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RISK MANAGEMENT STRATEGIES USED BY RANGE LIVESTOCK PRODUCERS

Carl E. Olson and Martin J. Owens

Much work has been completed or is currently in progress dealing with market risks faced by agricultural producers. The work includes several simulation routines constructed to identify optimum risk management strategies for given situations. Econometric models have been developed to estimate welfare functions in terms of risk management. E-V frontiers have been estimated for given situations showing the trade-off between "risk" and "income" for different enterprises and there has been work to identify optimal financial management strategies to deal with market risk (5). Almost without exception, though, risk management research has dealt with intensive agriculture. Limited research in market risk analysis for extensive agriculture or range livestock operations has been conducted recently.

In this paper an attempt is made to identify the physical limitations that range livestock producers face and the market risks with which they must deal. Organizational and operational strategies for dealing with market risk are identified and evaluated as to their potential for reducing market risks faced by producers.

Twenty range livestock producers were interviewed to gain insights as to what risk management strategies they are currently using and why they are being used. ^{1/} The producers were also asked their opinions about selected market risk management strategies. The results of the interviews gave direction to the analysis.

The Western Range Livestock Area

The western range livestock industry is a unique part of agriculture. This uniqueness is derived from the fact that there are limited uses for most of its available land resources. The limitations on alternative agricultural uses of the land resources stem from climatic factors and soil characteristics. Despite the limitations, this industry makes an important contribution to our natural food and fiber supply. Livestock are able to convert native grasses into usable agricultural products--meat and wool.

The general climate of the western range is arid to semi-arid. There is insufficient precipitation in much of the area to produce traditional agricultural crops. Often precipitation does not fall when crops need it. Thus the timing and the amount of precipitation are limitations on producer's crop selection.

As a result, there is considerable need for irrigation throughout the western livestock area. In some areas, where water and length of growing season are sufficient, cash crops are grown. The irrigated areas are limited, however, by economically feasible water supplies. Further limitation is imposed by the region's soils which are in many places very shallow and may easily be made alkali through irrigation.

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^{1/} Extrapolation to the population of range livestock producers is not feasible from this sample size, but it was sufficient for the intended purpose of gaining insights.

Temperature and growing seasons are other climatic factors limiting what the land resource can produce. Much of the western range lands are located at fairly high elevations resulting in short growing seasons. Killing frost for most crops can occur from late summer and early fall to late spring and early summer in a large part of the western range area. In areas where frost is not a problem, high temperatures coupled with limited or sporadic rainfall limit what can be grown. Thus, most of the land resources available to the western range livestock producer can be used only to graze native grasses for forage. The producer has few alternatives in terms of land use.

The climate, soils, and water for irrigation dictate how the land resources can be utilized by agriculture. The range livestock producer does not have the flexibility nor the opportunity to diversify to the extent available to the crop farmer. The range livestock producer therefore faces somewhat different market risks than do agricultural producers in areas of intensive farming.

