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Estimating Forage Values for Grazing National Forest Lands

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Estimating Forage Values for Grazing National Forest Lands. By William F. Hahn, Terry L. Crawford, Kenneth E. Nelson, and Russel A. Bowe. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture, Staff Report No. 89-51.

Abstract

Every 5 years, the Forest Service is required to update its estimates of the value of Forest Service grazing. This report provides estimates of the maximum ability of ranchers to pay for Forest Service grazing. Abilities to pay vary greatly depending on the region of the country and assumptions about costs. Based on current cash costs, the value of Forest Service grazing is greater than the grazing fee. Based on longrun economic costs, the value of grazing is less than the grazing fee. In some regions of the United States, the longrun value of grazing is zero. These low longrun values reflect the low returns to cow/calf producers in the period on which this study was based.

Keywords: public grazing, grazing permits, Resource Planning Act

Contents

Summary	v
Introduction	1
RPA Inventory Evaluation Process	1
Ranch Budgets	3
Forest Region Description	4
Developing Budgets	5
Linear Programming Analysis	6
Results	7
Region 1: The Northern Region	10
Region 2: The Rocky Mountain Region	15
Region 3: The Southwestern Region	20
Region 4: The Intermountain Region	25
Region 5: The Pacific Southwest Region	30
Region 6: The Pacific Northwest Region	35
Region 8: The Southern Region	40
Region 9: The Eastern Region	45
Comparison of Forage Value Estimates	51
Conclusions	53
References	54
Appendix: The Linear Programming Tableau	55
Columns	55
Rows	56

Summary

Every 5 years, the U.S. Department of Agriculture is required to update its estimates of the value of grazing on Forest Service lands. One set of estimates was provided in 1982 by C. Kerry Gee of the Economic Research Service (ERS). At the request of the Forest Service, ERS has updated its earlier study of the value of Forest Service grazing. ERS has used linear programming analysis to calculate the maximum ability of ranchers to pay for Forest Service grazing. This value represents the maximum value of forage to permittees.

The maximum ability to pay varies by region and by assumptions on the costs and profits of cattle enterprises. Based on shortrun variable cost, the maximum ability to pay in every Forest Service region is greater than the grazing fee. Based on 1986 costs and prices, the U.S. average maximum ability to pay for Forest Service grazing is \$5.85/animal month (AM). The 1986 grazing fee was \$1.35. Based on average prices for the period 1980-86, the U.S. average maximum ability to pay is \$6.69/AM, while during that 7-year period the grazing fee was \$1.47/AM.

The maximum ability to pay was also calculated based on the assumption that the ranches would maintain the herd at 1979 levels. The maximum ability to pay was generally higher than that calculated when ranchers were allowed to vary their herd size in response to changes in profitability. With 1986 prices, the maximum ability to pay based on a fixed cow herd averaged \$7.61/AM. The maximum ability to pay based on average prices from 1980-86 was \$8.15/AM.

Adding in longrun variable costs has a great impact on the ability to pay. The national average ability to pay is \$0.49/AM based on 1986 prices and only \$0.36/AM based on 1980-86 average prices. These low returns indicate that the present conditions in the cow/calf industry cannot persist indefinitely. Either operators will go out of business, raising cattle prices, or resource values (land, grazing permits, or other assets) will fall, or other efficiencies must be found. These low values indicate pressure for structural cost adjustments and are not predictions of actual adjustments.

Estimating Forage Values for Grazing National Forest Lands

William F. Hahn
Terry L. Crawford
Kenneth E. Nelson
Russel A. Bowe

Introduction

The Resource Planning Act of 1974 (RPA) and the National Forest Management Act of 1976 (NFMA) require the U.S. Department of Agriculture (USDA) to evaluate and assess the forest and rangeland situation in the United States every 10 years with a 5-year intermediate update. That assessment determines the value to be placed on the inventory of resources to help guide program decisions about maintaining and improving forest and rangeland resources. USDA's Forest Service (FS) is the lead agency in that assessment. The FS has contracted with the Economic Research Service (ERS) to provide current cost-of-production (COP) budgets and value of marginal product estimates for national forest grazing.

RPA Inventory Evaluation Process

Three present net values (PNV's) for grazing will be estimated for the 1990 RPA process of the Forest Service (4).¹ PNV's will be based on January 1, 1987, costs and prices or the nearest available values (1986 annual prices). The three accounting stances to be developed are: (1) existing fees paid, (2) market clearing prices, and (3) willingness to pay. This report provides maximum ability to pay values which the Forest Service will use to calculate willingness to pay values.

