

**Public Lands Policy, Value-Added Ranching,
Rural Development**

**by
Gerald Marousek
A.E. Research Series 93-7**

**Presented at the 68th Annual
Western Economic Association International Conference
Lake Tahoe, Nevada
June 24, 1993**

Public Lands Policy, Value-Added Ranching, Rural Development

Gerald Marousek, University of Idaho

Abstract

Administration of public grazing lands affects the economic viability of both livestock enterprises and the rural communities of which they are a part. Analysis of changes in permit levels and fees should integrate ranch and community impacts. We have used a linear programming MOTAD (minimization of total absolute deviations) model to measure the trade-off between income and risk of various production management alternatives for livestock producers using public grazing in two areas of Idaho: western mountain type ranches and high (elevation) desert ranches. Results indicate that beef producers who rely on public land forage may have alternatives to marketing weaner calves, including backgrounding calves for sale or further growth, as well as retaining ownership of calves or yearlings in custom feedlots. Each alternative generates income and entails risk in a direct, but not proportional, relationship. In both ranch analyses the lower risk alternatives showed considerable potential for maintaining income. With no readily available substitute for federal grazing permits, fee increases raise operating costs and reduce net returns, but do not change the resource use pattern. However, reduction of grazing permits would necessitate a decrease in size of operations or substitution of other resources for public grazing. One means of offsetting reduction of BLM/FS forage is marketing fewer animals with greater value, usually achieved using higher risk alternatives. These alternatives require production inputs and market transactions which generate more economic activity, raising the challenge of finding a balance of ranch income/risk trade-offs compatible with community economic growth and development goals.

Public Lands Policy, Value-Added Ranching, Rural Development

Gerald Marousek*

Large areas of the western USA are public lands. Society, represented through the U.S. Congress and various state legislatures, has directed that multiple-use management be applied to these public resources. Among those uses are agricultural, mineral, timber, and wildlife production; watershed protection; and recreation. Agricultural production is realized through harvesting natural forage by range livestock. The Bureau of Land Management (BLM) administers 270 million acres of federally owned rangeland, providing forage for 3.5 million head of livestock. The U.S. Forest Service System (FS) comprises 230 million acres, grazing 2.4 million head of livestock in 1988 (9).

The subject of U.S. Forest Service (FS) and Bureau of Land Management (BLM) public land grazing fee structure and permit levels continues to be debated in the U.S. Congress and at livestock gatherings. From the standpoint of public policy as well as the economic viability of livestock enterprises and the rural communities of which they are a part, administration of public grazing lands needs a regional focus.

Our hypothesis is that public grazing permits may not be as crucial as livestock interests insist, nor is the value of their use as great as advocates of alternative public land use contend. In many areas and individual livestock enterprises, resource

*Professor of Agricultural Economics, University of Idaho, Moscow 83844-2334. The author acknowledges the contributions of those who participated in various phases of the research reported here: Patricia Carlson, Carole Drury, Chad Gibson, Robert Loucks, Joseph Schimmel, and Leroy Stodick.

substitution and alternative production management systems can result in comparable and stable returns. Community and regional economic returns may be further increased by backward and forward linkages resulting from diversified ranching operations.

Several studies relating to the economic linkage between the western livestock industry and rural communities are being pursued. They address the impacts of public land grazing on the level and stability of economic activity in local communities, but seldom investigate the effects of modified ranching practices (2, 6, 12).

The research reported here, independent of the studies cited, entails an analysis of production management alternatives for livestock producers using public grazing in two distinct geographic areas of Idaho: western mountain-type ranches and high (elevation) desert ranches. This paper summarizes the results of those studies and discusses some of the ways public grazing policies, ranching alternatives, and community development programs affect one another.

OBJECTIVES, MODEL, DATA SOURCES

The study used an LP MOTAD model to address production, marketing, and management decisions encountered by cow-calf producers using public range. The specific objectives were:

1. To develop a total ranch, long-term, profit-maximizing management plan.
2. To determine expected gross margin, risk-efficient sets of production and marketing alternatives, thereby illustrating the tradeoffs between income and the associated level of risk.

