

***COMPARATIVE LIVESTOCK SYSTEMS  
FOR WYOMING NORTHERN PLAINS  
CATTLE RANCHING***

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COMPARATIVE LIVESTOCK SYSTEMS FOR WYOMING NORTHERN  
PLAINS CATTLE RANCHING

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INTRODUCTION

The Great Plains region of the United States is one of the largest natural grassland range areas in the world. It includes the western portions of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas, and the eastern portions of New Mexico, Colorado, Wyoming and Montana. The foothills of the Rocky Mountains on the west and the 100th meridian on the east are approximate boundaries.

Clawson places a dividing line between the Northern and Southern Great Plains at the Arkansas River through southeastern Colorado into southwestern Kansas (4).<sup>a/</sup> An area of Central Great Plains is delineated to include the area of the

Northern Great Plains from the Cheyenne River and the Black Hills in Wyoming and South Dakota down to the Arkansas River in Colorado (19).

The Northern Great Plains, following Clawson's delineation and including the Central Plains, has a rolling topography with a few intruding mountains. The elevation ranges from 1,500 to 6,000 feet over most of the area. The climate is continental and summers are hot and winters are cold. Precipitation varies from about 12 to 20 inches and occurs mainly in April, May, and June. This fact is important from the standpoint of the management of ranches and decision-making.

Present Agriculture

The ten Plains states had almost 1.4 million farms in 1935. In that year nine of the ten states had the highest number of farms ever reported. Montana was the single exception. Total number of farms in the ten Plains states was 645,040 in 1964 (31). Data are not readily available for 1964 for the Great Plains portions separate from state totals. However, there were

863,564 farms in the Plains states and 319,524 in the Great Plains portion per se in 1954. Livestock farms, primarily beef cattle or sheep operations, accounted for 90,510 of the 319,524 total farms (Table 1).

\*Division of Agricultural Economics

a/ Numbers in parentheses refer to reference list.

TABLE I

Economic Data on the Great Plains Region, 1954 (32)<sup>a/</sup>

Item	Northern Plains (a)	Southern Plains (b)	Great Plains total	Plains states total
Number of farms	181,543	137,981	319,524	863,564
Livestock farms other than dairy or poultry	56,881	33,629	90,510	202,106
Land in farms (thousand acres)	209,086	153,505	362,591	551,032
Total cropland (thousand acres)	76,245	29,177	105,422	182,393
All cattle (thousand head)	11,665	5,722	17,387	33,534
Beef cows (thousand head)	4,421	2,574	6,995	12,727
Dairy cows (thousand head)	719	348	1,067	2,977

(a) Includes Colorado and Kansas and states north of them.

(b) Includes Oklahoma, Texas, and New Mexico.

Almost 363 million acres of land were reported in farms in the Great Plains in 1954. Large acreages of public lands in Montana, Wyoming, and New Mexico and smaller acreages in other states bring the total area of the Great Plains to about 400 million acres. About 105 million acres were classed as cropland, whether harvested or not. The balance is predominately grazing land.

There were more than 17 million cattle in the Plains area in 1954. About seven million were beef cows, and one million were dairy cows. Livestock feeding was not as large an enterprise in the Plains in 1954 as it is today. So about nine million cattle were predominately younger animals grazing ranges and pastures.

Number of beef cattle in the Plains states increased about 13 percent between 1954 and 1960-64.<sup>(1)</sup> Livestock feeding has increased greatly; however, grazing of pastures and ranges by young animals is still very significant and probably near the levels of 1954.

The adaptability of livestock grazing types of operations to the Plains environment is illustrated by the Plains area of Wyoming. Due to a combination of factors including elevation, precipitation, soils, and topography, this area is not well adapted to production of dry-land wheat or other crops. Average annual precipitation varies from about 12 to 16 inches except for the immediate vicinity of the mountains, where it is higher. The average warm season precipitation is about

<sup>a/</sup> Numbers in parentheses refer to reference list.

eight to 12 inches with large year-to-year fluctuations. The growing season varies from 100 to 120 days for most of the area.

Livestock, other than dairy or poultry, was the predominating type of ranching in 1964 (Table 2). About 77 percent of the total

and about 93 percent of the commercial farms in Niobrara and Weston Counties were classified as livestock-type operations. Livestock ranches comprised 70 percent of the commercial farms in the rest of the Plains area of Wyoming.

TABLE 2

Number of Farms in the Great Plains Area of Wyoming by Type of Farm, 1964 (31)

Type of farm	Niobrara and Weston counties		Eight other Plains counties <sup>a/</sup>	
	No. of farms (No.)	Percent of total (Percent)	No. of farms (No.)	Percent of total (Percent)
Livestock	418	77.4	2,308	58.7
Cash grain	21	3.9	441	11.2
Other field crop	---	---	113	2.9
Poultry	2	.4	20	.5
Dairy	1	.2	83	2.1
General farms	6	1.1	314	8.0
Miscellaneous and unclassified	92	17.0	652	16.6
All farms	540	100.0	3,931	100.0

a/ Sheridan, Johnson, Campbell, Crook, Converse, Platte, Goshen, and Laramie Counties

Numbers of all farms in the plains counties of Wyoming declined from 9,507 to 4,471 between 1930 and 1964 (Table 3). However, the number of livestock operations fluctuated from 3,100 to 3,700 from 1930 to 1954, and decreased to 2,726 in 1964. About 61 percent of all farms and ranches were livestock ranches in 1964.

The Northern Plains area of Wyoming represents an extreme in non-adaptability for cultivation. Livestock ranches are able to survive when other types of farms are decimated in this environment.

TABLE 3

Change in Type of Farming in the Great Plains Area of Wyoming,  
1930-64 (33)

Year	Number of farms		Livestock farms as a percent of all farms (Percent)
	All farms (No.)	Livestock farms (No.)	
1930	9,507	3,234	34.0
1939	7,641	3,674	48.1
1944	6,466	3,709	57.4
1949	6,235	3,113	49.9
1954	5,631	3,308	58.7
1959	4,628	2,888	62.4
1964	4,471	2,726	61.0

#### Problems in Great Plains Cattle Ranching

Livestock ranching, particularly cattle ranching, is the agricultural activity best adapted to much of the Plains area. The following questions often arise: (1) What methods of operation and types of operation are best adapted to Plains conditions? and (2) What strategies could ranch operators use to solve, or ameliorate, some of their problems? There may be advantages in using one system of operation, as compared with other systems. Several different types of livestock systems are being used in the Plains. Included are cow-calf breeding herds, purchased stocker operations, and intermediate types, including the cow-calf-yearling systems using owned calves, but none purchased. Cow-calf operations are found in all parts

of the range areas; however, they are less dominant and cow-yearling operations or systems using purchased stockers are more dominant in many of the range areas than is generally believed.

On January 1, 1966, the number of beef calves on farms in Wyoming represented a little more than 50 percent of the number of beef cows and heifers (Table 4). Calf crop has been averaging less than 80 percent of total number of beef cows and heifers. It follows that beef calves retained on farms as of January 1 have constituted from 60 to 70 percent or more of the total calf crop.

TABLE 4

Numbers of Various Classes of Beef Cattle on Farms in Montana, Wyoming and Colorado, January 1, 1966 (1,000 head) (35) (40)

Item	Montana	Wyoming	Colorado
Beef cows and heifers	1,723	775	1,364
Beef calves	853	408	810
Steers over one year	94	87	465
Total beef cattle (a)	2,739	1,302	2,693
Young cattle on feed	97	41	596
Young cattle not on feed (b)			
Total	850	454	679
Percent of beef cows and heifers	49.3	58.6	49.8

(a) Includes bulls also.

(b) Young cattle are defined here as beef calves and steers one year and over.

#### Statement of the Problem

The objectives of this study are to make comparisons among livestock systems to determine which are most suitable for Northern Plains conditions from the standpoint of: (1) level of income and (2) variability in income.

Various types of livestock operations are tested by budgeting. Actual prices received from 1946-65 and cost indexes are applied to basic budgeted data to indicate the effects of price and cost variations on average levels and variability in income, assuming constant physical product.

#### Sources of Data

Data are drawn from a number of sources. Information on costs of operating typical ranches are based on conditions in northeast Wyoming. These data were obtained by personal interview surveys of ranches in that area.

Since more Wyoming cattle are shipped to Nebraska than to any other state, material on prices is drawn primarily from published information from the central market at Omaha. Information on marketing

costs, which are an important factor in determining net prices, is based on studies conducted by the Agricultural Economics Division, University of Wyoming.

Principal sources of experimental data are the Central Plains Experimental Range about 25 miles southeast of Cheyenne, Wyoming, and the Northern Plains Experimental Range near Miles City, Montana. Conditions at both these ranges are quite similar, and like conditions

in the Wyoming plains. This study represents conditions in Wyoming; it should also be applicable to a

much larger area of Northern and Central Plains.

#### RESOURCES AND INVESTMENT

Ranches included in studies made by the Agricultural Economics Division of the University of Wyoming in the Northern Plains area have an average carrying capacity of about 5,800 animal-unit-months. About 1,000 AUM's of the total are from harvested feeds and 4,800 AUM's from range. A slight increase in this carrying capacity, about 200 more AUM's, is obtained from purchased feeds. This size of

ranch can be operated quite efficiently with any livestock system and is the size of ranch considered for all livestock systems discussed in this study.

Land inventories for the basic ranch situation are shown in Table 5. Investment in all assets except cattle are summarized in Table 6.

TABLE 5

#### Summary of Land Inventories, Basic Ranch<sup>a/</sup>

	Acres		Animal months
	Owned	Leased	
All hay	300	50	
Crested wheatgrass	125	--	
Native range	10,415	3,550	
Public lands	--	--	610
TOTAL	10,840	3,600	610

<sup>a/</sup> Hay yields .9 tons per acre, sufficient for cattle and saddle horses. Total production of 315 tons with no sales.

TABLE 6

#### Summary of Investment in Resources Other than Cattle, Basic Ranch

Item	Investment	
	Per animal unit	Total
Owned land	\$497	\$248,500
Buildings and improvements	76	38,000
Machinery and equipment	45	22,500
Horses	3	1,500
TOTAL	\$621	\$310,500

### Livestock Systems

The livestock systems to be compared will be designated by Roman numeral and descriptive title as follows:

- |  |   |
|--|---|
| <p>I - <u>Cow-calf</u>, selling cull cows, calves and a very few yearling steers and heifers.</p> <p>II - <u>Cow-steer calves-heifer yearlings</u>, selling cull cows, steer calves, yearling heifers and a very few yearling steers.</p> <p>III - <u>Cow-heavy steer calves-mixed yearlings</u>, selling cull cows, fifty percent of the steer calves, and yearling steers and heifers.</p> <p>IV - <u>Cow-yearlings</u>, selling cull cows and yearling steers and</p> | <p>heifers.</p> <p>V - <u>Cow-yearlings-purchased yearlings</u>, selling cull cows and yearlings.</p> <p>VI - <u>Spring-purchased stockers</u>, sold after a five or six month grazing program.</p> <p>VII - <u>Fall-purchased stockers</u>, wintered and sold the subsequent fall.</p> <p>VIII - <u>Stockers purchased both in fall and spring</u>, and sold in the fall.</p> <p>IX - <u>Cow-yearlings with additional stockers purchased in the spring</u>.</p> |
|--|---|

### Cattle Inventories and Investment

Ranch inventories for all livestock systems were calculated to utilize approximately 4,800 AUM's of range forage, except for the spring-purchased stocker operation (Table 7). It was assumed that 312 additional AUM's could be produced for the spring-purchased stocker operation by diverting land capable of producing 156 tons of hay to use as pasture.

