EXPANSION POSSIBILITIES FOR THE LIVESTOCK FEEDING AND BEEF PACKING INDUSTRY IN MONTANA

FARMER COOPERATIVE SERVICE • U.S. DEPARTMENT OF AGRICULTURE • SERVICE REPORT 140

PREFACE

Montana citizens are concerned that their State is not sharing proportionally in the Nation's economic growth. They recognize that a major part of their population is employed in agriculture and that opportunities for traditional agricultural employment are declining. Agricultural development in Montana, as elsewhere, has required large, modern machines and the latest technology. These modern practices have reduced traditional employment opportunities in Montana's agriculture. Because young people are the most mobile segment of the population, Montana will suffer a much greater loss of young people than population projections indicated for the years ahead unless alternative forms of employment can be found.

Noting these problems, many local communities have formed development corporations to seek new or expanded industries that will provide employment opportunities. In addition, representatives of these communities have organized or become associated with regional development associations within the State. Inventory resource studies have been made and others are underway by the State's educational institutions and independent organizations. These studies are useful guides for spontaneous local movements for changes in goals and for greater economic growth.

An Ad Hoc Committee on Rural Development, representing 34 counties in eastern Montana, has worked on rural development problems for more than 3 years. It has prepared a broad research proposal that covers in detail most potential areas for agri-industrial development projects. An effort was made at an early April 1973 meeting between Farmer Cooperative Service and this committee to reduce this broad proposal into alternative industrial development possibilities and to establish priorities. It was a firm conviction of the spokesman for the Ad Hoc Committee that the highest priority and the immediate thrust of the proposed industrial development studies should be directed at cattle-related industry. He further stated that primary emphasis should be placed on slaughter and meat processing because Montana has demonstrated that it can feed cattle.

While Montana has a high cattle population and considerable cattle feeding within the State, these animals may be sold at any time to the highest bidder. An integrated and coordinated cattle-beef marketing system may be necessary to stabilize a consistent supply of slaughter animals for a cattle slaughter operation. Farmer Cooperative Service, in recognition of the strong cattle slaughter interest of this group, agreed to determine the capital and raw material needs for three scales of cattle slaughter plants with annual volumes of 60,000, 100,000, and 300,000 head and to offer some guidelines for adapting an existing cash cattle-beef market to an integrated beef marketing system.

Discussion at the Montana meeting brought out that, until these factors were compiled it would be difficult or impossible to determine whether they could be met or what scale of operation should be proposed and considered.

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HIGHLIGHTS AND CONCLUSIONS

A beef production and consumption analysis of the United States shows that Montana and Idaho have a surplus of cattle available for slaughter compared with potential consumption. These two States also produce more beef than can be consumed in the nearest production deficit area of Washington and Oregon. Shipment to the next deficit area, California, is inhibited by distance causing high freight rates, and the location advantage that adjacent, beef-surplus Arizona has in the California market. The difference between Washington's and Oregon's ability to take Montana's surplus beef and the total might be made up by exports from northern Pacific ports.

Another problem facing a new slaughter plant in Montana is the availability of a year-round supply of cattle which is needed to keep operations at or near capacity. Such a supply does not now exist because feeder cattle are normally sold to other regions, usually in the fall. These regions have a longer grazing and crop-residue season than Montana. However, an integrated feeding and slaughtering program could be instituted to coordinate production and slaughtering, for neither grain production nor feeder cattle production limit expanding Montana's beef packing industry.

Nevertheless, predicting the economic feasibility of a new slaughtering facility in Montana is difficult. While 11 to 14 percent return on investment may look reasonable, it must be accepted with caution. The venture is risky, which can be attested by some tenuous assumptions which had to be made in the analysis, and the returns may not adequately compensate for that risk, especially in an economy that is experiencing an annual inflation of 7 to 10 percent.

The results presented in the study are based on the following assumptions which may or may not be attainable:

1. The slaughter plant will feed cattle in its own feedlots or under contract in privately held feedlots to provide year-round production at 90 to 100 percent of plant capacity.

2. These cattle will be available at $1/cwt. below the Omaha price for cattle of similar weight and grade.

3. Beef carcasses will be sold at the normal carlot wholesale prices in relationship to live prices.

4. Entry into local northwestern markets can be achieved for 100 percent of the output of the 60,000-head plant and 60 percent of the 300,000-head plant and other assumptions about markets in table 12 will also hold true.

Additional assumptions of construction costs, capital turnover, labor efficiency, taxes, transportation rates, etc., are believed to be fairly representative of the industry.

Success of expanding the cattle feeding and slaughtering industry in Montana will depend on careful and close coordination of feeder and fed cattle production, slaughtering and processing, and distribution. Some form of integration can probably provide the necessary coordination. Success will also depend on ability to market processed beef products. Herein lies a significant amount of uncertainty concerning this project because of the distance from Montana to significant production deficit areas. One should also recognize the fact that no attempt has been made to estimate the start-up costs and the market entry costs which must be considered in making the final decision. These costs could readily remove all estimated net profits in the first one or two years.

EXPANSION POSSIBILITIES FOR THE LIVESTOCK FEEDING AND BEEF PACKING INDUSTRY IN MONTANA

by
Winston K. Ullman

The U.S. Beef Industry in Perspective

The foundation of the beef industry is the beef breeding herd. Montana had 1,719,000 beef cows that calved by July 1, 1973 (fig. 1). While this sum represents an impressive beef industry, six other midwestern States from South Dakota to Texas had larger beef cow numbers during this same period. However, total cow numbers alone are not an accurate indicator of the concentration of a State's beef industry. Some small States, such as Arkansas, Indiana, and Tennessee, have impressive beef cow numbers in relation to their geographic size.

The calculated beef calf crop of 1,648,000 for 1973 is directly reflected from cows that calved July 1, 1973 (fig. 2). The annual calf crop establishes the upper limit of locally grown beef feeders that will be available from Montana ranches in the fall. It is customary for independent ranchers, businessmen specializing in a cow-calf operation, to sell their feeders at the time they consider most advantageous.

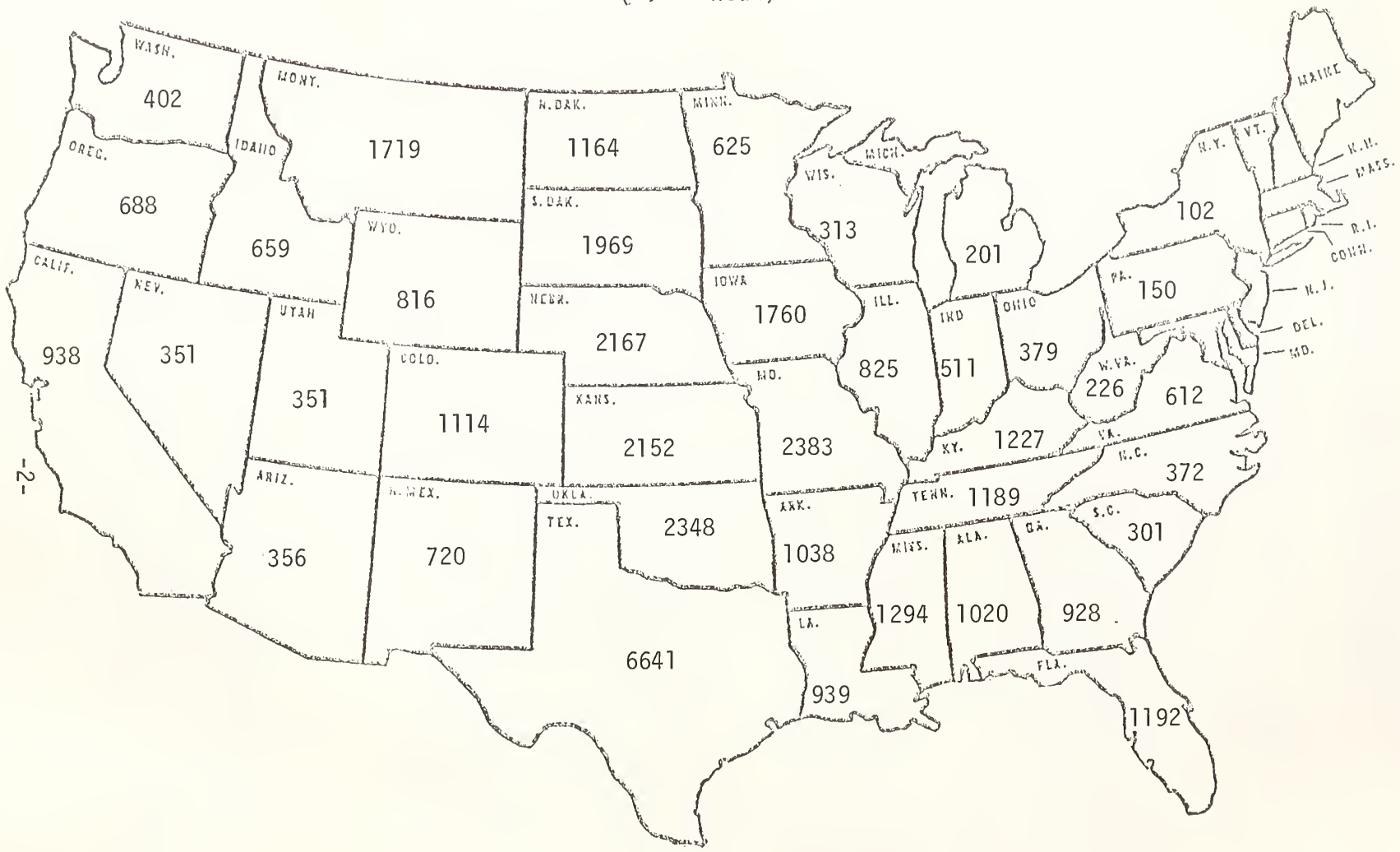
This may be a contract sale in the spring or a cash sale at the end of the grazing season, or, depending on their winter feed situation and feeder price, ranchers may even carry over a limited number. When ownership is transferred, most of these feeders leave Montana for other feeding regions. It is customary for cattlemen in warmer regions to purchase Montana feeders to utilize longer fall and winter grazing seasons and crop residues. In addition to providing a market for seasonal fall pasture and bulky low-value crop residues, this practice extends the fall feeder cattle market flow and enables commercial cattle feedyards to more fully utilize their specialized feeding facilities by achieving greater utilization and turnover. This function, whether performed in Montana or in neighboring States and regions, is necessary to achieve a more uniform flow of slaughter cattle through meat-packing plants and to provide a stable supply of fresh beef for consumers.

