Idaho is lagging behind the rapidly expanding finishing phase of the beef industry. In 1967, for the first time since World War II, Idaho became a deficit producer of beef breed feeder calves. However, an adequate supply of feeder calves is available from the neighboring states of Montana, Utah, and Oregon.

- The production of fed cattle in the western region is highly responsive to: (1) production of alfalfa hay; (2) roughage and grain consuming animal units, other than beef animals, on farms; (3) calf-beef price ratio; and (4) price of beef received by farmers. Looking at Idaho alone, short-run variations in fed beef production appear to be highly responsive to the production of beef breed feeder animals.

- Idaho has a relative advantage in the availability and costs of feed. However, the state's location, away from population centers, is an acute marketing disadvantage. High transportation costs tend to limit Idaho's comparative advantage.

## The Author

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# Idaho Cattle Feeders — How Well Can They Compete?

A. A. Araji

## Part I. Introduction

### Importance of Idaho's Beef Industry

Agriculture is the principle contributor to Idaho's income. Among the 11 western states\* Idaho ranks fourth behind California, Colorado, and Washington in total cash receipts from farm marketings (24). Of all agricultural commodities produced in Idaho, cattle and calves rank first in cash receipts (Table 1). In 1968, cattle and calves accounted for 26.7% of the state's cash farm receipts with an output of \$146 million.

Fed cattle is the primary component of the beef industry in the state. In 1968 Idaho's farmers marketed 412,000 head of grain-fed cattle, which accounted for 59% of all cattle marketed in the state (20, 25).

### The Problem

Idaho is a surplus producer of agricultural resources used in cattle feeding and has the capacity to produce more. An increasing supply of feed grain and roughage; continuous development of new irrigated land; declining demand for Northwest soft wheat, and maximum allocation of land into potato production lead to questions about the most economic utilization of the state's agricultural resources. Expansion of cattle feeding has been considered as the primary alternative.

A thorough analysis of Idaho's potential for producing and marketing fed beef is, therefore, essential for policy decisions. Answers are needed to such questions as: (1) What is the demand outlook for beef; (2) What are the state's advantages in the production and marketing of beef relative to other western states; (3) What limitations may hinder the profitability of fed beef production in Idaho relative to other western states; and (4) What adjustments must be made for optimum use of Idaho's agricultural resources in cattle feeding.

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\* Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon and California.

## Economic Potential and Past Growth

Agricultural resources in Idaho are well suited to cattle feeding. Idaho is a surplus feed grain producer, ranking fourth behind Montana, Arizona, and New Mexico among the western states. Idaho ranks second to California in production of silage and alfalfa hay (20). During each of the next 15 years, approximately 30,000 acres of new land will be brought under irrigation (2). This will add to the state's feed grain and roughage supply.

On the other hand, the number of grain and roughage consuming animals other than beef cattle is declining in Idaho (Fig. 1). Idaho ranks seventh after Montana, Colorado, California, Wyoming, New Mexico, and Oregon in the number of beef cows. However, Idaho had the highest calving rate in the region in recent years (20). Weather conditions in the major cattle feeding areas of the state are conducive to fed cattle production, requiring no protection from the elements (28).

Market outlets and slaughtering plants are well established in Idaho. The state's beef slaughtering capacity exceeds present requirements and can meet any foreseeable expansion in the fed cattle industry (23, 26).

During the 1960-68 period, the number of fed cattle marketed from Idaho's feedlots increased significantly, although the state's position in comparison with the western region showed only a moderate improvement. In 1960 Idaho accounted for 6% of the total fed cattle marketed from western feedlots and ranked fourth in the region, while in 1968 the state marketed 7.1% of the region's fed cattle and again ranked fourth behind California, Colorado, and Arizona (Table 2). In recent

**Table 1. Percentage of cash receipts from farm marketing by major commodities in Idaho, 1964-1968.**

Commodities	1964	1965	1966	1967	1968
Cattle and calves	21.4	23.1	25.9	23.6	26.7
Potatoes	19.9	21.8	19.2	16.4	17.5
Wheat	11.9	10.7	10.8	13.4	11.2
Dairy products	10.7	9.7	10.6	11.4	11.0
Sugar beets	7.7	7.2	5.6	7.5	8.6
Sheep and wool	4.9	4.8	4.3	4.1	4.4
All hay	3.9	3.8	4.9	3.6	3.3
Barley	3.2	3.3	3.1	2.9	2.7
Dry beans	2.5	2.4	3.0	2.2	2.2
Poultry and eggs	2.1	1.9	2.2	2.0	1.8
Hogs	1.3	1.4	1.4	1.3	1.3
All others	10.5	9.8	9.1	11.5	9.3
Total (\$1,000)	456,658	505,615	534,043	514,500	546,100

Source: U.S. Department of Agriculture, Economic Research Service. Farm Income — State Estimates.

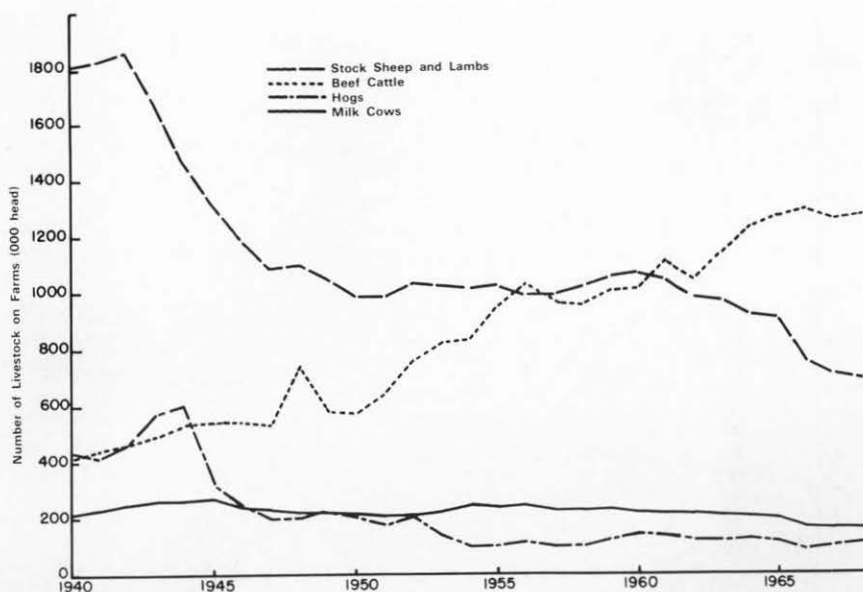


Fig. 1. Total beef cattle, milk cows, hogs, and sheep and lambs on farms in Idaho on January 1, 1940 to 1968.

years Idaho cattle feeding industry has shown a high annual growth rate, ranking third to New Mexico and Colorado in the western region (Fig. 2). Oregon is the only other western state that has a growth rate above the regional average.

The economic structure of the industry and transportation costs associated with the relatively long distances cattle are hauled to the

Table 2. Fed cattle and calves marketed by western states as a percentage of the western region.

State	1960	1964	1965	1968
Montana	3.0	2.6	2.6	2.7
Idaho	6.0	5.3	5.0	7.1
Wyoming	2.2	1.2	1.2	1.2
Colorado	19.2	19.7	21.3	24.4
New Mexico	2.9	3.4	3.2	5.4
Arizona	12.2	12.4	12.1	12.0
Utah	3.1	2.8	2.3	1.7
Nevada	1.2	0.8	0.9	1.0
Washington	5.7	6.0	5.7	5.7
Oregon	3.0	3.0	3.1	3.1
California	41.5	42.7	42.5	35.6
Western states (1,000 head)	3,839	4,828	5,374	5,812

Source: U.S. Department of Agriculture (25).

