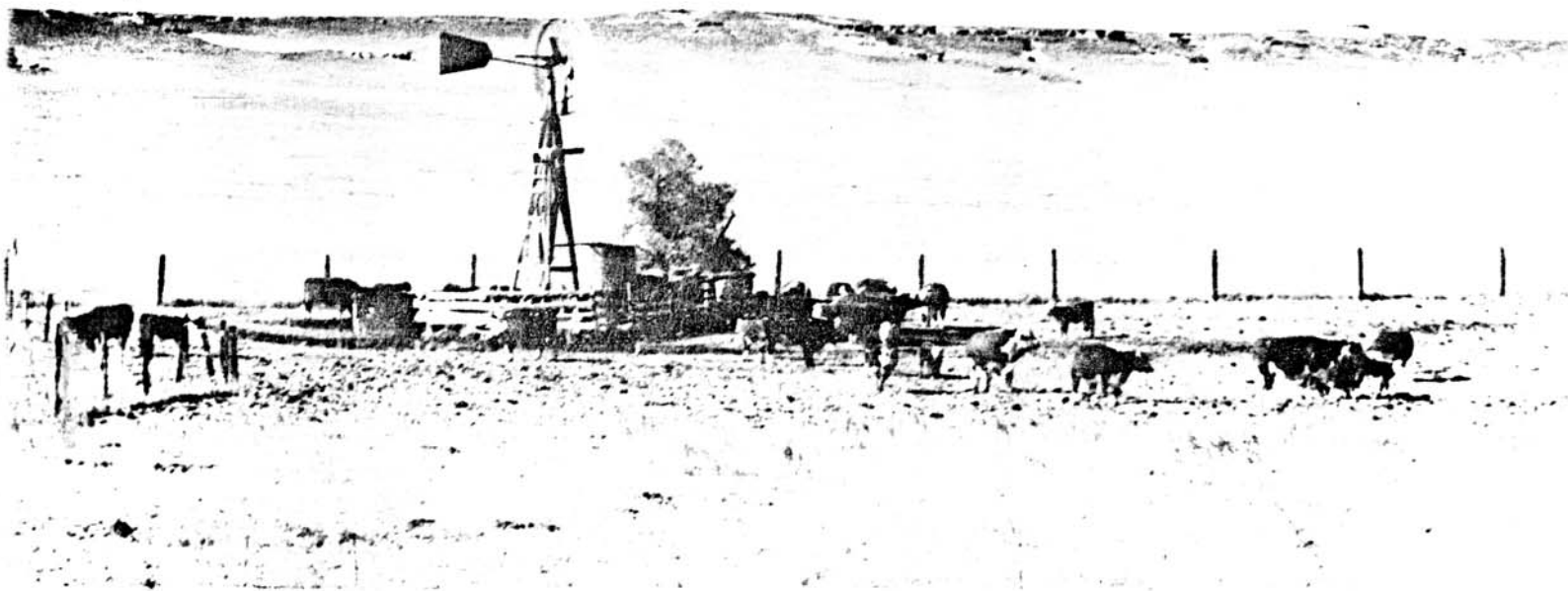


CATTLE RANCHING

in the
Northern Plains Area
of **Wyoming**



AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF WYOMING, LARAMIE

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NORTHERN PLAINS AREA
OF WYOMING

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SUMMARY AND CONCLUSIONS

Cattle ranching is the most important agricultural activity in the plains area of Wyoming. It has been increasing in relative importance for at least 25 years compared with other types of agriculture. A survey was made in 1959 to obtain information on inputs used, organization and operation of ranches, costs and returns, and management practices followed. Three sizes of operations and two types of ranches, cow-calf and cow-yearling, were studied.

The small, medium, and large-size ranches included in this study averaged about 4,500, 9,800, and 32,700 acres of land, respectively, including both deeded and leased land. This is about 27 to 34 acres per cattle unit for the three ranch sizes, with a much wider range on individual ranches.

Investments ranged from an average of about \$91,000 on the small operations to about \$686,000 on the large ranches, or \$547 to \$705 per cattle unit.

Cash costs of operations averaged about \$43 to \$45 per cattle unit for the three ranch sizes. Operating costs amounted to \$52 to \$56 per cattle unit. These costs included maintenance of capital and changes in inventories but not interest on investment or operator's wage.

Economies of size, either in resource use, investment requirements, or costs of operation, do not appear within the size ranges studied. If smaller units had been considered, then it is possible that economies of size would have been shown between such smaller units and units of the size ranges included in the study.

Cattle sales and change in cattle inventories were, by far, the most important revenue items on these specialized cattle ranches accounting for about 94 to 97 percent of total cash income. Total cash income amounted to about \$95 per cattle unit for small and medium-sized operations and to \$86 for large-sized operations.

Net ranch income was about \$50 per cattle unit on the small-sized operations and about \$43 to \$45 on the medium-sized and large operations.

There was little difference between cow-calf and cow-yearling types of operation. On a per-cattle-unit basis, the types were nearly identical in land requirements, investment, revenues, costs and returns. The differential in prices between calves and yearlings becomes large when cattle prices are high. In 1959 prices for cattle were relatively high, and calf operations may have been favored by a price differential larger than normal. No conclusions can be drawn regarding the relative advantage of cow-calf and cow-yearling operations without analysis of particular ranch situations since resources are important in determining adaptation to a cow-calf or cow-yearling type.

Variations in numbers, weights, and prices of cattle sold were the principal factors accounting for variations in net returns. There was much less variation in costs than in returns. Ranchers obtaining high calf crops and selling heavier calves and yearlings early enough to be ahead of the price break fared much better in 1959 than did other ranchers.

Data were presented on the basis of cattle-units to facilitate comparison between different size of ranches and between cow-calf and cow-yearling operations. Data were also presented on the basis of breeding-cow units to make for more ready comparison between the results of this

study and a rancher's own operation. On this latter basis, the cow-calf-yearling operations have substantially more cattle units per breeding cow unit than the cow-calf operation. This is because the entire calf crop is held over to be marketed as yearlings and adds to the number of animal units. The cow-calf-yearling operations also have substantially more land, investment, income, and expenses per breeding cow unit.

Information was also obtained on labor requirements in man hours per breeding-cow unit. Labor requirements varied; it depended upon season of the year and also upon size of operation. Labor requirements in man hours varied from about 12.25 to 7.10 for cow-calf operations, ranging from 100 to 500 breeding cow units. Labor requirements per breeding-cow unit were slightly larger on the cow-yearling operation, of course, ranging from 15.57 to 10.40 on operations of 100 to 500 breeding cow units.

Information was also obtained on feed use on ranches included in the study. Smaller ranches tended to feed more hay and concentrates to all classes of livestock except bulls. All sizes of ranches appeared to use approximately equal volumes of hay for their bulls. The larger ranches fed more concentrates to bulls than did the smaller ranches.

The level of management, particularly livestock management, was good on most ranches. Ranchers seemed aware of Experiment Station recommendations relating to livestock management and, generally speaking, followed them well. They did not follow recommendations regarding range-management practices so closely. Most ranchers felt they were stocking ranges conservatively. Many ranchers did not see the need to adopt range-improvement practices such as reseeding, brush removal, pitting or other tillage-type improvements.

INTRODUCTION

The Great Plains of Wyoming lie east of the Big Horn Mountains in the north and east of the Laramie Range in southern Wyoming. The data were collected primarily from Niobrara and Weston counties with some overlapping into adjacent areas of Campbell, Converse, and Crook. The study area was limited to avoid areas of intensive irrigation farming or extensive dryland-cropping operations. Although the study was confined to a locality perhaps 50 miles wide by 100 miles long, the ranches of this area are representative of range and ranching conditions extending over a much larger part of the Great Plains of Wyoming and adjacent states.