To measure the ability of National Forest System permittees to pay for forage, a representative economic setting must be developed. First, ERS developed a representative economic budget for each Forest Service region. ERS used the analytical tool of linear programming (LP) to measure the value of forage at current use. LP allows the calculation of the level and mix of variable inputs that produce the most profitable levels of cows owned and calves produced. The determination of costs depends on the time span for the analysis. The short run is that time period in which some of the costs, like feed, can be varied while other costs, like the depreciation of buildings, cannot. The long run is the time period in which every cost is variable. All

¹Underscored numbers in parentheses refer to sources cited in the References at the end of this report.

costs must be covered in the long run if an enterprise is to remain in business.

In addition to the proper or optimal level of inputs and outputs, LP analysis provides a mirror set of prices or "shadow prices" to indicate the values of fully utilized inputs. The shadow price of National Forest System grazing represents the maximum amount per unit that a typical permittee could pay for small increases in National Forest System grazing and just break even on the purchase. The shadow price also reflects the minimum amount someone would have to pay a permittee to make a small cutback in his/her use of Forest Service grazing. The shadow price of National Forest System grazing is based on the change in the cattle produced and/or the mix of forages bought in response to a change in Forest Service grazing use or availability.

The Forest Service will use the maximum abilities to pay to calculate willingness-to-pay values. The Forest Service will use these willingness-to-pay values in its present net value analysis of resource programs. Analysis of economic efficiency for the evaluation of alternatives consists of a comparison of benefits and costs. This comparison is made by calculating the present net value of the difference between benefits and costs. Discounted total gross benefits minus discounted total gross costs yield net value. The total gross benefits in a PNV calculation are based on willingness to pay, which consists of a market price (or estimated market price) times the quantity of an input, plus the grazing permittees' surplus. Market price and quantity are determined by exchange in a free market. Permittees' surplus is the difference between what they would pay in the market for forage and the total they would be willing to pay for each unit of forage. The calculation of permittees' surplus depends on developing a demand curve for the FS grazing. The demand curve represents the whole range of prices and quantities of forage that would be demanded by permittees. For nonmarket outputs, such as Forest Service forage, the problem is further complicated by the absence of a market price. In this case, both the willingness to pay and the demand curve must be estimated for forage.

The LP models recognized the feed mix involved in the livestock enterprise and the level of ranch dependency on public forage as opposed to all other forage/feed inputs. The ranch budgets were not factored for sources of feed other than those already in the budget or the risk involved in cattle production or the variation in the pricing of livestock and livestock inputs. The shadow prices represent the maximum ability to pay, given the set of prices used in the analysis. The willingness to pay should be somewhat less than the ability to pay.

Forage used by National Forest System permittees is based largely on grazing of Federal lands prior to the time they were reserved for public use. Shadow prices are used to estimate the economic value to the permittee and to society for nonmarketed goods. Thus, the range forage values (shadow prices) produced by each LP solution measures the value contributed to return above cost per AM or the value of the marginal product of an AM of grazing on National Forest System lands.

The second set of prices that the Forest Service will use in the 1985 RPA update are the estimated market values per region. The market values were derived through market value appraisal, a subcomponent of the 1985 Grazing Fee Study (5). The appraised market values for the 1985 update ranged from 50

percent (region 6) to 72 percent (region 2) of the LP shadow prices. The national average was 60 percent of the LP shadow prices.

In 1990, the RPA process will also use the amount received by the U.S. Treasury for grazing of National Forest lands in measuring value. This value represents what is available for use by the Government even if the value to permittees or society is higher. It represents the political or social allocation of the value of grazing to the public as determined by Government and grazing permittees.

Ranch Budgets

ERS has developed 255 ranch cost-of-production (COP) budgets, representing up to four ranch sizes for each of those forests having grazing. These budgets were developed by Gee (1) between 1979-82 and used in 1982 as the base for costs and returns. The COP methodology used by Gee is similar to the ERS methodology used in 1981 and earlier years. ERS has since revised its COP methodology, changing the display format and the manner in which returns are allocated among management, investment, interest, and land. The Forest Service requested that ERS use the 1981 methodology to maintain the consistency of the results.

The ranch COP budget was developed for the whole ranch herd and includes all cattle and forage sources used by the ranch operation. Some of the herd may not graze on Forest Service land. Because enterprises are organized around the whole herd, not only FS permits, we consider the whole herd interaction in the analysis.

Each ranch budget was developed to represent an average budget for its particular forest and size group. These budgets were created by a delphi process. A delphi process provides forecasts or estimates by a consensus of experts. Panels consisting of 10 to 30 permittees provided the basic budgeting and production data. From their individual records and experiences, the panel members created a consensus estimate of the typical budget for a particular forest and size of operation. The panel members were given ERS COP budgets and asked to verify the feed requirements and list of inputs. Livestock and input prices were obtained from market news or USDA survey statistics as appropriate. The budgets were constructed under the assumption that the operation would maintain the size of the breeding herd. Thus, the initial herd is neither expanding nor liquidating. The pattern of marketing reflects the average rate of culling and heifer retention necessary to maintain the herd.