Risk

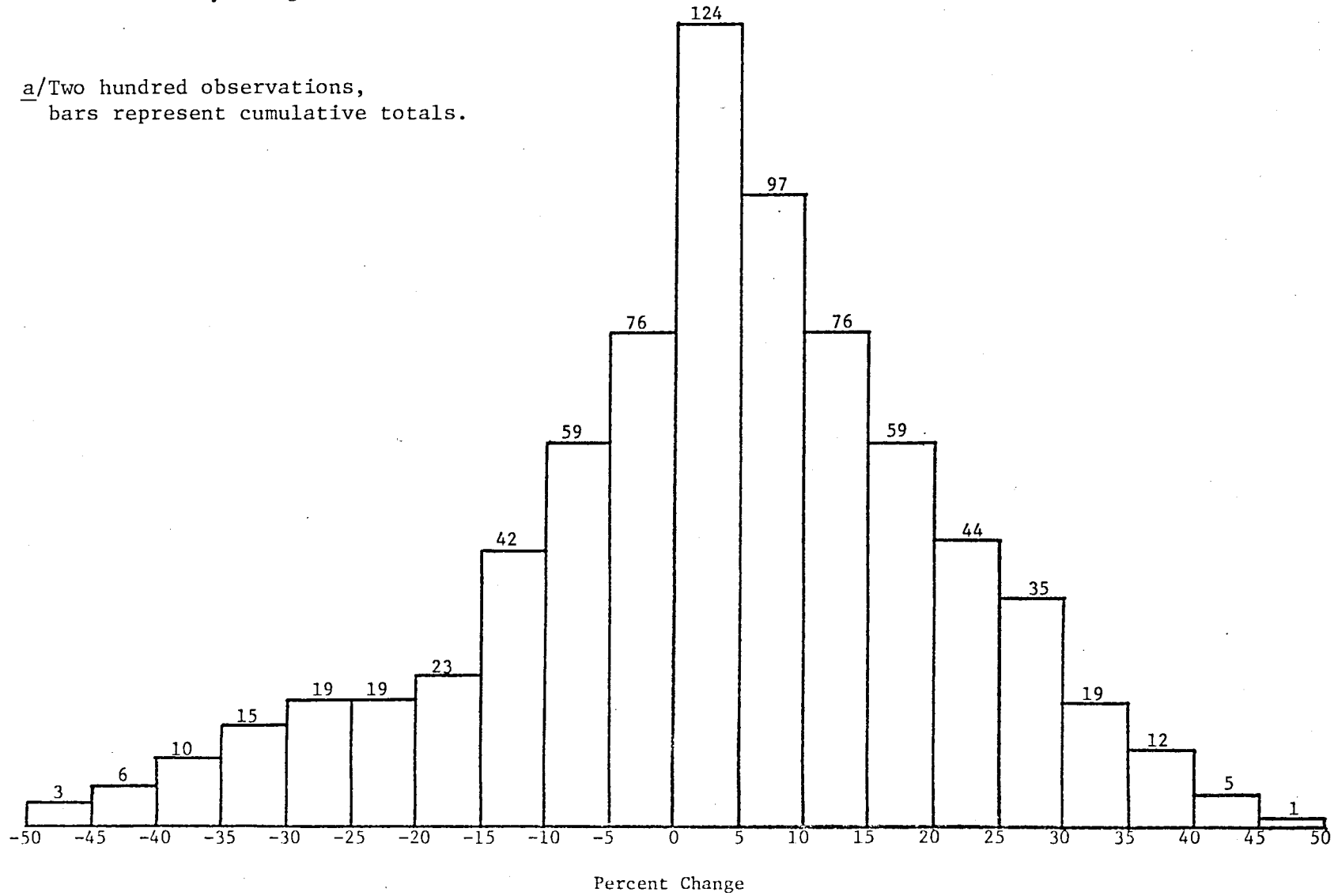
The range livestock operator faces both market risks and non-market risks, as do all agricultural producers. The most potentially hazardous form of risk which must be managed by range livestock producers is market risk. This is the risk of economic loss due to price fluctuation and may occur in both input and output markets. The degree of market risk faced by individual producers may be most directly viewed through examination of the sets of prices paid and received by those producers over time. The authors feel, however, that perhaps a more indicative measure of risk faced by the range livestock producer is the magnitude of relative price changes between years.

Omaha prices for the livestock classes and sale months indicated in Table 4 were obtained for the years 1946-1976. Percentage price changes between years for the sale months were calculated, and from these a histogram of the aggregated tabulation was constructed (see Figure 1). The histogram indicated that the distribution of percentage price changes over time is characteristically normal and therefore conducive to the use of standard normal measures of dispersion. The results indicate an average change in price of approximately 5 percent between years (see Appendix A). This upward trend most likely reflects inflation and, as such, was anticipated. A 90 percent confidence interval constructed about the percentage-change means, however, failed to indicate the direction of price movement. These results suggest that this type of analysis is not suited to forecasting. A number of other methods may provide better forecasting results (1,7).

Cattle prices are historically cyclical and display seasonality; however, "... the usual irregularities in a particular year make the use of historical seasonal price patterns for forecasting the future a very risky business" (15). The value of this brief price analysis, then, lies in a descriptive framework. It exemplifies the extreme fluctuations in price to which range livestock producers are subject. It is these fluctuations that are primarily responsible for the wide range of incomes displayed in Table 5 which summarizes part of the following analysis.

Figure 1. Percentage Price Change, Relative Frequency, Aggregate of all Livestock Classes considered in study, Monthly Average Prices, Omaha, 1946-1976. a/

a/Two hundred observations,
bars represent cumulative totals.



The non-market risks facing the range livestock producer can be attributed to weather, health, and societal interactions. Adverse weather conditions can cause unusually high death loss and health problems. Drought conditions create forage shortages, both in the range and hay crops, which may force the operator to reduce his livestock inventory or purchase costly hay. Disease and health problems are controllable to a certain extent with management, but there remains a large element of risk associated with them. The third general area of non-market risk can be thought of as a societal or institutional risk. These are risks generated by social and/or political action, such as changes in the grazing policies of the Bureau of Land Management or the U.S. Forest Service (11,12). All agricultural producers face institutional risks at one time or another.