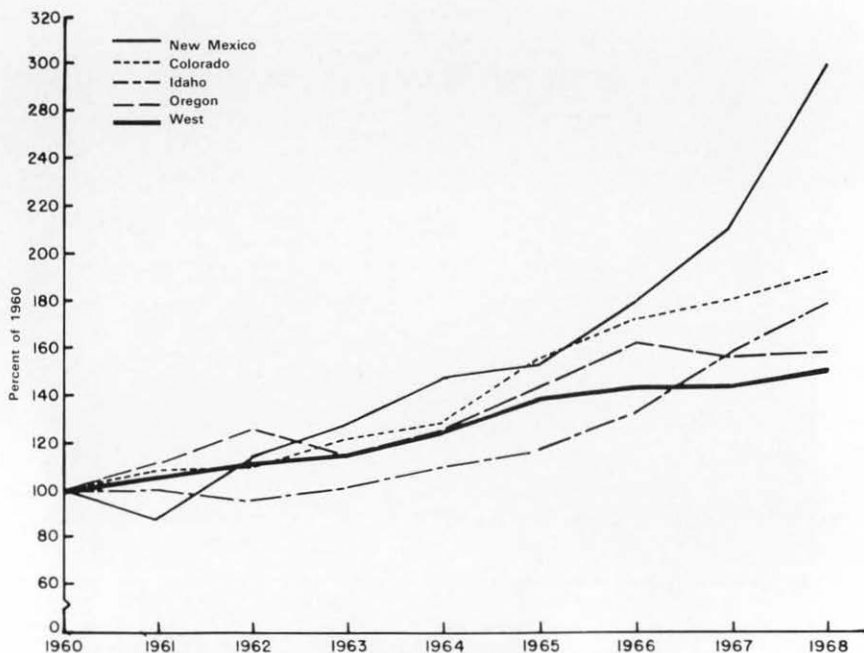


Fig. 2. Trends in numbers of fed cattle and calves marketed in selected western states, 1960 to 1968.

markets are the major disadvantages of the state's cattle feeding industry. In 1968, Idaho furnished 1.8% of the fed cattle marketed in the United States and ranked 15th among the major cattle feeding states.\*

### Objectives of the Study

Among the economic factors that might contribute to the cattle feeding industry's differential growth rates among areas are:

1. Economies associated with beef-livestock-feed interrelationships.\*
2. Economies associated with organization, scale of operation, and extent of technological adoption.
3. Economies associated with the availability and production efficiency of market outlets.

\*The leading cattle feeding states in order of importance and approximate percentage of total U.S. cattle fed are: (1) Iowa 18.5%, (2) Nebraska 15.1%, (3) California 9%, (4) Texas 8.6%, (5) Colorado 6.2%, (6) Kansas 5.8%, (7) Illinois 5.6%, (8) Minnesota 4%, (9) Missouri 3.1%, (10) Arizona 3.1%, (11) South Dakota 2.9%, (12) Indiana 2.1%, (13) Ohio 2%, (14) Oklahoma 1.8%, (15) Idaho 1.8%, (16) all others 10.5%.

\*Beef-livestock-feed interrelationships as used here refer to relationships among number of beef animals on farms, number of grain and roughage-consuming animal units other than beef cattle on farms, and the availability of concentrate and roughage.



4. Economies associated with opportunity cost.
5. Economies associated with transportation costs.
6. Economies associated with climatological factors.

With these factors in mind, the primary objective of this study is to evaluate Idaho's economic potential for producing and marketing fed cattle relative to other western states, and specifically to:

1. Analyze the economic structure of Idaho's cattle feeding industry.
2. Evaluate the state's relative advantage in production and costs of the resources basic for cattle feeding, and to estimate the production process and the supply response for fed beef.
3. Analyze Idaho's potential for marketing fed beef.

### Method of Study

Data on the number, size, and location of Idaho feedlots were obtained from the Idaho Crop and Livestock Reporting Service and the U.S. Department of Agriculture Statistical Reporting Service. The economic structure of Idaho's cattle feeding industry was analyzed and compared to the structure of the cattle feeding industries in other western states. The structural effect of the fed beef industry upon the economic feasibility and extent of technological adoption was examined.

Data on type of ownership, extent of integration, source of resources, selling and buying methods, etc., were obtained by questionnaires mailed to all cattle feeders with a feeding capacity of 100 head or more. Over 55% response was obtained in three attempts. A random sample of non-respondents was contacted by telephone and their remarks were compared with those who had answered previously. Duncan's Multiple Range Test was employed in comparing respondents and non-respondents with respect to ownership, extent of integration, source of resources, and selling and buying methods. No significant difference was detected at  $P \leq .05$ .

The availability and costs of the agricultural resources basic for finishing cattle, feed conversion efficiency, the effect of climatological elements, availability of market outlets, and transportation costs were evaluated for Idaho and other western states.

Stepwise multiple regression was used to estimate the supply response for fed cattle. The same procedure was also used on reduced form equations to estimate the demand functions for beef.

Table 3. Number and size distribution of cattle feedlots in the western states, 1962 and 1967.

State	1962 feedlot capacity				1967 feedlot capacity				% increase (decrease) 1962 to 1967			
	Under 1,000 head		1,000 head and over		Under 1,000 head		1,000 head and over		Under 1,000 head		1,000 head and over	
	No. lots	Cattle markd.	No. lots	Cattle markd.	No. lots	Cattle markd.	No. lots	Cattle markd.	No. lots	Cattle markd.	No. lots	Cattle markd.
		(000)		(000)		(000)		(000)	%	%	%	%
Montana	577	60	23	40	461	54	39	110	(2)	(10)	69	175
Idaho	870	79	60	142	653	69	83	296	(25)	(13)	38	108
Wyoming	600	69	12	12	495	39	19	24	(18)	(43)	58	100
Colorado	1,200	233	80	582	1,172	281	94	1,049	(2)	21	18	80
New Mexico	96	26	34	103	66	12	54	266	(31)	(54)	59	119
Arizona	95	36	94	532	11	7	65	651	(88)	(81)	(31)	22
Utah	962	82	15	29	504	62	17	33	(48)	(24)	13	14
Nevada	105	13	13	17	49	7	18	48	(53)	(46)	38	182
Washington	585	108	39	150	321	72	36	243	(45)	(33)	(8)	62
Oregon	603	63	45	85	445	43	45	138	(26)	(38)	0	62
California	305	42	300	1,802	231	31	300	2,018	(24)	(26)	0	12
Total west	5,998	811	715	2,774	4,408	677	770	4,836	(26.5)	(16.5)	7.6	74.3

Source: U.S. Department of Agriculture, Statistical Research Service. 1968. Number of cattle feedlots by size group and number of fed cattle marketed, 1962-1967. SRS-14.

## Part II. Economic Structure Of the Cattle Feeding Industry

Given the potential for beef production, the relative profitability of cattle feeding between areas is influenced by management practices, scale of operation, and extent of specialization (5). The cattle feeding industry in Idaho is characterized by relatively few large feedlots, which represent over 82% of the production, and by large numbers of farmer-feeders, representing less than 18% of the production.\* The trend is toward more concentration in large-scale feeding operations.

### Structural Trend in the Western Cattle Feeding Industry

Before World War II, small-volume farmer-feeders produced virtually all of the fed cattle in the United States. They are still the primary feeders nationally (31), producing 54.5% of fed cattle marketed in 1967. In the western region, however, large feeding operations produce most of the fed cattle. In 1962, large feedlots produced 77.3% of fed cattle marketed in the western region; in 1967, this had increased to 87.7%. From 1962 to 1967, production of fed cattle by large feedlots in the western region had increased by 74.3%, while the number of these feedlots increased by only 7.6%. The sharp increase in production by these large feedlots is primarily the result of internal expansion. The number of farmer-feeders declined by 26.5% and the production of fed cattle in this size group decreased by 16.5% during this same period (Table 3).

The relative importance of farmer-feeders in the production of fed cattle declined in all western states during the 1962-67 period. In Idaho, the number of farmer-feeders and the production of fed cattle by this group declined by 25 and 13%, respectively, while the number of large feeding operations and their production increased by 38 and 108%.

#### Economies of Scale and Structural Changes

The rapid growth of large-scale feeding operations has been stimulated by lower per unit costs associated with the increase in size, although these economies by themselves do not explain the whole dimension of structural changes within the industry. Economy of scale

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\*Large feedlots are defined as those having the capacity and equipment necessary to feed 1,000 head or more through a fattening period. Farmer-feeders are defined as those having the capacity and equipment necessary to feed less than 1,000 head annually.

studies suggest that internal or "in-plant" cost savings beyond 5,000 head are insignificant (7, 32). External cost-savings factors that have contributed to the increased size of feedlots include: (1) large-scale procurement of feeder cattle; (2) procurement and transportation to the feedlots of feed ingredients; (3) large-scale marketing and distribution of fed cattle; (4) wider and more accurate knowledge regarding alternative prices and future market outlooks; and (5) flexibility in selling the finished product.

#### Future Outlook of Farmer-Feeders

The trends to large-scale feeding operations and large-scale processing and distribution facilities that demand a steady supply of quality products raise considerable doubt about the future of farmer-feeders. With the increase in number and volume of large feeding operations in the western region, farmer-feeders often find it difficult to buy feeder cattle at competitive prices. Financing is a problem for the small feeder. Even if he can obtain financing, he may be forced to pay higher interest rates. And his cattle may yield up to 4% less than those finished by the large-scale feeders (31). The small numbers of cattle involved and the relatively lower yield of the finished cattle tend to limit the market outlet for the farmer-feeders.

While internal economies of scale may not be an immediate threat to the competitive position of farmers-feeders (10), these external economies associated with developments in production and marketing phases of the industry severely test the farmer-feeders' abilities to fit into the evolving economic structure.

Table 4. Number and size distribution of cattle feedlots by crop reporting district, Idaho, 1969.