The long-term deterministic model is a conventional LP model which maximizes expected total ranch gross margin subject to structural and transfer constraints. When optimum herd size, annual crop plans, and cattle plans have been obtained from the deterministic model, an efficient E, V (expected income, variance frontier) set of marketing plans can be calculated using the MOTAD method. Risk is described as the sum of the negative deviations of the gross margin coefficients (3, 5). This sum can then be converted to the MAD (mean absolute deviation) estimator of variance by the equation: $\tilde{V} = 4FS^2/T^2$

where:

\tilde{V} is the MAD estimator of variance.

S is the sum of the negative deviations.

T is the number of sample observations used to determine the probability distribution of the coefficients in the equation for gross margin.

$F = 0.5\pi T/(T - 1)$.

University of Idaho Department of Agricultural Economics Crop and Livestock Enterprise Budgets (7, 8) were the basis for the production activities in the model alternatives. All costs were inflated to the final year of a five-year series, using the annual index of prices paid for factors of production (10). Weekly feeder and slaughter cattle prices, by sex and weight classification, were obtained from the detailed livestock quotations for the Idaho direct cattle market (11). Prices were averaged for the month when the cattle activity terminated.

MOUNTAIN-TYPE RANCH

This ranch is typical for Lemhi County, Idaho, with an elevation of approximately 4,000 feet. The ranch holds title to 160 acres of irrigated cropland and 125 acres of meadowland. Meadowland may be used for hay production and aftermath grazing or strictly as pasture. Private leases provide a total of 908 AUMs of grazing. Public range permits issued by the FS and BLM provide an additional 820 AUMS of grazing. Alfalfa hay production is the principal use of cropland, although barley is grown as a companion crop when establishing alfalfa. Ranches in this area tend to be self-sufficient in feed for their cattle enterprises. However, the programming model allows hay and feed grain to be bought or sold.

Budgets were developed for a typical spring calving commercial beef cattle ranch. The livestock inventory includes 200 cows, 10 bulls, and 36 replacement heifers. Average annual costs and prices for 1984-88 were used in the long-term plan. Short-term, risk-efficient alternative plans used annual deviations from the five-year averages.

Traditionally, most cow-calf producers sell 6- to 8-month-old calves after weaning in the fall. There are two production alternatives for each sex of calf not sold at weaning: Backgrounding to spring yearlings on a growth and preconditioning diet, or retaining ownership to slaughter in a custom feedlot. Yearling backgrounded cattle may be sold as spring yearling feeder cattle or placed in a custom feedlot. In all alternatives, ownership of the cattle is maintained by the cow-calf producer. Figure 1 shows the options: The mountain-type ranch did not include the yearling stocker option.