Organizational Strategies

There are three basic ranch organizations that range livestock producers commonly adopt. The first is the cow-calf operation. Cows are bred to calve in late winter and early spring, with calves ready for sale usually in October and November. Some operations with proper facilities will calve year-round and sell 350 to 450 pound calves all year.

The second type of organization is the cow-yearling operation. Again, cows are usually bred to calve in late winter and early spring. The calves are held to approximately 18 months of age and sold in September and October at weights ranging from 650 to 750 pounds. The cow-yearling operation will have fewer cows than a cow-calf operation using the same land resources. Thus, the cow-yearling operation will require less labor as there are fewer cows calving each year.

The third major organization available to range livestock producers is the stocker operation. The producer buys 350 to 400 pound calves in October and November and carries them 10 to 12 months for sale in September and October. These yearlings are sold at weights of approximately 700 pounds.

With all three organizations, the ranch is marketing forage in some form. An alternative for the ranch operator is to rent his rangeland and sell the hay he harvests, as opposed to marketing the forage as livestock. Some operators are doing this with part or all of their land resources; however, the practice is not common.

It is possible for the range livestock operator to change his basic organization; however, such a major change in operation may take considerable time to complete. Also, the operator would most likely need additional financing to complete the change from one organization to another. Another constraint on organizational change is the balance of the unit. By balancing the unit, we mean having sufficient forage available throughout the year from all sources to feed or carry the entire livestock inventory. Ranchers located in the colder parts of the area need to provide supplemental hay to their livestock during the winter months. The length of the feeding period depends on the severity of the winter and the availability of forage. A given set of range resources may "fit" one organization much better than another.

Analysis of a "Typical" Cattle Ranch in the Western Plains

The following is an analysis of how a typical cattle ranch in the central plains area of Wyoming would perform utilizing each of the three basic organizational forms previously described. The effectiveness of the alternative organizations considered is measured in net incomes generated. Net income as used in this study is what the operator and his family have available for living expenses. It is assumed that the operator will want the highest possible income subject to his willingness to accept risk (i.e., income variation). Normally, higher incomes are achieved through the acceptance of higher degrees of income variation.

The perceived land, buildings and equipment inventory with valuation and carrying capacity for the typical western ranch unit are shown in Table 1. The livestock inventories that the land resources can carry and values for the three basic organizations are shown in Table 2. These inventories utilize fully the forage available on the unit in a "normal" year.

A ranch of this size is normally a two man operation. The two men, usually an operator and a hired man, provide most of the labor needed. It is assumed that the operator's family and sometimes the family of the hired man provide extra labor when it is needed.

The area in which the typical unit is located is one with "open" winters. That is, the livestock graze year-round with supplemental hay feedings for only limited periods immediately following snow storms or periods of extended snow cover. The ranches in this area of Wyoming typically do not harvest hay. Thus no haying equipment is shown in the equipment inventory. If they do harvest hay, it is from areas along creek and stream bottoms that are subirrigated. The equipment used is normally old and has little inventory value.

The operating costs of the three basic organizations are summarized in Table 3. The explanatory footnotes for Table 3 are in Appendix B.

Returns from Alternative Marketing Methods

Included in the operating expenses shown in Table 3 are costs of three general methods of cattle marketing commonly practiced by Wyoming cattle producers. These include (A) sale at auction, (B) direct sale with no pencil shrink, and (c) direct sale with 3 percent pencil shrink. The method of marketing substantially affects costs as is indicated in Table 3.

The gross returns for the three ranch organizations depend on the products being sold and the prices received. Table 4 shows the pounds of beef sold in a normal year by weight of animal and time of sale, and the gross returns based on 1976 Omaha prices for the three basic organizations.

The 1967-1976 net returns to operator's labor and management for the three organizations are given in Table 5. The cost allowances for operator's labor given in Table 3 are included in the net returns shown in Table 5. Total costs are adjusted to the appropriate year using the U.S.D.A. cost of production index with 1976 as the base year, with the exception of inventory purchases which were estimated using the Omaha prices for the appropriate years. The returns for the various organizations in a given year were determined by using the Omaha prices and the livestock sales and weights shown in Table 4.

The income figures presented in Table 5 were derived using the assumption of marketing costs A in Table 3. The assumption of sale at auction, it was felt, was most justifiable for use with the Omaha prices. The prices received by ranchers through direct sale treaties are dependent on the terms agreed to by the bargaining parties. ^{2/} The price a rancher may receive at his location is usually less than he would receive at auction in reflection of the marketing charges, transportation charges, and possibly shrinkage costs that he would be avoiding.