Records were obtained from a sample of 24 ranches selected from lists previously stratified as to size and type of operation. The small ranch size was defined as one requiring the operator's attention full time but with a minimum of hired labor. The medium ranch size requires at least two men most of the time and should allow for some efficiencies in the use of labor and other resources. The large ranch size should allow economies of size to be fully effective. Records were obtained on both cow-calf and cow-yearling operations in each of the three size strata.

In selecting the sample, all ranches thought to be below the size for a good economical unit were excluded. Approximately 60 percent of the livestock farms and ranches in the Wyoming plains area are actually smaller than those in the small-sized group as defined here. At the same time, both the medium-sized and large ranches described here would be considered large compared with all ranches in the plains. Only about 12 to 15 percent of all plains ranches would be as large.

RANCH ORGANIZATION

The average cattle inventories for each type and size of ranch are shown in Table 1. The average number of cattle carried on small ranches with yearling operations was equivalent to 192 cattle units, compared with 140 cattle units on the small ranches with calf operations.^{1/} The medium-sized ranch with yearling operations had 423 cattle units compared with 290 cattle units on those with calf operations. The large ranches with calf operations had 1,031 cattle units and those with yearling operations had 913 cattle units.

Land Requirements

Cattle ranching requires the use of extensive areas of land. Even the ranches classed as small averaged around 4,500 acres, including both owned and rented land (Table 2). The large-sized operations used about 33,000 acres.

On the average, the smaller operators used a higher proportion of leased land than did the larger operators. They also tended to use their land more intensively; they had more hayland and cropland per cattle unit but less rangeland than the larger operators. Because of the extensive areas involved, it was not possible to evaluate the quality of land used or the intensity of grazing on rangelands. Possibly, however, the larger operations are situated on lower quality land. Another possibility is that the medium and large-sized operations had higher family incomes and did not feel the need to stock their ranges as intensively as did the smaller operators.

^{1/} Cattle units correspond to animal units; however, only cattle are included. In computing cattle units the mature cow was considered the base as 1.00 unit, coming two-year-olds as .80 unit, coming yearling heifers as .61 unit, coming yearling steers as .64 unit, and mature bulls as 1.25 units.

Table 1 --- Average Cattle Inventory by Size and Type of Operations, 1959

Item	Size of operation									
	Small			Medium				Large		
	Calf operations (Number)	Yearling operations (Number)	Yearling operations (Number)	Calf operations (Number)	Yearling operations (Number)	Yearling operations (Number)	Calf operations (Number)	Yearling operations (Number)	Calf operations (Number)	Yearling operations (Number)
Number of ranches	5	5	3	4	3	3	3	3	3	3
Cattle inventories										
Breeding cows and yearling heifers	126	120	276	259	276	873	586			
Heifer calves	26	50	120	49	120	203	243			
Steer calves	1	50	107	6	107	49	246			
Yearling steers							7			
Bulls	5	5	11	9	11	25	26			
Total cattle	<u>158</u>	<u>225</u>	<u>514</u>	<u>323</u>	<u>514</u>	<u>1155</u>	<u>1108</u>			
Total cattle units	140	192	423	290	423	1031	913			
Calves weaned	114	98	226	211	226	616	495			
Calf crop (percent) ^{a/}	88.1	85.6	80.5	85.7	80.5	83.9	87.0			

a/ Calf crop is number calves weaned as a percent of cows and heifers in beginning inventories which had the opportunity to be bred. Cattle inventories are averages of beginning and ending, and breeding cows and heifers include some heifers not bred. Hence, calf crop, which was calculated from other data, cannot be computed directly from this table.

Table 2 -- Land Resources, by Size of Operation, 1959

Type of land	Size of operation			Weighted average ^{a/}
	Small	Medium	Large	
	(Acres)	(Acres)	(Acres)	(Acres)
Owned land	2,449	6,831	20,346	6,471
Leased land	<u>2,080</u>	<u>3,001</u>	<u>11,878</u>	<u>3,597</u>
Total land	<u>4,529</u>	<u>9,832</u>	<u>32,724</u>	<u>10,068</u>
	(Acres per cattle unit)	(Acres per cattle unit)	(Acres per cattle unit)	(Acres per cattle unit)
Owned land				
Cropland	.43	.19	.02	.22
Hayland	.54	.65	.72	.61
Rangeland	<u>13.78</u>	<u>18.56</u>	<u>20.71</u>	<u>20.52</u>
Total owned land	14.75	19.70	21.45	21.35
Leased land				
Cropland	.20	.06	---	.08
Hayland	.30	.09	.16	.19
Rangeland	<u>12.03</u>	<u>8.51</u>	<u>12.07</u>	<u>11.59</u>
Total leased land	12.53	8.66	12.23	11.86
Total land				
Cropland	.63	.25	.02	.30
Hayland	.84	.74	.88	.80
Rangeland	<u>25.81</u>	<u>27.37</u>	<u>32.77</u>	<u>32.11</u>
Total land	<u>27.28</u>	<u>28.36</u>	<u>33.67</u>	<u>33.21</u>
Source of leased land				
Private lease	8.16	4.79	5.76	5.54
State lease	.39	3.05	2.85	2.22
Federal lease	3.98	.82	3.62	4.10

a/ Weighting was by cattle units and by number of ranches in each size group from which the sample was selected.

Feed Use

Feed use varied a good deal among all the ranches (Table 3). Smaller ranches tended to use more hay and small grains and protein supplements combined than did the larger ranches except in the case of bulls. For some reason, possibly the availability of more cash, the larger ranches fed considerably more protein supplement and small grains to bulls than did the smaller ranches.

Table 3 -- Feed Use Per Head on Ranches, 1959^{a/}

Class of livestock and feed use	Unit	Size of ranch		
		Small	Medium	Large
Cows				
Hay	Tons	.65	.58	.25
Protein supplement	lbs.	144	124	58
Yearling heifers				
Hay	Tons	.75	.55	.25
Protein supplement	lbs.	145	119	45
Calves				
Hay	Tons	.33	.52	.38
Protein supplement	lbs.	100	150	139
Grains	lbs.	140	64	57
Bulls				
Hay	Tons	1.26	1.43	1.26
Protein supplement	lbs.	240	385	372
Grains	lbs.	98	148	345

^{a/} Information on feed use was obtained on only about 3/4 of the ranches sampled.

Labor Requirements

Labor used in connection with the cattle enterprise on these ranches included that for repairing fences and buildings and attending sales or auctions. It also included the more obvious requirements of feeding, herding and inspecting, branding, trailing to ranges, rounding up in the fall, and tending during calving time. Labor is expressed per breeding-cow unit and also includes labor necessary to care for the young cattle and bulls as well as breeding cows (Table 4).

Ranchers have much latitude in deciding just how much labor they wish to use in caring for their cattle. There is also a good deal of variation from one ranch to another in the layout of range pastures, in their location and distance from each other and from ranch headquarters. There is much variation in fall labor; it depends upon whether or not the operators wish to spend much time watching the market by attending auctions.