Size range (head)	Districts				Total
	North	Southwest	Southcentral	East	
Below 50	8	40	112	108	268
50- 99	5	18	25	39	87
100-299	3	30	69	39	141
300-499	-	9	10	11	30
500-999	-	6	11	6	23
Sub-total	16	103	227	203	549
1,000- 1,999	1	12	14	9	36
2,000- 3,999	-	12	6	6	24
4,000- 6,999	-	9	4	5	18
7,000-11,999	-	1	2	1	4
12,000-19,999	-	-	1	1	2
20,000 and over	-	-	2	1	3
Sub-total	1	34	29	23	87
Total	17	137	256	226	636

Source: U.S. Department of Agriculture, Statistical Reporting Service, Idaho Livestock and Crop Reporting Service, Boise.

## Geographical Distribution of Idaho's Cattle Feeding Industry

Three areas — the southwest, southcentral and east — are the principle cattle feeding areas in Idaho. The southcentral area had 40.3% of the feedlots in 1969, while the east and southwest areas had 35.5 and 21.5% (Table 4). In terms of capacity, the southcentral area represented 65.8% of farmer-feeder capacity and 41.2% of large feedlot capacity. The southwest area accounted for 14.2% of the farmer-feeder capacity and 36.3% of the large feedlot capacity, and the eastern area represented 17.3% of the farmer-feeder capacity and 22.5% of the large feedlot capacity.

In 1969, Idaho's feedlot capacity was estimated at 362,000 head for any one fattening period. Assuming an average turnover of two times per year, the state's feedlots have the capacity to produce over 700,000 head per year. Fed cattle marketed from Idaho's feedlots, however, were estimated at 412,000 head. Many feedlots, especially those below 1,000-head capacity, reported annual fed cattle production below what their facilities can handle for one fattening period.

### Legal Ownership

Among the western states, corporate feeding operations are most common in Idaho, Colorado, California, and Arizona (31). In Idaho, corporate form of ownership is more frequent among the large feeding operations, while single proprietorship is the dominant form among the farmer-feeders.

#### Custom Feeding

Most of the custom feedlots are in California and Arizona (31). However, custom feeding is becoming more important in Idaho, and large-scale custom feeding operations are being established. In 1968 approximately 13% of the cattle fed in Idaho were custom fed primarily for ranchers, packers, and investors.

#### Packers' Ownership

The western region's relative share of cattle and calves fed by or for meat packers is declining. In 1963 the region had 54.5% of total cattle and calves fed by or for meat packers. In 1968, however, the region accounted for only 46.1% of these cattle and calves. California led the region, followed by Washington, Arizona, Idaho, Colorado, New Mexico, Utah, Montana, and Oregon.

Packers' ownership of fed cattle and calves has declined more in Idaho than in other western states. In 1963, packers owned 74,000 head of fed cattle and calves in Idaho. This was 31.7% of the fed cattle and calves marketed in the state and 6.3% of the total fed by or for meat packers in the United States. Idaho led the nation in percentage of fed cattle and calves owned by packers that year. In 1968, however, pac-

Table 5. Cattle and calves fed by or for meat packers, packer feeding as percentage of fed cattle marketings, and percentage of packers' cattle fed in each western state, 1963 and 1968.

State	Cattle fed by packer			% of state fed cattle marketings fed by packer			% of packers' cattle fed in the state		
	1963	1968	increase (decrease)	1963	1968	increase (decrease)	1963	1968	increase (decrease)
	(000)	(000)	%	%	%	%	%	%	%
Montana	15.6	14.5	(7.0)	15.6	9.2	(6.4)	1.3	1.0	(0.3)
Idaho	73.9	37.3	(49.5)	31.7	9.1	(22.6)	6.3	2.7	(3.6)
Wyoming	*	*							
Colorado	64.5	54.3	(15.8)	7.2	3.8	(3.4)	5.5	3.9	(1.6)
New Mexico	32.4	18.7	(42.3)	22.3	5.9	(16.4)	2.8	1.3	(1.5)
Arizona	75.7	79.8	5.4	12.5	11.4	(1.1)	6.4	5.7	(0.7)
Utah	19.8	19.6	(1.0)	17.4	19.6	2.2	1.7	1.4	(0.3)
Nevada	*	11.4			19.0			0.8	
Washington	78.5	144.0	81.6	29.4	43.4	14.0	6.7	10.3	3.6
Oregon	5.9	9.2	55.9	4.4	5.1	0.7	0.5	0.7	0.2
California	273.4	255.3	(6.6)	14.4	12.3	(2.1)	23.3	18.3	(5.0)
Western region	639.7	644.1	0.6	14.2	11.0	(3.2)	54.4	46.1	(8.3)

\* Fewer than 5,000 head.

Source: U.S. Department of Agriculture, Consumer and Marketing Service. 1966 and 1969. Packers and stockyards resume. Washington, D.C.

packers' ownership amounted to only 37,000 head, representing 9.1% of Idaho's marketings and 2.7% of the total cattle and calves fed by or for meat packers. Among the western states, Washington significantly increased the number and proportion of fed cattle and calves owned by packers during the 1963-68 period (Table 5).

The development of large-scale feeding operations and the deficit supply of resources basic for cattle feeding have generally contributed to the decline in packers' ownership of fed cattle and calves in the western region.

## Integration

Vertical integration is evident in the Idaho beef industry. Backward integration by cattle feeders to secure a supply source of feeder calves is also increasing. In 1969, farmer-feeders produced over 35% of the feeder calves they placed on feed, while the large feeding operations produced 12% of their feeder calves.

The rapid growth in Idaho of large-scale feeding operations, capable of providing a steady supply of quality products demanded by meat packers, and high transportation costs to the markets have minimized the packers' incentive to expand their backward integration into the production phase of the beef industry.

## Part III. Idaho's Economic Potential For Producing and Marketing Fed Beef

The number of fed cattle marketed from Idaho's feedlots increased by over 78% from 1960 to 1968. Among the western states, Idaho ranked third behind New Mexico and Colorado in the growth of the cattle feeding industry during this period (Table 6).

The growth potential of the beef industry in any area is affected by factors associated with (1) demand, (2) the availability and costs of resources essential for production, (3) marketing costs of processing and distribution, and (4) the economic structure and productive efficiency of the fed beef industry.

### Demand for Beef

Analysis of the quantity of beef demanded, retail price of fed beef, price of fed beef received by farmers, and price of feeder calves is essential for assessing changes in the production of fed beef. All variables included in the demand analysis for beef are U.S. averages unless otherwise specified. Variables representing prices received by farmers were deflated by the Index of Prices Received by Farmers (1957-59=100). Variables representing income, retail prices, and wages

**Table 6. Total fed cattle marketed by state, percentage of western region marketings, and percentage change, western states, 1960 and 1968.**

State	1960		1968		% increase (decrease) 1960 to 1968
	Total	% of region	Total	% of region	
	(000)		(000)		
Montana	115	2.99	157	2.70	36.52
Idaho	231	6.01	412	7.08	78.35
Wyoming	82	2.13	69	1.18	(15.85)
Colorado	738	19.22	1417	24.38	92.00
New Mexico	113	2.94	316	5.43	179.64
Arizona	466	12.13	698	12.00	49.78
Utah	117	3.04	100	1.72	(14.52)
Nevada	45	1.17	60	1.03	33.33
Washington	220	5.73	332	5.71	50.90
Oregon	117	3.04	183	3.14	56.41
California	1595	41.54	2068	35.58	29.65
Total region	3839	100	5812	100	51.39

Source: U.S. Department of Agriculture (25).



were deflated by the Consumer Price Index (1957-59=100). Twenty-one annual (time series) observations (1948-68) were analyzed. For the purpose of statistical analysis, the following variables are defined:

- $X_1$  = Retail price of fed beef per pound, year  $t$ ,
- $X_2$  = Farm price of fed beef per pound, year  $t$ ,
- $X_3$  = Average hourly earning of manufacturing meat products,
- $X_4$  = Price of feeder steer, \$/cwt., at eight markets, year  $t$ ,
- $X_5$  = Number of dairy breed feeder animals available for feeding, year  $t$ ,
- $X_6$  = Quantity of beef demanded, year  $t$ ,
- $X_7$  = Population of the United States, including the armed forces, year  $t$ ,
- $X_8$  = Per capita disposable income, year  $t$ ,
- $X_9$  = Civilian population, year  $t$ ,
- $X_{10}$  = Civilian per capita consumption of beef, year  $t$ ,
- $X_{11}$  = Civilian per capita consumption of pork, year  $t$ ,
- $X_{12}$  = Quantity of beef purchased by the government, year  $t$ , and
- $X_{13}$  = Net import-export, year  $t$ .

Functional relations, along with the associated coefficient of multiple determination and elasticity coefficients<sup>\*</sup>, were estimated for the retail price of fed beef, the farm price of fed beef, the price of feeder calves, and the quantity of beef demanded.