The procedure used assumes that the ranch unit sells the same number of cattle at the same weight each year. Such an assumption removes any effect of adverse weather conditions on the number of livestock marketed and their marketing weights. The adjustment to adverse weather conditions that a particular operator makes depends on many factors which create problems in this type of analysis. Under adverse weather, sale weights are lower and breeding herds are often reduced which reduces the number of feeder animals that can be sold. When range conditions improve to "normal," the operator will increase his inventory which again reduces sales for a short period of time. The time involved in such adjustments depends on the severity of the adverse conditions and the stocking rates used by the operator.

The stocker operations show the highest returns to operator's labor and management under the three situations examined in nine of the ten years. In the tenth year the stocker operation has losses ranging from \$145,000 to \$160,000, depending on the marketing method. It is doubtful that many operators could survive such a loss. A major problem with the stocker operation is the questionable availability of calves. If a large number of operators in an area shift from a breeding operation to a stocker operation, the number of calves available may decline. Calf prices will be bid up, reducing the potential for large returns shown in Table 5. Also, with higher calf prices, returns from a cow-calf operation are increased making it a more attractive alternative. The attractiveness of the stocker form of organization varies with individual preferences and attitudes toward risk. It may have a great deal of appeal to an individual who favors the challenge inherent in this form.

The cow-yearling operation appears desirable for the resources and the feeding conditions found in the study area. The organization has consistently higher returns to operator's labor and management than does the cow-calf operation. Thus, given the assumptions used and the geographic area considered, the cow-yearling operation may be the best strategy under the variation in market prices from 1967 through 1976. Interviews with producers in the central plains area of Wyoming confirm this conclusion.

Conclusion

An important part of the research effort was interviews with livestock producers to obtain their views on risk management. The preceding analysis was based to a large extent on the interview results. Many of the risk management practices thought to be beneficial to producers were, in fact, not being used. Very few producers of feeder animals, calves and yearlings, were using futures markets. The producers did not use forward contracting nor did they seem interested in retaining ownership through the feed yard.

^{2/} For a more explanatory description of cattle marketing in Wyoming see reference no. 13.

There were many reasons given for not following these practices. The main reason given was that it worked against them in their efforts to increase income and/or reduce market risks. Operators were reluctant to follow a risk management strategy if they did not fully understand how the strategy operated. Work being done at the Wyoming Agricultural Experiment Station with livestock futures markets should be useful to these range livestock producers.

The results of our research point out that the market risk management strategies followed by range livestock operators are dependent upon several factors that vary from one operation to another. The age of the operator is important, as is his equity position. The location of the operation enters in as the operator strives to balance his unit with the resources available. The variability in the productivity of the land resources in small areas may result in two adjoining livestock operators with similar equity positions and risk preferences having completely different ranch organizations. The operation must fit the land resources available. The lack of homogeneity in land resources throughout the range livestock area makes it difficult to say any one organization and set of operational strategies are "best" for dealing with market risk. The strategies must fit each individual situation.

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Table 1. Central Wyoming Plains Ranch Land, Buildings and Equipment Inventory and Value, and Carrying Capacity, 1976.

| | | | | Value |
|----------------------|--|--------------|--------------|-------------|
| <u>Land</u> | | <u>Acres</u> | <u>Yield</u> | |
| Owned: range | | 24,480 | 4A/AUM | \$60/A |
| subirr. pasture | | 320 | .75A/AUM | \$200/A |
| Leased: range | | 19,200 | 6A/AUM | |
| Total | | 44,000 | | \$1,532,800 |
| <u>Capacity</u> | | | | |
| Year-round grazing | | | 9,320 AUM's | |
| Pasture | | | 427 AUM's | |
| Total | | | 9,747 AUM's | |
| <u>Improvements</u> | | | | |
| Main House | | | | \$36,000 |
| Labor House | | | | 25,000 |
| Shop | | | | 11,000 |
| Barn & sheds | | | | 40,000 |
| Corrals | | | | 3,000 |
| Total | | | | \$115,000 |
| <u>Equipment</u> | | | | |
| Pickup, 3/4T, 4WD | | | | \$6,000 |
| Pickup, 3/4T, 4WD | | | | 3,000 |
| Stock trailer | | | | 3,000 |
| Shop & vet equipment | | | | 500 |
| Feeding equipment | | | | 1,000 |
| Portable corrals | | | | 2,500 |
| Total | | | | \$16,000 |
| Total Value | | | | \$1,663,800 |

Table 2. Central Wyoming Plains Ranch Livestock Inventories (January 1),
1976 Valuation.