Table 4 -- Labor Requirements, Man-Hours per Breeding-Cow-Unit for Typical Cattle Inventories

Type and size of operation breeding-cow units	Season of year				Total ^{a/}
	Winter	Spring	Summer	Fall	
Cow-Calf					
100	3.29	5.54	2.03	1.39	12.25
200	2.08	4.58	1.88	2.18	10.72
300	1.69	4.05	1.72	2.00	9.46
400	1.52	3.62	1.54	1.59	8.27
500	1.43	3.22	1.37	1.08	7.10
Cow-Yearling					
100	3.59	6.32	2.62	3.04	15.57
200	2.38	5.36	2.48	3.82	14.04
300	1.97	4.82	2.31	3.64	12.74
400	1.82	4.39	2.15	3.23	11.59
500	1.73	3.99	1.96	2.72	10.40

^{a/} Total is sum of the seasonal requirements and is not exactly the same as would be calculated using the regression equation for total requirements.

Some small ranch operators spent considerable time attending auctions, whereas, some larger operators who had assured markets direct to feeders or who shipped to central markets, spent very little time at auctions.

Winter labor varies too. It depends upon the type of feeding program as well as upon cattle numbers. Operators of smaller ranches who fed more hay used more labor, proportionately, than did operators of larger ranches. Labor requirements vary also, depending upon location of the winter range with respect to headquarters and upon the number of winter pastures used. The time required to pick up feed from storage, transport it to the cattle, and call cattle together is substantial. The actual numbers of cattle fed or the number of sacks of protein supplement that must be scattered are often less important in determining labor requirements for winter feeding.

Investment

Large amounts of capital as well as large areas of land are used in cattle ranching. Estimates of the current market values of their ranches were obtained from ranchers in the study. Information was also obtained on the value of improvements and equipment on the ranch apart from the total value. These items were valued at new cost less depreciation, or, if new costs were not available, at a depreciated value of current replacement cost for improvements. Standard values were set on all livestock except bulls. The values used were \$175 per head for mature cows, \$150 for heifers coming two years old, \$90 for heifer calves, and \$110 for steer calves. Bulls were valued at the midpoint between average purchase price and salvage value.

The average value of capital used on these ranches varied from \$90,892 on small operations to \$685,768 on large operations (Table 5). There was relatively little variation between sizes of operation in average investment per cattle unit. What variation did occur may suggest that slightly higher investments per cattle unit were used on the large operations. This observation is consistent with the tendency previously noted for greater land acreages to be used per cattle unit on the larger ranches.

Costs of Operation

Expenses of operating cattle ranches include cash costs and non-cash costs. Cash costs are for production items purchased currently and for which cash is paid out or a debt incurred. Interest on ranch debts was not included as a cash expense. Cash expenses varied considerably on individual ranches included in the study; however, there was very little

Table 5 -- Investment per Cattle Unit and Total Investment, 1959

Investment item	Size of operation			Weighted average
	Small	Medium	Large	
	(dollars)	(dollars)	(dollars)	(dollars)
Investment per cattle unit:				
Owned investment				
Owned land	241	361	399	350
Operator's house(s)	32	17	12	21
Other improvements	50	61	76	64
Equipment and machinery	39	32	26	33
Feed and seed	12	11	9	10
Total owned land, improvements, etc.	374	482	522	478
Cattle	170	179	181	175
Horses and other livestock	3	2	2	2
Total capital owned	547	663	705	655
Owned investment per ranch:	90,892	230,112	685,768	198,823

variation in average cash expenses of ranches grouped by size or type of operation. Cash expenses for the medium-sized operations averaged \$45.32 per cattle unit compared with \$43.12 for the large operations and \$43.99 for the small operations (Table 6).

The principal non-cash costs are depreciation, or what may be called capital maintenance of equipment and improvements, and changes in inventories. The average charge per cattle unit for capital maintenance varied from \$7.67 to \$8.99 for the three sizes of operation. In 1959 the ranchers incurred an unusual non-cash cost in that they fed more farm-raised feed than was produced during the year, and thus depleted their feed inventories slightly. Average ranch expenses, excluding compensation for the operator and interest on investment, ranged from \$52.4 to \$56.10 per cattle unit for the three size groups.

Table 6 --- Costs of Operation per Cattle Unit, by Size of Operation, 1959

Expense item	Size of operation			Weighted average
	Small	Medium	Large	
	(dollars)	(dollars)	(dollars)	(dollars)
Cash expenses				
Hired labor	4.44	10.60	8.81	8.25
Feed purchased	8.89	9.04	8.22	9.23
Truck, auto, & machinery	2.07	1.31	1.86	1.78
Supplies	1.00	2.43	1.65	1.67
Repairs and maintenance	5.36	3.98	3.78	4.38
Veterinary	.81	.55	.52	.64
Gas and oil	4.32	3.48	2.04	3.15
Taxes	3.69	3.73	3.12	3.71
Insurance	1.32	1.02	.77	1.05
Utilities	1.16	.58	.78	.86
Rent of land and pasture	9.38	6.68	6.93	6.93
Other expenses	1.55	1.92	4.64	2.82
Total cash expenses	<u>43.99</u>	<u>45.32</u>	<u>43.12</u>	<u>44.47</u>
Capital maintenance				
Capital expenditures	8.41	9.98	4.33	6.96
Inventory increase	.74	1.43		
Inventory decrease ^{a/}	--	--	4.66	1.25
Total capital maintenance ^{b/}	7.67	8.55	8.99	8.21
Decrease in feed inventories	.81	2.23	1.85	1.56
Total ranch expenses	<u>52.47</u>	<u>56.10</u>	<u>53.96</u>	<u>54.24</u>
Operator's labor	21.69	13.85	6.17	13.57
Interest on capital	<u>28.67</u>	<u>34.54</u>	<u>36.87</u>	<u>34.23</u>
Total costs	<u>102.83</u>	<u>104.49</u>	<u>97.00</u>	<u>102.04</u>

a/ Improvements and equipment.

b/ Corresponds to depreciation.

Interest on investment and a wage for the operator are costs which must be met in the long run. They differ from other non-cash costs in that they are a cost to the ranch operation but are also a return to the operator's labor and capital. Average total costs of operation, including interest and operator's labor, ranged from \$97 to \$104.49 per cattle unit for the three size groups.

Revenues

Although individual ranches varied greatly, little variation showed among the three size groups in sales of cattle per cattle unit. Sales averaged \$94.32 on large operations compared with \$98.21 and \$99.09 on small and medium-sized operations (Table 7). The cost of cattle purchased, including stockers, breeding stock, and bulls, was deducted from total cattle sales to give net cattle sales. Other income items in addition to cattle sales were sales of other livestock and livestock products, sales of hay and grain, government payments, and miscellaneous income items. These additional income items, added to the net value of cattle sales, constituted total cash income.

Table 7 -- Value of Cattle Sold and Other Income Items per Cattle Unit, by Size of Operation, 1959

Sales or income item	Size of operation			Weighted average
	Small	Medium	Large	
	(dollars)	(dollars)	(dollars)	(dollars)
Cattle sales				
Cows	17.78	16.04	11.01	15.50
Young cattle	79.21	32.12	81.08	80.53
Bulls	<u>1.22</u>	<u>.93</u>	<u>2.23</u>	<u>1.40</u>
Total cattle sales	98.21	99.09	94.32	97.43
Cost of cattle purchased	<u>9.31</u>	<u>7.43</u>	<u>11.35</u>	<u>10.15</u>
Net value of cattle sales	88.90	91.66	82.97	87.28
Other income	<u>6.08</u>	<u>3.29</u>	<u>3.47</u>	<u>4.32</u>
Total cash income	<u>94.98</u>	<u>94.95</u>	<u>86.44</u>	<u>91.60</u>
Net value of cattle sales	88.90	91.66	82.97	87.28
Increase in cattle inventory	<u>.75</u>	<u>1.61</u>	<u>11.29</u>	<u>4.00</u>
Cattle income	89.65	93.27	94.26	91.28

Changes in cattle inventories were added to net value of cattle sales to provide an estimate of cattle income, which measures the value of beef actually produced on the ranch during the year.