Cattle on Feed

The January 1 "Cattle and Calves on Feed Report" (USDA, Statistical Reporting Service) gives us one view of the volume and trend of cattle feeding in Montana and neighboring States (table 1).

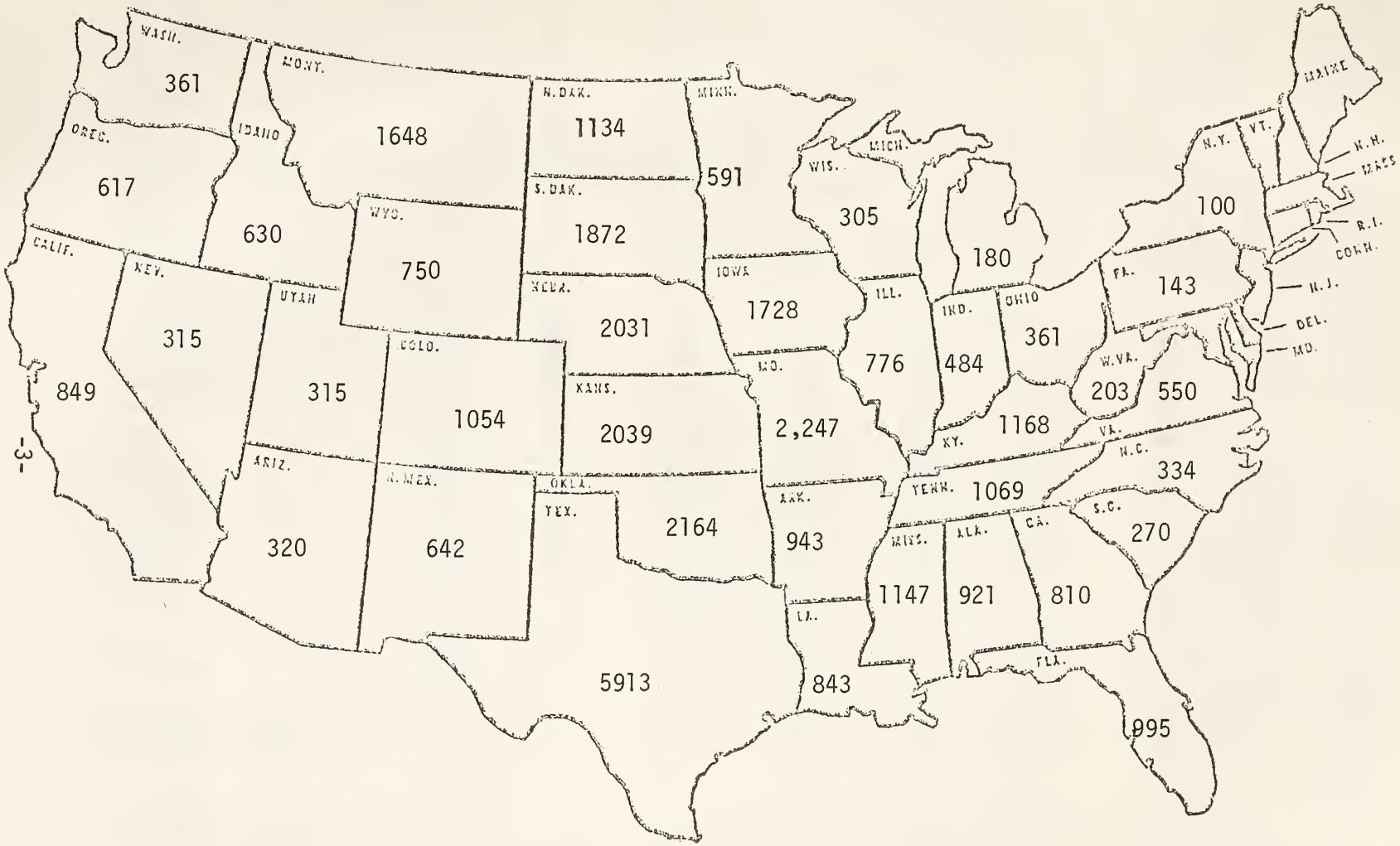
These observations are noteworthy. Montana has expanded cattle feeding 90,000 head since 1960. All neighboring States, except Oregon and Wyoming,

Figure 1 --Beef cows that calved by
July 1, 1973
(1,000 head)



50 State Total: 42,363

Figure 2 --Calculated beef calf crop, 1973
(1,000 head)



48 States Total: 39,937

Table 1--Cattle and calves on feed, January 1, selected States and regions, selected years, 1960-73

States or regions	1960	1965	1968	1969	1970	1971	1972	1973
				1,000 head				
East North Central	1,361	1,685	1,813	1,897	1,866	1,738	1,730	--
West North Central	3,526	4,640	5,385	5,840	5,997	5,604	6,067	--
Oklahoma	69	115	181	205	223	236	253	272
Texas	248	488	810	1,075	1,417	1,480	1,781	2,245
Montana	70	92	104	120	115	130	165	160
Idaho	138	153	199	248	230	222	265	205
Wyoming	55	40	46	36	31	35	37	--
Colorado	404	534	628	711	795	888	983	1,050
New Mexico	54	99	185	209	209	165	188	226
Arizona	265	348	385	442	510	524	539	655
Utah	61	66	66	61	57	68	55	--
Nevada	32	25	31	39	47	45	49	--
Washington	115	139	152	159	155	141	168	180
Oregon	66	93	91	91	96	80	82	69
California	665	195	902	968	1,031	1,001	1,045	1,181
26 States	7,212	9,512	--	--	--	--	--	--
22 States	--	--	10,755	11,893	12,581	12,167	13,278	13,873

Source: USDA, Statistical Reporting Service.

presently have more cattle on feed than Montana. Of the States listed, Oklahoma, Texas, Colorado, New Mexico, Arizona, and California have expanded cattle feeding more during 1960-73 than the total fed cattle supply reported January 1, 1973, in Montana.

To the extent that the cattle on feed report represents growth in cattle feeding beyond the capacity of existing area slaughter facilities, it represents potential capacity for new or additional local plants. It has been estimated by USDA that Montana feedlots in aggregate average about two turnovers annually.