Purchased protein supplements and grains provide additional AUM's capacity to result in ranch operations of approximately 6,018 AUM's or 502 animal units for the basic

cow-calf system. Greater amounts of protein supplement and grain used to supplement the hay for fall-purchased stockers allows slightly larger sized operations for systems purchasing stockers in the fall. Hay capacity diverted to pasture reduces the spring-purchased stocker operation to about 5,656 AUM's.

Investment in cattle inventories is shown in Table 7, and total investment in Table 8.

### INPUT-OUTPUT DATA FOR ANALYSIS

#### Calf Crop

Calf crops reported by the Wyoming Cooperative Crop and Live-

stock Reporting Service averaged about 89 percent of cows two years

TABLE 7

## Cattle Inventories and Investment

Livestock system and class of cattle	Number (head)	Investment	
		Per head (dols.)	Total (dols.)
<u>I Cow-calf</u>			
Cows past "2's"	317	\$152	\$ 48,184
Heifers coming "2's"	63	152	9,576
Heifers coming "1's"	79	114	9,006
Steers coming "1's"	16	90	1,440
Bulls	13	315	4,095
Total			\$ 72,301
<u>II Cow-steer calf-heifer yearlings</u>			
Cows past "2's"	295	\$152	\$ 44,840
Heifers coming "2's"	59	152	8,968
Heifers coming "1's"	148	95	14,060
Steers coming "1's"	15	90	1,350
Bulls	15	315	4,725
Total			\$ 73,943
<u>III Cow-heavy steer calves-mixed yearlings</u>			
Cows past "2's"	280	\$152	\$ 42,560
Heifers coming "2's"	56	152	8,512
Heifers coming "1's"	140	95	13,300
Steers coming "1's"	70	99	6,930
Bulls	14	315	4,410
Total			\$ 75,712
<u>IV Cow-yearlings</u>			
Cows past "2's"	262	\$152	\$ 39,824
Heifers coming "2's"	52	152	7,904
Heifers coming "1's"	131	95	12,445
Steers coming "1's"	131	109	14,279
Bulls	13	315	4,095
Total			\$ 78,547
<u>V Cow-yearlings-purchased yearlings</u>			
Cows past "2's"	212	\$152	\$ 32,224
Heifers coming "2's"	42	152	6,384
Heifers coming "1's"	106	95	10,070
Steers coming "1's"	318 <sup>a/</sup>	108	34,390
Bulls	11	315	3,465
Total			\$ 86,533
<u>VI Stockers-spring purchase</u>			
Stocker yearlings	1,432	\$125 <sup>b/</sup>	\$178,744
<u>VII Stockers-fall purchase</u>			
Stocker yearlings	1,173	\$109 <sup>b/</sup>	\$128,176
<u>VIII Fall-and spring-purchased stockers</u>			
Fall-purchased	492	\$106 <sup>b/</sup>	\$ 52,998
Spring-purchased	785	124 <sup>b/</sup>	96,622
Total			\$149,620
<u>IX Cow-yearlings and spring-purchased stockers</u>			
Cows past "2's"	200	\$152	\$ 30,400
Heifers coming "2's"	40	152	6,080
Heifers coming "1's"	100	95	9,500
Steers coming "1's"	100	109	10,900
Bulls	10	315	3,150
Spring purchased stockers	343	123 <sup>b/</sup>	42,072
Total			\$102,102

<sup>a/</sup> Weaned during the year rather than beginning inventory.

<sup>b/</sup> Some differences due to rounding.



TABLE 8

Summary of Investment for Ranches Using Usual Technologies  
(Dollars)

Livestock system	Investment		
	Fixed resource <sup>a</sup>	Cattle	Total
I	310,500	72,301	382,801
II	310,500	73,943	384,443
III	310,500	75,712	386,212
IV	310,500	78,547	389,047
V	310,500	86,100	396,600
VI	310,500	86,493	396,993
VII	310,500	123,944	434,444
VIII	310,500	101,309	411,809
IX	310,500	86,062	396,562

a/ See Table 6 for details on fixed resource investment.

old and over, on hand, January 1 each year during 1960-65 (39). However, if heifers coming two years of age January 1 are added to the cow inventory, the percentage calf crop of the combined number is lowered to less than 74 percent for 1960-65. Not all heifers are bred to calve at two years old. The calf crop on a statewide basis has probably averaged around 80 percent of the cows and heifers actually expected to calve during recent years.

Studies of cattle ranching in the Northern Plains area of Wyoming reported calf crops of about 85 percent in 1959 and about 79 percent in 1965 (5) (15). If good management is involved, a calf crop of 83.3 percent seems a reasonable expectation and that level will be assumed for this study.

#### Death Loss

Information on death losses was derived from the previously cited studies of cattle ranching in the Wyoming plains area and from a study of stocker operations made by Eikenberry (7).

For purposes of this study estimates of percentage death loss

have been rounded slightly to 1.6 for cows, 3.0 for heifers coming two years of age, 5.0 for bulls, 1.8 and 1.0 for steer and heifer calves, respectively, and 1.0 and 2.0 for summer stockers and year-long stocker operations, respectively.

### Livestock Sales and Weights

An average weight of 1,000 pounds will be assumed for cull cows under all livestock systems. Bull replacement costs are a depreciation item, and weights assumed for bulls are significant because salvage value affects amount of depreciation charged. Culling weight of 1,300 pounds for bulls will be assumed for purposes of this study.

P. V.   
 Patterson made a study of transportation and marketing costs and conditions of sale for marketing calves and yearlings by various methods (25). Steers and heifers sold from the eastern parts of Wyoming averaged 708 and 623 pounds, respectively, if only yearlings were sold. Calves from these same areas averaged 390 pounds for steers and 362 pounds for heifers if the ranches sold only calves (Appendix Table 1).

Between 1926 and 1953, 3,775 steer and bull calves averaged 390 pounds; and 3,661 heifer calves averaged 368 pounds at weaning at the Northern Plains Experimental Range (3).

After examination of available data, it was assumed that heifers would be sold at an average of 620 pounds from the systems where all heifers are sold as yearlings, and at 680 pounds on the system where the few yearling heifers sold are culls from the replacement heifers. Steers sold from the typical cow-yearling or purchased stocker systems would average 705 pounds. It was also assumed that ranch operations selling predominately calves would sell 90 percent of their steer calves and 50 percent of their heifer calves at weights of 390 and 360 pounds.

Data on 7,468 calves at the Northern Plains Experimental Range and 2,052 calves weighed during production testing over a four-year time span on a Wyoming ranch were used to establish proportions of a calf crop within various weight ranges. Weights of calves and yearlings marketed under mixed marketing systems were adjusted accordingly (Table 9).

Grazing experiments conducted each year from 1940 until 1959 at the Central Plains Experimental Range show that heifers grazing from May through October gained about 270 pounds at moderate rates of stocking (19)(20). A smaller number of steers used in these experiments gained about 285 pounds.

Eikenberry found that calves purchased on stocker operations averaged about 380 pounds (7). Calves purchased in the spring gained 308 pounds and those purchased in the fall gained 337 pounds, while being wintered at slightly above the maintenance level then grazed through the summer. Eikenberry's study was carried on for only one year on a limited sample of ranch operations and at unknown grazing intensities, but the results are near enough to Central Plains Experimental Range results to be taken as identical.

Purchase weights of stockers were set to allow for attainable gains, so that the stocker systems would also sell yearling steers at 705 pounds. Stockers would be purchased in the spring at 420 pounds, delivered to the ranch and attain gains of 285 pounds during the grazing season. Steer calves purchased in the fall average 375 pounds delivered and gain 330 pounds.

TABLE 9  
Cattle Sales

Livestock system and class of cattle	Number <sup>a/</sup> (head)	Average weight (lbs.)	Total weight <sup>a/</sup> (cwt.)	Price per cwt. <sup>b/</sup> (dols.)	Value <sup>b/</sup> (dols.)
I Cow-calf					
Cows	56	1,000	564.26	12.85	7,250
Yearling heifers	15	680	102.39	21.04	2,154
Heifer calves	79	360	285.30	24.19	6,902
Steer calves	142	390	556.34	27.69	15,404
Yearling steers	16	598	93.07	24.19	2,252
Total					33,962
II Cow-steer calf-heifer yearlings					
Cows	53	1,000	525.10	12.85	6,747
Yearling heifers	87	620	539.59	21.67	11,694
Steer calves	133	390	517.72	27.69	14,335
Yearling steers	15	598	86.61	24.19	2,095
Total					34,871
III Cow-heavy steer calves-mixed yearlings					
Cows	50	1,000	499.07	12.85	6,413
Yearling heifers	83	620	512.80	21.67	11,113
Steer calves	70	423	296.50	27.11	8,037
Yearling steers	68	662	453.81	23.47	10,652
Total					36,215
IV Cow-yearlings					
Cows	47	1,000	466.36	12.85	5,992
Yearling heifers	77	620	479.20	21.67	10,385
Yearling steers	129	705	906.94	23.06	20,912
Total					37,289
V Cow-yearlings-purchased yearlings					
Cows	38	1,000	377.36	12.85	4,849
Yearling heifers	63	620	387.75	21.67	8,403
Yearling steers	312	705	2,198.40	23.06	50,689
Total					63,941
VI Stockers-spring purchase					
Stocker yearlings	1,418	705	9,994.64	23.06	230,446
VII Stockers-fall purchase					
Stocker yearlings	1,151	705	8,104.26	23.06	186,860
VIII Fall and spring-purchased stockers					
Fall-purchased	482	705	3,399.23	23.06	78,376
Spring-purchased	777	705	5,478.91	23.06	126,327
Total			8,878.12		204,703
IX Cow-yearling and spring-purchased stockers					
Cows	36	1,000	356.00	12.85	4,574
Yearling heifers	59	620	365.80	21.67	7,928
Yearling steers	98	705	692.31	23.06	15,963
Spring-purchased stockers	340	705	2,393.97	23.06	55,197
Total					83,662

a/ Numbers sold are rounded, but weight is calculated considering effect of death loss on average sales.

b/ Based on 1956-65 average prices.

### Feed and Pasture Requirements

Pasture requirements are calculated on the basis of animal-unit-months, abbreviated AUM's. An AUM is the amount of feed required to maintain a 1,000-pound cow for one month. Basal metabolism in ruminants is related to body weight by the formula,  $AU = \frac{W^{.75}}{1,000}$ . W is

the average of monthly weights of the animal and the denominator represents the weight of a mature cow (24). This formula produces AUM requirement coefficients consistent with generally accepted requirements for animals from the size of range sheep up to the size of range bulls. The formula was used to calculate AUM coefficients shown in Appendix Table 2 for different weights of cattle found for different live-stock systems.