Summary of Net Returns

Ranchers may think of several ways to measure net returns. Perhaps the simplest measure is net cash income, which is cash returns minus cash costs. Net cash income varied from \$43.32 per cattle unit for the large operations to \$50.99 for the small operations (Table 8). This does not take into consideration any of the non-cash costs, change in cattle inventories, or non-cash-income items.

Table 8 -- Summary of Net Returns per Cattle Unit,
by Size of Operation, 1959

	<u>Size of operation</u>			<u>Weighted average</u>
	<u>Small</u>	<u>Medium</u>	<u>Large</u>	
	(dollars)	(dollars)	(dollars)	(dollars)
Cash receipts	94.98	94.95	86.44	91.60
Cash expenses	<u>43.99</u>	<u>45.32</u>	<u>43.12</u>	<u>44.47</u>
Net cash income	50.99	49.63	43.32	47.13
Non-cash items				
Income				
Perquisites ^{a/}	6.42	2.68	1.40	3.57
Increase in cattle inventory	.75	1.61	11.29	4.00
Expenses ^{b/}	<u>8.48</u>	<u>10.78</u>	<u>10.84</u>	<u>9.77</u>
Net ranch income	49.68	43.14	45.17	44.93

^{a/} Includes an allowance for rental value of dwelling and ranch produce used in the home.

^{b/} Includes charge for capital maintenance and change in inventories other than cattle.

A second measure of net returns, one which more accurately reflects ranch production, is net ranch income. It is calculated by deducting the charge for capital maintenance from net cash income, by adding or subtracting the change in cattle and feed inventories, and by adding non-cash

income items represented by the ranches' contributions to family living. Average net ranch income varied from \$43.14 per cattle unit on medium-sized operations to \$49.68 on small operations. The pattern of variations between groups does not suggest that returns per cattle unit increase with increased size of operation.

The summary of costs, returns, and net income has been presented on a per-cattle-unit basis to facilitate comparisons between operations of different sizes. The summary of net returns is also presented on basis of averages per ranch to give the reader a better idea of the physical magnitude of the ranches described and of their earning capacity (Table 9). Cash receipts on these ranches ranged from \$15,767 on the small operations to \$83,994 on the large units. Net ranch incomes ranged from \$8,247 on the small operations to \$43,895 on the large.

Table 9 -- Summary of Net Returns per Ranch, by Size of Operation, 1959

Item	Size of operation			Weighted average
	Small	Medium	Large	
	(dollars)	(dollars)	(dollars)	(dollars)
Cash receipts	15,767	32,911	83,994	27,761
Cash expenses	7,303	15,709	41,899	13,477
Net cash income	8,464	17,202	42,095	14,284
Non-cash items				
Income				
Perquisites	1,066	930	1,368	1,079
Increase in cattle inventory	124	558	10,968	1,213
Expenses				
Net ranch income	8,247	14,953	43,895	13,616
Interest on investment				
Ranch labor income	4,760	11,972	35,825	10,374
	3,487	2,981	8,070	3,242
Net ranch income	8,247	14,953	43,895	13,616
Operator's wage	3,600	4,000	6,000	4,111
Return on owned capital and management	4,647	10,153	37,895	9,505
Rate of return on owned capital	(Percent) 5.11	(Percent) 4.41	(Percent) 5.53	(Percent) 4.78

In addition to measuring net returns to the ranch as a whole, it is possible to measure returns to various factors of production as the residual claimant. These factors are labor, management, and capital.

If operator's labor and management are to be considered as the residual claimant to earnings, then a charge for the use of capital must be made. For this purpose, (interest on average owned investment) was charged at the rate of five percent on all fixed capital and chattels. A charge of six percent for one-half year was made for the (use of working capital) to pay (ranch-operating expenses). The total charge for interest was deducted from net ranch income to yield labor income, which is the residual return to labor and management. Labor income ranged from around \$3,000 on the medium and small-sized ranches to about \$8,000 on the large ranches.

The returns to capital and management as residual claimants were determined by deducting the operator's wage from net ranch income. For this purpose wages for the operator were set at \$3,600, \$4,800 and \$6,000 for the small, medium, and large-sized operations respectively. Average rates of return on owned investment for the three size groups ranged from 4.41 to 5.53 percent. These figures indicate that average net ranch incomes were just about adequate to cover compensation for the operator's labor and to allow a modest return to capital and management.

EFFECTS OF VARIATIONS OVER TIME

Gross and net incomes to cattle ranchers vary greatly from year to year. This is especially true in the Northern Plains area. Price variations for cattle sold can effect gross incomes considerably. Varied weather conditions also affect the weight of cattle sold and operation

costs. The U.S. Department of Agriculture as part of a larger study maintains a series of estimates of costs and returns on "Cattle Ranches Northern Plains Livestock Area."^{1/}

The cattle ranches on which the USDA provides estimates differ in a number of respects from the type of ranches examined in this study. Since the area of interest is much larger, the types of ranching operations are not as narrowly defined. They include ranching operations with considerably larger acreages of cropland and somewhat smaller cattle enterprises than the small-size enterprise shown in this study. Nevertheless, the USDA series is useful to indicate degree of variation in gross income, costs of operation, and net returns.

The ranches in the USDA series had about 3,700 acres of land in 1946. The acreage increased gradually to 4,430 in 1963. Total cattle numbers on the Northern Plains type of ranch remained relatively constant, about 130 to 140 head, through the time period 1946-1963. Cows and heifers two years old and over increased from 61 to 94 head, indicating a considerable shift toward marketing cattle at younger ages.

Although there have been relatively steady trends in acreages and numbers of cows and heifers two years old and over, as well as relative stability in total cattle numbers, gross ranch income has fluctuated from as little as \$8,000 in some years to more than \$17,000 in other

^{1/} U. S. Department of Agriculture, Costs and Returns on Commercial Farms, Long-Term Study, 1930-57, Statistical Bulletin No. 297, Farm Economics Division, Economic Research Service, USDA, Washington, D.C.

U. S. Department of Agriculture, Costs and Returns, Commercial Farms, by Type, Size, and Location, Agricultural Information Bulletin No. 230 (revised periodically,) ERS, USDA, Washington, D. C.

U. S. Department of Agriculture, Costs and Returns Western Livestock Ranches, FCR-18, ERS, USDA (published annually).

years (Table 10). In terms of percentage change, taking 1957-1959 averages as 100 percent, this varies from 68 to 149 percent.