The producer panels validated data from USDA surveys. The key information derived from each panel is the seasonal pattern of feed utilization and cattle production and marketing. The nutrient requirements of the herd are calculated from National Research Council standards as reported by Gee (1).

Most cattle operations have a variety of forage sources. These sources are measured in a variety of units. Some examples are Federal grazing, which is measured in animal months; private leased grazing and grazing on deeded land (owned by the operator), both generally measured in acres; and hay, measured in tons. To measure the relative importance of each forage source in maintaining the herd in any month or over a year, the traditional units of forage supply and utilization had to be converted to a common unit. The unit

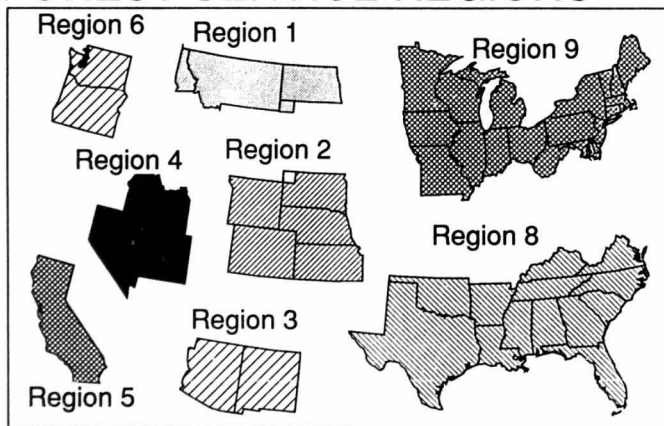
used in this study is the animal unit month or AUM. The AUM is defined as 300 pounds of total digestible nutrients (TDN), which is the amount of feed required to maintain a 1,000-pound dry cow.

The Forest Service charges for grazing based on the head of cattle grazed, not on the forage they consume. Consequently, the AUM's provided by an AM or head month vary according to the animal grazed and the time of the year. In the winter, most cows are early in their pregnancy and their feed requirements are low. As the pregnancy progresses, the feed requirements increase. After calving, the feed requirements continue to increase as milk production and calf size increases. A cow's feed requirements drop again at weaning. On average, a breeding cow unit with a nursing calf requires 17.5 AUM over the course of the year. The forage required to support calves, bulls, and replacement heifers is also included in the 17.5 AUM/breeding cow.

Forest Region Description

The Forest Service divides the United States into nine administrative regions (fig. 1). Eight of the nine regions have grazing. The six regions in the western States account for 97 percent of the Forest Service grazing. The two regions in the eastern United States account for only 3 percent of the grazing. The Alaskan region (region 10) has no Forest Service grazing. The Forest Service granted permits for about 10 million animal months (AM's) of grazing in 1986. An AM is grazing for 1 month for a cow, or a cow with a calf under 6 months, or a calf over 6 months old. Since 1988, a head month has been used by the Forest Service to measure grazing. For fee purposes, five sheep or goats, weaned or adult, are equivalent to one cow, bull, steer, heifer, horse, or mule.

Figure 1
FOREST SERVICE REGIONS



Three regions account for 70 percent of the permitted Forest Service grazing. The Southwest region, Rocky Mountain region, and the Intermountain region each have between 22 and 25 percent of the grazing on National Forest lands.

All regions in the continental United States offer summer grazing on National Forest System lands. However, more year-round grazing is available in the Southwestern region. Dependence on Forest Service grazing varies widely across regions and also with the size of the operation. Permittees in the Northern region are the least dependent on Federal grazing for their cattle's feed supply during the year. Permittees in the Southwest region are the most dependent. Larger enterprises are generally more dependent on Forest Service grazing than smaller ones.

Developing Budgets

RPA is a measurement process at 5- and 10-year intervals that may be used to make resource planning decisions with a 40- or 50-year life span. Selecting the proper base time for measurement is a problem. The selection of one year as a base may over- or understate the return to grazing. The problem of the base year selection is partially resolved by updating the estimates every 5 years. The Forest Service requested that ERS update the 1982 regional budgets to January 1, 1987. The last complete year of prices available for the analysis was 1986. To minimize the effects of the cattle and business cycles, the budgets were also updated to reflect the average of 1980 to 1986 prices.