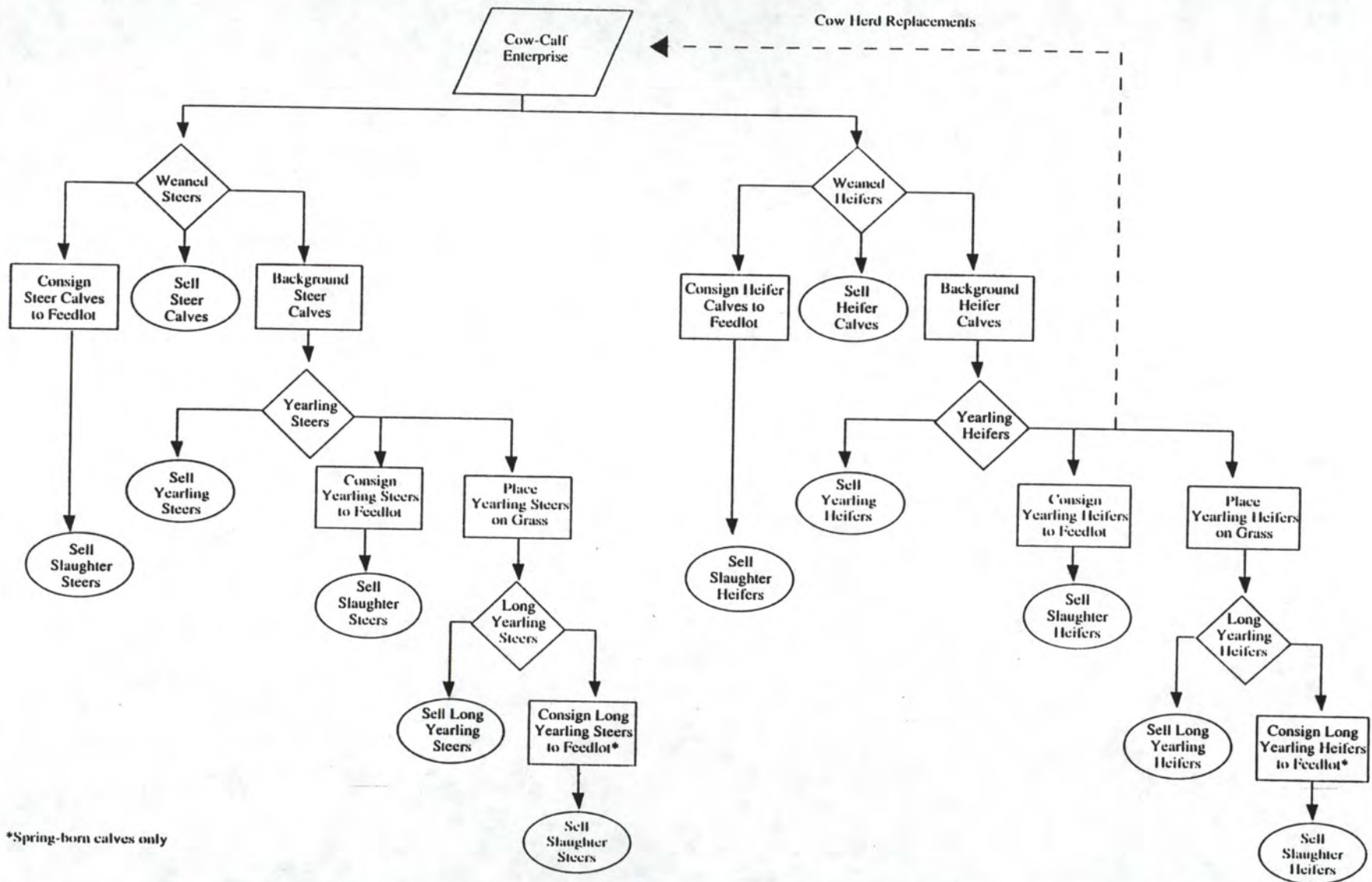


Figure 1. Beef production management and marketing options

The program determines (a) optimal cattle and crop marketing and feed utilization activities, (b) expected annual income or gross margin, and (c) income deviation, for the optimal long-term production management and marketing plan and for each of six successively lower risk short-term plans (Table 1). The plans result from maximizing the gross margin for any combination of the production management options, as risk is reduced. Each plan may include one or more of the specified options, with any number of animals in an option. A plan may have animals being marketed at several different stages, e.g. weaners, yearlings, fed cattle. The details of the numerous marketing outcomes of the several plans are recorded in a research bulletin (4).

The focus of this paper is on the income/risk tradeoffs among the plans. Risk, as measured by income deviation or variance, drops more rapidly than income when moving to lower risk plans. However, the most conservative plans sacrifice income with essentially no further risk reduction (Figure 2).

HIGH DESERT RANCH

This ranch is based on an Owyhee County, Idaho operation. Elevation is 3,000 to 6,000 feet; annual precipitation is less than 10 inches. Feed resources include 4,000 AUMs of BLM grazing, 900 AUMs of private leased pasture, 400 acres of irrigated cropland (alfalfa and oat hay), and 75 AUMs of leased hay aftermath. The cattle breeding herd consists of 500 cows, 20 bulls, and 95 replacement heifers. Twenty percent of the cows calve in December, a practice which began before pregnancy testing reduced the length of the calving season, but which also spreads the labor requirements relative to 100 percent spring calving.