Table 10 -- Variations and Trends in Ranch Income and Expenses, 1946-1963

Year	Land in ranch (acres)	All cattle (no)	Gross ranch income (dols)	Operating expenses	Net ranch income	Indexes 1957-59=100		
						Gross ranch income	Operating expenses	Net ranch income
1946	3,686	140	8,330	3,082	5,248	71	47	100
1947	3,843	143	11,831	3,876	7,955	101	60	152
1948	3,804	136	12,432	4,604	7,828	106	71	149
1949	3,754	141	8,734	5,710	3,024	74	88	58
1950	3,790	137	10,465	5,378	5,087	89	83	97
1951	3,813	134	17,577	7,773	9,804	149	119	187
1952	3,990	138	13,071	6,601	6,470	111	101	123
1953	4,010	141	10,600	6,297	4,303	90	97	82
1954	4,120	142	10,034	6,269	3,765	85	96	72
1955	4,170	142	9,128	6,298	2,830	78	97	54
1956	4,205	140	8,002	5,862	2,140	68	90	41
1957	4,225	133	10,378	6,219	4,159	88	95	79
1958	4,240	135	12,764	6,351	6,413	109	98	122
1959	4,340	137	12,137	6,967	5,170	103	107	99
1960	4,380	140	11,710	6,732	4,986	100	103	95
1961	4,390	141	12,405	6,128	6,277	105	94	120
1962	4,410	130	14,099	6,847	7,252	120	105	138
1963 ^{a/}	4,430	142	15,017	7,477	7,540	128	115	144

^{a/} Preliminary.

Source: same as in footnote 1/.

Operating expenses have been more stable. They increased rapidly immediately after World War II, but since 1949 they have ranged from about \$6,000 to \$7,000. On a percentage basis, again taking the 1957-1959 average to represent 100 percent, operating expenses have fluctuated from 90 to 119 percent of the average from 1951 through 1963. Ranchers tend to allow operating expenses to rise in years of higher net ranch incomes, and to "tighten their belts" and reduce operating expenses

in years of lower ranch incomes. However, ranch operators are definitely limited in their ability to adjust expenses as gross income varies.

With the large variations in gross income and the relatively narrow variations in operating expenses, net ranch income varies extremely. It jumps from an index of 41 in 1956 to 187 in 1951 and 144 in 1963, again taking the 1957-59 average as 100.

Since prices and gross income vary considerably from year to year, and since operating costs remain relatively much more constant, it is possible to calculate the situations which would have existed on ranches included in this study under different price situations. Average marketing season prices for 1953-1962, and for 1959 and 1964 at the Omaha central market are shown in Table 11. Estimated marketing costs were deducted from the Omaha prices for comparison with prices received on the ranches in 1959.

The adjusted Omaha prices compare with prices received on the study ranches for cows, steer and heifer calves, and cull bulls. Prices on the study ranches deviate considerably from the Omaha prices for yearling steers and heifers. Some of the yearlings were marketed somewhat earlier than normal because of drouth. Also, some ranchers had contracted yearlings for fall delivery at prices substantially above actual market prices in the fall of the year. These two things may have accounted for some deviations in yearling prices.

Assuming that the marketing season prices at Omaha, adjusted for estimated market costs, represent what ranchers might have received on the average during 1953-1962 and in 1964, and assuming that production and operating costs would remain relatively stable, it is possible to

Table 11 -- Prices Received on Ranches, 1959, and Fall-Marketing Season Prices at Omaha for Various Periods

Item	Marketing season prices Omaha		
	1959	1953-1962 Average	1964
Cows	16.05	13.25	12.74
Good and choice yearlings			
Steers	23.20	22.99	21.00
Heifers	25.98	21.20	18.90
Good and choice calves			
Steers	34.10	25.81	22.56
Heifers	31.30	22.76	20.21
Bulls	19.55	15.07	15.17

Item	Prices received on study ranches	Marketing Season Prices - Omaha - Adjusted for Estimated Marketing Costs		
		1959	1953-1962 Average	1964
Cows	14.57	14.65	11.85	11.34
Good and choice yearlings				
Steers	29.05	26.70	21.50	19.50
Heifers	27.19	24.50	19.70	17.40
Good and choice calves				
Steers	32.98	32.60	24.30	21.06
Heifers	29.65	29.80	21.25	18.71
Bulls	18.24	18.10	13.60	13.72

calculate estimates of average earnings for these ranches over a time period and for 1964 (Table 12). Net ranch income under 1953-1962 average prices would have been adequate to provide wages for operator's labor at the levels indicated, and give a return to capital of about 2 to 3.5 percent. Prices were lower yet in 1964, and net ranch income would provide a return on capital of only about 1 to 2.3 percent, after allowing for operator's labor.

The rate earned on investment in 1959 was about "normal". As 1959 was better than a "normal" year, based on average conditions over a longer

Table 12 -- Summary of Estimated Net Returns Per Ranch,
1953-1962 Averages and 1964

Item	Size of operation			Weighted average
	Small	Medium	Large	
	(dollars)	(dollars)	(dollars)	(dollars)
Average 1953-1962				
Cash receipts	12,410	25,520	66,598	21,872
Inventory change ^{a/}	98	433	8,696	955
Perquisites	<u>1,066</u>	<u>930</u>	<u>1,368</u>	<u>1,079</u>
Total receipts	13,574	26,883	76,662	23,906
Operating expenses ^{b/}	<u>7,979</u>	<u>17,811</u>	<u>48,025</u>	<u>15,054</u>
Net ranch income	5,595	9,072	28,637	8,852
Operators wage	<u>3,600</u>	<u>4,800</u>	<u>6,000</u>	<u>4,111</u>
Return on capital	1,995	4,272	22,637	4,741
Percent return ^{c/}	2.3	1.9	3.5	2.5
<u>1964</u>				
Cash receipts	11,207	22,987	59,977	19,705
Inventory change ^{a/}	88	838	7,831	906
Perquisites	<u>1,066</u>	<u>930</u>	<u>1,368</u>	<u>1,079</u>
Total receipts	12,361	24,755	69,176	21,690
Operating expenses ^{b/}	<u>7,979</u>	<u>17,811</u>	<u>48,025</u>	<u>15,054</u>
Net ranch income	4,382	6,944	21,151	6,636
Operators wage	<u>3,600</u>	<u>4,800</u>	<u>6,000</u>	<u>4,111</u>
Return on capital	782	2,144	15,151	2,525
Percent return ^{c/}	0.9	1.0	2.3	1.3

^{a/} Cattle inventories only.

^{b/} Includes capital-maintenance charges and changes in feed inventories which were previously shown separately. Over the longer time period these types of items are both converted to cash expenses. Operating expenses have also been adjusted downward from an index level of 107 to 98.

^{c/} Investment has been adjusted to reflect longer-term average values for cattle inventories. Other investment items are at the 1959 level.

time period, it appears that the ranches are fully valued or perhaps overvalued at the levels set. Average earnings over a longer period might fail to support such high ranch values, and it would be difficult for a beginning rancher to acquire a ranch and retire any substantial debt out of ranch earnings alone.

The tendency to overvalue ranch resources undoubtedly is due to the willingness of established ranchers to pay higher prices to expand

their operations. They can afford to pay higher prices and accept low returns on a small part of their investment if the major part of their investment is debt free. Ranchers may also be willing to accept a rate of return on their investment lower than the market interest rate as long as they believe they will receive a non-cash return in the form of gradual appreciation of value of their investment.

Remember that net ranch income must be used to pay income taxes, to pay interest on any indebtedness, and to make annual payments toward reducing indebtedness. After these charges against the income are met, the balance is available for family living or for additional capital accumulation. Hence, the ranches which have been characterized as small for the purposes of this report are probably near the minimum size that any family should consider an economical unit. That is particularly true in view of probable future increases in income needed to maintain a desirable standard of living and to provide educational and other opportunities for children.

Young people interested in ranching, especially, should be aware of the resource and capital required for a minimum-sized economical unit that will permit debt retirement and produce a reasonable standard of living.