Gee's 255 individual forest budgets were aggregated into eight regional budgets. Gee's original study provided information on the number of cattle represented by each budget. The Forest Service provided ERS with information on the total permitted AM's in each forest and a regional summary showing the total permitted AM's in each region. The regional budgets are weighted averages of the individual budgets in the regions. Each budget is weighted by the product of its share of its forest's production and its forest's share of the total AM's in the region.

When Gee's budgets were updated, only the prices were changed. ERS did not change any of the physical relationships, except for those caused by the aggregation of the budgets. The herd size, production and marketing patterns, seasonal feed requirements, and seasonal feed sources were not changed when the budgets were updated. Keeping the physical relationships constant is necessary for two reasons. First, the budgets represent enterprises which are neither expanding nor contracting. Second, technological change for this type of enterprise occurs slowly. We assume that the original budgets are accurate representations of grazing enterprises.

USDA's market news provided the prices for the regions and types of cattle marketed. ERS used 1986 prices for steer calves, heifer calves, yearling steers, heifers, and cull cows sold for slaughter to replace the 1982 prices in the regional budgets. Prices paid for inputs were updated using data from USDA's National Agricultural Statistics Service (NASS). Items not covered in NASS surveys were updated using comparable items in the ERS livestock COP budgets. Alternate grazing enterprise budgets were also prepared using the 1980-86 average prices for cattle and inputs.

Linear Programming Analysis

Gee (1) calculated the value of Forest Service forage using linear programming or LP. LP analysis is used in this updated study as well. LP is a mathematical technique for solving a class of optimization problems. Used in farm and ranch management analysis, an LP solution will show the combination of enterprises and resources that maximize the farm's profitability given the available resources (3).

LP finds the most profitable combination of enterprises and inputs given the constraints facing the decisionmaker. In ranch problems solved in this study, the costs and availability of cattle feed is balanced against the herd's feed requirements. The "optimal" solution is the combination of herd size and monthly feed use that gives the highest possible profits given the constraints facing the ranch and the costs and prices used in the analysis.

In Gee's 1982 study, he derived LP shadow prices for the 255 individual budgets. He then averaged the shadow prices for each region using the 1982 permitted Forest Service AM's. In this study, we first averaged the budgets for each region and then calculated shadow prices based on the average budgets.

The aggregation of individual budgets into regional budgets will affect the calculated values of the maximum abilities to pay. It is impossible to predict how the calculated maximum ability to pay will differ between the methodology used in this report and that used by Gee. Therefore, LP's were run using 1982 prices to provide a base from which to measure changes.

The LP problem for this study generalizes Gee's original design. The budgets provide information on the physical relationships and the costs and returns associated with various activities. We refined the analysis so the LP would consider feeding periods of 1 month to accommodate the variations in feeding patterns within and between regions. The details of the LP tableau and its generation from the budget are outlined in the appendix of this report.

Gee's original budgets were created in 1979 to reflect typical operations in 1979. Since that time, the Nation's cow herd has declined. The decline in the cow herd has been caused by lower profitability. The changes in the prices of cattle and the costs of alternative forage sources may have changed the herd sizes and combination of feeds used. Our LP formulation allows ranches to adjust their herd size and their feed sources to reflect the changes in prices and costs. For the sake of comparison, we also ran LP problems that required the ranchers to use the same combination of feed sources and raise the same number of cattle as they did in 1979.

In addition to finding the most profitable combination of herd size and feed supplies, the LP solution provides "shadow prices." Shadow prices are associated with the constraints of the LP problem; they measure the effects of the constraint on the profitability of a solution. The most relevant constraint in this study is the number of Forest Service AM available to the ranch. The Forest Service shadow price measures how much additional profit the ranch could earn if it were given one additional AM of Forest Service grazing. This additional profit earned from an AM can be used to calculate the maximum amount a rancher could pay to get another AM and still break even

on the purchase. This maximum ability to pay can be used by the Forest Service as a starting point in their calculations of the willingness to pay.

The shadow price for Forest Service grazing is affected by a number of factors. "Sensitivity Analysis" shows how changes in an LP problem can affect the problem's solution. In this study, the effects of varying the available AM's of Forest Service grazing and the effects of using costs from different time periods were investigated. Separate LP problems were developed from budgets based on 1986 prices and the average prices from 1980-86. Optimal solutions were also computed based on shortrun variable costs and on longrun variable costs. The shortrun variable costs are those that represent out-of-pocket cash costs that change as the herd size changes. The shortrun variable costs in the enterprise budgets are feed, veterinary medicine, trucking, marketing, hired labor, fuel and lubrication, repairs, and interest on operating capital. The longrun variable costs are defined in this study as the shortrun variable costs plus the value of family labor, interest on investment (other than land investment), and capital replacement. Budgets for each region can be found in the results section. The costs of land and taxes on land were not included as part of the ranches' longrun costs. Land was excluded because in the long run, the value of grazing land will be a function of the profitability of raising cattle. Taxes on land are a function of the value of land, and were excluded also.