Table 1. Optimal ranch management plans in E-M efficient set

Ranch plan	Cattle marketing activities (head)					
	Weaned calves		Backgrounded yearlings		Custom fed calves	
	Steers	Helpers	Steers	Helpers	Steers	Helpers
1	0	0	91	60	0	0
2	0	0	91	60	0	0
3	0	0	91	40	0	19
4	0	30	91	0	0	30
5	71	10	20	0	0	49
6	92	5	0	0	0	54
7	92	5	0	0	0	54

Ranch plan	Crop utilization and marketing activities (tons)					
	Alfalfa hay		Meadow hay		Spring barley	
	Fed	(Buy) Sell	Fed	(Buy) Sell	Fed	(Buy) Sell
1	518.8	41.2	0.4	295.8	54.3	(21.3)
2	288.1	272.0	296.3	0.0	54.3	(21.3)
3	274.9	285.1	296.3	0.0	51.6	(18.6)
4	247.8	312.2	296.3	0.0	45.9	(12.9)
5	194.3	365.7	296.3	0.0	35.9	(2.9)
6	178.8	381.2	296.3	0.0	33.0	(0.1)
7	0.0	560.0	525.6	(229.3)	33.0	(0.1)

Ranch plan	Expected gross margin (\$)	Mean absolute deviation (\$)
1	66,327	24,720
2	66,260	24,504
3	65,869	23,337
4	64,145	21,602
5	62,129	19,683
6	61,546	19,130
7	60,566	18,991