Fed Cattle Marketed

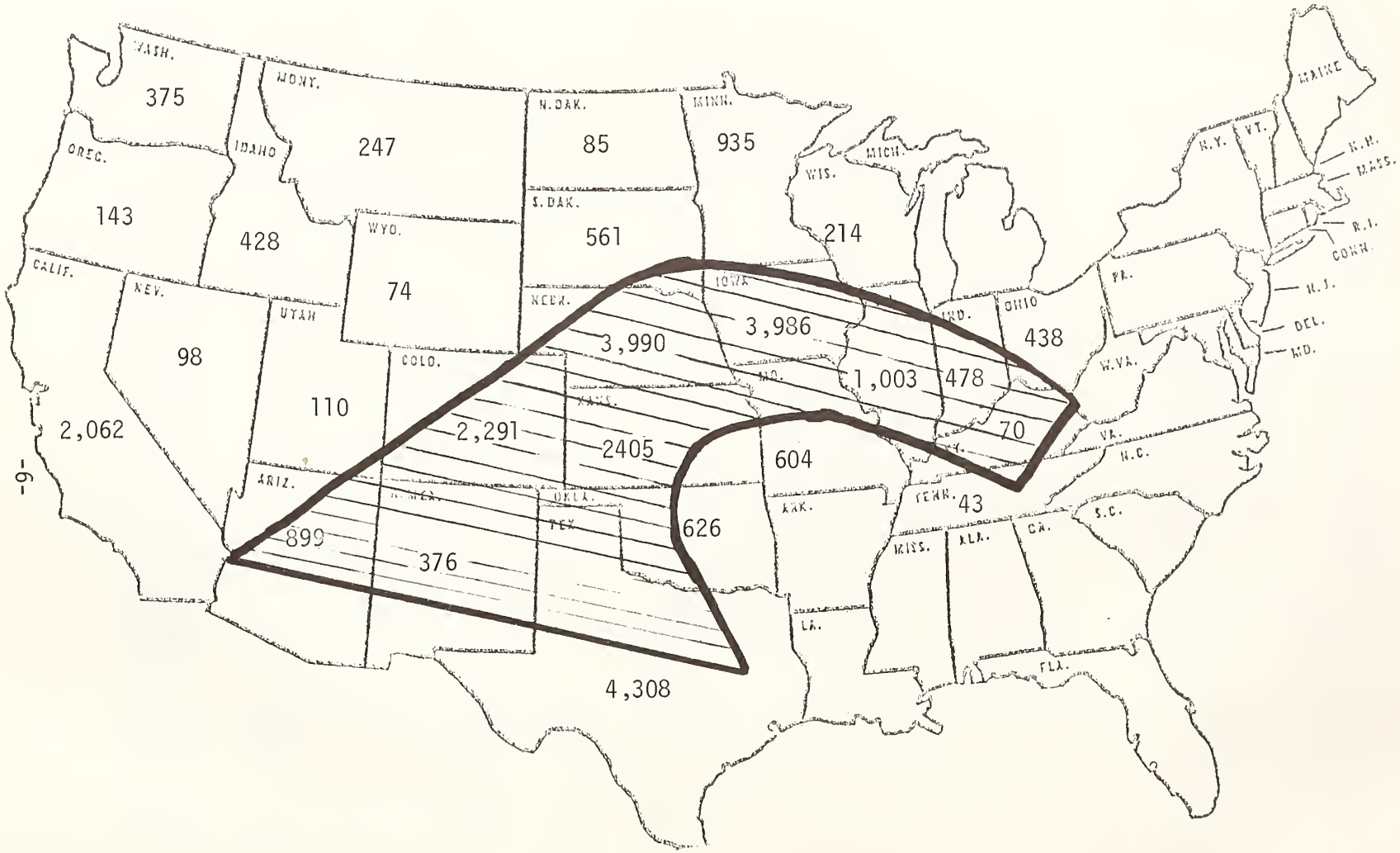
The highest concentrations of fed cattle marketed tend to fall within a diagrammatic outline on the map of the United States (fig. 3). This outline indicates the "most favored cattle feeding area" as described in a recent econometric model of the U.S. beef industry.1/ California represents the only State marketing large numbers of fed cattle that does not fall within the "most favored area." California, however, has a large beef deficit and, therefore, has a more favored local beef market. This "most favored feeding area" attracts many buyers and large fed cattle supplies encourage construction of new or expanded slaughter facilities in the area. These plants are able to maintain uniform, near-capacity slaughter year-round from locally fed cattle in nearby feedlots. In addition, the assembly cost is low and slaughter scheduling is more convenient when reserve animals may be held temporarily in commercial feedlots to even out day-to-day supplies. While Montana marketed 247,000 fed cattle in 1972, this market volume was exceeded by Idaho, Washington, California, and Colorado in Montana's western and southern trading areas.

Total Cattle Available for Slaughter

In figure 4, the upper number in each State represents total animals available for slaughter, including cull cows and bulls. The lower number includes actual cattle slaughtered. When we consider normal culling of cows and bulls, Montana's total cattle available for slaughter was 524,000 in 1972. This indicates that Montana even now does not slaughter all cattle available within the State. This fact suggests that perhaps the seasonality of local cattle marketing affects the ability of Montana plants to slaughter and market beef profitably, or perhaps other States are able to pay Montana feeders more money during certain periods. This map points out that Montana is an exporting State and Washington, California, and Utah import considerable numbers of cattle for slaughter.

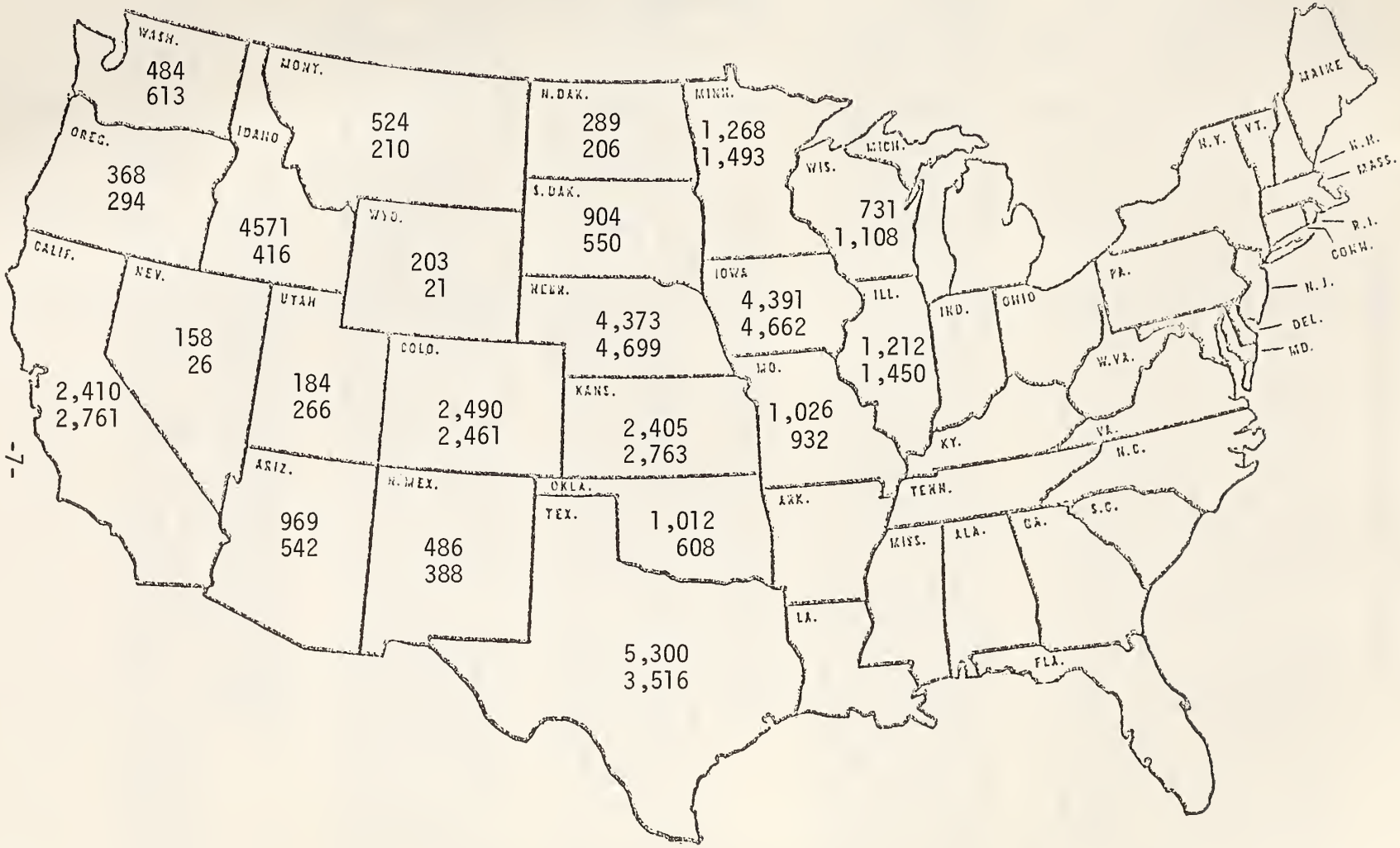
1/ Raymond A. Dietrich, Interregional Competition in the Cattle Feeding Industry: With Emphasis on Economies of Size, Texas Agricultural Experiment Station, B1115, September 1971.

Figure 3.--Fed cattle marketed--selected States, 1974
(1,000 head)



Source: Raymond A. Dietrich, Interregional Competition in the Cattle Feeding Industry: With Emphasis on Economies of Size, Texas Agricultural Experiment Station, B1115, Sept. 1971.

Figure 4 --Cattle for slaughter and cattle slaughtered including cull cows and bulls, selected States, 1972
(1,000 head)



Seasonality of Fed Cattle Marketed

A comparison of the seasonality of fed cattle marketed by Montana and Colorado, by quarters, reveals a marked difference during 1970-72 (table 2). Montana had a more uniform seasonal marketing pattern in 1972 than in 1970; however, the adjustment tended to be erratic and varied more than 10 percent above normal during October-December. This seasonality of fed cattle marketings detracts from a local slaughter plant's ability to attain a high utilization level. In contrast, Colorado's seasonality was much less in 1970, and it achieved even more uniform marketing in 1972. Lack of uniform fed cattle marketings is a major deterrent to new slaughter plant construction in Montana, when it must depend on the local open market for fed cattle. Feedlot integration can, but will not automatically, overcome this disadvantage.