#### Winter Feed Requirements

Actual winter feed used in the plains' area varies considerably from ranch to ranch and year to year depending upon the individual ranch resources and weather and range conditions. Average feed consumption in the typical plains counties of Wyoming has amounted to about 1,200 pounds of hay per head of cattle, and is budgeted at that level for cows and heifers coming two years old, along with 150 pounds of protein supplements per head (Appendix Table 3). Bulls are allowed 1,400 pounds of hay, 200 pounds of protein and 100 pounds of grains.

Rations for weaned calves are budgeted at 900 pounds of hay, 125 pounds of protein supplement and 150 pounds of grain for all live-stock systems except those involving purchase of calves. Purchase of

stocker yearlings in the fall creates excessive total hay requirements under this type of ration. Therefore, range forage, protein supplement, or grains were substituted for some hay on purchased stocker systems.

A small requirement of 200 pounds of hay and 20 pounds of protein supplement per head was also allowed for calves purchased in the spring-purchase system before the range is fully ready for pasturing.

#### Pasture Requirements

Pasture requirements for approximately a 150-day winter season and 215-day spring-fall season have been calculated (Appendix Table 3). Hay and concentrates together furnish a little less than half the winter season AUM's required for the cow-calf system of operation to around 75 to 80 percent of the requirement for the systems purchasing stockers. Range forage provides the balance of feed requirement for the 150-day winter season.

Range forage provides the total AUM's required for 215 days from spring through fall.

#### Total Animal Units

Total animal units vary slightly from 502 to 519 for ranches using breeding herds, due to the use of more or less purchased feeds. The spring stocker system has 472 animal units, and the fall stocker system, which requires more purchased feed, has 593 animal units (Appendix Table 3).

### Ranch Operating Costs

Operating costs were derived from physical requirements for some inputs such as feed and labor and from assessments and levies for taxes on real estate and livestock. A regression analysis was also used to estimate cost functions for categories such as veterinary, motor supplies, repairs, and utilities (18). Costs which will be used for further computations are shown in Appendix Table 4.

Major truck-hire expenditures in connection with procurement or marketing of cattle were excluded; these costs are handled as deductions from gross receipts or as

additions to stocker procurement costs.

Interest on operating costs is charged at seven percent for one-half year.

Depreciation on bulls was calculated on the assumptions that bulls would be purchased at \$400, have a salvage value of about \$229, and a useful life of four years. Death loss on bulls was calculated to be five percent of the average inventory value of bulls.

### Prices Received for Cattle

Glandt found that after transportation and marketing cost differentials were considered, the Billings, Montana, and Omaha, Nebraska, markets were quite comparable to each other and to five local Wyoming auctions in average annual or fall marketing season prices paid to ranchers (8). Omaha prices for the fall marketing months will be used in this study with appropriate adjustment for transportation and marketing costs.

The average April price for calves at five Wyoming auctions was within a few cents of the average price at Omaha for 1959-63, before adjustment for a transportation cost differential. The differentials between the Wyoming auctions and Omaha were also much less than

the transportation differential in March and May. Consequently, the adjustment used for spring-purchased stockers will reflect this fact. Marketing and transportation costs used to adjust central market prices are summarized in Appendix Tables 5, 6, and 7.

It is convenient to assume that sale weights specified previously are net sale weights; then shrinkage on output can be ignored. However, there is shrinkage between the purchase weight of stockers and weight actually delivered to a ranch. The weight loss must be regained within the normal gain allowed for stockers. Purchase weights of stockers have been set so that expected shrinkage and subsequent normal gain will result in sale weights as specified previously.

### Prices as a Function of Livestock Weights

Prices of feeder cattle vary inversely with weight. The price difference between weights also varies from time to time, and is larger when the general level of livestock prices is high and smaller when prices are low. Regression techniques have been used to estimate prices for specific weights for 1947-55, 1956-65, and 1947-65 (18).

Specialists have estimated that a majority, perhaps as much as 90 percent, of the calves and yearlings marketed from typical Wyoming ranches would grade choice or better. It has also been argued that ranch operators selling livestock direct and in good-sized lots may obtain some premiums in price. Consequently, estimated prices at choice grades will, perhaps, give more realistic estimates of net income than those from good-and-choice-estimated

prices, or quotations for various weight ranges. Prices actually used, adjusted for marketing costs, are shown in Appendix Table 8. Prices were estimated, then adjusted, for marketing costs of \$1.72, \$1.92, and \$1.95 per hundredweight for cows, yearlings, and calves, respectively.

Purchase prices for fall-purchased stockers are the November calf prices for the year prior to sale. Prices were adjusted by deducting a transportation differential of \$1.40 per hundredweight to convert the central market price level to a local market level, assuming stockers could be purchased locally. A cost for acquisition was then added to the adjusted price to cover costs of transportation from point of purchase to the ranch. Prices for spring-purchase stockers are April calf prices. Local auction prices were about equal to Omaha prices in the spring, so spring-purchase prices were adjusted by adding the acquisition cost to the estimated price.

### Prices and Cost Index for Inputs

Feed prices and a cost index are shown in Appendix Table 9. The feed prices used for a given year were the prices actually paid in the fall of the preceding year when most of the feed supplies would have been procured.

Ranch operators are capable of reducing costs for a few years, if necessary, when product prices are low. They then concentrate substantial expenditures to repair or replace worn out equipment and improvements and, possibly, to purchase additional equipment and improvements in years of high cattle

prices. This results in a certain degree of correlation between book-keeping costs and gross receipts. This is illustrated by the cost index, which was constructed from costs per animal unit for operating Northern Plains cattle ranches.

Given the information available, it will be assumed that the data on prices received for livestock, prices paid for feeds, and the cost index adequately represent year-to-year variations. The variation in the cost index is due partly to book-keeping rather than economic costs.

Sources of Variability - Assumptions

Ranch operators attempt to accumulate hay in years when hay yields and production exceed winter feed requirements; they use these inventories when winter feed requirements exceed production. The following assumptions will be made with respect to variations in forage supply:

1. Inventories can be managed so that surplus hay produced in years of high production can be used to supply deficits in years when production is less than requirements;
2. Numbers of livestock can be held constant.

Calf crop estimates published by the Crop and Livestock Reporting Service averaged about 80 percent of cows two years old and over in January 1 inventories, 1946-50. Estimates varied from 72 percent in 1949 to 87 percent in 1950. Since 1950, calf crop has averaged between 80 and 90 percent, and varies only one to four percent from year to year. Adjustment for heifers actually expected to calve results in a much lower true calving percentage, but probably would not affect the variability greatly. The calf crop for a specific ranch would vary unpredictably and by a greater amount, and thus, the number of calves and yearlings avail-

able for sale could vary. Weaning weights of calves and sale weights of cull cows and yearlings also vary.

Adequate data are not presently available representing variability in different aspects of output from a single ranch. However, variations in output on a particular ranch are largely independent of price variations. Consequently, output can be held constant and comparisons among systems should be about the same as if output varied randomly. Therefore, the following assumptions were made:

1. Calf crops are constant at average levels predicted. They almost certainly vary in a highly irregular and unpredictable way.
2. Weaning weights and sale weights of calves, yearlings, and cows will be held constant over time within each system, but total weight sold varies among systems due to variations in numbers and proportions of different-aged animals sold.

When physical output is held constant, it is relatively easy to make calculations allowing prices for inputs and outputs to vary. That was done and the procedure is described in following sections.

COMPARISON OF THE COW-CALF AND COW-YEARLING SYSTEMS

The calculations made for purposes of comparing different time periods and livestock systems are illustrated for the cow-calf and cow-yearlings systems, I and IV (Table 10).

Average sale of livestock and

other products were summarized and \$1,300 was also allowed for perquisites.

Expenses for hay, protein supplements and grain were calculated, using prices shown in Appendix Table A-9. Other cash expenditures and



TABLE 10

Summary and Comparisons of Averages of Operating Results, Cow-Calf  
and Cow-Yearling Systems, Ranches I and IV, 1946-55 and 1956-65

Item	Cow-calf (I)		Cow-yearling (IV)	
	1946-55	1956-65	1946-55	1956-65
<b>Sales</b>				
Cull cows	\$ 8,206	\$ 7,250	\$ 6,782	\$ 5,992
Yearling heifers	2,040	2,154	9,677	10,385
Heifer calves	6,472	6,902	0	0
Steer calves	14,126	15,404	0	0
Yearling steers	2,167	2,252	20,685	20,912
Total cattle sales	\$33,011	\$33,962	\$37,144	\$37,289
Total income <sup>a</sup>	34,311	35,262	38,444	38,589
<b>Expenses</b>				
Protein supplement	\$ 2,939	\$ 2,568	\$ 3,414	\$ 2,982
Hay	25	22	0	0
Grain	383	322	997	837
Other cash <sup>b</sup>	13,668	15,174	14,091	15,645
Interest on cash costs	595	633	648	681
Depreciation	4,798	5,327	4,820	5,352
Total	\$22,408	\$24,046	\$23,970	\$25,497
Net ranch income	11,903	11,216	14,474	13,092
Wage allowed operator	3,600	3,600	3,600	3,600
Return to total capital and management	\$ 8,303	\$ 7,616	\$10,874	\$ 9,492
Interest on cattle	5,503	5,061	5,729	5,498
Return to fixed capital and management	\$ 2,800	\$ 2,555	\$ 5,145	\$ 3,994
<b>Percent return on:</b>				
Total capital and management	<u>c/</u>	1.99	<u>c/</u>	2.44
Fixed capital and management	<u>c/</u>	.86	<u>c/</u>	1.20
<b>Income tax summary</b>				
Ordinary income	\$ 2,397	\$ 2,666	\$ 6,392	\$ 5,800
Capital gains	4,103	3,625	3,391	2,996
Taxable income	\$ 6,500	\$ 6,291	\$ 9,783	\$ 8,796
Taxes due	\$ 610	\$ 514	\$ 1,204	\$ 944
Net ranch income less tax	\$11,293	\$10,702	\$13,270	\$12,148
<b>Standard deviations</b>				
Net ranch income	\$ 9,045	\$ 4,988	\$ 9,965	\$ 4,839
Return to fixed capital	7,708	4,364	8,588	4,144
Net ranch income less tax	7,685	4,232	8,216	4,029
<b>Coefficients of variation</b>				
Net ranch income	76	44	69	37
Return to fixed capital	275	164	167	100
Net ranch income less tax	68	40	62	33

a/ Includes \$1,300 in perquisites.

b/ A detailed listing of costs at 1963-65 levels has been included in Appendix Table 4. These have been modified through use of cost indexes and price series and the costs shown here represent 1946-55, or 1956-65 average costs.

c/ Percent return not calculated because investment was not calculated for 1946-55.



depreciation were based on basic costs budgeted and shown in Appendix Table 4 and adjusted from year to year by use of the cost index from Appendix Table 9. Interest on operating capital was charged at seven percent for six months on the cash expenses.

Net ranch income was calculated by deducting the total expenses from income. A wage of \$3,600 was allowed the operator as compensation for labor only, it was deducted from net ranch income to arrive at a return to total capital.

Interest on investment in cattle also was charged at seven percent on beginning inventories. Cows were valued at the price of commercial cows; calves were valued at the average of good-and-choice steer or heifer calves; and bulls were valued at average investment.