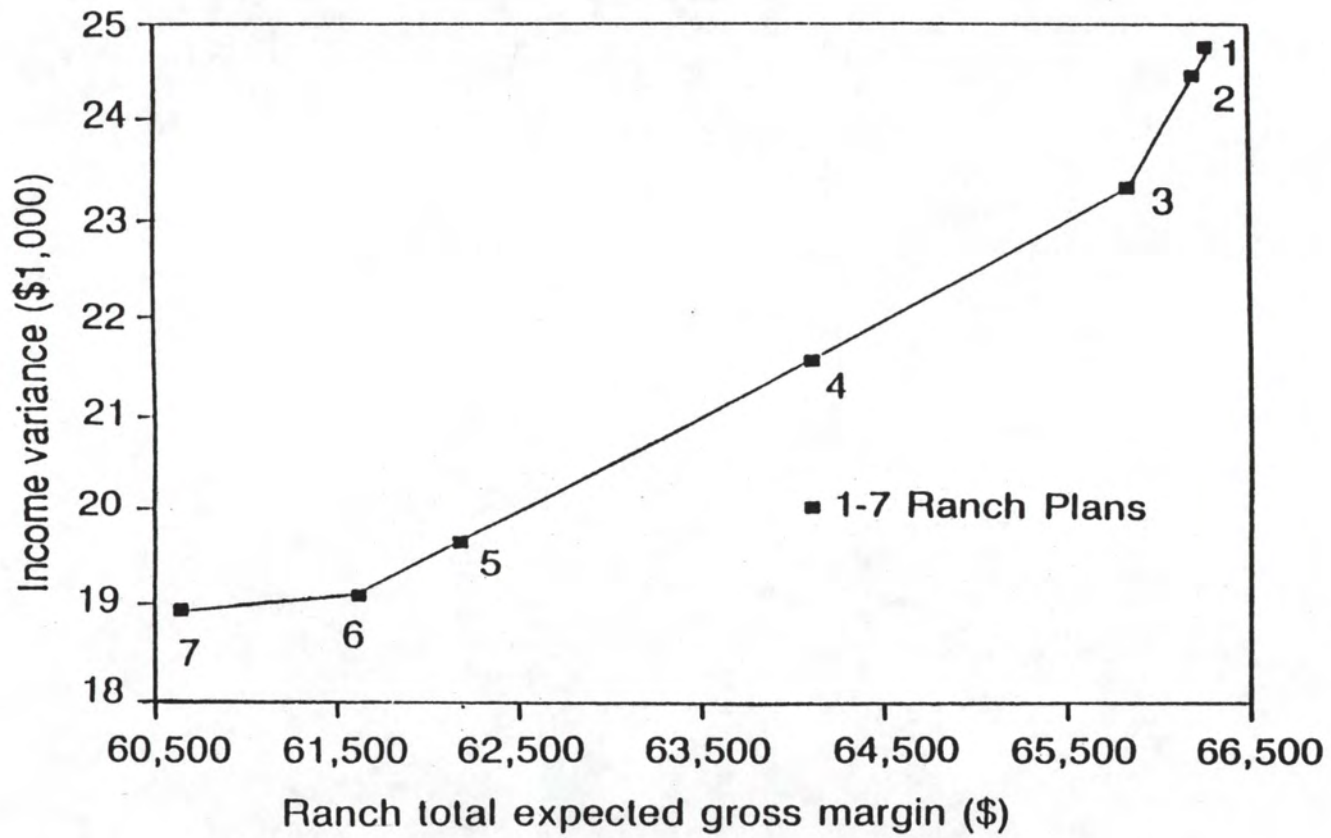


Figure 2. Expected income - income variance, seven Idaho mountain-type plans

The production management and marketing options considered for the high desert ranch included all those for the mountain-type ranch (selling weaners, backgrounding, custom feeding, buying or selling feed), plus placing backgrounded yearlings on summer pasture and then selling as long yearlings or consigning to a custom feedlot (Figure 1). Because fall-born calves are heavier at any given calendar date, the timing of their activities expanded the programming model to twice that of the mountain-type ranch.

Costs and prices for the high desert ranch included the five-year period, 1986-1990. Definitions and computations are the same as those for the mountain-type ranch, except that the mean absolute deviation in income is expressed in relative terms. In this analysis the risk factor for each plan is expressed in relation to the long-term optimal plan risk level. Risk, relative to the long-term plan level, goes down while income is nearly stable in high income/high risk plans. At low income and risk levels, income falls as much as risk (Figure 3).

EFFECTS OF INCREASING PUBLIC GRAZING FEE

The budgets used the average BLM/FS grazing fees for the years included: \$1.45/AUM for the mountain-type ranch (1984-88) and \$1.58/AUM for the high desert operation (1986-90). The formula for determining the fee includes a base value derived in 1966 from the relationship between public and private grazing fees, adjusted annually for changes in production costs, beef price, and private grazing land lease rates. In recent years, the fee has ranged from \$1.35/AUM (1986 and 1987) to \$1.97/AUM (1991) (13). The U.S. Congress in the past several sessions has