A review of cattle slaughter statistics for selected western States reveals that Montana's cattle slaughter numbers were lower than those of all mountain and coastal States except Wyoming and Nevada in 1972 (table 3). Further, Montana's slaughter declined slightly in the last 6 years recorded. Utah, Nevada, Oregon, and California also declined, while, in contrast, Idaho, Colorado, New Mexico, Arizona, and Washington expanded their cattle slaughter numbers during this same period.

Feed Potential for Fed Cattle Increases

Availability of feed grain at reasonable price is a key requirement for an expanded cattle feeding industry. While Montana has had a consistent feed surplus, it fluctuated more than 400 percent in a 10-year period (1963-73). While feed grain from local production does not appear to be a limiting factor to a slaughter operation, the price cattle feeders are willing to pay will be the only factor preventing its movement out-of-State.

A review of the deficit or surplus feed grain situation for the Mountain and Pacific States reveals that Montana has produced a consistent surplus over its own needs; however, all States west and south, except Idaho, have consistently been deficit (table 4). During these 10 years, Montana's surplus ranged from 231,000 to 1,022,000 tons. In addition to locally produced feed grain, feed grains consistently move to Montana from both North and South Dakota on backhauls from lumber deliveries to the Twin Cities.

Feed Required for Additional Fed Cattle to Supply Alternative Sized Packing Plants

Using USDA estimate of 2,867 pounds of grain per animal fattened, additional feed grain required to support any of the three scales of slaughter plants under consideration could reasonably be met either from Montana's surplus

Table 2--Seasonal and trend indexes for fed cattle marketings, by quarters, 1970-72

State	12 quarter trend index												Seasonal index 1970-72 average			
	1970				1971				1972							
	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D
Montana	121	63	72	76	117	105	112	90	99	108	130	108	112	92	105	91
Colorado	92	90	86	92	100	102	104	101	107	108	104	114	100	100	98	102
5 State average 1/	97	90	90	94	101	102	105	102	106	105	102	110	101	99	99	101

1/ Montana, North Dakota, South Dakota, Idaho and Colorado.

Table 3--Commercial cattle slaughter, selected States, 1967-72 1/

State	1967	1968	1969	1970	1971	1972
			1,000 head			
Illinois	1,491.0	1,407.0	1,417.0	1,349.0	1,398.0	1,450.0
Minnesota	1,900.0	1,985.0	1,868.0	1,654.0	1,585.0	1,493.0
Iowa	4,229.0	4,588.0	4,130.0	4,322.0	4,281.0	4,662.0
Missouri	1,502.0	1,565.0	1,590.0	1,271.5	943.5	931.5
North Dakota	183.4	206.9	183.4	195.9	199.8	206.3
South Dakota	729.5	719.5	681.5	661.5	506.0	550.0
Nebraska	3,552.0	3,847.0	4,159.0	4,338.0	4,428.0	4,699.0
Kansas	1,617.0	1,504.0	1,664.0	2,014.0	2,341.0	2,495.0
Oklahoma	534.5	698.5	713.5	647.5	644.5	607.5
Texas	2,573.0	2,779.0	3,011.0	3,184.0	3,529.0	3,516.0
Montana	234.2	190.6	197.8	208.1	208.1	210.2
Idaho	334.2	356.5	386.0	384.5	405.5	416.0
Wyoming	30.7	33.6	26.4	31.2	20.4	20.7
Colorado	1,558.0	1,574.0	1,714.0	1,975.0	2,311.0	2,461.0
New Mexico	288.2	313.8	333.3	341.3	353.5	388.0
Arizona	245.4	417.1	499.5	508.5	520.5	541.5
Utah	271.0	277.1	273.7	258.5	269.8	265.5
Nevada	27.0	27.2	23.8	24.2	19.7	25.7
Washington	564.5	592.5	587.4	545.0	599.0	613.0
Oregon	316.7	347.4	369.5	340.5	331.2	294.1
California	3,050.0	2,919.0	2,936.0	2,849.0	2,854.0	2,761.0
48 States	33,868.6	35,026.4	35,236.9	35,024.9	35,585.1	35,778.6

1/ Includes slaughter in federally inspected and other slaughter plants, but excludes animals slaughtered on farms.

Table 4--Feed grain: Deficit or surplus, selected States and years 1/

State and region	1963		1967		1968		1969		1970		1971		1972	
	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over	Under	Over
	1,000 tons													
Mountain														
Montana	--	759	--	231	--	328	--	989	--	1,022	--	508	--	702
Idaho	--	186	-26	--	-168	--	--	27	--	342	--	198	--	72
Wyoming	-6	--	-42	--	-31	--	-31	--	--	8	-10	--	23	--
Colorado	-182	--	-1,031	--	-1,355	--	-1,541	--	-1,329	--	-1,983	--	2,080	--
New Mexico	--	178	-92	--	-246	--	-309	--	-217	--	-172	--	485	--
Arizona	--	80	-67	--	-236	--	-564	--	-624	--	-744	--	1,858	--
Utah	-168	--	-380	--	-411	--	-463	--	-388	--	-410	--	427	--
Nevada	-23	--	-110	--	-131	--	-146	--	-140	--	-153	--	252	--
Pacific														
Washington	-31	--	-687	--	-666	--	-469	--	-219	--	-187	--	730	--
Oregon	-110	--	-417	--	-387	--	-204	--	-106	--	-152	--	309	--
California	-2,151	--	-3,210	--	-3,783	--	-4,632	--	-4,478	--	-5,080	--	6,401	--

1/ Additional disappearances not included in this computation: Feed grain for seed, human food, and industry as well as export. Thus, this table probably overstates surpluses and understates deficits within each State.

or from grain surpluses in the Dakotas (table 5). For these reasons, feed grains do not appear to be a limiting factor to expanding cattle feeding in Montana.

Relationship of Carcass Beef Production to Aggregate Consumer Demand

It was not the objective of this study to do a comprehensive beef marketing study; however, surplus beef must move to deficit beef consuming areas. A preliminary review of carcass beef production by States is available from statistics compiled from Federal meat inspection. This production, expressed in million pounds, is shown in figure 5. Beef consumption by States was computed by multiplying 116 pounds per capita consumption by recent State population figures. These figures, expressed in million pounds, are given on a similar map (fig. 6). By simple computation, we arrived at a beef production-consumption balance, also in million pounds (fig. 7).

This suggests that Montana and Idaho would have a location advantage in satisfying the beef deficit of Oregon and Washington. This location advantage may also apply to parts of the Canadian market, as well as beef export out of Seattle. Without sufficient beef export, Montana's surplus beef must compete at a location disadvantage with Arizona's beef surplus in the California market or with all the other major surplus States in the deficit eastern States' market.

While we assume a new local packer will be able to share to some extent the preferred Montana and northwestern beef market, price competition could be disastrous to a new firm with low reserves. The success of any new slaughter firm may depend highly on the amount of beef it must market outside the Pacific Northwest and its ability to compete in California and eastern States' deficit beef markets.

Feedlot Size Related to Fed Cattle Marketed

A complete classification of Montana's fed cattle marketed by Livestock and Meat Statistics (USDA, Economic Research Service) gave feedlot capacity, number of feedlots, and number of fed cattle marketed. In the less than 1,000 head capacity range, 317 typical farm feedlots marketed 26,000 head in 1972 (table 6), averaging 82 head per feedlot on a single turnover basis. One turnover is typical for farm feeders who feed cattle only during the winter months. This winter feeding practice enables farmers and other small feeders to utilize crop residue, balance their workload, and market surplus grain on the farm. It also enables grain farmers to concentrate on grain farming during the spring planting and summer harvest periods.

Table 5--Feed equivalent required for additional fed cattle supplying alternative scale plants 1/

Item	Annual production	
	Head	Tons
Plant A	60,000	86,010
Plant B	100,000	143,350
Plant C	300,000	430,050

1/ Based on USDA estimate of 2,867 pounds per animal fattened.