| | Number | Average Weight (Lbs.) | 1976 Ave. Price (\$) | Value (\$) |
|---------------------|--------|--------------------------|-------------------------|---------------------|
| <u>Cow/Calf</u> | | | | |
| Bulls | 22 | 1,250 | 31.45 | 8,648.75 |
| Cows | 540 | 1,000 | 25.70 | 138,780.00 |
| Heifer calves | 130 | 400 | 35.64 | 18,532.80 |
| Repl. heifers | 130 | 800 | 34.65 | 36,036.00 |
| | | | | <u>\$201,997.55</u> |
| <u>Cow/Yearling</u> | | | | |
| Bulls | 20 | 1,250 | 31.45 | 7,862.50 |
| Cows | 450 | 1,000 | 25.70 | 115,650.00 |
| Steer calves | 191 | 420 | 41.09 | 32,962.40 |
| Heifer calves | 190 | 400 | 35.64 | 27,086.40 |
| Repl. heifers | 100 | 800 | 34.65 | 32,872.00 |
| | | | | <u>\$221,433.30</u> |
| <u>Stocker</u> | | | | |
| Steer calves | 947 | 420 | 41.09 | 163,431.37 |
| Heifer calves | 445 | 400 | 35.64 | 63,439.20 |
| | | | | <u>\$226,870.57</u> |

Table 3. Central Wyoming Plains Ranch (9,743 AUM's), Operating Costs, 1976.

| Expense Items | Cow/Calf (\$) | Cow/Yearling (\$) | Stocker (\$) |
|--|------------------|----------------------|-----------------|
| <u>Variable Costs</u> | | | |
| Operator's labor ¹ | 15,800 | 17,800 | 16,360 |
| Hired labor ² | 7,200 | 7,200 | 7,200 |
| Purchased feed ³ | 18,065 | 18,605 | 17,960 |
| Horse maintenance ⁴ | 1,065 | 1,120 | 1,065 |
| Veterinary expenses ⁵ | 1,560 | 1,755 | 1,655 |
| Motor supplies ⁶ | 4,090 | 4,090 | 4,090 |
| Utilities ⁷ | 1,460 | 1,460 | 1,460 |
| Repairs ⁸ | 2,340 | 2,340 | 2,340 |
| Inventory purchases, inc. transportation ⁹ | -- | -- | 185,580 |
| Miscellaneous ¹⁰ | 1,560 | 1,560 | 1,560 |
| Interest on livestock inventory ¹¹ | 8,325 | 8,780 | -- |
| Interest on inventory purchases ¹² | -- | -- | 16,700 |
| Interest on operating costs ¹³ | 2,390 | 2,245 | 2,345 |
| Depreciation on bulls ¹⁴ | 550 | 500 | -- |
| A Marketing costs ¹⁵ | 3,805 | 4,320 | 17,190 |
| B Marketing costs ¹⁵ | 65 | 55 | 275 |
| C Marketing costs ¹⁵ | <u>1,455</u> | <u>2,005</u> | <u>9,815</u> |
| A Total Variable Costs | 68,210 | 65,775 | 275,505 |
| B Total Variable Costs | 64,470 | 61,510 | 258,590 |
| C Total Variable Costs | 65,860 | 63,460 | 268,130 |
| <u>Fixed Costs</u> | | | |
| Rent on operator's land ¹⁶ | 29,240 | 29,240 | 29,240 |
| Depreciation on buildings & equipment ¹⁷ | 2,740 | 2,740 | 2,740 |
| Grazing fees ¹⁸ | 4,830 | 4,830 | 4,830 |
| Insurance ¹⁹ | 1,805 | 1,805 | 1,805 |
| Property taxes ²⁰ | <u>11,160</u> | <u>11,160</u> | <u>11,160</u> |
| Total Fixed Costs | 49,775 | 49,775 | 49,775 |
| A Total 1976 Cost Estimate | 117,985 | 115,550 | 325,280 |
| B Total 1976 Cost Estimate | 114,245 | 111,285 | 308,365 |
| C Total 1976 Cost Estimate | 115,635 | 113,235 | 317,905 |

See Appendix B for footnotes.