The availability of Forest Service grazing was varied between zero and 150 percent of the 1986 permitted level for each of four price/cost combinations. Forest Service grazing was varied uniformly throughout the year, that is, a 10-percent reduction in Forest Service grazing implies a 10-percent reduction in January, a 10-percent reduction in February, and so on.

The shadow prices calculated for various levels of Forest Service grazing are valid only if the prices of cattle and the prices and availability of other forage sources are fixed. Large shifts in the availability of Forest Service grazing may cause adjustments in other factors.

Results

The maximum ability to pay for Forest Service grazing depends upon (1) the region, (2) the level of available AM's, and (3) the assumptions underlying costs and output prices (see tables 1 and 2).

In all regions, shadow prices based on shortrun variable costs increase as the available AM's decrease. Cattle prices were higher and the costs of feed and pasture lower in 1986, compared with the average of 1980-86 prices. Consequently, profits were higher in 1986. However, the maximum ability to pay based on 1986 prices was lower than the maximum ability to pay based on 1980-86 average prices. The fact that the maximum ability to pay is greater for the 1980-86 prices suggests that the costs of alternative feeds are more important in determining the value of Forest Service grazing than is the price of cattle (table 1).

The maximum ability to pay based on shortrun variable costs is greater than the grazing fee for all regions and for all the levels of availability

examined. However, the maximum ability to pay based on longrun variable costs is generally lower than the grazing fee (table 2).

Generally the optimal herd size for each region given 1986 prices and 1980-86 average prices is smaller than the typical 1979 herd size. Only in the Eastern region (region 9) is the optimal herd size the same as it was in 1979. The declines in the optimal herd size reflects the decline in the profitability of cattle ranching relative to 1979.

Including longrun variable costs results in further reductions in the optimal herd size for each region. The results of the longrun analysis must be interpreted with caution. The results are based on the assumption that all factors remain fixed. The large reductions in the cow herd implied by the longrun results is likely to cause reduction in the value of forage sources or increases in the value of cattle. The longrun results do show that maintenance of the cattle herd at current levels is going to require greater returns to cow/calf operations.

After the discussion for each region are four tables. The first three are budget tables. The first budget is Gee's original budget based on 1979 production and resource use with 1982 prices. The next two budgets update Gee's budgets to 1986 and 1980-86 average prices, respectively. These updated budgets do not reflect the changes in resource use and optimal herd size implied by the changes in prices and costs. The fourth table in each set provides more detail on the sensitivity analysis for shortrun variable costs.

TABLE 1--Maximum ability to pay (in \$/AM) for Forest Service grazing based on shortrun variable costs

Grazing relative to current use*	With 1986 prices and costs								
	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	U.S. average
0%	\$14.32	\$14.73	\$9.22	\$13.94	\$15.11	\$13.46	\$9.97	\$14.26	\$12.97
25%	\$11.99	\$14.73	\$8.88	\$13.94	\$14.46	\$12.78	\$9.94	\$14.26	\$12.47
50%	\$10.65	\$14.73	\$8.88	\$13.94	\$13.29	\$12.78	\$9.94	\$14.26	\$12.21
75%	\$9.68	\$11.54	\$8.88	\$4.74	\$13.29	\$12.78	\$9.57	\$14.26	\$9.20
90%	\$9.68	\$5.33	\$8.83	\$4.74	\$3.79	\$5.62	\$6.96	\$14.26	\$6.66
100%	\$7.87	\$3.12	\$8.83	\$4.71	\$3.79	\$4.64	\$6.96	\$13.67	\$5.85
110%	\$7.19	\$3.12	\$8.68	\$3.02	\$3.79	\$4.64	\$6.88	\$13.19	\$5.31
125%	\$7.19	\$3.12	\$8.44	\$3.02	\$3.79	\$4.64	\$6.88	\$13.19	\$5.25
150%	\$7.19	\$2.36	\$8.41	\$1.91	\$3.65	\$4.64	\$6.88	\$13.19	\$4.81