Figure 5 --Estimated carcass beef production from cattle available for slaughter, 1972
(Millions carcass pounds)

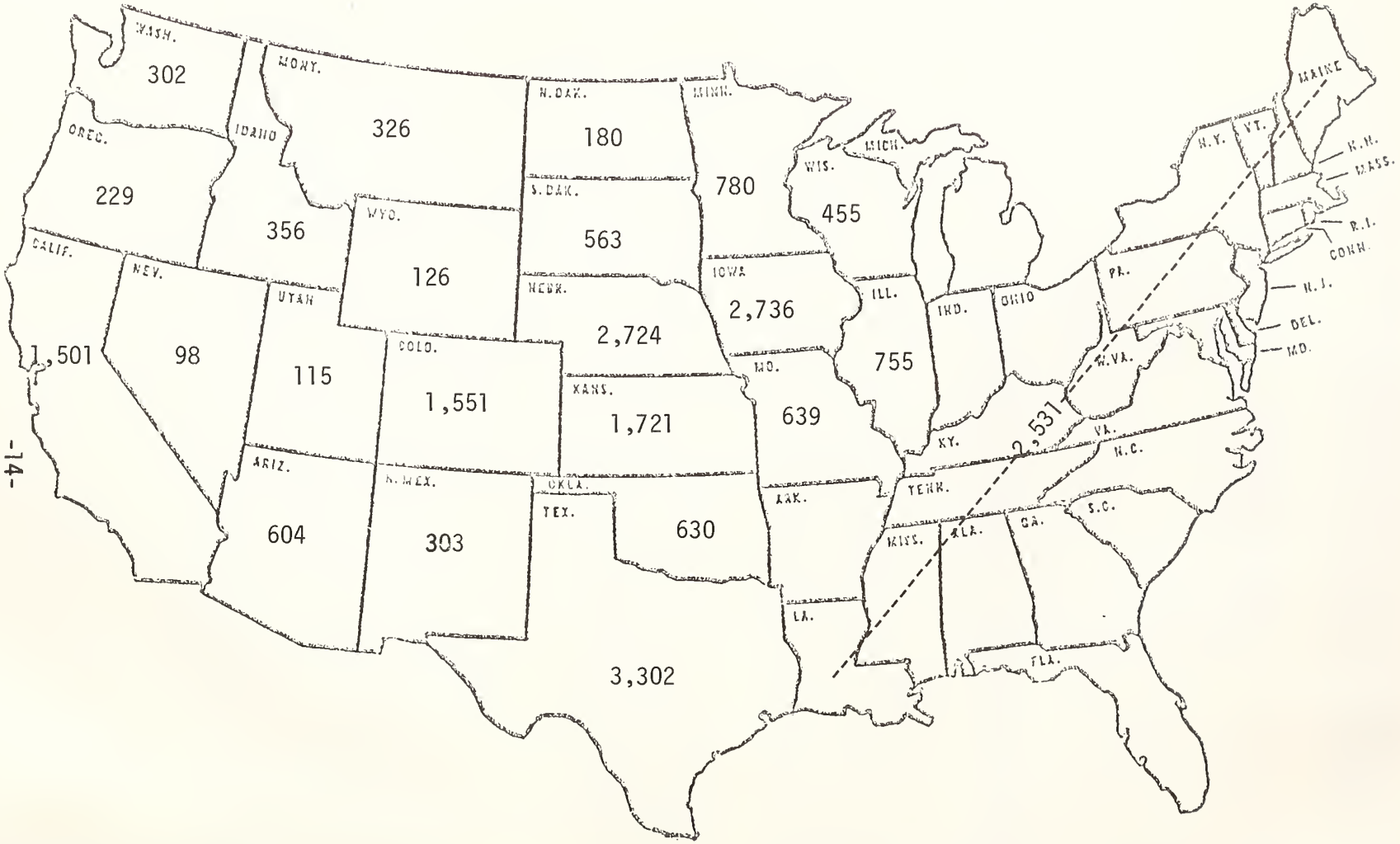


Figure 6 --Consumption of beef, 1972
(Millions carcass pounds)

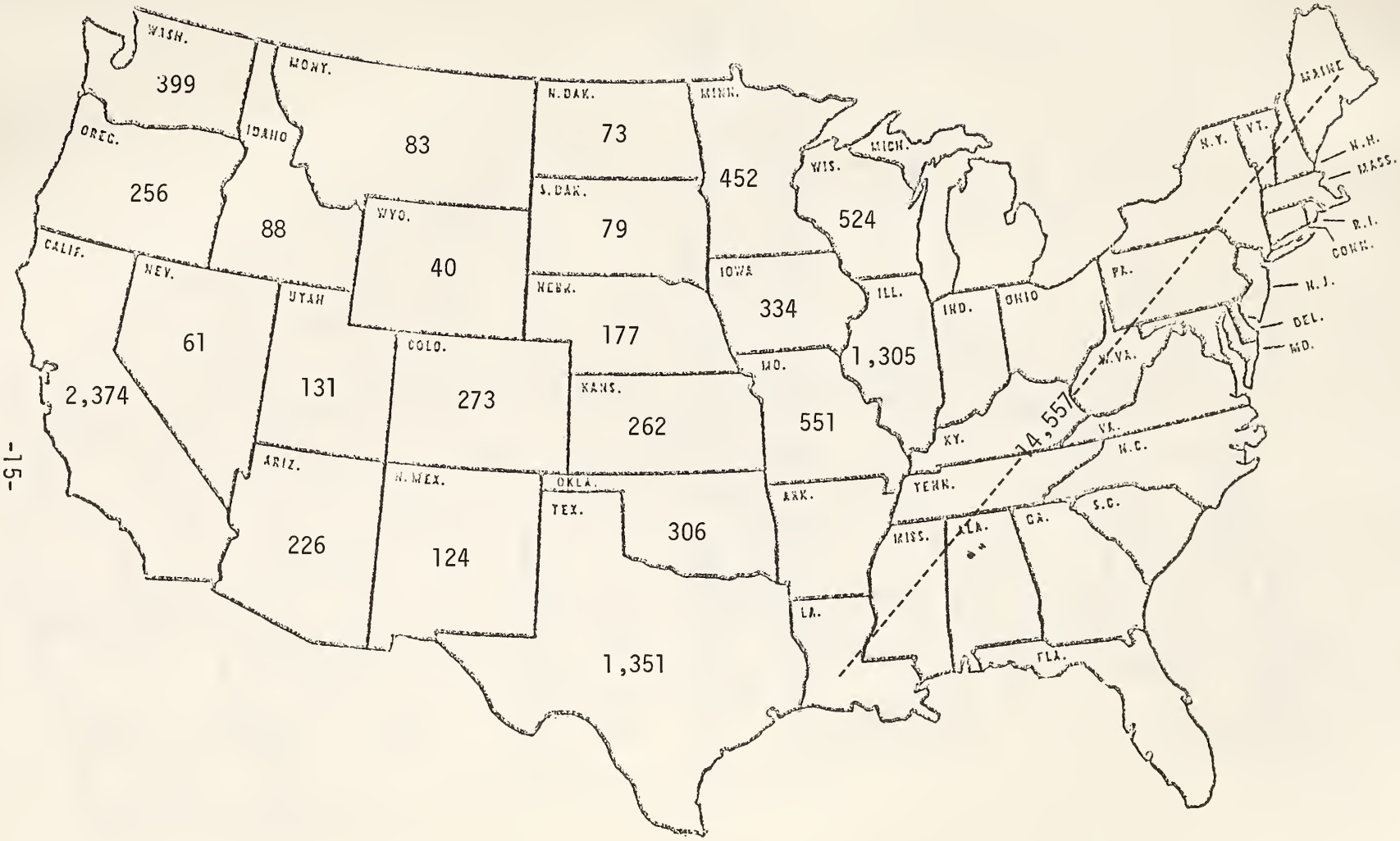


Figure 7 --Production-consumption balance, 1972
(Millions carcass pounds)