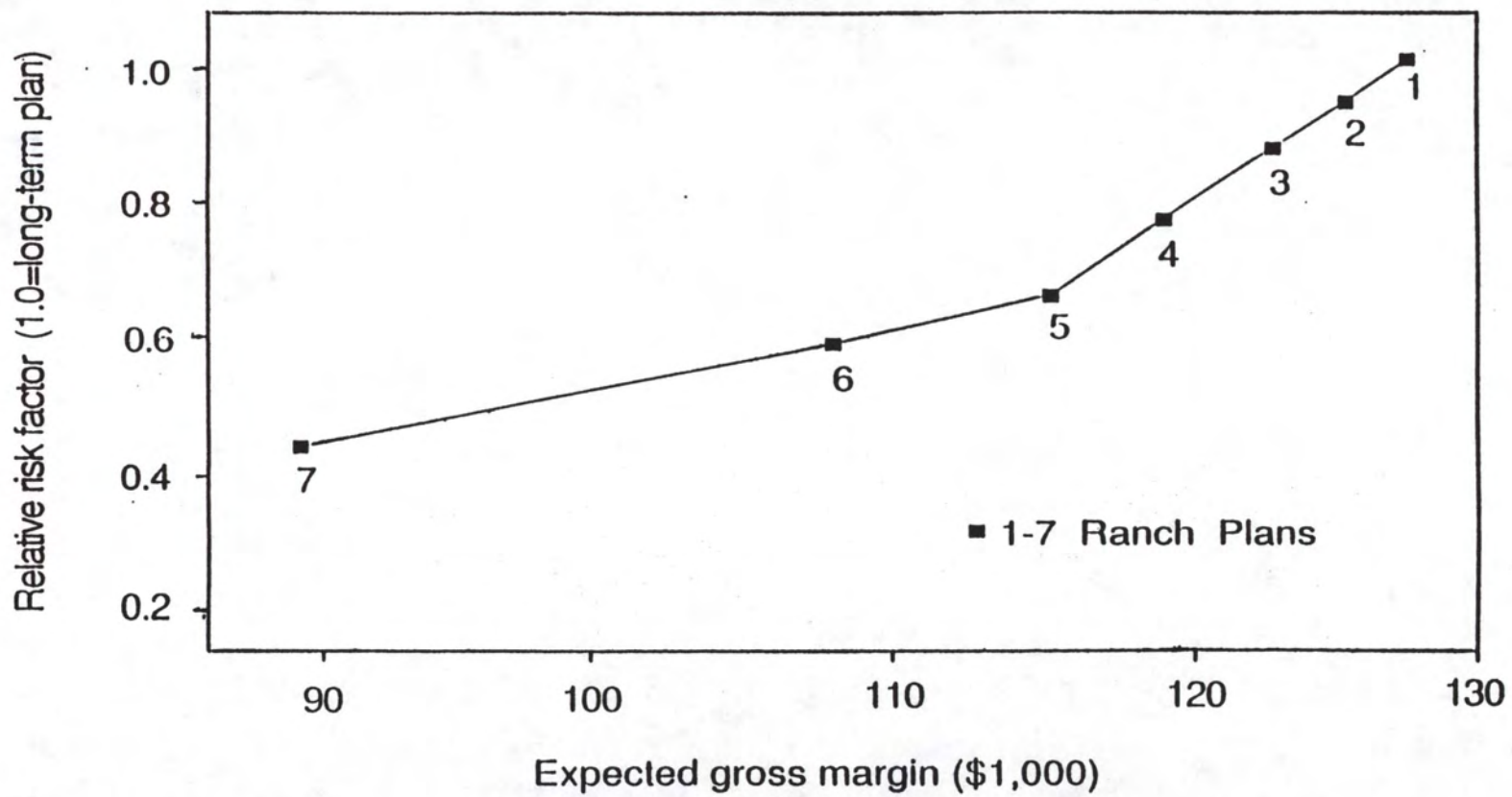


Figure 3. Income - risk relationships, seven Idaho high desert ranch plans

considered legislation to set grazing fees on federal lands at a minimum of \$8.70/AUM (1).

The impact of a change in grazing fees on the alternative ranch management plans was considered. Cow-calf grazing on BLM/FS lands is common to all plans in the model. Therefore, production costs change by the same amount in each plan, and the rank order of expected gross margins does not change. The effects on the long-term optimal high desert ranch plan when the grazing fee is increased from \$1.58/AUM to \$8.70/AUM are a \$30,431 (24%) decrease in expected gross margin and a \$14,240 (14%) increase in borrowed capital (operating loan). The initially passed but ultimately rejected fee for 1993 (\$2.56/AUM) would have lowered income about 3 percent.

CONCLUSIONS AND IMPLICATIONS

The study results indicate that beef producers who rely on public land forage may have economically viable alternatives to marketing calves directly off the range. These potential value-adding activities include backgrounding calves for sale or for further growth, as well as retaining ownership of calves or yearlings through feeding to slaughter grade in custom feedlots.

Each alternative generates income and entails risk in a direct, but not proportional, relationship. In both the mountain and high desert cattle ranch analyses some lower risk production/marketing plans showed considerable potential for maintaining income. As risk level declined, income fell by relatively smaller increments. The more risky plans often showed a sharp rise in income deviation with little improvement in average income, relative to lower risk options. Table 2 (left

side) shows the percentage reduction in income and risk, moving from the long-term plan (Plan 1) where risk is not considered.

The analyses did not include production management plans without BLM/FS grazing. For these ranches, there is no readily available substitute for federal grazing permits. (Public lands comprise 92 percent of Lemhi County and 84 percent of Owyhee County.) Grazing fee increases will raise operating costs and reduce net returns, but will not change the resource use pattern under current production management systems. However, this is not the likely result if the AUMs of public grazing are reduced. In such a situation, beef cattle producers would either have to decrease their size of operations or substitute other resources for public grazing.