Grazing relative to current use*	With 1980-86 average prices and costs								
	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	U.S. average
0%	\$14.55	\$15.28	\$9.28	\$14.24	\$15.01	\$13.95	\$10.04	\$16.25	\$13.25
25%	\$13.12	\$15.28	\$9.07	\$14.24	\$14.34	\$13.95	\$9.90	\$16.25	\$12.95
50%	\$12.94	\$15.13	\$9.07	\$14.24	\$14.34	\$12.22	\$9.90	\$16.25	\$12.77
75%	\$11.40	\$15.13	\$9.07	\$5.51	\$13.15	\$12.22	\$9.33	\$16.25	\$10.41
90%	\$11.40	\$3.88	\$9.01	\$5.51	\$4.46	\$6.80	\$8.35	\$16.25	\$6.99
100%	\$9.49	\$3.21	\$9.01	\$5.48	\$3.98	\$5.21	\$8.35	\$15.24	\$6.49
110%	\$9.49	\$3.21	\$8.50	\$3.82	\$3.98	\$5.96	\$7.48	\$14.57	\$5.93
125%	\$6.34	\$1.62	\$8.50	\$3.82	\$3.39	\$5.96	\$7.48	\$14.57	\$5.11
150%	\$6.34	\$1.62	\$8.50	\$1.88	\$3.39	\$5.96	\$7.02	\$14.57	\$4.64

Total AM's	1,400,254	2,170,567	2,437,298	2,356,468	621,023	745,349	211,108	57,079	9,999,146
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TABLE 2--Maximum ability to pay (in \$/AM) for Forest Service grazing based on longrun variable costs

Grazing relative to current use*	With 1986 prices and costs								
	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	U.S. average
0%	\$1.74	\$0.005	\$0.005	\$0.005	\$2.74	\$4.23	**	\$1.38	\$0.74
25%	\$1.74	\$0.005	\$0.005	\$0.005	\$2.74	\$4.23	**	\$1.38	\$0.74
50%	\$1.74	\$0.005	\$0.005	\$0.005	\$2.41	\$4.23	**	\$1.38	\$0.72
75%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$4.23	**	\$1.38	\$0.54
90%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$4.23	**	\$1.38	\$0.54
100%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$3.57	**	\$1.38	\$0.49
110%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$1.94	**	\$1.38	\$0.37
125%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$1.94	**	\$1.38	\$0.37
150%	\$0.98	\$0.005	\$0.005	\$0.005	\$1.19	\$1.94	**	\$1.25	\$0.37

Grazing relative to current use*	With 1980-86 average prices and costs								
	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	U.S. average
0%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
25%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
50%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
75%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
90%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
100%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
110%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
125%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$2.60	**	\$0.82	\$0.36
150%	\$0.55	\$0.005	**	\$0.04	\$1.17	\$1.20	**	\$0.82	\$0.25

Total AM's	1,400,254	2,170,567	2,437,298	2,356,468	621,023	745,349	211,108	57,079	9,999,146
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* 100% is grazing at current authorized use. Percentages less than 100 represent reductions; percentages above 100 are expansions in Forest Service permitted grazing.

** No cattle raised, F.S. AM's worth nothing.

Region 1: The Northern Region

The typical ranch size in Forest Service region 1 is relatively large with 743 bred cows. These ranches are primarily cow-calf operations. Most of the calves are sold as weaners, few are raised to yearlings. Ranches in region 1 are not highly dependent on Federal lands: 9 percent of their forage is obtained from Forest Service lands, and 7.2 percent from Bureau of Land Management (BLM). The ranches in this area are highly dependent on hay as little forage grows during the harsh winters (tables 3, 4, and 5).

Under 1986 prices and variable costs, the optimal herd size in region 1 is 737 cows. The optimal herd size with 1980-86 average prices and costs is 607 bred cows. With 1986 prices, the estimated maximum value of Forest Service grazing is \$7.87/AM, while the estimated maximum value is \$9.49 with 1980-86 average prices (table 6).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$7.59/AM based on 1986 prices and \$6.56/AM based on 1980-86 average prices.

Sensitivity analysis shows that decreasing the availability of Forest Service grazing increases its value. Under 1986 prices, the optimal size of the cow herd is quite sensitive to the availability of Forest Service grazing. Eliminating all Forest Service grazing eliminates 9 percent of the ranch's available forage. This 9-percent reduction in forage results in a 17-percent decrease in the optimal cow herd. Expanding Forest Service grazing 50 percent supplies 4.5 percent more forage, and results in a 2.5-percent increase in the cow herd. The size of the cow herd is much more sensitive to decreases in Forest Service grazing than increases (table 6).

Under 1980-86 average prices, the optimal cow herd size actually decreases slightly as the availability of Forest Service grazing increases between 0 and 100 percent of the current allotment. The use of rented land and hay declines as more Forest Service grazing become available. Forest Service grazing is less expensive than either hay or rented land. Profits increase as more Forest Service grazing become available because of declining costs.