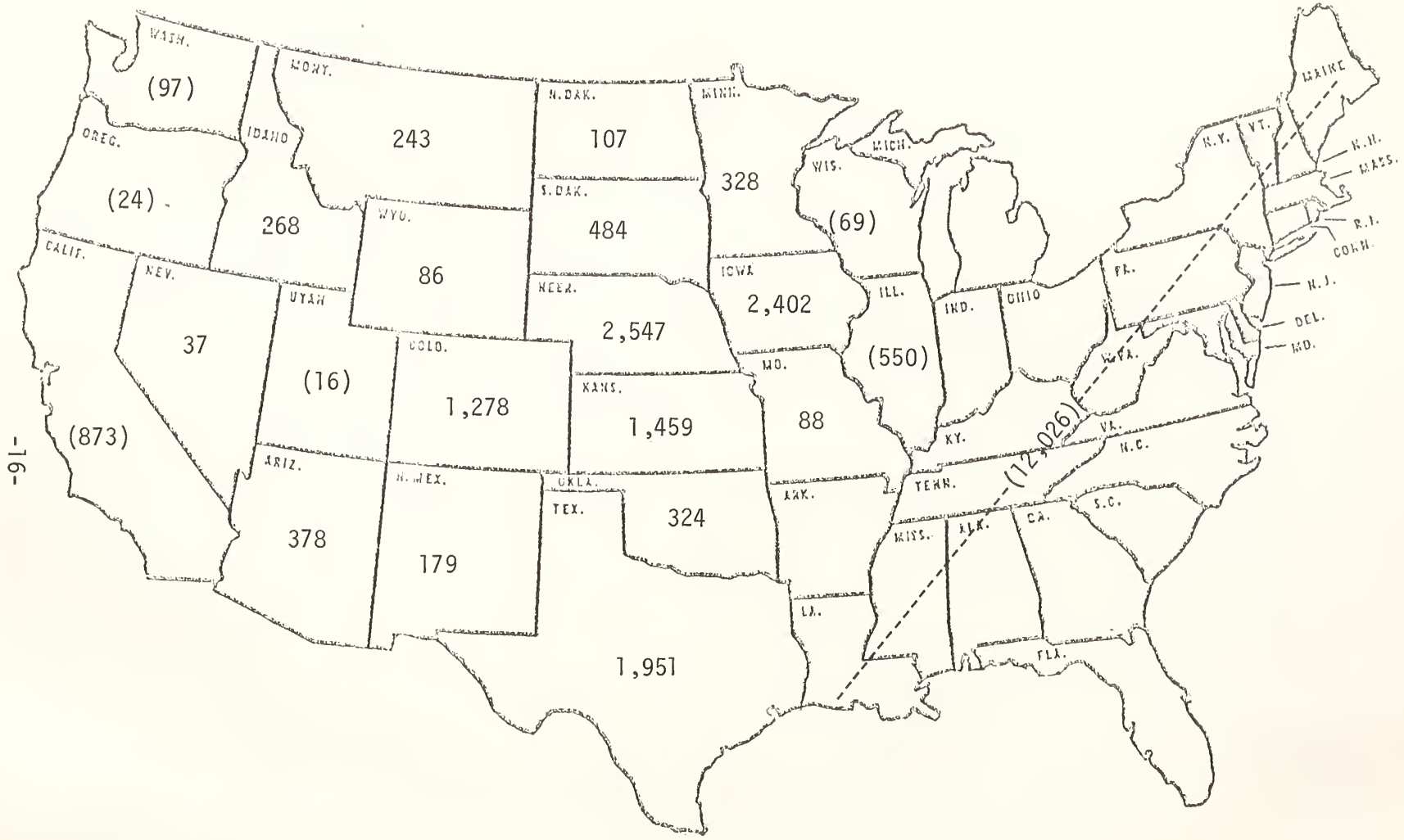


Table 6--Fed cattle marketed by number and size of feedlot, Montana, 1972

Lot size in head capacity	Feedlots	Head marketed
	Number	
Under 1,000	317	26,000
1,000 - 1,999	36	31,000
2,000 - 3,999	17	33,000
4,000 - 7,999	14	86,000
8,000 - 15,999	1/ 5	1/ 71,000
16,000 - 31,999	0	0
Total	389	247,000

1/ Lots and marketings from larger size groups are included to avoid disclosing individual operations.

Source: Livestock and Meat Statistics, USDA, ERS, Stat. Bulletin No. 522, July 1973.

Thirty-six feedlots, with capacities ranging between 1,000 and 1,999 head, marketed 31,000 head of fed cattle. These lots averaged 861 head of fed cattle marketed. This suggests that many of these lots either were empty or were utilized far below their capacity for one turnover.

Seventeen feedlots with capacities of 2,000 to 3,999 head marketed 33,000 fed cattle, averaging 1,941 head per lot. The remaining 19 feedlots with capacities of more than 4,000 head marketed 157,000 head, or more than 150 percent of the fed cattle marketed by 370 smaller feedlots in Montana. These statistics tend to confirm that larger feedlots have a higher turnover of fed cattle, and as a consequence, spread the fixed feedlot investment over greater cattle numbers. This enables them to use specialized labor, equipment, and facilities more fully. In addition, larger feedlots provide a year-round local source of fed cattle which is vital to full utilization and profitability of specialized cattle slaughter facilities.

It is not the purpose of this report to suggest the size or number of cattle feedlots for Montana. We assume that the fed cattle supply needs of any slaughter plant can be met from any combination of sizes of feedlots; however, we recognize that the problem of supply coordination becomes greater as feedlot numbers increase. Table 7 breaks down the minimum number of coordinated feedlots required of each size, at one, two, and three annual turnovers, to supply the three alternative sizes of slaughter plants considered. Any combination of feedlot sizes or turnovers could deliver the required fed cattle supply with proper coordination. The logistics of this coordination will be simpler with a few, large-size feedlots that have several turnovers. An integrated system will exert some positive force to insure feedlot supply performance if it has invested several million dollars in slaughter facilities.

These factors contribute to the coordination problem from small feedlots:

--Cattle feeding tends to complement other farm and ranch enterprises that return greater revenue.

--Cattle feeding tends to be highly seasonal, with one turnover annually.

--There is less incentive to keep the feedlot full because total feedlot investment is low.

--Small feeders frequently do not have the line of credit necessary to guarantee supply performance.

--Small feedlots tend to remain idle when the owner drops out of the cattle feeding business.

Table 7--Coordinated feedlots required at specified plant sizes and turnover rates

Plant and annual capacity	200 head turnover			1,000 head turnover			3,000 head turnover			10,000 head turnover		
	1	2	3	1	2	3	1	2	3	1	2	3
	Number											
A (60,000 head)	300	150	100	60	30	20	12	6	4	6	3	2
B (100,000 head)	500	250	167	100	50	34	20	10	7	10	5	3
C (300,000 head)	1,500	750	500	300	150	100	60	30	20	30	15	10

Requirements for Three Cattle Slaughter Plants

The overall physical requirements for labor, cattle supply, and investment for three alternative-scale cattle slaughter plants are compared in table 8. The weekly kill requirements of these plants are more meaningful than annual requirements in planning the ultimate scale because these weekly kill demands must be met regularly each week if the plant is to operate efficiently and hold in-plant costs to competitive levels.

Failure to meet these volume goals seriously affects the investment and interest cost per head, as well as the operating cost (table 9). The highly competitive nature of the meatpacking industry means that these cost savings from scale and the degree of utilization cannot be ignored. When operating at capacity, plant investment and interest cost per head drop substantially as plant size is increased.

From an industrial development standpoint, employment requirements of each scale plant could easily be met in Montana and the payroll would be advantageous to any community. It should be noted, however, that a modern slaughter plant is a capital intensive rather than a labor intensive form of industrial development. While aggregate cost estimates of the three plants vary from 3.0 million to 12.6 million (table 10), a more meaningful measure is represented in the cost per head of plant capacity. This measure becomes paramount because the plant must repay this capital with interest during the useful life of the plant if the program is to be economically feasible.

Investment and Operating Costs for Cattle Slaughtering Plants

Investment in plant and equipment (including land) plus operating capital in three sizes of slaughtering plants is:

	60,000 head/yr.	100,000 head/yr.	300,000 head/yr.
	Million dollars		
Building and equipment	1.6	2.4	5.2
Operating capital	1.4	2.4	7.4
Total	3.0	4.8	12.6
		Dollars	
Total/Head	50.68	48.30	42.14

Table 8--Physical requirements for specified scale of cattle slaughter plants

Plant and annual capacity	Employees	Kill rate			Total investment	Investment per head capacity		10% interest charge on investment	
		Hourly	Daily (8 hrs.)	Weekly (5 day)		Investment Utilization 100%	Investment Utilization 75%	10% interest charge on investment Utilization 100%	10% interest charge on investment Utilization 75%
	Number				Million dollars	Dollars			
A (60,000 head)	47	30	240	1,200	3.041	50.68	67.58	5.07	6.76
B (100,000 head)	75	50	400	2,000	4.830	48.30	64.40	4.83	6.44
C (300,000 head)	188	150	1,200	6,000	12.641	42.14	56.18	4.21	5.62

Table 9--Cost of operating a 100,000 head capacity slaughtering plant at selected percentages of capacity, Montana

Item	Cost of operating at different percentages of full capacity					
	50%	75%	90%	100%	110%	125%
	Dollars					
Sales	496.65	496.65	496.65	496.65	496.65	496.65
Cost of goods sold	462.00	462.00	462.00	462.00	462.00	462.00
Gross margins	34.65	34.65	34.65	34.65	34.65	34.65
Operating expenses						
Payroll	13.84	10.25	9.39	8.83	9.07	9.35
Freight-in	3.50	3.50	3.50	3.50	3.50	3.50
Freight-out	7.85	7.85	7.85	7.85	7.85	7.85
Depreciation	9.62	6.41	5.34	4.81	4.37	3.85
Other	4.35	3.38	3.06	2.90	2.77	2.61
Total	39.16	31.39	29.14	27.89	27.56	27.16
Net profits	(4.51)	3.26	5.51	6.76	7.09	7.49
Depreciation and net profit	5.11	9.67	10.85	11.57	11.46	11.34

Table 10--Estimated investment for cattle slaughtering plants, selected sizes, Montana

Item	60,000 head plant (30 head/hour)	100,000 head plant (50 head/hour)	300,000 head plant (150 head/hour)
		Dollars	
Land	150,000	205,000	320,000
Site work	30,000	40,000	90,000
Water system	115,000	145,000	300,000
Waste water system	165,000	195,000	375,000
Corrals	98,000	161,000	455,000
Building and equipment	978,000	1,580,000	3,534,000
Architectural fees	59,000	79,000	177,000
Subtotal	1,595,000	2,405,000	5,251,000
Per head	26.58	24.05	17.50
Operating capital 1/	1,445,790	2,425,400	7,389,830
Total investment	3,040,790	4,830,400	12,640,830
Investment per head	50.68	48.30	42.14

1/ 5 percent of annual operating expenses (less depreciation) and cost of goods sold is needed continuously to purchase cattle, pay employees, inventory supplies, etc. prior to being paid for beef and by-products sold.