Table 4. Central Wyoming Plains Ranch, Annual Sales, 1976 Valuation.

| Category | Sale Month | Number Head | Ave. Weight (lbs.) | Lbs. Sold (lbs.) | 1976 Price (\$/cwt) | Contribution to Gross Revenue (\$) |
|---------------------|------------|-------------|--------------------|------------------|---------------------|------------------------------------|
| <u>Cow/Calf</u> | | | | | | |
| Steer calves | Nov. | 230 | 393 | 90,390 | 38.21 | 34,538.02 |
| Heifer calves | Nov. | 99 | 372 | 36,828 | 32.16 | 11,843.88 |
| Repl. heifers | March | 22 | 1,800 | 17,600 | 32.18 | 5,663.68 |
| Cull cows | March | 54 | 1,000 | 54,000 | 27.88 | 15,055.20 |
| Cull cows | Oct. | 54 | 1,000 | 54,000 | 23.03 | 12,436.20 |
| Totals | | 459 | | 252,818 | | \$79,536.98 |
| <u>Cow/Yearling</u> | | | | | | |
| Yearling steers | Oct. | 190 | 693 | 131,670 | 35.44 | 46,633.85 |
| Yearling heifers | Oct. | 90 | 631 | 56,790 | 32.18 | 18,275.02 |
| Repl. heifers | March | 10 | 800 | 8,000 | 32.18 | 2,574.40 |
| Cull cows | March | 45 | 1,000 | 45,000 | 27.88 | 12,546.00 |
| Cull cows | Oct. | 45 | 1,000 | 45,000 | 23.03 | 10,363.50 |
| Totals | | 380 | | 286,460 | | \$90,422.77 |
| <u>Stocker</u> | | | | | | |
| Yearling steers | Oct. | 932 | 693 | 645,876 | 35.44 | 228,898.45 |
| Yearling heifers | Oct. | 439 | 631 | 277,009 | 32.18 | 89,141.50 |
| Totals | | 1,371 | | 922,885 | | \$318,039.95 |

Table 5. Central Wyoming Plains Ranch Gross Revenue, Total Expenses and Net Revenue for Sales at Auction, 1967-1976.

| Year | Gross Revenue | | | Total Expenses | | | Net Revenue | | |
|------|---------------|------------------|---------|----------------|------------------|---------|--------------|------------------|-----------|
| | Cow/ Calf | Cow/ Yearling | Stocker | Cow/ Calf | Cow/ Yearling | Stocker | Cow/ Calf | Cow/ Yearling | Stocker |
| 1967 | 56,885 | 65,040 | 233,040 | 53,345 | 51,340 | 216,330 | 3,540 | 13,700 | 16,710 |
| 1968 | 55,705 | 66,785 | 238,330 | 53,535 | 51,475 | 213,870 | 2,170 | 15,310 | 24,460 |
| 1969 | 66,615 | 76,575 | 276,770 | 56,190 | 53,935 | 219,150 | 10,425 | 22,640 | 57,620 |
| 1970 | 71,400 | 81,635 | 292,615 | 58,425 | 56,245 | 246,605 | 12,975 | 25,390 | 46,010 |
| 1971 | 73,840 | 83,330 | 299,915 | 60,915 | 58,695 | 260,745 | 12,925 | 24,635 | 39,170 |
| 1972 | 90,340 | 102,085 | 375,555 | 65,900 | 63,370 | 274,760 | 24,440 | 38,715 | 100,795 |
| 1973 | 114,395 | 129,270 | 468,340 | 80,405 | 77,325 | 344,505 | 33,990 | 51,945 | 123,835 |
| 1974 | 68,955 | 79,510 | 259,345 | 87,555 | 84,950 | 418,390 | (18,600) | (5,440) | (159,045) |
| 1975 | 72,085 | 88,930 | 329,545 | 93,875 | 89,495 | 255,805 | (21,790) | (565) | 73,740 |
| 1976 | 79,535 | 90,605 | 318,040 | 101,475 | 96,950 | 308,185 | (21,940) | (6,345) | 9,855 |

Appendix A. Percentage Price Changes, Measures of Dispersion, Omaha,
1946-76.

| Product | Market month | % change mean ₁ | % change standard deviation ₂ | 90% confidence interval on mean estimate ₃ | |
|------------------|--------------|----------------------------|--|---|-------|
| | | | | Low | High |
| Steer Calves | Nov. | 4.98 | 20.75 | -1.27 | 11.23 |
| Heifer calves | Nov. | 5.31 | 22.75 | -1.54 | 12.16 |
| Yearling steers | Oct. | 4.34 | 19.19 | -1.44 | 10.12 |
| Yearling heifers | Oct. | 4.68 | 20.15 | -1.39 | 10.75 |
| Cull cows | Mar. | 2.25 | 20.55 | -4.53 | 9.03 |
| Cull cows | Oct. | 1.47 | 19.01 | -4.80 | 7.74 |

¹ Simple average of percentage changes in price for the classes and months identified from year n to year n + 1, 1946-1976.

² Standard deviations in terms of percentage changes in price about the respective means.

³ Expressed in terms of percentage change in price from the current price.

Appendix B. Explanations and Assumptions, Source References, Central Wyoming Plains Ranch Operating Costs, 1976.

