Economics of Improved Production on Utah Cattle Ranches

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Ranchers, researchers, educators, and lenders need up-to-date information about ranch production and net return capabilities. Numerous range improvement practices and management guidelines are available, but producers and lenders prefer to minimize the risk associated with management changes by evaluating improvement options before they are implemented. Net returns to range livestock operations can be increased significantly by applying the proven managerial techniques of budgeting and optimization. Budgeting is a basic tool for estimating changes in ranch costs and returns that result from changes in input use and production. Linear programming (LP) is a sophisticated computer-based budgeting procedure capable of estimating optimal (least cost or maximum profit) combinations and amounts of inputs and products.

The Computer Optimization PLANning (COPLAN) program developed by Child and Evans (1976) was recently applied to a sample of medium-sized west central Utah cattle ranches to estimate optimal herd size and resource use. Calculations were made of maximum break-even investments that can be made in various range management and range improvement practices. Specific objectives were to:

1. Quantitatively describe the typical west central Utah cattle ranch,
2. Develop a computer-based framework for economic analysis of cattle ranch improvement options, and
3. Calculate the net value of improved ranch production practices.

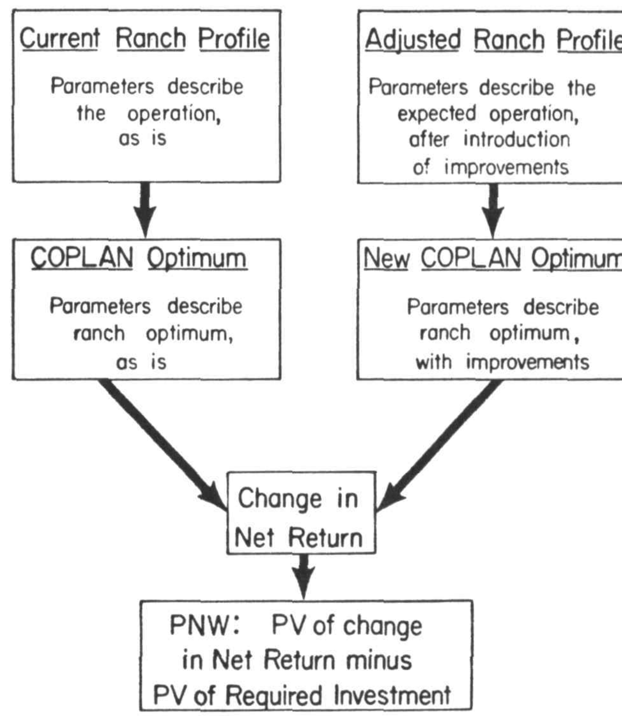

Fig. 1. *Flow diagram showing consecutive steps of comparisons used in analyses.*

Methods

Personal interviews were conducted with managers of 19 medium-sized (100-300 brood cows) ranches in west central Utah. We used the case method of ranch surveys (Cook and Stubbendieck 1986). Interview data from four previous studies in the general study area (Capps and Workman 1980, Capps and Workman 1982, Resource Concepts 1980, King 1985) were used to increase the sample size to 115 ranches.

The COPLAN program was used to estimate optimum ranch management schemes (herd size, resource use, and product mix), both before and after the introduction of various range improvement practices. This allowed the calculation of added net returns to each improvement (Figure 1). Present net worth (PNW) calculations were based on a long-term real interest rate of 4% (Row et al. 1981) and an expected improvement life of 20 years.

Linear programming (LP) analyses of ranching operations are commonly based on forage quantity (AUMs) but not forage quality, e.g., energy and protein (Ching et al. 1977, Gee 1981, Torell 1980, Torell et al. 1985). An important feature of our Utah study is that each forage source was assigned relative crude protein values, allowing the LP optimization model to select the least-cost forage combination based on both forage quality and cost. Crude protein values were based on data from Bohman et al. (1981), Cook (1966), Cook (1967), Cook and Harris (1968), Cooperative Extension Service (1981), Murray et al. (1978), Olson (1986), and Roberts and Torell (1958).

Results and Discussion

Ranch Descriptions

Based on results from rancher interviews, a 179-brood cow ranch profile was constructed to represent west central Utah. Forage source data for the representative ranch profile appear in Table 1. The average ranch includes 2,878 acres (994 AUMs) of private foothill range and 253 acres (197 AUMs) of low elevation meadow. Grazing permits consist of over 1,000 AUMs on Forest Service and BLM lands, 1,132 acres (184 AUMs) of private foothill range, and 311 acres (138 AUMs) of private low meadow. About 185 acres produce alfalfa and grass hay and 100 acres produce barley and wheat.

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Table 1. Forage sources and amounts, west central Utah ranch profile, 1985.

Forage Source	Acres	AUMs
FS Permits		323
BLM Permits		688
State permits		42
Lease Native Foothill	876	109
Lease Low Meadow	311	138
Lease Crested Wheatgrass	256	75
Lease Seeded Pasture	75	22
Owned Native Foothill	1975	670
Owned Low Meadow	253	197
Owned Crested Wheatgrass	903	324
Aftermath Alfalfa Hay	117	177
Aftermath Grass Hay	68	103
Aftermath Barely/Corn	49	37
Aftermath Wheat	51	77

During the average year, 584 tons of hay are produced and hay is normally fed from about Christmas until May 1. The average ranch weans 83 calves in November for every 100 brood cows in the previous January 1 inventory. The brood cow replacement rate is 18%, including 15% ranch-raised heifer calves and 3% purchased yearling heifers. All weaner calves except heifers retained for replacements are sold in November. The bull to cow ratio averages 1:33.