Prices reached higher levels in 1951 for all classes of cattle, and were lower in 1953 for most of the price series than at any time before or since. Consequently, cattle prices were much more variable through 1946-55 than 1956-65. Stocker margins also fluctuated widely. Because of these differences livestock systems have been compared for the two periods separately. This comparison also provides a simple means of studying trends between time periods.

The 1946-55 and 1956-65 time periods compare quite closely for average levels of gross receipts,

expenses and net ranch incomes for both the cow-calf and cow-yearling systems. Coefficients of variation in all measures of net returns in 1956-65 are only 50 to 60 percent as great as in 1946-55.

Comparisons between the typical cow-calf operation and the cow-yearling operation indicate a \$2,600 advantage in net ranch income for the cow-yearling system over the cow-calf system for the first time period considered, but the advantage was reduced to about \$1,900 in the second time period.

The different livestock systems are subject to different income tax treatment. Breeding cow sales can be treated as a sale of capital items and taxed as a capital gain. Calves or yearlings sold and stockers purchased for resale are treated as ordinary income for tax purposes. A cow-calf system receives slightly more favorable tax treatment than other systems because of the capital gains treatment of cow sales; these are proportionately greater on the cow-calf system than on any other. Therefore, comparisons of income after taxes are also made among various organizations. Regression equations were derived to facilitate computer work and provide coefficients for calculating tax liability (18).

The advantage of the cow-yearling system over the cow-calf system is reduced to \$1,446 for 1956-65 when comparisons are based on income after taxes.

#### COMPARISONS AMONG ALTERNATIVE LIVESTOCK SYSTEMS

Net ranch incomes represent returns to operator's labor and management and total capital, in-

cluding that required for investment in cattle. Deducting a charge for operator's labor (\$3,600 in this case)

from net ranch income leaves a return to total capital and management as a residual. A charge for interest on investment in livestock can also be deducted from return to total capital, regardless of whether the operation is a breeding herd or a stocker operation, leaving a return to management and fixed capital.

Measures of net returns are compared for all livestock systems in Table 11. System II, selling almost all steer calves and retaining heifer calves for sale as yearlings, is approximately equal to the cow-calf system in all measures of net returns. System III, which sells the heaviest half of the steer-calf crop, shows about \$1,200 advantage in net ranch income and about \$1,000 advantage after taxes over the cow-calf or cow-steer calf-heifer yearling systems for 1956-65.

Moderate increases in total incomes and total costs and slight decreases in net ranch incomes before and after taxes occurred between 1946-55 and 1956-65 for systems I through IV (Appendix Table 10).

System V operates with a breeding herd and purchases additional stocker animals equal to number of calves raised. Measures of net income are noticeably better than for systems using only breeding herds for the 1946-55 time period. The comparison for 1956-65 would still favor system V, though by not so decisive a margin.

System VI, the spring purchase stocker operation, had large total income, relatively low operating costs, and high net income. System VII, which is the fall purchase stocker operation, also shows high total income, but operating costs are much higher than for ranch VI,

due to large amounts of feed purchased. Systems VI and VII show less pronounced advantages over the breeding herd systems in measures of net returns in 1956-65 as compared with 1946-55 (Appendix Table 10).

The use of prices estimated for specific weights has the effect of reducing net ranch incomes on VI and VII by about \$3,000 and \$5,000, respectively, compared to net ranch incomes calculated using reported prices for specified weight ranges (18). Thus, if reported rather than estimated prices had been used, the stocker systems would have appeared even better in comparisons with other systems. The prices estimated for specific weights thus are more conservative with respect to the purchased stocker systems and are preferable for that reason as well as for the refinement brought into other systems. The effect of variations in stocker procurement costs will be considered subsequently.

System VIII, a fall- and spring-purchased stocker system without any breeding herd, uses enough stockers purchased in the fall of the year to utilize the hay produced. Additional stockers are purchased in the spring of the year to fully utilize the pasture. This system is intermediate between VI and VII in returns.

System IX is a combination cow-yearling system with additional stockers purchased in the spring of the year. Input-output data for system IX are an amalgamation of the data for systems IV and VI. Net returns for system IX are intermediate between IV and VI, but much closer to IV.

The livestock systems are compared on a total, per animal unit, and per cow basis in Table 12.

TABLE 11

Summary and Comparison of Ranch Incomes and Expenses,  
All Livestock Systems, 1956-65 (Dollars)

Item	Livestock systems and distances stockers are hauled <sup>d</sup>									
	I	II	III	IV	V-30	VI-30	VII-30	VIII-30 <sup>c</sup>	IX-30	
Receipts										
Cattle sales	33,962	34,871	36,254	37,289	63,941	230,446	186,860	204,703	83,662	
Less cattle purchased	---	---	---	---	22,404	172,996	123,944	149,620	42,072	
Net cattle sales	33,962	34,871	36,254	37,289	41,537	57,450	62,916	55,083	41,590	
Total income <sup>a</sup>	35,262	36,171	37,554	38,589	42,837	58,450	64,216	56,383	42,890	
Expenses										
Cash costs	18,719	19,399	19,773	20,145	21,946	14,892	33,522	22,092	19,523	
Depreciation	5,327	5,447	5,404	5,352	5,211	4,602	4,602	4,602	5,175	
Total expenses	24,046	24,846	25,177	25,497	27,157	19,494	38,124	26,694	24,698	
Net ranch income	11,216	11,325	12,377	13,092	15,680	38,957	26,092	29,689	18,192	
Return to total capital and management <sup>b/</sup>	7,616	7,725	8,777	9,492	12,080	35,357	22,492	26,089	14,592	
Interest on cattle	5,061	5,176	5,300	5,498	6,027	6,055	8,676	7,092	6,024	
Return to fixed capital and management	2,555	2,549	3,477	3,994	6,053	29,302	13,816	18,997	8,568	
Percent return on:										
Total capital and management	1.99	2.01	2.27	2.44	3.05	8.91	5.18	6.34	3.68	
Fixed capital and management	.82	.82	1.12	1.29	1.95	9.44	4.45	6.12	2.76	
Income tax summary										
Ordinary income	2,666	3,278	4,664	5,800	9,531	37,657	24,792	28,389	12,318	
Capital gains	3,625	3,374	3,206	2,996	2,424	--	--	--	2,287	
Taxable income	6,291	6,652	7,870	8,796	11,955	37,657	24,792	28,389	14,605	
Taxes due	514	576	782	944	1,606	9,542	5,582	6,448	2,151	
NRI less tax	10,702	10,749	11,595	12,148	14,074	29,415	20,510	23,241	16,041	

<sup>a/</sup> Includes also an allowance of \$1,300 in perquisites except for livestock system VI where the allowance for perquisites was \$1,000.

<sup>b/</sup> A wage of \$3,600 has been allowed for the operator and deducted from net ranch income.

<sup>c/</sup> Fall purchased stockers transported 30 miles, spring purchased stockers transported 100 miles.

<sup>d/</sup> Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-yearlings; IV - Cow-yearling; V - Cow-yearling-purchased yearlings; VI - Spring purchased stockers; VII - Fall purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

TABLE 12 Comparative Summary of Livestock Systems, 1956-65

Item		Livestock system and number of animal units <sup>g</sup>								
		I	II	III	IV	V	VI	VII	VII	IX
Animal-units		502	505	506	509	519	472	593	515	502
Cows	Units	317	295	280	262		1,432 <sup>e</sup>	1,173 <sup>e</sup>	1,277 <sup>e</sup>	
						Total				
Annual beef production <sup>a</sup>	(Lbs.)	160,136	166,902	176,218	185,250	216,131	392,440	366,563	368,880	235,410
Annual beef sales <sup>b</sup>	(Lbs.)	160,136	166,902	176,218	185,250	296,351	999,464	810,426	887,814	380,808
Gross ranch income <sup>c</sup>	(Lbs.)	35,262	36,171	37,554	38,589	42,837	58,450	64,216	56,383	42,890
Costs:										
Cash	(Dols.)	18,719	19,399	19,773	20,145	21,946	14,892	33,522	22,092	19,523
Non-cash	(Dols.)	5,327	5,447	5,404	5,352	5,211	4,602	4,602	4,602	5,175
Total	(Dols.)	24,046	24,846	25,177	25,497	27,157	19,494	38,124	26,694	24,698
Net ranch income	(Dols.)	11,216	11,325	12,377	13,092	15,680	38,957	26,092	29,689	18,192
Return to operators										
Capital and management	(Dols.)	7,616	7,725	8,777	9,492	12,080	35,357	22,492	26,089	14,592
		Averages per animal unit								
Annual beef production <sup>a</sup>	(Lbs.)	319.00	330.50	348.26	363.94	416.44	831.42	618.14	716.25	468.94
Annual beef sales <sup>b</sup>	(Lbs.)	319.00	330.50	348.26	363.94	571.01	2,117.46	1,366.62	1,723.87	758.57
Gross ranch income <sup>c</sup>	(Lbs.)	70.24	71.63	74.22	75.81	82.54	123.83	108.29	109.48	85.44
Costs:										
Cash	(Dols.)	37.29	38.41	39.08	39.58	42.29	31.55	56.53	42.89	38.89
Non-cash	(Dols.)	10.61	10.79	10.68	10.51	10.04	9.75	7.76	8.94	10.31
Total	(Dols.)	47.90	49.20	49.76	50.09	52.33	41.30	64.29	51.83	49.20
Net ranch income	(Dols.)	22.34	22.43	24.46	25.72	30.21	82.53	44.00	57.65	36.24
Return to operators										
Capital and management	(Dols.)	15.17	15.30	17.35	18.65	23.28	74.91	37.93	50.66	29.07
		Averages per breeding cow <sup>f</sup>								
Annual beef production <sup>a</sup>	(Lbs.)	505.17	565.76	629.34	707.06	d/	274.05	312.50	288.87	d/
Annual beef sales <sup>b</sup>	(Lbs.)	505.17	565.76	629.34	707.06	d/	697.95	690.90	695.24	d/
Gross ranch income <sup>c</sup>	(Lbs.)	111.24	122.61	134.12	147.29	d/	40.82	54.74	44.15	d/
Costs:										
Cash	(Dols.)	59.05	65.76	70.62	76.89	d/	10.40	28.58	17.30	d/
Non-cash	(Dols.)	16.81	18.46	19.30	20.43	d/	3.21	3.92	3.60	d/
Total	(Dols.)	75.86	84.22	89.92	97.32	d/	13.61	32.50	20.90	d/
Net ranch income	(Dols.)	35.38	38.39	44.20	49.97	d/	27.20	22.24	23.25	d/
Return to operators										
Capital and management	(Dols.)	24.03	26.19	31.35	36.23	d/	24.69	19.17	20.43	d/

(Continued)

TABLE 12 (Continued)

- a/ Net pounds of beef produced.
- b/ Gross pounds sold, including resale of weight purchased as stockers.
- c/ Gross receipts plus perquisites less cost of purchased stockers for systems using stockers.
- d/ Not calculated because of inter-mixture of breeding herd and stocker systems.
- e/ Number of stocker animals, instead of cows.
- f/ Averages per head of stockers for systems VI, VII, and VIII.
- g/ Livestock systems are: I - Calf-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearling-purchased yearlings; VI - Spring purchased stockers; VII - Fall purchased stockers; VIII - Stockers purchased in both fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

Variability Among Alternate Livestock Systems

Variability in income is also an important consideration. Income variability as measured by the standard deviations are about equal for systems I through IV (Table 13). The coefficients of variation are somewhat less for systems III and IV due to slightly higher net income after taxes and slightly lower standard deviations of net income. Systems VI, VII, and VIII show the highest levels of variability as indicated by standard deviations. Systems V and IX, which used purchased stockers in conjunction with a breeding herd, show slightly higher variability than the straight breeding herd systems, but not nearly so high as the purchased stocker systems. When coefficients of variation are considered, then systems VII and VIII show highest coefficients of variation and stocker systems V, VI and IX are quite comparable to the breeding herd systems.