Operating capital requirements are generally equal to plant and equipment requirements. Operating capital per head is fairly constant; hence, all economies of size for the investment accrue to more efficient use of building and equipment resources as size increases.

As plant size increases, "payroll" and "other expenses" per head decline. But increases in plant size generally mean that cattle must be secured from a broader area, thereby increasing "freight-in" charges. In Montana, a larger plant must also distribute its product over a much wider area, thereby increasing "freight-out" expense. The assumption on market shares and distances used to calculate "freight-in" and "freight out" are shown in tables 11 and 12.

Montana is in the unique position of being neither a fed cattle surplus State nor a consumption deficit State. Hence, the rapid increase in both "freight-in" and "freight-out" expenses as plant size increases. This situation contrasts with the situation of plants located near large cattle supplies as in Colorado, Texas, and Nebraska, and plants located near meat-deficit areas like California, Pennsylvania, or Florida. The results is that total "operating expenses" actually exhibit diseconomies of size for plants located in Montana (table 13).

Adding a surcharge to adjust for the likelihood that a plant under existing conditions in Montana would not operate at 100-percent capacity makes the expenses increase as follows:

	Costs per Head by Size of Plant		
	60,000 head/yr.	100,000 head/yr.	300,000 head/yr.
Operating expenses	$21.70	$24.68	$31.82
Surcharge	3.75	3.50	2.75
Total	$25.45	$28.18	$34.57

If the plant can sell at the usual carlot wholesale prices for choice carcass meat, it can make a net profit on the two smaller plants only if it pays $1/cwt. below the Omaha price for choice fed steers. The larger plant must discount the Omaha price even more (table 13).

An integrated cattle feeding and slaughtering operation would be more profitable, assuming cattle could still be provided at $1/cwt. below Omaha (choice 900 to 1,100 pound steers). Integration could permit the plant to operate at 90 to 100 percent capacity year-round, thereby removing the "surcharge." Integration would also tie nearby cattle supplies to the plant, thereby reducing the "freight-in" cost. Under an integrated system, the net return before taxes would almost double for the two smaller plants and be eight times larger for the 300,000 head plant (table 13).

Table 11--Supply assumptions for determining freight-in costs, Montana slaughter plant

Supply area	Potential market share		Transportation costs ($/1,050 lb. steer)	Distribution of supply by size of plant		
				60,000 head	100,000 head	300,000 head
	Percent	No. of head	Dollars	No. of head		
Under existing supply conditions						
Montana	33	82,000	2.38	60,000	80,000	80,000
North Dakota	10	8,500	10.32	--	--	8,000
South Dakota	10	56,100	10.72	--	--	55,000
Idaho	10	42,800	10.12	--	10,000	42,000
Wyoming	15	11,000	8.44	--	10,000	10,000
Colorado	5	110,000	11.41	--	--	105,000
Nebraska	5	199,325	17.87	--	--	--
Total head		400,325		60,000	100,000	300,000
				Dollars		
Average price/cwt.				44.00	44.00	44.00
Average transportation cost/head				2.50	3.50	8.50
				No. of head		
Under integrated supply conditions						
Montana feedlots operated by the packer	67			40,000	67,000	200,000
Other Montana feedlots	33			20,000	33,000	100,000
Total head				60,000	100,000	300,000
				Dollars		
Average transportation cost/head				2.00	2.50	3.50
Savings of integrated supply				.50	1.00	5.00

Table 12--Market assumptions for determining freight-out costs, Montana slaughtering plant

Market area	Potential market share		Price for carcass beef	Transportation cost ($/630 lb. carcass)	Distribution of sales by size of plant					
					60,000 head		100,000 head		300,000 head	
	Percent	Million pounds	Dollars/cwt.	Dollars	Million pounds	Percent of sales	Million pounds	Percent of sales	Million pounds	Percent of sales
Montana	15	12.5	70.10	2.84	12.5	33.1	12.5	19.8	12.5	6.7
Neighboring states	5	23.6	70.10	5.67	23.6	62.4	23.6	37.4	23.6	12.7
Washington, Oregon and Japan	10	74.2	71.10	12.03	1.7	4.5	26.9	42.8	74.2	39.9
California	5	118.7	70.50	17.45	--	--	--	--	75.7	40.7
Total pounds					37.8	100.0	63.0	100.0	186.0	100.0
					---------- Dollars ----------					
Average price/cwt.					70.15		70.50		70.65	
Average transportation cost/head					5.00		7.85		12.80	

Table 13--Estimated operating budgets for cattle slaughtering plants, selected plant sizes, Montana

Item	60,000 head plant (30 head/hour)	100,000 head plant (50 head/hour)	300,000 head plant (150 head/hour)
	Dollars per head		
Under existing supply conditions			
Sales			
Beef carcasses 1/	441.95	444.15	445.10
By-products	52.50	52.50	52.50
Total	494.45	496.65	497.60
Cost of goods sold			
Cattle 2/	462.00	462.00	462.00
Gross margin	32.45	34.65	35.59
Operating expenses			
Payroll 3/	9.00	8.83	7.09
Freight-in 2/	2.50	3.50	8.50
Freight-out 1/	5.00	7.85	12.80
Depreciation 4/	1.77	1.60	1.17
Other expenses	3.43	2.90	2.26
Total	21.70	24.68	31.82
"Surcharge" for variable supply 5/	3.75	3.50	2.75
Net profit, before taxes	7.00	6.47	1.02
Under integrated supply conditions			
Total operating expenses above	21.70	24.68	31.82
Freight-in savings 2/	.50	1.00	5.00
Net profit, before taxes	11.25	10.97	8.77
Federal income tax	5.40	5.27	4.21
Net profit after taxes	5.85	5.70	4.56
Total investment 6/	50.68	48.30	42.14

1/ Prices received for beef carcasses increase as plant size increase because higher priced markets are entered. However, these higher priced markets are further away, thereby increasing freight-out costs. See table 12 on market assumptions.

2/ Based on fed steers weighing 1,050 lbs. and purchased at $44/cwt., $1 below estimated Omaha price. As plant size increases, the supply area must be enlarged. While this is expected to have little influence on the price paid, freight-in costs are increased. See table 11 on supply assumptions.

3/ Includes gross salary plus 20 percent for payroll taxes, insurance, and fringe benefits. Number of employees is 46, 74, and 186, respectively.

4/ Useful life is estimated to average about 15 years.

5/ Estimated to be equivalent to operating at 75 percent of capacity.

6/ Includes operating capital.

Computing profits for a new Montana plant is very tentative because any small change in the average price paid for cattle or the average price received for beef and by-products could mean the difference between a net loss or a net profit. For example, $1/cwt. more for live cattle means $10.50 less gross margin; or $1/cwt. less for carcass beef means $6.30 less gross margin. Changes in dressing percentages, by-product values, or distances to haul cattle or products also affect profitability.

Under the assumptions made above, there are net before-income-tax returns of $11.25, $10.97, and $8.77 per head for integrated operations. If the corporation pays the standard 48 percent Federal income tax, after-tax returns are $5.85, $5.70, and $4.56. With investments of $50.68, $48.30, and $42.14, after-tax-returns on investment are 11.5, 11.8, and 10.8 percent, respectively, for the three plant sizes. By the end of the fifth year of operation, depreciation will have reduced the investment in plant and equipment, and the returns on investment are estimated at 14.0, 14.1 and 12.6 percent. By the end of the tenth year, the estimates are 17.7, 17.6, and 15.0 percent. These returns compare with Iowa Beef Processors and Missouri Beef Packers, who have had about 13.0 percent returns on stockholders' equity during the past 5 years (table 14).

The above after-tax-return would allow a full recovery of the plant investment (not including operating capital) in approximately 3.5, 3.3, and 3.1 years.

Nevertheless, the confidence one could put in returns on a new Montana plant must remain low at this time, largely because of uncertainty about supply and product markets. Integration was used above to solve the supply uncertainty, but the product market uncertainty remains wide open. It is very unlikely that these kinds of returns could be achieved in the first year, or possibly two years, while start-up costs (not included above) and market entry costs (not included above) must be borne.

The above analysis centers solely on the production of steer beef carcasses, and related by-products. The same plant could also slaughter heifers and cows. In fact, cows generally provide a gross margin which is $5 larger than that for steers, while encountering essentially the same operating expenses. Montana has about 250,000 beef cows available for slaughter each year.