Analysis of Improvement Options

The COPLAN optimum combined the various inputs available to the representative ranch to maximize net return over variable costs (Table 2). The optimum specified that all owned sources of forage and all USFS permits be fully utilized and that 84 of 117 acres available (1,100 AUMs) of alfalfa hay be grown and fed January 1-April 15. Although the "as is" optimum called for both BLM and private low meadow leases to be decreased by one-half, the optimal cow herd size increased slightly from 179 to 184 head. The entire 83% calf crop (except 33 replacement heifers) was retained for March sale as short yearlings, rather than being sold in November as weaners. Net return above variable costs for the "as is" optimum represenative ranch was $3,048 (Table 2).

The expected costs and returns of range improvements or management changes should be estimated before improvements are implemented. A common question in the context of planning range improvements might be: how much could a rancher afford to spend to develop his private foothill range? The LP model employed by this study allows improvement evaluations that are fast, inexpensive, and relatively simple. Five management and range improvement scenarios were examined. In each case the LP model answered the question: what is the effect of a change in productivity on net return above variable costs? Table 2 displays the optimum cow herd size, net return, and net return increase for the following scenarios: (1) representative ranch, "as is", (2) 5% increase in weaning weights, (3) 3% increase in number of calves weaned, (4) alfalfa hay production costs reduced by 20% from $54 to $43 per ton, (5) 50% increase in crested wheatgrass carrying capacity during the first 10% of the grazing season, (6) crested wheatgrass available for grazing two weeks earlier (April 15 instead of May 1), and (7) a combination of scenarios (5) and (6).

Values of Improved Production

Present value (PV) analysis was used to determine how much a rancher could afford to pay to obtain the various production improvements listed above. Calculations were based on expected improvement lives of 20 years and a real interest rate of 4% (Row et al. 1981). The maximum affordable investments to obtain the net return increases calculated for each improvement scenario are shown in Table 2. Option 4 (haying cost reduction) gives the greatest increase in net returns, followed by Option 2 (increased weaning weights) and Option 3 (increased number of calves weaned).

Summary

Ranchers, researchers, educators, and agricultural lenders require up-to-date knowledge of ranch production and net return capabilities. This study provides a methodological framework for analyzing a variety of ranch improvement options. Profitability of range improvement and ranch management practices were examined for medium-sized Utah cattle ranches. A representative ranch profile was developed based on data obtained from 115 rancher interviews. Annual net return over variable cost and present value analysis were used to gauge the value of several improvements in ranch production.

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Table 2. Changes in optimum number of brood cows and net returns due to improvements in ranch production.

	1 Optimum; "as is"	2 Optimum; weaning weight up 5%	3 Optimum; weaned calf numbers up 3%	4 Optimum; haying costs down 20%	5 Optimum; 50% increase in crested	6 Optimum; crested availabile 2 weeks earlier	7 Optimum; combine 5 and 6
Optimum number of brood cows	184	223	222	223	184	184	184
Net return($)	3048	5824	5176	7589	3288	3603	4091
Net return increase over "as is" optimum ($)	—	2776	2128	4541	240	555	1043
Maximum affordable investment to obtain net return increase ($)		37,700	28,900	61,700	3260	7540	14,175

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Short-Duration Grazing: An Economic Perspective

Thomas M. Quigley

The current economic difficulties in U.S. agriculture are being felt by the western ranching industry. Many ranchers are facing serious debt. Cyclical beef prices do not appear to be moving toward a favorable position for livestock operators. These realities have caused ranchers to search for ways to lower costs and increase productivity as a means of surviving the economic pressures. Short-duration grazing (SDG), with its purported increase in production efficiency, has attracted much attention toward meeting this end.

Short-duration grazing or a similar system has been the subject of considerable discussion in the range-management community. Symposia, workshops, and technical journal articles have been used as a forum to debate the biological, ecological, hydrologic, and economic implications of SDG. Current Research Information System reports reveal that 41 projects are now underway to examine questions about SDG. The projects are spread throughout the beef-producing states, so even more articles on SDG will probably be published soon.

Before this approach to management is adopted, some of the economic issues surrounding the adoption of SDG technology should be examined.

What is Short-Duration Grazing?

The range science community has recognized the difficulty in defining short-duration grazing. Some common definitions are intensive grazing management, Savory grazing method (Savory and Parsons 1980), holistic resource management, cell grazing, high-intensity short-duration grazing, time-controlled grazing, and high performance grazing. The term SDG is used in this paper in the context of a strategy of intensive management with higher stocking rates and more frequent movement than are associated with conventional management, such as deferred-rotation and rest-rotation grazing systems. This definition places short-duration grazing in the category of a management philosophy rather than a set of rules and guidelines that can be predefined and readily applied by any rancher. Malechek and Dwyer (1983) have referred to the management level necessary to maintain this grazing system as similar to managing a modern dairy; mainly, daily actions are required to ensure proper stocking control and timed changes.

Short-Duration Grazing and Economics Research

Research on the economics of SDG under all circumstances is difficult to establish because SDG represents a management philosophy. The observations of one study may be applicable in some ecosystems where the topography is gentle but not applicable where the topography is steep. Similarly, length of the winter feeding period may result in some ranches not being suitable for adoption of SDG with cow-calf enterprises. Any given research project may not result in a definitive answer on the biological, ecological, or economic acceptability of this management approach about all ecosystems, terrain, and owner categories. But, each research project will add information about the appropriateness of the technique in the circumstance under study. The combined case studies will eventually provide more general answers.

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