The quantity of beef demanded is

$$(1.1) \quad X_6 = -18446919.55 + 159.13 X_7 + 2761.71 X_8$$

(39.98)                      (1460.41)

$$R^2 = .966$$

$$E_{X_7} = 6.36$$

$$E_{X_8} = 1.01$$

where

$$X_6 = (X_9 \cdot X_{10}) + (X_{12} + X_{13}).$$

Retail price of fed beef is

$$(1.2) \quad X_1 = 108.60 + .033X_8 - .923X_{10} - .161X_{11}$$

(.003)                      (.120)                      (.022)

$$R^2 = .873$$

$$E_{X_8} = .01$$

$$E_{X_{10}} = -.78$$

$$E_{X_{11}} = -.19$$

Farm price of fed beef is

$$(1.3) \quad X_2 = -0.672 + 0.934X_1 - 0.0104X_3$$

(.051)                      (.008)

$$R^2 = .954$$

$$E_{X_1} = .58$$

$$E_{X_3} = .02$$

\* Each elasticity was calculated at the point of mean,

$$\frac{\partial X_i}{\partial X_j} \cdot \frac{\bar{X}_j}{\bar{X}_i}$$

Feeder calf price is

$$(1.4) X_4 = -14.94 + .350X_2 - .0002X_5$$

$$\begin{aligned} R^2 &= .866 \\ E_{X_2} &= .65 \\ E_{X_5} &= -.21 \end{aligned}$$

### Interpretation of the Results

The quantity of beef demanded is highly responsive to per capita disposable income and population. Since both are increasing (19), quantity of beef demanded can be expected to increase.

Retail price of fed beef is a function of disposable income, beef consumption, and pork consumption per capita. Per capita disposable income accounted for over 55% of the explained variation in the retail price of beef, while per capita pork consumption and per capita beef consumption represented 26 and 19% respectively. Per capita pork consumption is decreasing while per capita beef consumption is increasing (Fig. 3). The future outlook for retail price of beef is favorable.

Farm price of fed beef depends on the retail price and wages paid in the meat packing industry. However, the impact of meat packing industry wages on the farm price of fed beef is minimal. For every \$1 increase in wages, only 2 cents is charged to the fed beef producer in terms of lower price for his beef and 98 cents is either passed to the consumer as an increase in retail price of beef or taken by the packers as cut in profit. Every \$1 change in retail price of fed beef causes 58 cents change in the farm price of fed beef.

Feeder calf price is a function of farm price of fed beef and the number of dairy breed feeder calves available for feeding. Farm price of fed beef represented over 82% of the explained variation in the price of feeder calves.

In general, all demand indicators point toward favorable future outlook for quantity of beef demanded, price of fed beef at the farm and retail levels, and price of feeder animals.

## The Production Aspect of the Cattle Feeding Industry

Idaho's competitive advantage in the production of fed cattle, relative to other western states, is hypothesized to be influenced by:

1. Availability and costs of concentrates.
2. Availability and costs of roughage.
3. Availability and costs of feeder calves.
4. Feed conversion efficiency and cost of 100 lb. gain.
5. Climatological factors.
6. Availability and costs of labor.
7. Organization, management, and extent of technological adoption.

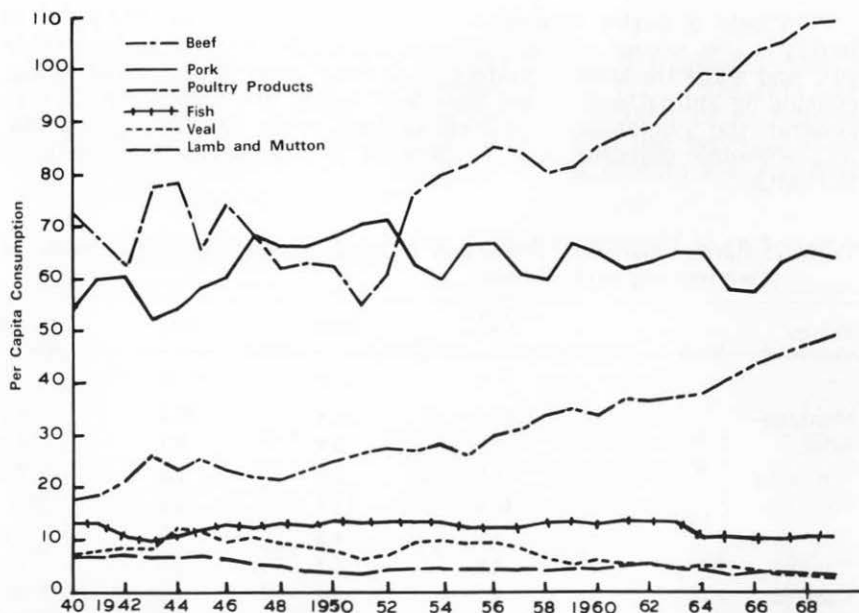


Fig. 3. Pounds of red meat, poultry, and fish consumed per capita (civilian) in the United States, 1940 to 1969.

### Feed Grain

In the western region, the proportion of grain used in cattle finishing rations ranged from 20 to 68% (12). Arizona, Oregon, Montana, California and New Mexico feeders used high-level grain rations, with 68, 63, 60, 58, and 50% grain, respectively. On the other hand, Idaho, Colorado, Wyoming, Washington, and Nevada feeders used rations with 39, 33, 32, 27, and 20% grain. Barley is the primary grain used in cattle feeding rations in Montana, Oregon, California, and Idaho. Feedlots in New Mexico and Arizona depend primarily on milo in their cattle feeding ration, while Colorado utilizes both corn and milo (12).

Idaho ranks fourth in the western region in feed grain production (Table 7). In general, the region is a deficit feed grain area, particularly California, but Montana, Arizona, New Mexico, and Idaho are surplus feed grain states (Table 8). Idaho's potential for feed grain production is increasing. An estimated 1/2 million acres of irrigated land, at an approximate rate of 30,000 acres per year, will be added to production by 1985 (2).

Barley is the major feed grain produced in Idaho, accounting for 88% of the barley equivalent produced in 1969. Most of the state's feed grain is produced in the principal cattle feeding areas. In 1969, the southcentral, southwest, and eastern districts produced more than 78% of the state's barley equivalent (Table 9). The eastern district alone produced 49.2% of the total.

Idaho ranks third among western states in silage production following California and Colorado (Table 11), and is second to California in alfalfa hay production (Table 12). The state's production of silage and alfalfa hay is increasing.

Potato by-products are utilized in some cattle finishing rations in Idaho. Large quantities of potato by-products are produced in Idaho each year, which further augments the state's supply of roughages.

**Table 11. Silage production in the western states as a percentage of western region production.**

States	1960	1964	1965	1968
	%	%	%	%
Montana	6.2	4.5	6.3	7.0
Idaho	11.1	11.2	10.1	10.8
Wyoming	3.8	3.0	3.2	4.3
Colorado	31.5	33.2	35.8	35.4
New Mexico	5.6	7.1	4.2	5.8
Arizona	8.7	5.0	5.2	3.2
Utah	7.0	5.9	5.6	6.5
Nevada	0.9	1.0	1.0	0.8
Washington	5.2	7.3	6.3	6.0
Oregon	4.0	4.1	3.6	3.6
California	16.0	17.7	18.6	16.6
Region (1,000 tons)	8089	8350	9152	11523

Source: U.S. Department of Agriculture (20).

**Table 12. Alfalfa hay production in the western states as a percentage of western region production.**

State	1960	1964	1965	1968
	%	%	%	%
Montana	9.8	10.3	10.2	11.4
Idaho	14.4	14.6	14.5	16.2
Wyoming	4.0	4.4	4.6	5.5
Colorado	10.8	9.6	9.3	9.0
New Mexico	3.2	3.5	3.4	4.0
Arizona	6.0	4.8	5.2	4.9
Utah	6.1	6.0	6.7	6.9
Nevada	1.9	2.1	2.4	2.6
Washington	5.4	6.5	8.0	8.1
Oregon	5.3	5.9	5.7	5.5
California	33.1	32.2	30.0	25.9
Region (1,000 tons)	17,985	19,773	20,965	22,930

Source: U.S. Department of Agriculture (20).

Table 13. Western state alfalfa hay prices in comparison with average price in the western region.

State	1960		1964		1965		1969	
	Over avg	Under avg	Over avg	Under avg	Over avg	Under avg	Over avg	Under avg
	%	%	%	%	%	%	%	%
Montana	-	-	-	8	-	5	-	2
Idaho	-	9	-	15	-	11	-	21
Wyoming	6	-	-	10	-	6	-	19
Colorado	-	2	16	-	7	-	-	0.4
New Mexico	2	-	6	-	7	-	11	-
Arizona	2	-	6	-	7	-	2	-
Utah	7	-	-	9	-	1	-	8
Nevada	10	-	-	8	-	1	-	0.7
Washington	-	10	-	3	-	2	22	-
Oregon	-	6	8	-	11	-	9	-
California	-	3	2	-	1	-	2	-
Avg regional price (\$/ton)	24.65		23.79		23.26		25.80	

Source U.S. Department of Agriculture. 1961-1969. Agricultural prices.