There is a very marked reduction in the coefficients of variation for all systems for 1956-65 as compared with 1946-55.

Net ranch income before taxes and returns to fixed capital were considerably more variable than net returns after taxes (Appendix Table 10). Year-to-year variations are indicated in Appendix Tables 11, 12, 13, and 14.

Small variations in purchasing or selling prices from the monthly averages used in evaluating the various systems also have great impact on net incomes for livestock systems VI, VII, VIII, and IX. Systems VI and VII require the purchase of 6,070 and 4,439 hundred-

weight of animals at weights used for local purchasing. A \$1 change in price thus will produce a \$6,070 or \$4,439 change in net incomes before taxes. Sales from these ranches are 9,995 and 8,104 hundredweights; a change of \$1 in selling price also will produce \$9,995 or \$8,104 change in gross and net incomes. Systems VIII and IX would also be affected in a similar way.

Deviations in purchasing or selling prices may be either positive or negative, as compared with monthly average prices with consequent beneficial or detrimental effects on net income. In either case, variations in buying and selling prices could increase variability of incomes for all of the stocker systems of operation.

One would normally expect that average prices paid by individuals purchasing stockers would be more variable than monthly average prices. However, the size distribution of cattle ranches selling calves and consequent purchasing patterns forced on people procuring stockers would tend to mitigate this source of variability. Relatively few large lots of calves are offered for sale; but many lots of less than 100 head and many lots of only a few hundred head each are offered. If the purchaser has average abilities, or is "unbiased", then procurement of lots of cattle is analogous to a sampling procedure. As the number of trials or observations increases or as the number of separate lots purchased increases, the average cost of the lots is expected to approach an average market price for a corresponding time period.

TABLE 13

Net Income and Variability in Net Income After Taxes,  
Nine Livestock Systems

Livestock system	Net ranch income after taxes		Standard deviations of NRI after taxes		Coefficients of variation of NRI after taxes	
	1946-55	1956-65	1946-55	1956-65	1946-55	1956-65
I	11,293	10,702	7,685	4,232	68	40
II	11,130	10,749	7,861	4,242	71	39
III	12,279	11,595	8,068	4,178	66	36
IV	13,270	12,148	8,216	4,029	62	33
V	16,187	14,074	11,599	5,608	72	40
VI	32,441	29,415	21,027	11,903	65	40
VII	25,374	20,510	25,744	14,844	101	72
VIII	27,652	23,241	22,827	12,817	83	55
IX	18,140	16,042	11,905	5,459	66	34

Due to the progressive income tax rate, returns after taxes are much less variable than returns before taxes for all livestock systems. Also, where taxable incomes were negative, the losses were "carried back" to offset against incomes in

previous years. The tax refund was then credited as part of the net ranch income after taxes for the years in which the losses occurred. The refund helped reduce variability in net income after taxes.

EFFECTS OF VARIATIONS IN PURCHASING COSTS OF STEERS

Small changes or variations in purchase prices for stockers are completely reflected in the stocker margins and can have a significant effect upon net income. Variations stem from differences in transportation and shrinkage costs in acquiring cattle or from variations among individual ability to bargain and buy or sell cattle. The results described in the immediately preceding section are based on acquisition of a supply of stocker animals at average market prices from a local area with a minimum of combined

transportation and shrinkage costs.

St. Clair assembled transportation, marketing and cattle shrinkage data (28). Table 14 reproduces portions of his data to show the effect of distance to a stocker supply area on transportation costs and weight which must be purchased to offset shrinkage. Procurement at a local auction, 30 miles from a ranch, requires the purchase of less than four pounds of additional weight at a cost of perhaps \$1 per head. Transportation costs would be 15¢



TABLE 14

Weights Purchased and Costs to Obtain Stocker Animals  
of Specified Weights from Supply Areas at Varying  
Distances from the Ranch

Distance to supply  (miles)	Estimated shrinkage  (percent)	Weight purchased to get delivered weight		Transportation costs per cwt.  (dollars)
		375 lbs. a/ (pounds)	420 lbs. b/ (pounds)	
30	.91	378.4	423.9	.15
100	2.42	384.3	430.4	.36
200	3.25	387.6	434.1	.58
400	3.93	390.3	437.2	.92
1,200	5.30	396.0	443.5	2.75

a/ The fall purchase systems require animals delivered at 375 pounds.

b/ The spring purchase systems require animals delivered at 420 pounds.

Source: Columns 1, 2 and 5 are reproduced by permission of the author from (29), Table 3, and (28), Table 9.

per hundredweight; the combined cost for procuring stockers from a local supply area amounts to less than \$1.60 per head or 40¢ per hundredweight.

If procurement were from an area 400 miles away from the ranch, then combined shrinkage and transportation costs would result in procurement costs approaching \$2 per hundredweight. An ample supply of stocker animals exists in the plains area so that fall-purchase stocker operations should be able to procure cattle within 200 miles, or 400 miles at a maximum.

Supply of stockers available in the Northern Plains for spring purchase is much more limited; in fact, prices at Wyoming auctions in the spring were almost identical with Omaha prices (8). If very many ranch operators adopted a spring-purchase program it would be necessary to go much greater dis-

tances in order to find an adequate supply of stocker animals. Large numbers of stocker animals are sold from the southwest, approximately 1,200 miles from the Northern Plains area. The Fort Worth price for good-choice 300-500 pound steer calves in April averages 83¢ per hundredweight less than at Omaha or at Wyoming auctions. However, procurement from such a remote area would probably require the assistance of an order buyer at a fee of about \$1 per head or 22¢ per hundredweight for the spring-purchased stockers. Costs for transportation for 1,200 miles is about \$2.75 per hundredweight. The net effect of these adjustments adds about \$2.15 to the price quoted in Omaha or to Wyoming prices for procuring cattle from an area such as the Southwest. In addition, it would be necessary to purchase about 24 pounds of additional weight to offset shrinkage.

The effect on net ranch income



of procuring supplies of stocker animals from varying distances is summarized in Table 15. Net ranch incomes before and after taxes are higher on all the stocker systems, V through IX, than on the breeding herd systems I through IV when stockers are procured within 400 miles of the ranch. Transporting stockers for distances much greater than 400 miles would not appear to be feasible; certainly this should not be necessary for systems purchasing stockers in the fall.

The spring-purchase stocker system, VI, shows net income after taxes more than twice as great as

the breeding herd systems, with transportation charges from 400 miles. Transportation from a distance as great as 1,200 miles may be feasible for system VI; however, much of the advantage for this system over systems using breeding herds, I through V, would have been lost in transportation and shrinkage costs.

The mixed fall- and spring-purchase stocker system, VIII, and the breeding herd with spring-purchased stockers, IX, show marked advantages over the breeding herd systems when stockers are procured from reasonable distances.

#### SUMMARY AND CONCLUSIONS

The objective of this study was to evaluate and make comparisons among nine livestock systems for grazing under Northern Great Plains conditions. Ranch management surveys made in the Northern Plains area and experimental data from the Northern Plains and Central Plains Experimental Ranges and the Fort Robinson Beef Breeding Research Station were principal sources of data.

Budgets were constructed for typical ranch operations a little over 500 animal-units in size grazing Northern Plains ranges at moderate rates of utilization.

Nine livestock systems were studied using a simple form of simulation. Prices for feeds, an operating cost index, and prices for cattle were allowed to vary as they had actually varied over a 20-year time span in the Northern Plains area. The use of this form of simulation then allowed comparison of the livestock systems based upon average net incomes and variability

in net incomes over a time period.

This study indicates that systems using breeding herds, systems I through IV, do not differ greatly in financial results. The breeding herd systems marketing the major part or all of their young cattle as yearlings appeared to have slight advantages over the cow-calf system.

The analysis which has been made has been based upon a simulation of dynamic conditions as far as input and output prices and costs of operation were concerned. However, physical product and requirements for feed inputs have been held constant. It would be desirable to simulate the operations of various livestock systems assuming that these factors did, in fact, vary. It is quite likely that additional advantages would be shown for systems III and IV due to greater flexibility in marketing and adjusting livestock numbers to feed supply.

The fall-purchase system, VII,

TABLE 15

Summary and Comparison of Net Incomes, All Livestock Systems 1956-65  
(Dollars)

Ranch and distance stockers are hauled	1946-55		1956-65		Return to capital			
	Net ranch income	Returns after taxes	Net ranch income	Returns after taxes	1956-65			Percent return
					Total capital	Fixed capital	To total	
I	11,903	11,293	11,216	10,702	7,616	2,555	1.99	0.82
II	11,757	11,130	11,325	10,749	7,725	2,549	2.01	0.82
III	13,199	12,279	12,377	11,595	8,777	3,477	2.27	1.12
IV	14,474	13,270	13,092	12,148	9,492	3,994	2.44	1.29
V-30	18,454	16,187	15,680	14,074	12,080	6,053	3.05	1.95
V-100	18,016	15,838	15,247	13,727	11,647	5,588	2.93	1.80
V-400	17,275	15,164	14,513	13,135	10,913	4,804	2.74	1.55
VI-30	46,379	32,441	38,957	29,415	35,357	29,302	8.91	9.44
VI-100	42,977	30,689	35,694	27,270	32,094	25,925	8.05	8.35
VI-200	40,394	29,198	33,209	25,596	29,609	23,353	7.40	7.52
VI-400	37,247	27,267	30,111	23,528	26,511	20,146	6.60	6.49
VI-1,200	27,323	21,132	20,358	16,605	16,758	10,052	4.12	3.24
VII-30	34,341	25,374	26,092	20,510	22,492	13,816	5.18	4.45
VII-100	31,905	23,860	23,681	19,162	20,081	11,237	4.60	3.62
VII-200	30,064	22,881	21,860	18,183	18,260	9,288	4.16	2.99
VII-400	27,816	21,521	19,635	15,829	16,035	6,907	3.64	2.22
VIII-100	37,791	26,017	29,689	23,241	26,089	18,997	6.34	6.12
VIII-200	36,374	25,089	28,327	22,277	24,727	17,588	5.99	5.66
VIII-400	34,649	23,940	26,628	21,059	23,028	15,829	5.57	5.10
VIII-1,200	29,209	20,196	21,282	17,113	17,682	10,296	4.25	3.32
IX-30	21,113	17,901	18,192	16,042	14,592	8,568	3.68	2.76
IX-100	20,267	17,250	17,379	15,401	13,779	7,723	3.47	2.49
IX-400	18,930	16,212	16,081	14,370	12,481	6,376	3.14	2.05

Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

with procurement of stockers from nearby areas, appears to be superior to the breeding herd types of operations in net incomes produced.