The data in this study have not indicated any great advantages in efficiency or productivity for large-sized operations over smaller ones. The operators' management ability was not limiting on small and medium-sized operations, and consequently land and capital resources could be managed more intensively there. On the other hand, because of the much greater complexity of the operation, the operator's management ability did seem to be a limiting factor on some of the larger operations.

Consequently, management was frequently "looser" in controlling costs, other resources were used less intensively, and production rates were lower.

If ranches smaller than those in the sample had been considered, it is possible that one would find economies of size. It is doubtful, however, if economies of size exist within the size range of ranches studied. Variation within size groups was greater than variation between groups.

COMPARISON OF DIFFERENT TYPES OF OPERATIONS

Also compared were cow-calf type of operations and cow-yearling type of operations. Objectives were (1) to identify characteristics of the ranches which made the ranches more suitable for one type of operation than the other and (2) to determine the relative advantage of one type of operation compared with others.

The cow-calf and cow-yearling operations were similar in organizational characteristics, costs, and returns. However, cow-calf operations used more capital per cattle unit and leased more land than the cow-yearling operations. Ranches with yearling-type operations had slightly more harvested cropland and hayland. This indicates that a calf operation may be preferred on ranches where the feed supply available for wintering calves is limited.

There was little difference per cattle unit between calf and yearling operations in value of sales, costs, and net returns. Yearling operations had slightly higher gross and net sales of cattle and higher total cash income per cattle unit than did calf operations. Net cash income and net ranch income were also slightly higher for yearling

operations than for calf operations. When prices are lower and the price differential between yearlings and calves is less than in 1959, yearling operations may be more profitable than calf operations.

Ranchers who marketed calves preferred that type of operation because of higher prices received, capacity to run more cows, and reduction of wintering costs for calves. Incidence of water belly (urinary calculi) was also mentioned as a factor influencing ranchers to market calves.

Ranchers who marketed yearlings favored that operation since it meant fewer cows to calve in the spring. Also mentioned as advantages in the cow-yearling type of operation were greater flexibility in operations, a form of drouth insurance, and the possibility of identifying and selecting a higher proportion of superior heifer replacements.

This study does not indicate that either the calf type or the yearling type of operation is more advantageous than the other. Ranchers who are so situated as to make early calving possible, say, in late February and March, may find some advantage in marketing calves early in the fall. Ranchers who consistently get high calf crops and who have breeds or strains of cattle that produce heavy calves at weaning time, may also find some advantage in marketing calves.

On the other hand, ranchers who must plan for later calving, in April or May, might lose some advantage in marketing calves. The same is true for ranchers who consistently have lower calf crops or who have lighter calves at weaning time. Under these conditions, it may be more advantageous to market yearlings.

The relative advantages of marketing calves or marketing yearlings also vary with market conditions. When market prices are low, as they

were from 1953 to 1956, the price differential between calves and yearlings tends to be narrow. When prices are rising or higher, as they were from 1957 to 1960, the price differential tends to widen. Consequently, in comparing and evaluating the advantages of a calf operation versus a yearling operation, one must consider the price levels and the price differentials for one complete cattle-price cycle as well as the adaptation of resources to one type operation or the other. The advantage of flexibility in a yearling operation must also be evaluated over a period of years rather than for one year only.

PRINCIPAL CAUSES OF VARIATIONS IN NET RANCH INCOME

Average net ranch income per cattle unit varied little with size and type of operation, but varied greatly among individual ranches. In order to isolate some of the principal causes of high and low net ranch incomes, the ranches studied were ranked from high to low according to ranch income. Income ranged from a high of \$76.37 to a low of only \$22.12 per cattle unit (Table 13).

The ranking revealed some interesting contrasts. The ranch that ranked highest in net ranch income and the ranch that ranked lowest were both large cow-calf operations. The large cow-yearling operation ranked third highest, and a similar operation ranked fifth from the bottom. Two small cow-yearling operations and a medium and a small cow-calf operation rounded out the top six ranches or the top 25 percent. The lowest ranking 25 percent included two other large calf operations, a small calf operation, and medium-sized yearling operation in addition to the large yearling and calf operations cited previously.

Table 13 -- Ranking of Survey Ranches According to Net Ranch Income Per Cattle Unit

Net ranch income (dollars)	Classification of ranches		Rank
	Size	Type	
76.37	Large	Cow-calf	1
71.17	Small	Cow-yearling	2
63.53	Large	Cow-yearling	3
63.00	Small	Cow-yearling	4
58.50	Medium	Cow-calf	5
57.90	Small	Cow-calf	6
56.50	Medium	Cow-calf	7
54.01	Small	Cow-calf	8
51.10	Small	Cow-yearling	9
49.79	Large	Cow-yearling	10
48.50	Small	Cow-calf	11
47.70	Small	Cow-yearling	12
44.60	Small	Cow-calf	13
44.10	Small	Cow-yearling	14
42.90	Medium	Cow-calf	15
40.80	Medium	Cow-calf	16
40.45	Medium	Cow-yearling	17
38.01	Medium	Cow-yearling	18
37.75	Large	Cow-calf	19
37.60	Large	Cow-yearling	20
34.95	Large	Cow-calf	21
33.40	Medium	Cow-yearling	22
30.60	Small	Cow-calf	23
22.12	Large	Cow-calf	24

It is apparent that no particular size or type of operation is more outstanding in productivity or efficiency than other types. The differences between the high-ranking and low-ranking groups may be accounted for by some combination of superior resources, superior management, unusual environmental or price situations, and luck.

The high-ranking medium-sized calf operation and the large calf operation had several things in common: Calving was earlier

than is usual in the plains. On the medium-sized operation, calving began in mid-February, and on the large-sized operation it began in the latter part of March. These ranches had well-sheltered calving ranges and adequate buildings for protection from storms. Early calving enabled the operators to market heavy calves before prices broke in the fall of 1959. High weaning weight may have been due to early calving, or to the high milk-producing strains or breeds of cattle used, and also to some crossbreeding.

The high-ranking large yearling ranch stood out from others in that the operator followed a flexible marketing program. In 1959 the operator marketed cattle before the price break and achieved high prices for fairly good weights. This program, by conserving feed, reduced subsequent feed costs. The operator also controlled both cash operating costs and capital maintenance rigidly.

In contrast, operators of the least profitable group started calving in April and made less effort to have a closely bunched, uniform calf crop. They sold fewer, lighter calves. In spite of the late selling date, they received fairly good prices for calves because of the very light weights. They received relatively lower prices for lighter-weight cows and yearlings. In a year when prices trended upward or were fairly stable, marketing late in the year would not be so severely penalized.

Part of the difference between the most profitable and the least profitable group of ranches was due to chance. Operators of the most profitable ranches, by being able to calve earlier, or by flexible marketing program, avoided being hurt by the price break. The entire difference was not due to luck, however. Under any reasonable price

pattern, the most profitable 25 percent of the ranches selling heavier weight cattle would have the advantage over the least profitable 25 percent. The difference would be less, however, under a seasonal price pattern more normal than that of 1959.

The most profitable group of ranches netted \$66.21 per cattle unit compared with \$32.33 for the least profitable group (Table 14). The most profitable group sold almost 140 pounds more beef per cattle unit than the least profitable group. This difference lay all in the high-quality yearling and calf classes which brought good prices.

When changes in cattle inventories are also considered, the total weight of beef produced on the most profitable ranches was about 60 pounds greater than that produced on the least profitable ranches. Cow beef was relatively more important on the least profitable ranches than on the most profitable ones.