The price of alfalfa hay in Idaho is the lowest in the western region, 21% below regional average in 1969 (Table 13). In general, the availability and costs of roughage in Idaho substantially support the state's comparative advantage, compared to other western states, for producing beef.

### Feeder Calves

Feed grain, roughage, and feeder animals are the three agricultural resources basic for the production of fed cattle. The beef breeds\* represent 70 to 100% of the feeder animals placed on feed in the western states (Table 14). Idaho's fed cattle are 90% beef breeds and 10% dairy breeds. Using available data on cow herds, calf crop, and the utilization and disposition of calves, the following identity equation estimates the western states' potential for producing feeder calves:

$$(2.1) \quad Y = (Z_1 - Z_2) - (V_1 + V_2 + V_3 + V_4)$$

Where

Y is the number of feeder calves available, year t,

$a_1$  is the number of beef cows and heifers 2 years or older on farms, year t - 1,

\*The beef breeds as referred to in this study include English and crosses, Mexican, Brahman, "Okies," etc.

$a_2$  is the calving rate, percentage of calves born from beef cows and heifers 2 years or older, year  $t - 1$ ,

$Z_1$  ( $a_1 \cdot a_2$ ), the number of beef calves born, year  $t - 1$ ,

$Z_2$  is the beef calf deaths, year  $t - 1$ ,

$Z_1 - Z_2$  is the net beef calves available, year  $t - 1$ ,

$V_1$  is the heifer calves kept for herd replacement at year  $t$ , equaling 15% of net beef calves available at year  $t - 1$ ,

$V_2$  is the beef calves kept for bull replacements at year  $t$ , equaling 25% of bulls on farm at year  $t$ ,

$V_3$  is the number of beef calves slaughtered on farms, year  $t$ , and

$V_4$  is beef calf deaths at year  $t$ , equalling 2% of net beef calves available at year  $t$ .

Since this equation attempts to estimate the western states' potential for producing feeder animals, the number of calves slaughtered commercially was ignored.

Estimates obtained with equation (2.1) show that Montana leads the western region with the potential to produce more than 20% of the region's beef type feeder animals (Table 15). Idaho ranks seventh.

Equation (2.1) was also used to estimate the number of dairy breed feeder calves produced in the western states. Adjustments were made to allocate 25% of the dairy breed calves for heifer replacement and 0.5% for bull replacements. About 11% of the dairy breed feeder calves of the western region were produced in Idaho, placing the state third behind California and Washington (Table 15).

Table 14. Breeds of cattle fed in the western states.

State	English and Crosses	Dairy	Others*
	(% of total cattle fed annually)		
Montana	93	7	0
Idaho	90	10	0
Wyoming	100	0	0
Colorado	94	3	3
New Mexico	34	30	36
Arizona	36	37	27
Utah	81	19	0
Nevada	100	0	0
Washington	100	0	0
Oregon	95	5	0
California	30	4	66

\* Includes Mexicans, Brahma, Okies, etc.

Sources: Marousek (12). Idaho data from survey of Idaho cattle feeders, 1969; Nevada and Wyoming data estimated.

## Feeder Calf Utilization

Production of feeder calves is declining relative to the number of cattle fed in the western region. In 1960, the western region had 179,515 head of surplus beef breed feeder calves and 955,024 head of surplus dairy breed feeder calves. In 1968, however, the region had a deficit of 391,166 head of beef breed feeder calves and a surplus of 687,504 head of

**Table 15. Estimated total and percentages of beef breed and dairy breed feeder calves available for feeding in the western states, 1960 and 1968.**

State	1960				1968			
	Beef breeds		Dairy breeds		Beef breeds		Dairy breeds	
	Total calves	% of region	Total calves	% of region	Total calves	% of region	Total calves	% of region
Montana	756,051	19.7	54,229	4.8	1,030,977	20.4	32,608	3.3
Idaho	255,225	6.6	128,859	11.4	362,544	7.2	102,700	10.4
Wyoming	369,170	9.5	9,571	0.8	474,681	9.4	5,763	0.6
Colorado	490,463	12.8	87,163	7.7	685,494	13.6	65,704	6.7
New Mexico	389,431	10.1	24,881	2.2	469,024	9.3	22,893	2.3
Arizona	195,498	5.1	24,255	2.1	228,194	4.5	25,709	2.6
Utah	156,806	4.1	56,316	5.0	214,908	4.2	48,503	4.9
Nevada	155,973	4.1	7,950	0.7	186,298	3.6	7,224	0.7
Washington	172,147	4.5	147,492	13.0	251,784	5.0	122,323	12.4
Oregon	338,690	8.8	99,735	8.8	460,314	9.1	76,842	7.8
California	559,348	14.6	490,587	43.4	694,426	13.7	476,210	48.3
Total region	3,838,802		1,131,038		5,058,644		986,479	

**Table 16. Production of beef and dairy feeder calves in western states compared to numbers fed, 1960 and 1968.**

State	1960				1968			
	Beef breeds		Dairy breeds		Beef breeds		Dairy breeds	
	Surplus	Deficit	Surplus	Deficit	Surplus	Deficit	Surplus	Deficit
Montana	650,203	-	46,094	-	886,640	-	21,521	-
Idaho	48,493	-	104,475	-	-	7,251	61,620	-
Wyoming	287,952	-	9,571	-	403,479	-	5,763	-
Colorado	-	225,613	65,372	-	-	685,494	22,996	-
New Mexico	311,545	-	-	8,957	248,582	-	-	72,112
Arizona	-	269,787	24,255	-	-	470,079	25,709	-
Utah	63,922	-	34,352	-	133,243	-	29,586	-
Nevada	110,740	-	7,950	-	126,682	-	7,224	-
Washington	-	48,210	147,492	-	-	80,571	122,323	-
Oregon	223,535	-	97,740	-	345,235	-	67,620	-
California	-	973,265	426,680	-	-	1,291,632	395,254	-
Region	179,515	-	955,024	-	-	391,166	687,504	-

Source: Tables 6, 14, 15.

dairy breed feeder calves (Table 16). California had the largest deficit of beef breed feeder calves, feeding 1,291,632 head more than the state produced. Montana produced a surplus of 886,640 head.

Comparing calf production and fed cattle marketings, Arizona leads the western region by using 306% of its beef breed feeder calves. California, Colorado, Washington, and Idaho used 286%, 200%, 132%, and 102%, respectively (Table 17). Idaho's fed cattle production is expanding at a faster rate than the state's production of beef breed feeder calves (Fig. 4).

#### Source of Feeders

Approximately 21% of feeder cattle placed on feed in Idaho were raised by cattle-feeders and the remaining 79% were purchased in Idaho, Montana, Oregon, Nevada, Wyoming, Utah, and California. Fifty-five percent of the feeder animal purchases were made in Idaho (Table 18). In other words, 76% of the feeder animals used by Idaho's feedlots were raised in state. In 1968, 160,000 head of feeder cattle and calves were shipped into Idaho (22), while 75,000 head of feeder cattle and calves were shipped out (27). The Idaho feeder cattle and calves were shipped primarily into the northcentral states of Ohio, Indiana, Illinois, Michigan, Minnesota, Iowa, South Dakota, and Nebraska.

#### Feeder Calf Prices

Production of beef-breed feeder calves is increasing in the western region. For example, in 1960 about 77% of the feeder calves were of this type; in 1968, over 84% (Table 19). California and Washington had the lowest proportion of beef-breed feeder animals while Wyoming, Mon-

Table 17. Fed cattle and calves marketed as a percentage of feeder calves produced in the western states, 1960 and 1968.

States	1960		1968	
	Beef breeds	Dairy breeds	Beef breeds	Dairy breeds
	%	%	%	%
Montana	14	15	14	34
Idaho	81	19	102	40
Wyoming	22	0	15	0
Colorado	146	25	200	65
New Mexico	20	136	47	415
Arizona	238	0	306	0
Utah	60	39	38	39
Nevada	29	0	32	0
Washington	128	0	132	0
Oregon	34	2	25	12
California	274	13	286	17

Source: Tables 6, 14, 15.