It is also generally accepted that the breaking of beef carcasses into primal, subprimal, and in some cases, retail cuts, is a more profitable enterprise than a simple "kill and chill" operation producing beef carcasses. The necessary plant and equipment for fabricating all carcasses will raise capital requirements by approximately $300,000, $700,000 and $1 million for the three plant sizes. Fabrication of beef carcasses makes a lot of sense for a plant located in Montana because it reduces freight-out weight from 630 pounds to 450-550 pounds per carcass; hence it reduces

Table 14--Return on stockholder equity in meat packing business

Year	National average all meat packers [a]	Iowa Beef Processors [b]	Missouri Beef Packers [b]
	Percent		
1968	10.2	18.6	9.8
1969	8.8	10.0	16.8
1970	8.7	1/ 1.6	11.5
1971	10.8	9.4	13.0
1972	9.0	15.1	13.7
5 year average	9.5	13.3	13.0

1/ Low return was largely due to long labor strike in 1970; 1970 omitted from the average.

Source: [a] Marketing and Transportation Situation, USDA, ERS, November 1972. 1972 was estimated from Financial Facts About the Meat Packing Industry, 1972, American Meat Institute, July 1973.
[b] Annual reports.

freight-out expenses. Any success in securing a larger share of local markets plus the export to Japan or Alaska would improve the profitability of the plant.

The above analysis ignores the question of whether or not cattle feeding is the best alternative use of agricultural resources in Montana, and it also ignores whether or not Montana cattle feeders are able and willing to feed cattle for $1 a hundredweight less than the Omaha market.

Guidelines for an Integrated Cattle-Production, Slaughter-Beef Marketing System

Integrated systems may be viewed and evaluated from different points of view: Type of business organization, degree and method of control, or functional market efficiency--that is, market performance. Business organization and degree of control are only useful insofar as they contribute to improved market performance.

Business Organization

The type of business organization is a prerogative of the business owners. Businesses that involve risk and a large capital investment usually are organized as cooperative corporations or noncooperative corporations. Incorporation eases the task of raising capital for worthy ventures and limits the liability of a venture to the assets of the business. Corporations allocate or distribute their earnings to the equity shares of ownership, while cooperative corporations by law must limit their return to owner equity with the remainder allocated or returned to patrons in proportion to their patronage of the firm. To the extent that cooperative patrons own equity in proportion to their patronage, there would be no overall difference in the allocation or distribution of operating margins to owners.

Degree of Control

An integrated system may also be viewed or evaluated as to the degree of control it exercises over the product flow through the entire market channel. It follows, that with this control also goes the full responsibility for market performance. This product control may be achieved by ownership, through contracts with performance clauses, or by economic or geographic isolation from alternative opportunities, or by any combination of these methods.

Market Performance

Regardless of business organization used or degree of control a business achieves over the marketing system, success of the integrated or non-integrated system will be measured by how competitive it has become in the industry.

Functional Segments of the Beef Industry.--For purposes of analysis, the beef industry may be divided into the following major production and marketing functions:

1. Beef cow-calf operations
2. Stocker cattle operation
3. Cattle feeding
4. Slaughter and beef processing
5. Beef distribution to consumers

Beef Cow-Calf Operations

While slaughter beef may originate from cull cows, bulls, and as a by-product from the dairy industry, the primary source of U.S. beef production is beef cow-calf operation.

Beef cow-calf operations are a major agricultural enterprise in Montana. They are well adapted to the range and forestland covering much of the State, and it is unlikely that any other agricultural pursuit can utilize this land to better advantage. Ranchers have found through years of experience that they are able to obtain the greatest production with the highest gross return by calving as early in the spring as weather permits, using the coming spring's lush grazing to stimulate expanded milk production as the young animal grows to utilize it. With weaning and sale of feeders in the fall, the beef cow, along with any replacement heifers, are wintered with a minimum of harvest roughage and winter shelter to begin this cycle again in the spring.

Because the beef industry is national in scope and the volume of feeders in Montana is large, buyer influences from all feeding areas are felt in all of Montana's fall feeder markets. This cash feeder market is viable and responsive, and therefore, it is unlikely that an integrated beef marketing system will have any strengthening effect on Montana's feeder price. Rather, an integrated beef marketing system offers Montana's ranchers the opportunity to invest and participate in the operating margins of additional beef production and marketing functions.

Stocker Cattle Operations

This beef production function is not as distinctly defined as such; rather, it is usually viewed as a complementary, seasonal beef production operation carried on by various U.S. farmers or ranchers. It performs two distinct production and marketing functions: (1) It provides a market for fall pasture in the more southern States, as well as a crop gleaning or roughage marketing function in much of the grain or Corn Belt; (2) it spreads or extends the highly seasonal spring calf (feeder) market over a longer period, thus enabling specialized cattle feedyards to obtain replacements as their fed cattle are marketed for slaughter.

Because of the shorter grazing season, severe winters, and extent of small grain farming in Montana, this State does not adapt to the performance of this function over a long fall season. For this reason, feeder replacements are usually not available in Montana in as wide a selection over as long a season as in States farther south or in the Corn Belt.

Because of the complementary nature of many of these stocker operations, the cost of these gains are low. Therefore, it would be difficult or impossible to modify or to replace these normal operations on a purely independent or competitive basis.

Seasonality of feeder replacements has been overcome by interregional movements as well as spring and fall calving in major southern cattle feeding areas. When interregional movement involves a return of a feeder to the State of origin and this movement does not bring the resulting carcass beef nearer the ultimate consumer, it represents an unnecessary inefficiency in the beef marketing system.

Cattle Feeding

An earlier review of fed cattle marketed from the various sizes of feedlots indicated that operations of Montana feedlots are much the same as in other areas. While it may be desirable from an environmental or social point of view to disperse cattle feeding over a wide area of the State, in practice smaller feedlots tend to increase seasonality of cattle feeding, increase the coordination problem for an integrated system, and usually result in lower prices to smaller feeders because of higher operation costs for cattle buyers. These problems may be overcome if these small feeders organized and supported a jointly owned cooperative livestock marketing association; however, the operating cost of such an association must be borne by its member-owners.

Unless these problems of small feedlots are favorably resolved, the trend toward large feedlots will continue in Montana as it has in other States. For this reason, a new beef packing plant in Montana must presently look to the availability of year-round fed cattle supplies; a new Montana beef slaughter plant must solicit and receive owner equity and support with firm supply commitments if it is to succeed.

Slaughter and Beef Processing

What opportunity exists for a new Montana cattle slaughter facility? Our review of the beef packing industry indicates that the returns to equity capital in the beef packing industry is generally not high. This does not prevent a new, efficient, beef packing plant that is favorably located in relation to its market and operates at or near capacity from yielding more attractive net returns. However, our work reveals that it would be difficult for a new Montana plant to operate near full capacity without firm supply commitments from existing or new local commercial feedyards.

What can a new Montana beef slaughter plant offer commercial Montana feeders? The primary incentive for commercial cattle feeders to invest in and support a beef packing venture would be the opportunity to participate in the margins of marketing beef as well as fed cattle and to share proportionately added returns or losses from beef sales. To the extent that out-of-State buyers and in-State packers are paying less than the market value for fed cattle, a possibility for higher fed cattle price exists. While this may occur in isolated cases, it is unlikely over the long run where large feedlots are involved and many buyers operate in the area.

Beef Distribution to Consumer

The broad approach taken here has been to analyze the production of carcass beef in each State and to calculate its beef production-consumption balance. This supply-demand relationship was used to estimate the probable beef movement from the plants under consideration. Results of these calculations suggest that the success of any new beef slaughter operation in Montana leans heavily on the success it would have in gaining access to nearby markets or through West Coast exports.

A detailed beef marketing study would be necessary in order to pinpoint the market destination of processed beef and to accurately determine freight-out costs. Such a beef marketing evaluation must come from someone actively involved and associated with beef marketing on the West Coast. This work involved merely the balancing of beef carcass production against projected beef consumption, using 116 pounds per capita and most recent U.S. population figures.

Advantages of an Integrated Beef Marketing System

It has been shown that economies of scale exist in the cattle slaughter industry, and that penalties are severe when a high fixed-cost facility is not utilized to capacity. Failure to utilize fully the largest feasible-scale beef slaughter facility will eliminate all potential in-plant advantages that a new Montana plant could achieve. Since Montana's fed cattle marketings are more seasonal than in the "more favored" feeding areas, a new efficient slaughter plant must have a coordinated or integrated fed cattle supply in order to assure consistent operation at capacity. Unless full utilization is achieved, the plant is not likely to be competitive in today's U.S. beef market.

The presence of a new slaughtering plant in Montana will probably have little effect in increasing local feeder cattle or fed cattle prices because of the surplus production situation which will still exist. The major incentive for cattlemen to give up some of their decision-making freedom and to coordinate more closely with the slaughter function would be the opportunity to share in beef packing and marketing margins. However, these margins might not be very large.

Other Publications

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For copies, write Farmer Cooperative Information, U.S. Department of Agriculture, Washington, D. C. 20250

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