Management of cattle inventories also seemed to be related to financial success. The most profitable ranches selling calves had held over some light calves from 1958 to sell as yearlings. These ranches also sold almost all of the 1959 calf crop. The least profitable ranches were building up inventories, especially of cows, in 1959. It is impossible to say whether or not the difference in method of handling inventories was the result of good management, knowledge, or merely luck.

Calf crops were not highly correlated with financial success on these ranches. High calf crops undoubtedly contribute to financial success, but within the relatively narrow range of calving percentages found in this study, other factors were more important. Variations in weaning weights, weights of yearlings sold, and variations in prices received had more effect than calving percentages.

Table 14 -- Principal Causes of Variations in Net Ranch Income

Item	Most profitable 25 percent	Mid- range 50 percent	Least profitable 25 percent
Net ranch income per cattle unit (dollars)	66.21	45.26	32.33
Size of ranches (cattle units)	455.70	288.85	1059.10
Calf crop (percent)	87.42	86.41	85.27
All following items are expressed per cattle unit			
Owned land (acres)	18.76	19.18	29.18
Leased land	13.45	9.73	15.60
Total land	32.21	28.91	44.78
Cropland & hayland	.97	.71	.89
Labor costs including unpaid labor (dollars)	18.71	23.49	13.63
Land rent	9.59	6.48	4.39
Total cash costs	42.82	46.00	41.41
Capital maintenance	8.53	9.45	9.49
Weight of cattle sold (pounds)			
Total	399.94	403.88	261.17
Cows	70.47	119.31	74.16
Yearlings	193.18	218.10	103.99
Calves	136.29	66.47	83.02
Increase in inventory (pounds)			
Cows	37.30	3.19	67.83
Calves	---	19.62	3.09
Decrease in inventory (pounds)			
Yearlings	---	10.76	0.71
Calves	47.86	---	---
Total weight produced (pounds)	389.38	415.93	331.38
Cows	107.77	122.50	141.99
Yearlings	193.18	207.34	103.28
Calves	88.43	86.09	86.11
Value of sales (dollars)			
Cows	11.04	16.75	10.53
Yearlings	57.71	60.76	31.41
Calves	44.61	21.11	27.60
Average price received per cwt. (dollars)			
Cows	15.65	14.05	14.20
Yearlings	29.87	27.85	28.13
Calves	32.75	31.75	33.24

PRODUCTION INFORMATION PER BREEDING COW UNIT

The preceding data except for that on feed and labor requirements have been presented on the basis of cattle units to facilitate comparisons between different types and different sizes of operations. However, the cattle-unit basis makes it more difficult for individual ranchers to compare results with their own operations. Therefore, the data in this section are presented on a breeding-cow-unit basis to facilitate comparisons with operating ranches.

Cattle Inventories

Typical composition of cattle inventories for the cow-calf and cow-yearling types of operation is shown by Table 15. These inventories are based on 100 head of cows and heifers coming 2 years old. Thus, it is easy to see the relationship between number of cows, numbers of young stock and bulls, number of calves weaned, death losses, numbers of cattle sold, and heifers retained for replacement. Inventories have been shown on a "normalized basis," without any increases or decreases. Purchases of breeding animals, other than bulls, and purchases of stocker animals have also been eliminated.

Cow-calf and cow-yearling types of operations differed little in percentage death loss in various classes of cattle, and in replacement practices for the breeding herd. Differences were noticeable between the cow-yearling and the cow-calf type of operations in number of bulls kept. The difference, however, is in line with the requirements. Heifers coming one year old in the Jan. 1 inventories reach breeding age during the year, and cull cows are seldom removed before the breeding season. Hence, there are actually 140 females on the cow-yearling operation during the

Table 15 -- Typical Cattle-Inventories Composition for Cow-Calf and Cow-Yearling Types of Operations

Livestock Class	Beginning inventory	Death loss		Sales no.	Move up in age	Ending inventory
		No.	Pct.			
Cow-yearling operation						
Cows and heifers coming 2 years old	100	1.50	1.50	16.2	82.3	100
Heifers coming 1 year old	42	.40	.90	23.9	17.7	42
Calves weaned	(84) ^{a/}	<u>a/</u>	<u>a/</u>	--	84.0	<u>b/</u>
Steers coming 1 year old	42	.63	1.50	41.4	--	42
Bulls	4		4.00	1.0	--	4 ^{c/}
Cow-calf operation						
Cows and heifers coming 2 years old	100	1.50	1.50	16.2	82.3	100
Heifers coming 1 year old	24	.20	.90	6.1	17.7	24
Calves weaned	(34) ^{a/}	<u>a/</u>	<u>a/</u>	56.0	28.0	<u>b/</u>
Steers coming 1 year old	4		1.50	4.0	--	4
Bulls	3		4.00	.8	--	3 ^{c/}

a/ Calf crop born and weaned during the year, rather than beginning inventory. About 2.5-3.0 percent of calves born die before weaning time.

b/ Ending inventories for calves have been moved into the steer and heifer class.

c/ It is necessary to purchase bulls to replace death loss and those sold.

breeding season, or 35 females per bull, compared with 120 females on the cow-calf operation or 40 females per bull during the breeding season.

Average weights of cattle sold from the northern plains ranches in 1959 are shown in Table 16. That year was moderately drouthy in the plains area. Average weights shown may be slightly less than longer term averages. This is particularly true for yearling steers and heifers and cull cows. Calves nurse on their mothers; the cows tend to lose body weight but maintain a good flow of milk. Consequently, calf weights are probably not affected as much during moderate drought as are weights of older animals.

Table 16 -- Average Sale Weights of Cattle from Northern Plains Area Ranches, 1959 (Pounds)

Livestock class	All ranches	Cow-calf	Cow-yearling
All ranches			
Cull cows	1,038	1,058	1,021
Cull bulls	1,409	1,309	1,490
Steer calves	422	422	
Heifer calves	374	374	
Yearling steers	696	771	685
Yearling heifers	596	683	573

Differences between the weights of animals sold from the cow-calf operations and cow-yearling operations are probably not too significant except in the case of yearling animals sold from the cow-calf operations. Cow-calf operators sold yearling heifers which they culled from the group selected as herd replacements. Hence it is not surprising that they were heavier than the yearling heifers sold from the yearling ranches and which are animals not wanted as replacements. Similarly, relatively few yearling steers were sold on the cow-calf operations. These animals were probably fed good rations along with the heifer calves retained for replacement.

Resource Requirements

Since the entire calf crop is held about one year after weaning, the cow-yearling type of operation has more cattle units per breeding cow and heifer than does the cow-calf operation. On the cow-yearling operation there is a correspondingly greater requirement for resources per breeding cow. Weight of cattle sold, value of sales, costs, and net income per breeding cow are also greater on the cow-yearling operations than on the cow-calf operations. Because of these differences, direct comparisons of data on a breeding-cow-unit basis should not be

made between cow-calf and cow-yearling operations.

Cow-calf operations used 41.6 acres of land per breeding cow -- 23.9 acres owned and 17.7 acres leased (Table 17). Investment in owned land, improvements, equipment, and feed and seed averaged \$574 per breeding cow at 1959 market prices. Investment in cattle and other livestock raised the total investment to \$784 per breeding cow on cow-calf operations. Corresponding data for the cow-calf-yearling operations show that 49 acres of land were required -- 34 acres owned and 15 acres leased. Investments were \$729 per breeding-cow-unit in all assets exclusive of cattle, and \$1,003 including cattle.