The spring-purchase stocker system is also preferable to the other systems provided that an individual is willing to assume the necessary risks. The degree of advantage of the spring-purchase stocker system is dependent upon transportation costs involved in procuring stockers.

Small and part-time or semi-retirement types of operation have used the spring-purchase stocker system in Wyoming. Very large operations with diversified interests in other agricultural areas or outside of agriculture also use the system. The system seems quite successful wherever it is used, but it has not been observed in very many cases of "typical operations". A variation which involves purchase of stockers in the fall, having them fed through the winter on irrigated farms on a gain contract, then moving them to the ranch in the spring is also used.

System VIII, the fall- and spring-purchase stocker system, is an approximation to the system of buying small lots from fall through spring. This system is also observed occasionally in Wyoming. Analysis indicates income levels and variability intermediate between VI and VII. System IX utilizing a breeding herd with spring-purchased stockers was intermediate in net income between the typical breeding herd system and a spring-purchased stocker system.

The principal advantage of a stocker operation is the high degree

of flexibility. The annual or seasonal forage requirement can be varied from zero to a maximum by the simple expedient of varying stocker numbers.

The principal disadvantage of the stocker type of operation is vulnerability to price variations. The calves purchased invariably sell for a higher price per pound than heavier feeder animals of comparable grades at the same time. Price movements from purchase to time of resale can result either in reducing or enlarging the negative margin, perhaps even converting it to a positive margin. The possibility of relatively large windfall profits or losses due to price movements results in highly variable income to stocker operations.

The progressive feature of income taxes and the fact that tax credits can be obtained if losses occur both tend to reduce the extreme variability in net ranch incomes after taxes. The income averaging provision in the present tax structure will further reduce variability in incomes after taxes.

The all-aged or mixed cow-calf-yearling operations may be found in many places. The advantages of an all-aged system of operation are greater flexibility compared to the cow-calf system, and less price risk than the purchased-stocker operations.

It has been assumed in this study that the same livestock systems would be continued year after year. There are, in fact, opportunities to vary the livestock system being used.

A decision maker who would choose a cow-calf system as a long

run system could, in any given year, retain all or a portion of his calf crop for sale as yearlings. Similarly, a ranch operator who might choose a cow-yearling system as a longer-term optimum procedure could alternate from that to a mixed system by marketing part of a calf crop in addition to a normal marketing of yearlings. Any of the breeding herd systems could be varied by adding stockers purchased either in the fall or spring. A ranch operator using a stocker system of operation could alternate from a fall purchase to a spring-purchase system, or combine the two in varying proportions from year to year.

These variations might be made in response to changes in weather, feed supply, or market conditions.

The use of variations in systems of operation and strategies would be conditioned upon the abilities of ranch operators to formulate expectations of the future with sufficient confidence to justify variations in systems. Expectations must be formed sufficiently in advance of actual events so that the decision makers can take action indicated by the knowledge acquired. It also should be possible for him to achieve some gains in net returns.

APPENDIX TABLE 1

Summary of Average Weights of Yearlings and Calves Sold in Wyoming,  
1958-59 Sample Survey (25)

Item	Land resource situation		
	Public and private lands	Private only <u>a/</u>	Plains and transition counties <sup>b/</sup>
Ranches selling yearlings only			
Number of observations	52	15	73
Number of animals	15,234	2,479	20,516
Average weights			
Steers	652	690	708
Heifers	591	597	623
Ranches selling calves only			
Number of observations	20	20	51
Number of animals	7,622	1,208	9,035
Average weights			
Steer calves	381	375	390
Heifer calves	354	351	362
Ranches selling calves and yearlings			
Number of observations	7	2	13
Yearlings - number	1,371	241	1,331
Average weights			
Steers	645	696	672
Heifers	614	589	602
Calves - number	1,412	138	2,409
Average weights			
Steer calves	376	324	393
Heifer calves	341	---	360

a/ Ranch operations in the western "public land" portion of the state, but not reported using public lands.

b/ Ranch operations using deeded and state lands primarily, rather than public lands.

APPENDIX TABLE 2

## Animal-Unit Month Coefficients for Various Classes and Weights of Livestock

Class of livestock	Winter period weight			Winter AUM coefficient	Summer period weight			Summer AUM coefficient
	Begin	End	Average		Begin	End	Average	
Mature ewe	117	117	117	.200	117	117	117	.200
Cows and heifers	1,000	1,000	1,000	1.000	1,000	1,000	1,000	1.000
Bulls	1,345	1,345	1,345	1.250	1,345	1,345	1,345	1.250
Nursing calves	---	---	---	---	70	365	217	.319
Weaned heifer calves								
Replacement heifers	380	420	400	.503	420	690	555	.643
All heifers	355	395	375	.479	395	665	530	.621
Weaned steer calves								
"Tail enders"	268	312	290	.395	312	598	455	.554
Lightest 50 percent	332	378	355	.460	378	662	520	.612
All steer calves	375	420	398	.501	420	705	562	.649

APPENDIX TABLE 3

## Total Feed and Forage Requirements and Balance for Various Livestock Systems

Livestock system <sup>f</sup>	Animal units	Planning units (No.)	Calculated requirements				Substitution pasture/hay (AUM's/tons)	Hay surplus of deficit (Tons)	Concentrates	
			Pasture			Hay (Tons)			Protein (Tons)	Grain (Tons)
			Winter (AUM's)	Spring-fall (AUM's)	Total (AUM's)					
I	502	317 <sup>a</sup>	1,062	3,807	4,869	280	69/21	-1	35.9	7.8
II	505	295 <sup>a</sup>	1,003	3,814	4,817	296	17/5	-1	38.4	12.9
III	506	280 <sup>a</sup>	960	3,814	4,774	306	26/8	+2	40.0	16.5
IV	509	262 <sup>a</sup>	933	3,815	4,748	316	52/16	-	41.7	20.3
V	519	212 <sup>a</sup>	854	3,844	4,698	335	102/31	-4	50.8	32.3
VI	472	1,432 <sup>b</sup>	---	5,112	5,112 <sup>c</sup>	143 <sup>c</sup>	<u>b/</u>	+1	14.3	---
VII	593	1,170 <sup>d</sup>	573	4,177	4,750	316	50/15	-1	131.6	131.6
VIII	515	492 <sup>d</sup>	241	1,757	1,998	221	---	-	31.5	36.9
VIII		785 <sup>b</sup>	---	2,802	2,802	79	---	-	7.8	---
IX	502	200 <sup>a</sup>	712	2,912	3,624 <sup>e</sup>	241 <sup>e</sup>	---	-	31.8	15.5
IX		343 <sup>b</sup>	---	1,225	1,225 <sup>e</sup>	34 <sup>e</sup>	---	-	3.4	---

a/ Breeding herd, number of mature cows.

b/ Spring purchased stockers

c/ 312 additional AUM's are produced by diverting land capable of producing 156 tons of hay to pasture and allowing 2 AUM's of pasture production per ton of hay.

d/ Fall purchased stockers

e/ 50 Additional AUM's are produced by diverting land capable of producing 25 tons of hay to use as pasture.

f/ Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased in both fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

APPENDIX TABLE 4

Estimated Costs for Various Ranch Organizations  
(Dollars)

Item	I	II	III	IV	V	VI	VII	VIII	IX
<b>Total costs</b>									
Labor	\$ 3,850	\$ 3,909	\$ 3,929	\$ 3,937	\$ 4,133	\$ 2,100	\$ 4,350	\$ 4,350	\$ 3,850
Feed	3,351	3,778	4,043	4,342	5,687	1,264	16,348	4,898	3,661
Rent	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Taxes	1,781	1,827	1,849	1,870	1,955	1,873	2,413	2,034	1,736
Veterinary	434	463	478	488	545	716	869	761	545
Motor supplies	1,484	1,514	1,522	1,518	1,553	1,200	1,755	1,600	1,550
Repairs	1,758	1,817	1,847	1,871	1,916	1,800	2,000	1,900	1,900
Insurance	510	510	510	510	510	510	510	510	510
Utilities	481	532	560	584	684	650	800	800	750
Miscellaneous	2,400	2,400	2,400	2,400	2,400	2,000	2,400	2,400	2,400
Interest on operating costs	660	684	698	711	776	522	1,199	772	690
Replacement of bulls	741	863	819	766	620	---	---	---	585
Depreciation other	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>	<u>4,700</u>
Total operating costs	\$24,950	\$25,797	\$26,155	\$26,497	\$28,279	\$20,135	\$40,144	\$27,525	\$25,677
<b>Costs per animal unit</b>									
Labor	\$ 7.67	\$ 7.74	\$ 7.76	\$ 7.73	\$ 7.96	\$ 4.45	\$ 7.32	\$ 8.45	\$ 7.67
Feed	6.68	7.48	7.98	8.53	10.95	2.68	27.51	9.51	7.29
Rent	5.58	5.54	5.53	5.50	5.39	5.94	4.71	5.44	5.58
Taxes	3.55	3.62	3.65	3.67	3.76	3.97	4.06	3.95	3.46
Veterinary	.87	.92	.94	.96	1.05	1.52	1.46	1.48	1.09
Motor supplies	2.96	3.00	3.00	2.98	2.99	2.55	2.95	3.11	3.09
Repairs	3.50	3.60	3.65	3.68	3.69	3.82	3.37	3.69	3.78
Insurance	1.02	1.01	1.01	1.00	.98	1.08	.86	.99	1.02
Utilities	.96	1.05	1.11	1.15	1.32	1.38	1.35	1.55	1.49
Miscellaneous	4.78	4.75	4.74	4.71	4.62	4.24	4.04	4.66	4.78
Interest on operating costs	1.32	1.35	1.38	1.40	1.49	1.11	2.02	1.50	1.37
Replacement of bulls	1.48	1.71	1.62	1.50	1.19	--	--	--	1.17
Depreciation other	<u>9.37</u>	<u>9.31</u>	<u>9.28</u>	<u>9.23</u>	<u>9.05</u>	<u>9.97</u>	<u>7.91</u>	<u>9.13</u>	<u>9.36</u>
Total operating costs	\$49.74	\$51.08	\$51.65	\$52.04	\$54.44	\$42.71	\$67.51	\$53.46	\$51.15



APPENDIX TABLE 5

Charges Per Head for Typical Lots of Cattle, Five Wyoming Auctions,  
1963, and Two Terminals, 1966

Costs	Wyoming auctions					Terminals	
	Gillette	Lander	Sheridan	Torrington	Worland	Denver	Omaha
Yardage	\$ --	\$ --	\$ .60	\$ .50	\$ .40	\$1.25	\$1.20
Commission	2.35	2.45	3.10	1.30	1.85	1.25	1.29
Feed <sup>a/</sup>	.50	--	--	.35	.40	.54	.50
Bedding <sup>a/</sup>	--	--	--	--	--	.115	.12
Brand inspection	.20	.20	.20	.20	.20	.15	.15
Health inspection	.10	.10	.10	.10	.10	--	--
Fire insurance	--	--	--	.01	.05	.0025	--
N.L. & M.B.	--	--	--	--	--	.02	.02
Total/head	\$3.15	\$2.75	\$4.00	\$2.46	\$3.00	\$3.3275	\$3.28
Total/cwt. 600 lb. steers	\$ .525	\$ .458	\$ .667	\$ .409	\$ .500	\$ .555	\$ .55

<sup>a/</sup> Assumes 1,000 pounds of hay per carload of cattle in two feedings, and four bales of bedding material.