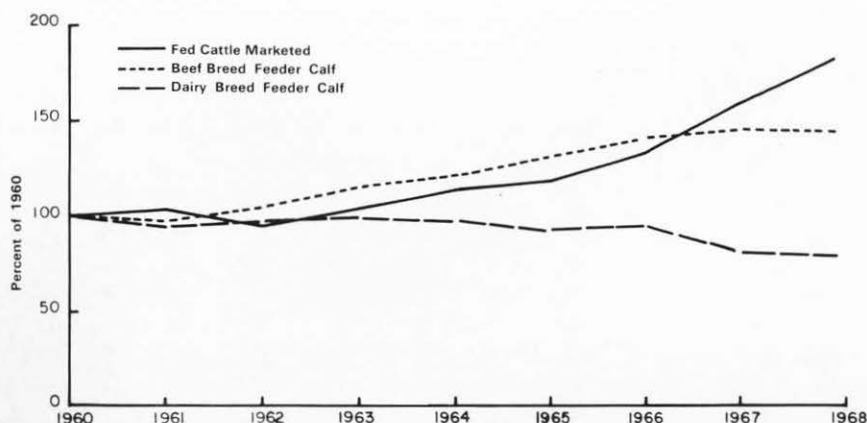


Fig. 4. Trends in numbers of fed cattle and calves marketed and in beef breed and dairy breed feeder calf production in Idaho, 1960 to 1968.

tana, and Nevada produced the greatest proportion. In 1968, Idaho's feeder calves were 78% beef breed and 22% dairy breed (Table 19).

From 1960 to 1966, calf prices in Idaho were about average or below for the western region. However, during the next three years, Idaho prices were among the highest in the region (Table 20). This increase in Idaho's calf prices is consistent with the rapid expansion of the state's fed cattle production, relative to the production of feeder calves, and the increase in the proportion of beef breed feeder animals produced.

#### Feed Conversion Efficiency

Feed conversion ratio, average daily gain, and costs per 100 lb. gain in Idaho (11) compare favorably with the other western states and the major cattle feeding states (8, 14, 18, 30, 33).

Table 18. Sources of feeder cattle purchased by Idaho's feedlots, 1969.

State of origin	Source			% of total feeder cattle purchased
	Direct	Auction	Terminal	
	%	%	%	%
Idaho	40	60	0	55
Montana	11	89	0	11
Utah	43	43	14	10
Oregon	69	15	16	9
Wyoming	100	0	0	6
Nevada	70	30	0	5
California	100	0	0	4

Source: Survey of Idaho cattle feeders, 1969.

**Table 19. Proportion of beef breed and dairy breed feeder calves produced in the western states.**

State	1960		1964		1965		1968	
	Beef	Dairy	Beef	Dairy	Beef	Dairy	Beef	Dairy
	%	%	%	%	%	%	%	%
Montana	93	7	95	5	95	5	97	3
Idaho	66	34	71	29	73	27	78	22
Wyoming	97	3	98	2	98	2	99	1
Colorado	85	15	89	11	89	11	91	9
New Mexico	94	6	95	5	95	5	95	5
Arizona	89	11	87	13	89	11	90	10
Utah	73	27	76	24	77	23	82	18
Nevada	95	5	95	5	96	4	96	4
Washington	54	46	62	38	64	36	67	43
Oregon	77	23	81	19	84	16	86	14
California	53	47	56	44	57	43	58	42
Region	77	23	80	20	81	19	84	16

Source: Table 15

**Table 20. Western state feeder calf prices compared with regional averages.**

State	1960		1964		1965		1969	
	Over	Under	Over	Under	Over	Under	Over	Under
	%	%	%	%	%	%	%	%
Montana	6	-	12	-	9	-	2	-
Idaho	-	5	1	-	-	-	4	-
Wyoming	10	-	1	-	1	-	1	-
Colorado	10	-	8	-	8	-	5	-
New Mexico	1	-	2	-	2	-	3	-
Arizona	-	2	-	3	-	3	-	7
Utah	-	6	-	6	-	6	-	2
Nevada	-	6	-	2	-	2	-	2
Washington	-	5	3	-	3	-	4	-
Oregon	-	4	-	7	-	7	-	3
California	-	4	-	5	-	5	-	3
Western region avg (\$/cwt.)	\$22.80		\$21.50		\$23.00		\$31.37	

Source: U.S. Department of Agriculture. 1961-1969. Agricultural prices.

## Climate

Studies on the influence of climate on the performance of beef animals indicate that the comfort zone of domestic beef breeds is between 30 and 75 F (17). Hot climate significantly reduces the rate of daily gain, increases sickness and death rate, and requires additional costs to protect animals from the heat and thermal radiation (9, 16). Cold environment is not an acute problem for beef cattle (29). The impact of precipitation on feedlot performance has not been firmly established.

The weather in the principal cattle producing areas in Idaho is favorable for beef production. Fig. 5 shows the average number of days in 1966-68 when temperatures reached 90 F or above. Usually the high temperature lasts only a few hours in the middle of the day. Days with temperatures of 0 F or below are limited (Fig. 5). Except in the high altitude areas, the state has a mild winter climate. The principal cattle producing areas of the state have also enjoyed low annual precipitation, minimizing the influence of humidity and mud on the performance of beef animals and necessitating no additional costs for housing (Table 21).

## Labor

The availability and cost of farm labor influence the production costs of beef and thus the area's comparative advantage. The linear regression coefficient for farm labor indicates that a 7,600 man-hour change in the use of labor is associated with a like change of 1,000 head in the number of non-dairy cattle on farms in the United States (15).

Labor cost in Idaho is above the regional average. California leads the region with the highest farm wage paid followed by Washington, Nevada, Oregon, and Idaho. New Mexico and Arizona report the lowest wage for farm labor (Table 22).

## Organization and Management

Availability and costs of the resources basic to fed-cattle production do not explain the scope of the area's competitive advantage in producing beef. Efficient organization and management of these resources is essential for optimum use of the area's economic potential.

Table 21. Annual precipitation by crop reporting districts, Idaho, 1966-1968.

Districts	1966	1967	1968
		(inches)	
North	24.88	25.96	30.35
Southwest	10.67	15.53	17.01
Southcentral	8.54	15.70	16.04
East	8.62	15.06	16.04

Source: U.S. Department of Commerce (28).

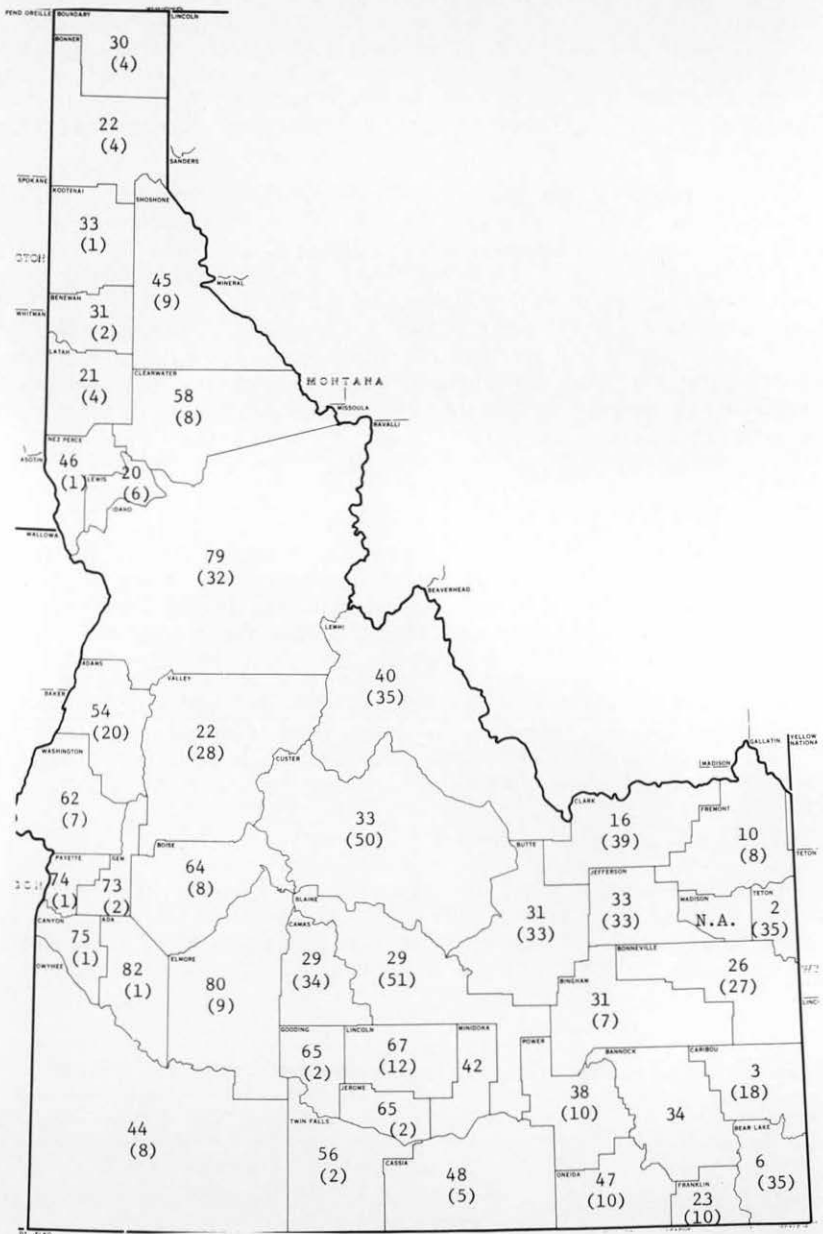


Fig. 5. Average number of days of 90 F or above (and 0 F or below) temperatures in Idaho counties, 1966-68. N.A. Not Available. Source: (28).