1. Operator's labor: Estimate of 4,748 hours labor needed to manage a 425-cow cow-calf operation, obtained from "Cost of Producing Crops in the North Platte River Ranching Area of Central Wyoming, 1976," AE 77-06, Division of Agricultural Economics, University of Wyoming, p. 6.

Extrapolating from 425 cows to 540 cows, a man-hour requirement of 6,032.75 hours is obtained. Extrapolation to 450 cows for the cow/yearling operation yields a requirement of 5,027.29 man-hours. Eliminating man-hours used in calving and extrapolating from the 783 head model, an estimate of 6,167.97 hours is reached. Reducing these requirements by 2,080 hours provided by hired labor, the operator labor requirements become:

| | <u>Hours</u> | <u>Wage</u> | <u>Annual Charge</u> |
|--------------|--------------|-------------|----------------------|
| Cow/calf | 3,950 | \$4.00/hour | \$15,800 |
| Cow/yearling | 2,950 | \$4.00/hour | \$11,800 |
| Stocker | 4,090 | \$4.00/hour | \$16,360 |

2. Hired labor: Subjective assumption of one full-time person receiving a wage of \$600/month, plus housing, for 2,080 hours per year.

3. Purchased feed:

Protein cake--an estimate of .47/AUM for 1975 was taken from "Impact of Potential Changes in BLM Grazing Policies on West-Central Wyoming Cattle Ranches," RJ 87, Agricultural Experiment Station, University of Wyoming, 1975, p. 6. Adjusted to .55/AUM for 1976 by the USDA Index of Prices Paid by Farmers for Commodities.

Supplemental hay--needed one month per year, from Feeds and Feeding, Morrison, 1961, Appendix Table VII, approximately 20 lbs. of good quality hay per day per AUM are needed to full feed wintering cattle. From "Wyoming Agricultural Statistics, 1977," the 1976 average price for all hay was \$56/ton.

| | <u>Cow/calf</u> | <u>Cow/yearling</u> | <u>Stocker</u> |
|----------------------------|-----------------|---------------------|----------------|
| Annual cattle AUM's | 9,721 | 9,721 | 9,721 |
| Protein cake costs* | \$5,345 | \$5,350 | \$5,345 |
| January AUM's--cattle | 757 | 789 | 751 |
| Hay requirement--lbs. | 454,200 | 473,400 | 450,600 |
| Hay costs* | \$13,776 | \$15,975 | \$12,615 |
| Total purchased feed costs | \$19,121 | \$21,325 | \$17,960 |

*Rounded to nearest \$5.

4. Horse maintenance: 6 horses, 90 AUM's per year
3.3 AUM's/ton of hay, \$56/ton.

| | <u>Cow/calf</u> | <u>Cow/yearling</u> | <u>Stocker</u> |
|-----------------------------|-----------------|---------------------|----------------|
| Available range, AUM's | 26 | 24 | 26 |
| AUM's of hay fed | 64 | 66 | 64 |
| Tons of hay fed* | 19 | 20 | 19 |
| Horse maintenance hay costs | \$1,064 | \$1,120 | \$1,064 |

*Rounded to nearest ton.

5. Veterinary expenses: Estimates for cow/calf and cow/yearling from "Economic Comparisons of the Cow-calf and Cow-yearling Systems for Northern Plains Cattle Ranching," RJ 67, Agricultural Experiment Station, University of Wyoming. Adjusted by the USDA Index of Prices Paid by Farmers for All Commodities. Stocker estimate from "An Economic Analysis of Stocker Operations in Wyoming," unpublished thesis by F. W. Eikenberry, Division of Agricultural Economics, University of Wyoming, 1966, p. 22.

| | <u>Cow/calf</u> | <u>Cow/yearling</u> | <u>Stocker</u> |
|----------------------------|-----------------|---------------------|----------------|
| Cost per AUM | .16 | .18 | .17 |
| Total veterinary expenses* | \$1,560 | \$1,755 | \$1,655 |

*Rounded to nearest \$5.

6. Motor supplies: Estimates from RJ 67 (above), adjusted by USDA Index of Prices Paid by Farmers for farm and motor supplies. Stocker cost assumed equal to cow/yearling.

| | <u>Cow/calf</u> | <u>Cow/yearling</u> | <u>Stocker</u> |
|-------------------------|-----------------|---------------------|----------------|
| Cost per AUM | .42 | .42 | .42 |
| Total motor supply cost | \$4,090 | \$4,090 | \$4,090 |

7. Utilities: Estimate from RJ 87 (above) adjusted by USDA Index of Prices Paid by Farmers for fuels and energy.

.15/AUM = \$1,460.00

8. Repairs: Estimate from RJ 87 (above) adjusted by USDA Index of Prices Paid by Farmers for building and fencing materials.