Source: First seven columns are reproduced by permission of the author from Tables 7 and 8 of (28). Omaha data obtained by correspondence with John Clay and Company, Omaha, Nebraska.

APPENDIX TABLE 6

Typical Charges Per Head for Various Classes of Cattle Sold in  
Carload Lots, Omaha Stockyards, 1966

Costs	Bulls	Cows	Fat cattle	Feeder cattle	Calves
Yardage	\$1.75	\$1.20	\$1.20	\$1.20	\$ .69
Commission	2.10	1.29	1.29	1.29	.82
Feed <sup>a/</sup>	.80	.75	.80	.50	.40
Bedding <sup>a/</sup>	.20	.18	.20	.12	.10
Inspection	.15	.15	.15	.15	.15
N.L. & M.B.	.02	.02	.02	.02	.01
Total	\$5.02	\$3.59	\$3.66	\$3.28	\$2.17
Total per cwt.	\$ .42	\$ .36	\$ .33	\$ .55	\$ .58
Average weight lbs.	1,200	1,000	1,100	600	375

<sup>a/</sup> Assumes 1,000 pounds of hay per carload of cattle in two feedings, and four bales of bedding material.

Source: John Clay and Company, Omaha, Nebraska

APPENDIX TABLE 7

Estimated Marketing Costs for Shipping 600 lb. Wyoming Feeder Cattle to Markets Located at Various Distances from the Ranch

Miles	Hours in transit at 40 mph.	Gross shrink percent	Net shrink (assume 35% fillback) percent	Truck transportation <sup>a/</sup> Dols./Cwt.	Total costs Dols./Cwt.
10	.25	.60	.39	.08	.63
20	.50	1.00	.65	.12	.67
30	.75	1.40	.91	.15	.70
40	1.00	1.80	1.17	.18	.73
50	1.25	2.15	1.40	.20	.75
60	1.50	2.50	1.62	.24	.79
70	1.75	2.85	1.85	.27	.82
80	2.00	3.20	2.08	.30	.85
90	2.25	3.47	2.26	.33	.88
100	2.50	3.73	2.42	.36	.91
120	3.00	4.00	2.60	.43	.98
160	4.00	4.50	2.92	.51	1.06
200	5.00	5.00	3.25	.58	1.13
300	7.50	5.63	3.66	.76	1.31
400	10.00	6.04	3.93	.92	1.47
600	15.00	6.76	4.39	1.37	1.92
800	20.00	7.30	4.74	1.83	2.38
1000	25.00	7.80	5.07	2.29	2.84
1200	30.00	8.15	5.30	2.75	3.30
1400	35.00	8.50	5.52	3.21	3.76

a/ Transportation costs are based on the Wyoming cwt. rates for cattle, 24M, from Wyoming Intrastate Motor Freight Tariff No. 3 (1965), out to 400 miles distance. Thereafter, the charges are based on a straight 55¢ per loaded mile and 24,000 lbs. loading.

Source: Reproduced by permission of the author from (29), Table 3, and (28), Table 9.

APPENDIX TABLE 8

Prices for Commercial and Utility Cows and Choice Grades of Other Cattle Based on Omaha Prices Adjusted for Marketing Costs (Dollars per cwt.)

Year	Cows <sup>a/</sup>	Calves <sup>a/</sup>			Yearlings <sup>a/</sup>					Stockers purchased		Stocker margins	
	commercial and utility	Heifers	Steers		Heifers		Steers			Fall b/	Spring c/	Fall	Spring
		360 lbs.	390 lbs.	423 lbs.	620 lbs.	680 lbs.	598 lbs.	662 lbs.	705 lbs.				
1946	12.55	16.15	18.16	17.95	16.15	16.09	17.63	17.53	17.52	14.43	17.57	3.09	-.05
1947	15.32	21.69	24.71	24.44	18.30	18.12	21.31	21.08	20.98	19.11	21.97	1.89	-.99
1948	17.62	25.82	28.45	28.08	22.29	21.96	25.96	25.57	25.36	25.67	27.89	-.31	-2.53
1949	14.32	23.25	25.58	25.22	20.11	19.84	23.05	22.73	22.57	29.43	26.48	-6.86	-3.91
1950	20.82	33.05	35.98	35.57	27.91	27.41	31.15	30.59	30.27	26.55	29.91	3.72	.36
1951	23.62	35.21	36.89	36.33	33.14	32.47	36.16	35.41	34.96	36.96	40.12	-2.00	-5.16
1952	13.78	21.84	24.33	23.83	20.57	20.23	23.89	23.50	23.29	37.91	34.57	-14.62	-11.28
1953	9.54	14.62	17.49	17.17	10.89	10.86	14.43	14.35	14.36	25.33	22.60	-10.97	-8.24
1954	9.29	17.84	22.24	21.96	16.17	16.02	20.17	19.97	19.90	18.46	21.60	1.44	-1.70
1955	<u>8.57</u>	<u>17.41</u>	<u>20.06</u>	<u>19.75</u>	<u>16.41</u>	<u>16.28</u>	<u>19.10</u>	<u>18.92</u>	<u>18.86</u>	<u>23.21</u>	<u>24.12</u>	<u>-4.35</u>	<u>-5.26</u>
Ave.	14.54	22.69	25.39	25.03	20.19	19.93	23.29	22.97	22.81	25.71	26.68	-2.90	-3.88
1956	9.14	17.12	21.25	20.85	15.73	15.42	19.00	18.62	18.43	21.03	21.27	-2.60	-2.84
1957	12.89	22.77	27.97	27.52	20.28	19.73	23.46	22.82	22.47	22.24	23.72	.23	-1.25
1958	16.95	30.63	36.08	35.40	26.91	25.89	29.56	28.43	27.74	28.96	31.47	-1.22	-3.73
1959	13.13	27.04	29.68	28.87	25.46	24.57	28.89	27.89	27.29	37.11	35.50	-9.82	-8.21
1960	13.38	24.79	26.77	26.09	21.08	20.49	23.16	22.49	22.10	30.73	31.56	-8.63	-9.46
1961	13.79	26.18	29.01	28.38	23.38	22.69	25.23	24.46	24.01	27.80	29.96	-3.79	-5.95
1962	13.84	27.21	31.72	31.13	23.31	22.58	25.89	25.08	24.60	30.04	28.37	-5.44	-3.77
1963	12.18	23.94	25.73	25.14	21.98	21.38	23.71	23.02	22.63	32.74	28.67	-10.11	-6.04
1964	10.60	19.52	21.90	21.39	17.86	17.45	19.81	19.33	19.08	26.75	24.92	-7.67	-5.84
1965	<u>12.59</u>	<u>22.73</u>	<u>26.77</u>	<u>26.29</u>	<u>20.73</u>	<u>20.19</u>	<u>23.20</u>	<u>22.58</u>	<u>22.22</u>	<u>22.90</u>	<u>24.54</u>	<u>-.68</u>	<u>-2.32</u>
Ave.	12.85	24.19	27.69	27.11	21.67	21.04	24.19	23.47	23.06	28.03	28.00	-4.97	-4.94

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a/ Based on November prices for cows and calves and October prices for yearlings, marketing costs of \$1.72, \$1.92 and \$1.95 per cwt. deducted for cows, yearlings, and calves, respectively.

b/ Prices for 384 pound steer calves in November of the previous year, adjusted by deducting \$1.40 per cwt. transportation costs and adding 36¢ for purchasing costs.

c/ Prices for 430 pound calves in April of the current year. Local auction prices are about equal to Omaha prices in April, so no deduction was made for transportation differential, but 36¢ per cwt. was added to cover purchasing costs.

APPENDIX TABLE 9

Prices Per Ton Paid for Feed, and Index of Other Operating Costs,  
Wyoming Plains Ranches (9) (10) (42)

Year <sup>a/</sup>	Barley <sup>b/</sup>	Hay <sup>b/</sup>	Protein supplement <sup>c/</sup>	Cost index <sup>d/</sup>
	(Dols.)	(Dols.)	(Dols.)	
1946	39.58	17.50	68.27	50.6
1947	52.09	20.00	75.20	61.2
1948	63.34	21.90	81.60	77.0
1949	35.42	27.80	84.00	92.8
1950	39.17	22.00	72.80	89.4
1951	45.00	25.00	80.00	126.1
1952	48.75	25.80	91.20	102.9
1953	59.17	34.50	104.00	96.0
1954	48.34	24.30	83.20	92.6
1955	50.42	27.10	78.40	93.3
1956	42.50	22.50	72.00	87.1
1957	46.25	21.70	70.40	96.8
1958	37.50	18.50	67.20	97.5
1959	37.92	16.20	68.00	105.2
1960	39.17	25.30	67.20	98.4
1961	40.84	28.60	72.00	87.7
1962	43.75	25.50	72.80	106.4
1963	40.84	19.00	73.60	110.5
1964	41.25	19.70	76.80	94.2
1965	42.50	21.50	75.20	95.2

a/ Prices are September prices of the year previous to the operating year to correspond with prices at the time many ranchers are procuring feed.

b/ The prices shown for barley and hay are the prices received by Wyoming farmers and ranchers in September. An additional charge of \$5 per ton has been added on the barley to cover costs for grinding or rolling and transporting barley and \$2 per ton has been added for transporting the hay.

c/ Studies made in the plains area indicated that the ranch operators were paying about 20 percent less than the price reported by the Crop and Livestock Reporting Service for protein supplements, perhaps due to quantity discounts or to the use of supplements having lower protein content. The price shown for the protein supplement is only 80 percent of the September average price reported by the Crop and Livestock Reporting Service.

d/ 1963-65 average = 100.