Efficient use of Idaho's resources to produce fed beef requires structural adjustments to make feasible the application of technological advances. Optimum use of technology is a function of managerial competence, capital outlays, and economic structure compatible with large-scale feeding operations. The high capital investment in small-scale feeding operations in Idaho tends to limit technological application. In general, using advanced technology with the existing economic structure is not likely to provide a significant savings for most of Idaho's cattle feeders.

## Supply Response

Stepwise multiple regression was used to estimate the supply equation of beef for policy and prediction purposes. Production of fed cattle was hypothesized to be influenced by the beef-livestock-feed relationships, prices of inputs, price of beef, and prices of competing products. All prices were deflated by the Index of Prices Received by Farmers (1957-59=100). Twenty annual (time series) observations (1949-68) were analyzed. All variables are state averages unless otherwise specified. For the purpose of statistical analysis, the following variables are defined:

$NCPF_t$  = Number of cattle placed on feed, January 1, year  $t$ ,

$BE_t$  = Total production of barley equivalent, year  $t$ ,

$AL_t$  = Total production of alfalfa, year  $t$ ,

Table 22. Farm wages in western states compared with wages in western region.

State	1960		1964		1965		1968	
	Over	Under	Over	Under	Over	Under	Over	Under
	%	%	%	%	%	%	%	%
Montana	-	1	-	3	-	1	-	3
Idaho	5	-	5	-	4	-	3	-
Wyoming	-	2	-	4	-	6	-	4
Colorado	-	5	-	2	-	2	-	1
New Mexico	-	26	-	27	-	23	-	22
Arizona	-	15	-	15	-	12	-	11
Utah	5	-	7	-	5	-	1	-
Nevada	9	-	8	-	7	-	9	-
Washington	11	-	12	-	10	-	13	-
Oregon	6	-	6	-	4	-	3	-
California	8	-	8	-	10	-	14	-
Western region avg (\$/hour)*	\$1.14		\$1.24		\$1.28		\$1.48	

\* Farm wage per hour not including room and board.

Source: U.S. Department of Agriculture, Statistical Reporting Service. 1961-1969. Farm labor.

$FW_t$	=	Farm wage without room and board, year t,
$BP_t$	=	Beef price received by farmer, year t,
$BP_{t-1/2}$	=	Beef price received by farmers, year t-1/2
$BEP_t$	=	Barley price, year t,
$ALP_t$	=	Alfalfa hay price, year t,
$WP_t$	=	Wheat price received by farmers, year t,
$MP_t$	=	Milk price received by farmers, year t,
$CP_t$	=	Calf price, year t,
$CP_{t-1}$	=	Calf price, year t-1,
$CBPR_t$	=	Calf-beef price ratio, year t,
$CBPR_{t-1}$	=	Calf-beef price ratio, year t-1,
$BFPR_t$	=	Beef-feed price ratio, year t,
$BFPR_{t-1}$	=	Beef-feed price ratio, year t-1,
$BHPR_t$	=	Beef-hog price ratio, year t,
$BHPR_{t-1}$	=	Beef-hog price ratio, year t-1,
$BWPR_t$	=	Beef-wheat price ratio, year t,
$BWPR_{t-1}$	=	Beef-wheat price ratio, year t-1,
$MFPR_t$	=	Milk-feed price ratio, year t,
$BBFC_t$	=	Number of beef breed feeder calves available, year t,
$DBFC_t$	=	Number of dairy breed feeder calves available, year t,
$RCAU_t$	=	Roughage-consuming animal units, other than beef, on farms, year t,
$GCAU_t$	=	Grain-consuming animal units, other than beef, on farms, year t, and
$T$	=	Time in years (1949 = 0).

The final estimated supply equation for the western region:  $R^2 = .893$

$$(3.1) \text{ NCPF} = 63701.15 + 6444.05 T + 61.72 AL_t + 4973.64 BP_{t-1/2} -$$

(924.18)            (9.34)            (655.56)

$$218.90 RCAU_t - 323966.00 CBPR_t - 92.94 GCAU_t + .081 BBFC_t$$

(28.85)            (39915.75)            (9.05)            (.02)

The production of fed beef in the western region is a function of: (1) time; (2) alfalfa hay production; (3) price of beef; (4) number of roughage-consuming animal units other than beef; (5) calf-beef price ratio; (6) grain consuming animal units other than beef; and (7) number of beef breed feeder animals available. Beef price, time, and alfalfa hay production accounted for 91% of the explained variation in the number of cattle placed on feed in the region.

The final estimated supply equation for Idaho:  $R^2 = .923$

$$(3.2) \text{ NCPF} = 84892.56 - 97.13 \text{ GCAU}_t + 0.35 \text{ BBFC}_t$$

(60.13)                      (.04)

Fed-beef production in Idaho is highly responsive to production of beef-breed feeder animals. The number of beef-breed feeder animals available represented 94% of the explained variation (.923) in the number of cattle placed on feed in Idaho.

## The Marketing Aspect of the Cattle Feeding Industry

The competitive advantage of any area in marketing beef is a function of the availability of market outlets and transportation costs. Three types of market outlets are important for the development and growth of the beef industry. They are (1) terminal or auction markets, (2) slaughtering plants, and (3) consuming markets.

### Auctions

Livestock auctions are dispersed throughout Idaho but tend to be concentrated in the southwest and southcentral parts of the state. In addition, auctions just beyond the state line in Washington, Oregon, and Montana provide additional outlets to many Idaho cattle feeders (Fig. 6).

Feedlot operators received greater net return for their slaughter animals when marketing directly than when selling through terminal or auction markets.\* Consequently, terminal and auction markets are becoming relatively less important as a market outlet for slaughter beef. In 1961-62, about 92% of fed cattle sold from southwest Idaho feedlots were sold directly, while feeders in the southeast and southcentral areas sold 90 and 73% of their cattle directly (13). In general, about 85% of Idaho's slaughter cattle are marketed through direct channels.

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\* For example slaughter beef animals weighing 900 to 1100 pounds, when marketed directly compared with selling through auction, netted the Idaho producer \$1.15/cwt. more for choice slaughter steer, \$1.74/cwt. for good slaughter steer, \$0.76/cwt. for choice slaughter heifer, and \$1.61/cwt. for good slaughter heifer (3). Direct marketing of slaughter beef netted the producer in Nebraska about \$6.40 more for 1,000 pound animal than terminal selling and packers' net saving from buying direct amount to about \$2.02, or a total net savings to producer and packer of about \$8.40 per 1,000 pound animal (4).

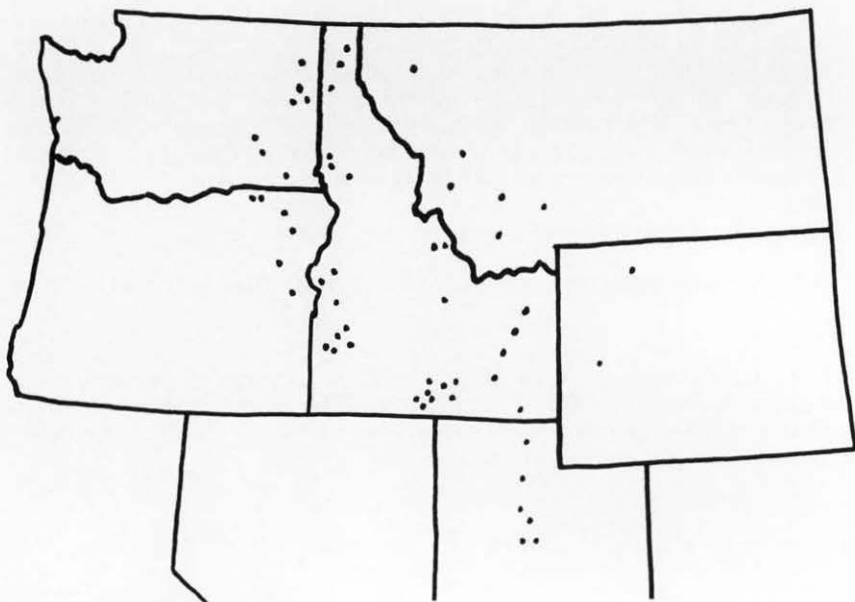


Fig. 6. Location of stockyards in Idaho and adjacent areas. Source: (23).