Incorporating longrun variable costs into the LP runs had a significant effect on the optimal solution. Under 1986 prices, only two-thirds of available Forest Service grazing would be utilized. The optimal herd size would be 455 head of bred cows. If the grazing fee were cut to \$0.98/AM or lower, all the Forest Service grazing would be used and the optimal cow herd size would be 470 head.

Given 1980-86 average prices and longrun variable costs, the optimal LP solution used no Forest Service grazing. If the grazing fee is cut to 55 cents, all the available Forest Service grazing is used, and the optimal herd size is 197 head.

TABLE 3

Budget for Typical Region 1 Cow-Calf Ranch
Baseline 1982, ERS (Gee) Budget

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW			
PRODUCTION:																
Bred cows (1)	Head	743					CASH COSTS, continued									
Annual cow loss	Head	19					Veterinary & med	Dol				3805	5.12			
Cows culled	Head	110					Hired trucking	Dol				1930	2.60			
Calves born alive	Head	645					Marketing (6)	Dol				1868	2.51			
Calves lost birth to weaning	Head	44					Hired labor	Hrs	4542		4.01	18192	24.28			
Steer calves weaned	Head	300					Fuel and lubricants	Dol				5809	7.82			
Sold as weaners	Head	210					Repairs	Dol				7124	9.59			
Lost after weaning	Head	2					Interest on operating capital (9)	Dol	62973.4		0.15	9320	12.54			
Sold as yearlings	Head	89					Total variable expenses					127700	171.87			
Heifer calves weaned	Head	301					FIXED EXPENSES									
Sold as weaners	Head	109					General farm overhead (7)	Dol				7248	9.76			
Lost after weaning	Head	4					Taxes (8)	Dol				6828	9.32			
Sold as yearlings	Head	58					Insurance	Dol				3573	4.81			
Kept for herd replacement(2)	Head	130					Total fixed expenses					17749	23.89			
Bulls	Head	33					Total cash expenses					145449	195.76			
SALES:																
Steer calves	Head	210	435	67.65	61794		OTHER COSTS									
Heifer calves	Head	109	400	59.59	25982		Family labor(10)	Hrs	3547		4.01	14241	19.17			
Yearling steers	Head	89	745	66.26	43935		Capital replacement (11)	Dol				22674	30.52			
Yearling heifers	Head	58	697	58.49	23646		Interest on investment other than land (12)	Dol				68271	91.89			
Cull cows	Head	110	994	35.02	38293		Land interest (13)	Dol				238721	321.29			
Total sales					193650	260.63	Total other costs	Dol				343907	462.86			
CASH COSTS:																
National Forest	AM	943.1		1.87	1764	2.37	TOTAL ALL COSTS	Dol				485225	653.06			
Bureau of Land Management	AM	742.3		1.87	1388	1.87	Return above variable costs	Dol				65950	88.76			
Private pasture lease	AUM	1403.7		8.85	12423	16.72	Return over cash costs	Dol				48201	64.87			
Other pasture lease (3)	AUM	1170.2		3.94	4611	6.21	Return above cash costs and family labor	Dol				33960	45.71			
State land lease	AUM	403.5		3.91	1578	2.12	Return to total investment (14)	Dol				11286	15.19			
Irrigated pasture	AUM	349.7		4.77	1668	2.25	Return above all costs (15)	Dol				-295706	-397.99			
Hay produced	TON	1092.6		33.57	36679	49.37	Total Forest Service grazing in region	AM	1400254							
Hay purchased	TON	258.8		57.07	14770	19.88	Cows in region	Head	1103158							
Total Forage Costs (4)	AUM	13379.0			74879	100.78										
Protein supplement (5)	Ton	15.2		238.88	3631	4.89										
Grain	Bu	14.1		2.13	30	0.04										
Other feed	Ton	0.0		0.00	0	0.00										
Salt and mineral	Cwt	260.2		4.27	1112	1.50										
Feed source:																
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)	
National Forest (17)	AM	11.7	10.6	8.7	7.6	60.6	91.7	199.3	201.6	193.7	83.8	62.1	11.7	9.0%		
Bureau of Land Mgt. (17)	AM	11.4	11.4	8.0	29.4	215.0	209.3	56.5	56.5	56.4	47.6	27.7	12.2	7.2%		
Pasture rent/lease (18)	AUM	0.0	0.0	0.0	23.4	193.2	246.1	247.7	248.8	263.2	173.0	4.1	4.2	10.5%		
State land lease (18)	AUM	3.0	2.7	2.8	17.6	61.3	65.9	68.4	68.7	101.7	11.4	0.0	0.0	3.0%		
Deeded rangeland (18)	AUM	28.7	32.8	41.4	83.2	403.2	479.1	551.1	559.4	564.4	352.3	164.7	32.4	24.6%		
Irrigated pasture (18)	AUM	0.0	0.0	0.0	0.0	0.0	90.1	107.1	107.8	24.2	20.5	0.0	0.0	2.5%		
Crop residue (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	359.6	624.6	186.0	8.7%		
Other pasture lease (18)	AUM	0.0	0.0	0.0	0.0	15.3	16.2	16.0	16.1	15.5	13.5	0.0	0.0	0.7%		
Hay	TON	248.3	272.6	292.0	290.7	54.8	0.0	0.0	0.0	0.0	2.3	2.2	185.5	33.7%		
Grain	Bu	2.6	3.1	3.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Protein supplement	TON	3.3	3.5	2.1	2.1	0.2	0.0	0.0	0.0	0.0	0.2	1.3	2.5	0.0		
Other feed	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Marketing Month:																
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.0	0.0		
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.2	0.0		
Yearling steers	Head	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	74.5	9.0	2.7	0.1	0.0		
Yearling heifers	Head	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	36.3	2.3	16.5	7.1	0.0		
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.9	88.0	20.4	0.0		