APPENDIX TABLE 10

Summary and Comparisons--All Livestock Systems Using Usual Technologies  
1946-55 and 1956-65

Item	Livestock systems <sup>ab</sup>								
	I	II	III	IV	V	VI	VII	VIII	IX
<u>1946-55</u>									
Total income	34,311	34,994	36,802	38,444	44,252	64,195	72,692	63,001	44,186
Operating costs	22,408	23,237	23,603	23,970	25,798	17,816	38,351	25,210	23,073
Net ranch income	11,903	11,757	13,199	14,474	18,454	46,379	34,341	37,791	21,113
Return to fixed capital	2,800	2,510	3,899	5,145	8,679	37,013	22,800	27,562	11,418
NRI after taxes	11,293	11,130	12,279	13,270	16,187	32,441	25,374	27,652	18,140
<u>1956-65</u>									
Total income	35,262	36,171	37,554	38,589	42,837	58,450	64,216	56,383	42,890
Operating costs	24,046	24,846	25,177	25,497	27,157	19,494	38,124	26,694	24,698
Net ranch income	11,216	11,325	12,377	13,092	15,680	38,957	26,092	29,689	18,192
Return to fixed capital	2,555	2,549	3,477	3,994	6,053	29,302	13,816	18,997	8,568
NRI after taxes	10,702	10,749	11,595	12,148	14,074	29,415	20,510	23,241	16,042
<u>Standard devs.</u>									
<u>1946-55</u>									
Total income	9,640	9,944	10,416	10,807	14,877	35,000	39,633	35,593	15,612
Operating costs	4,757	4,860	4,886	4,906	5,067	4,070	5,965	5,049	4,840
Net ranch income	9,045	9,306	9,669	9,965	15,006	35,486	41,769	36,635	15,632
Return to fixed capital	7,708	7,961	8,302	8,588	14,278	35,234	42,309	36,630	14,607
NRI after taxes	7,685	7,861	8,068	8,216	11,599	21,027	25,744	22,827	11,905
<u>1956-65</u>									
Total income	5,262	5,317	5,312	5,201	6,883	18,051	20,314	17,977	7,097
Operating costs	1,628	1,657	1,664	1,666	1,687	1,436	1,808	1,715	1,658
Net ranch income	4,988	5,020	4,986	4,839	6,969	18,049	20,901	18,227	6,898
Return to fixed capital	4,364	4,361	4,304	4,144	6,678	18,219	21,537	18,438	6,488
NRI after taxes	4,232	4,242	4,178	4,029	5,608	11,903	14,844	12,817	5,459

a/ Data are based on transportation of purchased stockers for 30 miles to the ranch, except for VIII, where transportation was 30 miles for fall-purchase and 100 miles for spring-purchased stockers.

b/ See footnote to Appendix Table 11 for listing of livestock systems.

APPENDIX TABLE 11

Estimated Net Ranch Incomes, Nine Livestock Systems Using Usual Technology,  
1946-65

Year	Livestock systems <sup>ab</sup>								
	I	II	III	IV	V	VI	VII	VIII	IX
1946	12,647	13,209	14,545	15,881	23,100	56,313	53,720	52,417	24,988
1947	17,336	16,757	17,730	18,435	25,620	62,016	55,685	56,244	28,144
1948	18,994	18,593	20,116	21,403	28,126	66,666	55,900	58,452	31,300
1949	10,970	10,626	11,962	13,086	13,788	44,331	14,995	28,340	19,540
1950	25,953	25,620	27,155	28,209	40,095	101,220	93,362	92,032	44,654
1951	21,437	22,410	25,185	27,759	36,317	78,913	74,812	70,644	38,525
1952	7,212	7,465	9,276	11,093	5,763	279	-20,733	-11,358	7,228
1953	-1,965	-3,485	-3,099	-2,868	-8,626	-15,015	-38,784	-25,758	-6,784
1954	4,129	3,925	5,237	6,453	13,311	47,443	41,859	41,836	15,333
1955	2,314	2,453	3,876	5,290	7,048	21,623	12,588	15,056	8,200
1956	4,749	4,709	5,748	6,640	9,798	35,821	22,124	26,952	12,730
1957	11,023	10,894	11,711	12,094	18,674	59,407	46,910	49,980	22,431
1958	21,312	21,427	22,143	22,114	29,275	64,710	61,174	58,186	31,172
1959	12,702	13,560	15,588	17,505	17,953	34,116	19,236	23,383	20,191
1960	11,085	10,802	11,699	12,303	11,510	7,620	6,895	4,190	10,001
1961	15,482	15,725	16,788	17,443	21,207	38,428	37,115	34,263	21,403
1962	13,297	13,015	13,678	13,759	16,394	50,446	27,155	36,254	21,396
1963	6,892	7,255	8,563	9,689	7,922	28,215	-1,449	11,798	12,934
1964	5,217	5,310	6,313	7,192	6,190	18,636	-345	7,822	8,913
1965	10,401	10,553	11,542	12,174	17,880	52,168	42,102	44,061	20,750

a/ Purchased stockers transported 30 miles to the ranch, except for VIII, where fall-purchased stockers were transported 30 miles and spring-purchased stockers transported 100 miles.

b/ Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

APPENDIX TABLE 12

Estimated Net Ranch Incomes, Three Stocker Livestock Systems Using Usual Technologies  
and Transporting Stockers Various Distances, 1946-65

Year	Livestock system and distance stockers are transported <sup>a</sup>								
	V-100	V-400	VI-100	VI-200	VI-400	VI-1,200	VII-100	VII-200	VII-400
1946	22,753	22,105	53,590	51,384	48,565	39,258	51,789	50,231	48,210
1947	25,246	24,571	58,944	56,567	53,616	43,977	53,608	51,959	49,883
1948	27,687	26,936	63,165	60,474	57,323	47,278	53,458	51,601	49,317
1949	13,311	12,528	40,960	38,406	35,255	25,338	12,337	10,380	8,022
1950	39,653	38,899	97,591	94,856	91,553	81,452	90,903	89,012	86,746
1951	35,754	34,884	74,516	71,364	67,734	56,843	71,677	69,428	66,878
1952	5,204	4,346	-3,723	-6,581	-10,028	-20,482	-23,845	-26,039	-28,573
1953	-9,037	-9,750	-18,085	-20,496	-23,475	-33,043	-41,070	-42,823	-45,004
1954	12,961	12,311	44,405	42,048	39,050	29,508	39,916	38,383	36,328
1955	6,632	5,921	18,411	15,920	12,874	3,104	10,272	8,509	6,349
1956	9,416	8,733	32,936	30,720	27,801	18,417	20,002	18,324	16,233
1957	18,286	17,604	56,415	54,008	51,042	41,501	44,749	43,115	40,986
1958	28,819	28,051	61,239	58,669	55,487	45,506	58,637	56,698	54,401
1959	17,428	16,597	30,453	27,732	24,433	14,281	16,313	14,195	11,733
1960	11,080	10,348	4,141	1,505	-1,682	-11,608	4,502	2,676	462
1961	20,790	20,078	35,038	32,486	29,307	19,461	34,792	33,034	30,866
1962	15,941	15,192	47,203	44,674	41,565	31,798	24,632	22,788	20,504
1963	7,435	6,644	24,884	22,400	19,279	9,485	-4,159	-6,154	-8,523
1964	5,778	5,063	15,532	13,185	10,167	583	-2,640	-4,403	-6,583
1965	17,500	16,826	49,099	46,711	43,709	34,158	39,985	38,326	36,267

<sup>a/</sup> Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.



APPENDIX TABLE 13

Estimated Net Ranch Incomes After Taxes, Nine Livestock Systems Using Usual Technologies,  
1946-65

Year	Livestock systems and distances stockers are hauled <sup>a</sup>								
	I	II	III	IV	V-30	VI-30	VII-30	VIII-100	IX-30
1946	11,931	12,351	13,413	14,454	19,966	40,602	39,310	38,576	21,350
1947	15,897	15,373	16,113	16,623	21,988	43,595	40,397	40,702	23,806
1948	17,354	16,964	18,123	19,068	23,954	45,891	40,514	41,889	26,195
1949	10,616	10,282	11,368	12,257	12,717	33,679	13,155	23,184	17,272
1950	22,976	22,625	23,715	24,417	32,497	58,886	56,764	56,331	35,384
1951	19,643	20,313	22,394	24,248	30,109	51,316	49,770	47,914	31,537
1952	7,396	7,576	9,093	10,584	5,969	820	-7,529	-3,165	7,205
1953	- 372	-1,577	-1,181	- 931	-4,412	-4,132	-22,123	-14,356	-2,998
1954	4,554	4,353	5,477	6,501	12,152	35,560	32,254	32,240	13,762
1955	2,937	3,040	4,272	5,478	6,927	18,195	11,232	13,203	7,886
1956	5,089	5,030	5,912	6,656	9,257	28,239	18,645	22,191	11,656
1957	10,595	10,446	11,099	11,380	16,569	42,250	35,362	37,176	19,440
1958	19,145	19,162	19,669	19,584	24,757	44,941	43,311	41,747	26,070
1959	12,004	12,666	14,286	15,779	16,012	27,097	16,458	19,584	17,731
1960	10,670	10,390	11,110	11,573	10,814	7,105	6,547	4,252	9,535
1961	14,317	14,462	15,283	15,761	18,575	29,952	29,197	27,293	18,692
1962	12,531	12,250	12,764	12,790	14,802	37,320	22,337	28,627	18,689
1963	7,058	7,336	8,428	9,348	7,772	23,009	179	10,593	11,921
1964	5,549	5,603	6,449	7,177	6,252	15,928	656	7,323	8,543
1965	10,060	10,148	10,946	11,435	15,933	38,305	32,408	33,628	18,140

a/ Livestock systems are: I - Cow-calf; II - Cow-steer calves-heifer yearlings; III - Cow-heavy steer calves-heifer yearlings; IV - Cow-yearling; V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

APPENDIX TABLE 14

Estimated Net Ranch Incomes After Payment of Income Taxes, Three Stocker Systems Using Usual Technologies and Transporting Stockers Various Distances

Year	Livestock systems and distances stockers are hauled <sup>a</sup>								
	V-100	V-400	VI-100	VI-200	VI-400	VI-1,200	VII-100	VII-200	VII-400
1946	19,702	19,209	39,104	37,858	36,224	30,488	38,219	37,322	36,137
1947	21,710	21,204	42,007	40,740	39,119	33,462	39,247	38,316	37,120
1948	23,631	23,078	44,174	42,805	41,146	35,462	39,163	38,111	36,789
1949	12,327	11,685	31,576	29,937	27,862	20,940	11,030	9,438	7,490
1950	32,203	31,699	57,858	57,031	55,972	52,328	55,956	55,309	54,506
1951	29,719	29,113	49,472	48,078	46,399	40,889	48,884	47,353	46,148
1952	5,486	4,741	768	- 829	-2,871	-10,181	-10,637	-11,524	-13,628
1953	-4,835	-6,397	-7,551	-9,720	-12,938	-19,263	-23,134	-23,434	-24,111
1954	11,867	11,337	33,725	32,262	30,354	23,922	31,019	30,027	28,676
1955	6,573	5,966	15,755	13,828	11,403	3,277	9,349	7,895	6,087
1956	8,938	8,366	26,295	24,769	22,714	15,760	17,043	15,757	14,130
1957	16,264	15,727	40,658	39,337	37,663	31,918	34,052	33,042	31,702
1958	24,426	23,865	43,199	41,863	40,152	34,396	41,987	40,948	39,689
1959	15,597	14,937	24,583	22,665	20,279	12,527	14,193	12,519	10,541
1960	10,458	9,848	4,167	1,892	- 190	-7,488	4,519	2,949	1,018
1961	18,254	17,702	27,716	25,988	23,781	16,559	27,650	26,458	24,963
1962	14,440	13,838	35,417	33,889	31,958	25,515	20,505	19,141	17,425
1963	7,358	6,683	20,608	18,776	16,420	8,650	2,015	3,714	-5,840
1964	5,898	5,283	13,515	11,653	9,209	1,087	-1,406	-2,692	-3,977
1965	15,633	15,099	36,537	35,123	33,296	27,125	31,063	29,990	28,636

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a/ Livestock systems are: V - Cow-yearlings-purchased yearlings; VI - Spring-purchased stockers; VII - Fall-purchased stockers; VIII - Stockers purchased both in fall and spring; IX - Cow-yearling with additional stockers purchased in the spring.

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