9. Inventory purchases:

| | | |
|--|--|-----------|
| Stocker: Buy November calves | | |
| 949 393-lb. steer calves @ \$35.79 | | \$133,480 |
| 446 372-lb. heifer calves @ \$30.20 | | 50,105 |
| (Good & Choice average monthly price, Omaha) | | \$183,585 |

Transportation--90-100 mi, \$.37/cwt.
(From Marketing Alternatives and Costs for Wyoming Cattle, RJ 108, Agricultural Experiment Station, University of Wyoming, 1976)

\$ 1,995
\$185,580

10. Miscellaneous: Estimate from RJ 87 (above), adjusted by USDA Index of Prices Paid by Farmers for All Commodities.

.16/AUM = \$1,560.00

11. Interest on breeding herd: Subjective estimate for 1976 of 6%. Bulls are depreciated. Cow values of \$257 from 1976 Omaha, Nebraska prices.

| | | | |
|---------------|-------------------------|--------------|---------|
| Cow/calf: | 540 cows | | \$8,325 |
| Cow/yearling: | 450 cows | \$6,940 | |
| | 280 yearlings (10 mos.) | <u>1,840</u> | |
| | Total cow/yearling | | \$8,780 |

12. Interest on inventory purchases: 9% = \$16,700

13. Interest on operating costs: Assumes a 9% interest rate and costs incurred evenly over the one-year period.

| | <u>Operating Costs</u> | <u>Interest</u> |
|--------------|------------------------|-----------------|
| Cow/calf | \$53,139 | \$2,390 |
| Cow/yearling | \$49,930 | \$2,245 |
| Stocker | \$52,129 | \$2,345 |

14. Depreciation on bulls: Value of \$365/head from Billings, Montana, prices for 1976. Assuming a five-year useful life, \$250 salvage value, straight-line depreciation = \$25/head/year.

| | <u>Number of bulls</u> | <u>Annual Depreciation</u> |
|--------------|------------------------|----------------------------|
| Cow/calf | 22 | \$550 |
| Cow/yearling | 20 | \$500 |

15. Marketing costs: Three alternative assumptions: A) sale at auction; B) direct sale, no cutback; and C) direct sale, 3% pencil shrink.

| | <u>Cow/calf</u> | <u>Cow/yearling</u> | <u>Stocker</u> |
|---|-----------------|---------------------|----------------|
| <u>A. Auction</u> | | | |
| Marketing charges: | | | |
| calves, .96/cwt | 1,220 | -- | -- |
| yearlings, .70/cwt | -- | 1,320 | 6,460 |
| 2-year heifers, .62/cwt | 110 | 50 | -- |
| cull cows, .44/cwt | 475 | 395 | -- |
| Total | <u>1,805</u> | <u>1,765</u> | <u>6,460</u> |
| Transportation: | | | |
| truck, 90-100 mi, .37/cwt | 935 | 1,060 | 3,415 |
| Shrinkage, 35% fillback, 2.3% net | <u>1,065</u> | <u>1,495</u> | <u>7,315</u> |
| Total marketing costs | <u>3,805</u> | <u>4,320</u> | <u>17,190</u> |
| <u>B. Direct sale, no cutback</u> | | | |
| brand inspection, .20/hd | 65 | 55 | 275 |
| <u>C. Direct sale, 3% pencil shrink</u> | | | |
| pencil shrink | 1,455 | 2,005 | 9,815 |

References: "Marketing Costs and Alternatives for Wyoming Cattle," RJ 108, Agricultural Experiment Station, University of Wyoming, 1976.

"Marketing Wyoming Feeder Cattle--A Descriptive Analysis of Alternative Market Outlets," RJ 118, Agricultural Experiment Station, University of Wyoming, 1977.

16. Rent on operator's land: Subjective assumption of a \$3/AUM fee = \$29,241
17. Depreciation on buildings and equipment: Subjective assumptions of
buildings--50-year life, no salvage
equipment--10-year life, 10% salvage
straight-line method
18. Grazing fees: Quoted from BLM, Rawlins, Wyoming. Assumes all leased land
is leased from the BLM @ \$1.51/AUM = \$4,830
19. Insurance: Estimate from RJ 87 (above), adjusted by USDA Index of Prices
Paid by Farmers for interest.
.185/AUM = \$1,805
20. Property taxes: From "Wyoming Agricultural Statistics, 1977"
.45/A = \$11,160