One means of offsetting reduction of BLM/FS forage is to market fewer animals with higher value, i.e., to incorporate value-adding production activities into the operation. As the right hand side of Table 2 shows, higher income plans (the lower numbered plans at the top of the column) generally result in larger proportions of ranch income coming from more advanced stages of animal production and marketing. These are the plans with higher risk. But they also require additional production inputs and market transactions, which generate more economic activity within the community and region. This raises the challenge of finding a balance of ranch income/risk tradeoffs compatible with community economic growth and development goals. Production specialists, economic analysts, and policy experts all have roles in specifying the possibilities and pitfalls.

Table 2. Income, risk and marketing stages for Idaho cattle ranch plans

<u>Type</u>	<u>Plan</u> ^a	<u>Income</u> ^b		<u>Risk</u>	<u>Income source by class of animal marketed</u>			
		\$	%		%	Calves	Spring yrlyg	Fall yrlyg ^c
Mountain	1	66,327	100	100	0	100	NA	0
	2	66,260	100	99	0	100	NA	0
	3	65,869	99	94	0	85	NA	15
	4	64,145	97	87	13	64	NA	23
	5	62,129	94	80	45	15	NA	40
	6	61,546	93	77	55	0	NA	45
	7	60,566	91	77	55	0	NA	45
Desert	1	128,417	100	100	0	0	0	100
	2	126,870	99	95	7	0	0	93
	3	124,536	97	89	16	0	0	84
	4	118,895	93	73	19	0	0	81
	5	114,147	89	63	35	0	0	65
	6	108,154	84	58	49	0	0	51
	7	89,933	70	44	42	0	0	58

^a In descending level of risk; 1 is long-term optimal outcome where risk is not considered.

^b Income or gross margin is defined as cash receipts less operating expenses.

^c Yearling stocker option not included in mountain-type ranch.

References

1. Doane's Agricultural Report. 1991. Heading off higher grazing fees. 54(6):4.
2. Fowler, J.M., D. Rush, and J. Hawkes. 1993. Western livestock industry impacts on local economies and infrastructure. Abstracts. Vol. 46. The annual meeting of the Society for Range Management. Albuquerque, N.M.
3. Hazell, P.B.R., and R.D. Norton. 1986. Mathematical programming for economic analysis in agriculture. MacMillan Co., New York.
4. Marousek, G.E., L.D. Stodick, and J.G. Schimmel. 1992. The economics of alternative beef cattle management and marketing systems. Res. Bull. 153. Idaho Agric. Exp. Stn., Univ. of Idaho, Moscow.
5. McCarl, B.A., 1980. Risk modeling. Unpublished manuscript. Dept. of Agric. Econ., Texas A&M Univ., College Station.
6. Rimbey, N.R., M.H. Robison, J.A. Tanaka, T.M. Quigley, and J.N. Hawkins. 1993. Importance of public land ranchers: an Idaho case study. Abstracts. Vol. 46. The annual meeting of the Society for Range Management. Albuquerque, N.M.
7. Smathers, R.L., C.C. Gibson, C.W. Gray, and N.R. Rimbey. 1990. 1990-91 crop and livestock enterprise budgets. Univ. of Idaho Coop. Ext. Syst. Misc. Series.
8. Smathers, R.L., N.R. Rimbey, C.W. Gray, and R.R. Loucks. 1990. 1989-90 crop and livestock enterprise budgets. Univ. of Idaho Coop. Ext. Syst. Misc. Series.
9. USDA. Agricultural statistics. 1991. U.S. Gov. Printing Office. Washington, D.C.
10. USDA. 1991. Annual price summary. Statistical Reporting Service. Washington, D.C.
11. USDA. 1984-1990. Livestock detailed quotations: Idaho direct cattle and sheep market. Agricultural Marketing Service. Washington, D.C.
12. VanTassell, L.W., R.R. Fletcher, D.T. Taylor, and B. Moline. 1993. Importance of federal grazing permits to the economic stability of ranchers and communities in northcentral Wyoming. Abstracts. Vol. 46. The annual meeting of the Society for Range Management. Albuquerque, N.M.
13. Wohld, M. 1990. Multiple-use threatened - grazing fee increase could drive cattle from range. Idaho Farmer-Stockman. 107(12):6.