Table 17 -- Land Resources and Investment Items per Breeding Cow and Heifer

Item	Cow-calf operations	Cow-yearling operations
Total land used	(acres)	(acres)
Cropland and hayland	1.3	1.7
Rangeland	<u>40.3</u>	<u>47.3</u>
Total land	<u>41.6</u>	<u>49.0</u>
Owned land	23.9	34.2
Leased land	17.7	14.8
Owned investment	(dollars)	(dollars)
Land	436	519
Improvements	85	145
Equipment & machinery	42	48
Feed & seed	<u>11</u>	<u>17</u>
Total owned land, improvements, etc.	574	729
Cattle	207	270
Other livestock	<u>3</u>	<u>3</u>
Total capital owned	784	1,002

Production and Sales

The calf operations typically sold a few yearling heifers culled from the replacement herd and a very few steers that they had kept over to yearlings for one reason or another (Table 18). The bulk of sales, however, and the value produced were from steer calves, heifer calves, and cull cows. Average sales on calf operations in 1959 were \$109.57 per breeding cow. The yearling operations typically sold a very few steer calves, the bulk of sales were yearling steers and heifers and cull cows. Their gross sales were \$155.60 per breeding-cow-unit. The sales shown are those actually occurring in 1959. They differ slightly from normalized sales in typical inventories given previously.

Table 18 -- Numbers, Weight, and Value of Cattle Sold per Breeding Cow and Heifer, 1959

Class of cattle	Cow-calf operation			Cow-yearling operation		
	Number	Weight	Value	Number	Weight	Value
	(No)	(lb)	(Dol)	(No)	(lb)	(Dol)
Cows	.152	157	22.51	.135	136	19.89
Yearling heifers	.066	45	10.97	.259	150	41.34
Yearling steers	.031	22	6.52	.451	305	29.40
Heifer calves	.180	64	18.24	--	--	.06
Steer calves	.381	149	49.33	.023	9	2.98
Bulls	.007	9	1.90	.007	10	1.93
Total	xxxx	xxxx	109.57	xxxx	xxxx	155.60

Operating Costs

Total cash expenses per breeding cow were \$51.89 for the cow-calf operation and \$69.20 for the cow-yearling operation (Table 19). Principal expense items were feed purchased, labor hired, and land rental cost. Other important cash expenses were costs for operating and maintaining autos, trucks, equipment, and other improvements, and property taxes. Also important were capital maintenance and changes in inventories, which

Table 19 -- Operating Expenses per Breeding Cow and Heifer, 1959

Item	Cow-calf operations	Cow-yearling operations
	(dollars)	(dollars)
Hired labor	8.02	14.38
Feed purchased	8.30	16.77
Truck, auto and machinery	2.28	2.57
Supplies	1.58	2.94
Repairs and maintenance	4.56	7.34
Veterinary	.83	.91
Gas and oil	4.70	3.91
Taxes	4.30	5.80
Insurance	1.33	1.52
Utilities	1.12	1.23
Rent of land	11.51	7.49
Other expenses	<u>3.36</u>	<u>4.34</u>
 Total cash expenses	 51.89	 69.20
Capital maintenance	9.89	12.46
Reduction in feed inventories	<u>2.98</u>	<u>1.32</u>
 Total operating costs ^{a/}	 <u>64.76</u>	 <u>82.98</u>

^{a/} Does not include interest on investment or operating capital, or allowance for operators' labor.

are non-cash costs. Inclusion of these cost items made total operating costs \$64.76 and \$82.98 per breeding cow for the cow-calf and cow-yearling operations, respectively. These operating costs do not include operator's labor or interest expense.

Net Income

Net sales per breeding cow amounted to \$98.14 and \$139.39 on cow-calf and cow-yearling operations, respectively, after deducting the cost of bulls and other cattle purchases (Table 20). Net cattle sales, adjusted to allow for change in cattle inventories, resulted in a cattle income of \$114.75 and \$143.75 per breeding cow. Net cash income was

Table 20 -- Summary of Income and Net Returns per Breeding Cow and Heifer, 1959

Item	Cow-calf operations	Cow-yearling operations
<u>Income items</u>		
Total cattle sales	109.57	155.60
Bulls purchased	4.44	8.20
Other cattle purchased	6.99	8.01
Net cattle sales	98.14	139.39
Change in cattle inventories	6.61	4.36
Total cattle income	<u>104.75</u>	<u>143.75</u>
<u>Net returns</u>		
Net cattle sales	98.14	139.39
Other income items	5.97	5.84
Total cash receipts	104.11	145.23
Cash expenses	51.89	69.20
Net cash income	52.22	76.03
Increase in inventories ^{a/}	3.63	3.04
Perquisites (rent and supplies)	4.65	5.06
Capital-maintenance expense	9.39	12.46
Net ranch income	50.61	71.67
Interest on investment	40.58	52.66
Ranch labor income	10.03	19.01
Net ranch income	50.61	71.67
Operator's wage	17.70	19.32
Return on capital and management	32.91	52.35
Percent return on capital	4.2	5.2

a/ Includes cattle and feed.

\$52.22 on the cow-calf operations and \$76.03 on the cow-yearling. When inventory changes and non-cash income and expense items were all considered, net ranch income was \$50.61 and \$71.67 per breeding cow. A charge for the use of capital was deducted from net ranch income to give labor incomes of \$10.03 and \$19.01 per breeding cow. Return to capital was determined by deducting an operator's wage from net ranch income. The return to operator's owned capital was \$32.91 or 4.2 percent per breeding cow for the cow-calf operation and \$52.35 or 5.2 percent for the cow-yearling operation.

APPENDIX

Estimating Labor Requirements

Regression equations were used to estimate labor requirements for the four seasons and for the entire year. The equations derived indicated a fairly good fit for total labor use and for spring and summer labor uses. The R^2 term indicated that the variables included accounted for around 70 percent of the variation in labor required during those periods. There was greater variation in fall and winter labor use, and the equations for those seasons were not as good.

The equations derived give logical estimates of labor requirements for herds of up to about 500 head of cows. Beyond that number, however, the X_2^2 term becomes very large, and the negative coefficient associated with it causes the equation to underestimate the labor requirements in larger herds.

Since the labor requirements estimated by the equations give approximations only, judgment should be exercised in using them. Adjustments may be made according to actual technology being used and the estimated labor requirements going with it.

A total of 11 variables were used in various formulations and combinations. The most acceptable results were given by the following equation:

$$X_1 = b_1 + b_2 X_2 + b_3 X_3 + b_4 X_2^2$$

The variables included were:

- X_1 = labor requirements for the particular season of the year.
- X_2 = average number of cows and heifers coming 2 years old in the inventory.
- X_3 = average number of other cattle, excluding nursing calves and bulls, in the inventory.

Appendix Table 1 -- Coefficients of Equations Representing Labor Requirements. (Standard errors of the coefficients in parenthesis)

Seasonal labor	b_1	b_2	b_3	b_4	\overline{R}^2
Total labor	78.654	11.672 (3.842)	5.097 (2.682)	-.0114 (.0065)	.727
Winter (Dec., Jan., Feb.)	247.506	.696 (.927)	.462 (.647)	.0003 (.0016)	.533
Spring (Mar., Apr., May)	125.259	4.409 (1.721)	1.188 (1.201)	-.0033 (.0029)	.700
Summer (June, July, Aug.)	-7.802	2.117 (.867)	.921 (.612)	-.0018 (.0015)	.672
Fall (Sept., Oct., Nov.)	-286.287	4.449 (1.566)	2.526 (1.094)	-.0065 (.0027)	.459

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