Direct selling is associated with the size of feeding operation. Feedlots with a capacity of over 1,000 head sold 90% of their slaughter animals through direct market channels. Those with capacities of 501 to 1,000 head and 500 head and below marketed 76 and 62% of their cattle directly (3). About 48% of all feeder animals purchased by Idaho's cattle feeders are bought directly (Table 18).

### Slaughtering Plants

Slaughtering plants in Idaho are concentrated in the three principal cattle feeding areas. Most of the plants slaughtering over 2 million pounds liveweight per year are in the southwestern part of the state. Large plants nearby in Washington, Oregon, Utah, and Montana provide additional slaughtering potential to many Idaho cattle feeders. In addition, medium-sized plants slaughtering between 300,000 and 2 million pounds liveweight per year are located throughout southern Idaho (Fig. 7).

The extent that Idaho's slaughtering capacity is used as a market outlet for the state's fed beef is not known. However, the kill capacity of Idaho's slaughtering plants favorably supports the state's marketing potential. In 1965 about 53 large and medium-sized livestock slaughtering establishments were operating in Idaho but only 2 specialized in cattle and calf slaughter (Table 23). In 1969, however, 5 plants specialized in cattle and calves with a daily kill capacity ranging from 125 to 800 head, or a total of 1,725 head per day.\* Assuming a

\* Data for 1969 obtained from the Idaho Cattle Feeders Association.



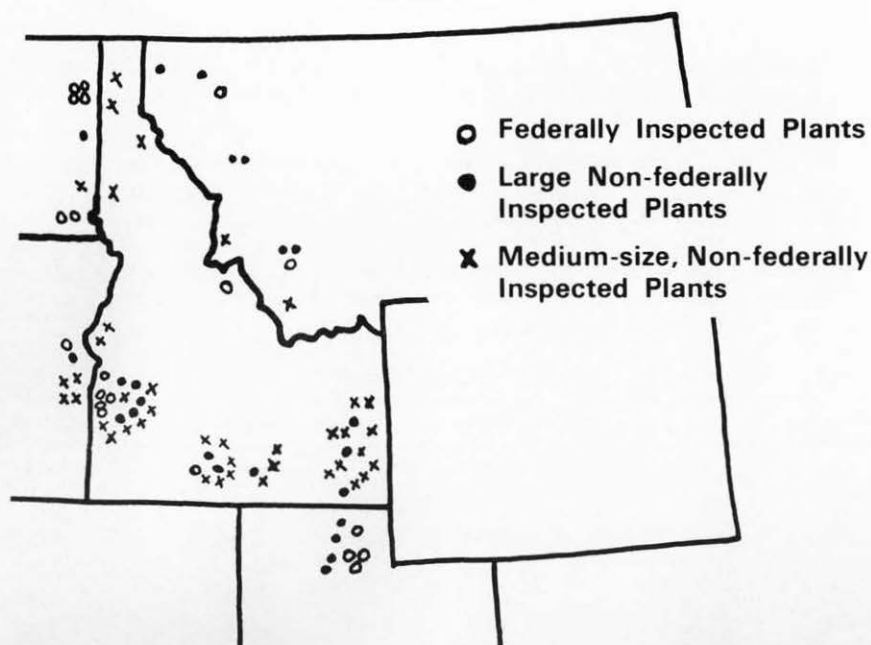


Fig. 7. Location of slaughter plants in Idaho and adjacent areas. Source: (26).

5-day operating week, these plants had a beef kill capacity of 415,296 head per year, more than the total number of fed cattle and calves marketed from Idaho's feedlots in 1968 (Table 6). This assumed capacity also exceeds the number of cattle and calves slaughtered in Idaho in 1968 (Table 24). These specialized plants, plus other plants slaughtering all species, provide adequate slaughtering outlet for Idaho beef and could meet any foreseeable expansion in the state's beef industry.

The production efficiency of the meat packing industry, and not necessarily the slaughter capacity, influences the profitability one area may have relative to another in the marketing of beef. Information is not available about the extent of modernization and operating costs of the meat packing industry in Idaho.

Table 23. Number of livestock slaughtering plants in Idaho by species slaughtered, 1960 and 1965.

Species	1960	1965
Cattle and calves, hogs, sheep and lambs	48	46
Cattle and calves	1	2
Cattle and calves, hogs	4	4
Cattle and calves, sheep and lambs	2	1
Total plants	55	53

Source: U.S. Department of Agriculture (26).

## Consuming Markets and Transportation Costs

Idaho not only lacks the population centers but is also surrounded by scarcely populated states. Cattle feeders in Idaho have to depend on out-of-state markets.

Most cattle shipped from Idaho are classified as fed heifers and steers (1). Shipping distance averages 568.6 miles, the third longest in the region following Montana and Utah. Truck rates per cwt. are positively correlated with the distance cattle are hauled. The rates vary among the western states from a low of 53 cents per cwt. for New Mexico to a high of 124 cents per cwt. for Montana. Idaho's truck rates average 110 cents per cwt. (Table 25).

**Table 24. Cattle and calves slaughtered in Idaho, 1960-1968.**

Year	Cattle	Calves	Total
	(000)	(000)	(000)
1960	202.7	9.0	211.7
1961	206.9	6.6	213.5
1962	219.0	5.1	224.1
1963	227.8	3.6	231.4
1964	262.9	3.0	265.9
1965	284.3	2.4	286.7
1966	311.0	1.7	312.7
1967	334.2	1.2	335.4
1968	356.5	1.2	357.7

Source: U.S. Department of Agriculture, Economic Research Service. 1968. Livestock and meat statistics, supplement to Stat. Bull. 333.

**Table 25. Average interstate truck rates for hauling cattle in the western states.\***

State	Avg distance hauled (miles)	Avg load (No. head)	Avg weight per head (lb.)	Avg rate per		
				Cwt.	Loaded mile	Ton-mile
Montana	717.9	50.2	808.8	124.3	65.2	3.68
Idaho	568.6	40.0	952.3	110.0	70.9	4.33
Wyoming	417.5	39.7	633.8	99.3	69.4	5.54
Colorado	352.8	55.4	641.1	75.9	73.3	4.69
New Mexico	247.7	41.4	654.9	53.0	51.1	4.49
Arizona	411.5	36.0	1000.0	88.3	86.9	4.77
Utah	648.7	47.5	762.3	120.0	62.9	3.90
Nevada	471.9	56.5	647.8	101.3	70.2	4.27
Washington	266.2	37.9	832.9	54.1	87.0	5.97
Western region	455.5	46.5	740.5	91.4	68.1	4.50

\* Data for Oregon and California not available.  
Source: Capener et al. (1)

## Part IV. Implications and Recommendations

While one would normally expect that beef cattle feeding would be most economically located in the surplus feed supply area with processed animal products moving to the excess demand areas (6), surplus feed and feeder animal supplies do not explain the whole location pattern of feedlots. Growth of this industry within the western region has been associated with the development of large-scale, specialized feeding operations.

The current trend toward large and more specialized feedlots in Idaho and the western region places considerable uncertainty on the bargaining position of the small feeders. Small feeders should produce their own raw material such as feeder animals and feed grain and should consider alternative forms of reorganization. The economic feasibility of an integrated beef enterprise is being studied in the Department of Agricultural Economics.

Potential benefits of cooperative arrangements should be considered. Through cooperatives, farmer feeders may be able to reduce risk, provide a steady supply of quality products demanded by the well-organized markets, and improve their bargaining position in buying raw materials. In general, farmer-feeders should avoid heavy investment in advanced technology. Optimum use of advanced technology requires the economic structure of a large-scale feeding operation.

The beef-livestock-feed interrelationship, costs of feed grain and roughage, and climatological factors are favorable for fed-beef production in Idaho relative to other Western states. However, the growth potential of the state's fed beef industry is inversely affected by the relatively high costs of shipping beef to market and the slow growth rate of feeder calf production in the state.

Idaho beef slaughtering capacity exceeds fed beef production by a wide margin, but a significant portion of Idaho beef is still shipped liveweight. In general, transfer of processed animal is more economical than liveweight (6). However, the savings from shipping processed animals depends greatly on the efficiency of the slaughtering facilities, and this is influenced by scale of operation, rate of utilization, and extent of modernization of these facilities. A complete economic evaluation of Idaho's meat packing industry is essential for policy decisions.

Production of beef-breed feeder calves in Idaho is lagging behind the rapidly expanding cattle feeding industry. Expansion of the beef

cow herd is important if the state's cattle feeding industry is to maintain its present growth rate, and if Idaho is to utilize its surplus agricultural resources to produce fed beef. The economic feasibility of the following alternatives should be evaluated: (1) improving the productive capacity of present ranches, and (2) utilizing a portion of newly developed land for irrigated pasture.

The first alternative is now being studied by the Department of Agricultural Economics in cooperation with the College of Forestry and Range Management and the Idaho Range Use Coordinating Committee.

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