For notes, see Table 35

11

TABLE 4

Budget for Typical Region 1 Cow-Calf Ranch
Updated to 1986 Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW								
PRODUCTION:							CASH COSTS, continued														
Bred cows (1)	Head	743					Veterinary & med	Dol			4254	5.73									
Annual cow loss	Head	19					Hired trucking	Dol			2016	2.71									
Cows culled	Head	110					Marketing (6)	Dol			2128	2.86									
Calves born alive	Head	645					Hired labor	Hrs	4542	4.44	20166	27.14									
Calves lost birth to weaning	Head	44					Fuel and lubricants	Dol			3032	4.08									
Steer calves weaned	Head	300					Repairs	Dol			7501	10.10									
Sold as weaners	Head	210					Interest on operating capital (9)	Dol	62973.4	0.12	7604	10.23									
Lost after weaning	Head	2					Total variable expenses				115762	155.80									
Sold as yearlings	Head	89					FIXED EXPENSES														
Heifer calves weaned	Head	301					General farm overhead (7)	Dol			6695	9.01									
Sold as weaners	Head	109					Taxes (8)	Dol			6010	8.09									
Lost after weaning	Head	4					Insurance	Dol			3100	4.17									
Sold as yearlings	Head	58					Total fixed expenses				15805	21.27									
Kept for herd replacement(2)	Head	130					Total cash expenses				131567	177.08									
Bulls	Head	33					OTHER COSTS														
SALES:							Family labor(10)	Hrs	3547	4.44	15747	21.19									
Steer calves	Head	210	435	69.49	63479		Capital replacement (11)	Dol			22139	29.80									
Heifer calves	Head	109	400	61.77	26932		Interest on investment other than land (12)	Dol			55702	74.97									
Yearling steers	Head	89	745	63.68	45223		Land interest (13)	Dol			194772	262.14									
Yearling heifers	Head	58	697	57.17	23112		Total other costs	Dol			288360	388.10									
Cull cows	Head	110	994	33.28	36388		TOTAL ALL COSTS	Dol			416457	560.51									
Total sales					192134	258.59	Return above variable costs	Dol			76372	102.79									
CASH COSTS:							Return over cash costs	Dol			60567	81.52									
National Forest	AM	943.1		1.35	1273	1.71	Return above cash costs and family labor	Dol			44820	60.32									
Bureau of Land Management	AM	742.3		1.35	1002	1.35	Return to total investment (14)	Dol			22681	30.53									
Private pasture lease	ALUM	1403.7		7.51	10542	14.19	Return above all costs (15)	Dol			-227793	-306.59									
Other pasture lease (3)	ALUM	1170.2		3.34	3908	5.26	Total Forest Service grazing in region	AM	1400254												
State land lease	ALUM	403.5		2.99	1206	1.62	Cows in region	Head	1103158												
Irrigated pasture	ALUM	349.7		4.95	1416	1.91	Feed source:														
Hay produced	TON	1092.6		29.38	32101	43.20	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)		
Hay purchased	TON	258.8		49.95	12927	17.40	National Forest (17)	AM	11.7	10.6	8.7	7.6	60.6	91.7	199.3	201.6	193.7	83.8	62.1	11.7	2.0%
Total Forage Costs (4)	ALUM	13379.0			64376	86.64	Bureau of Land Mgt. (17)	AM	11.4	11.4	8.0	29.4	215.9	209.3	56.2	56.2	56.2	47.6	27.7	12.9	7.3%
Protein supplement (5)	Ton	15.2		227.39	3456	4.65	Pasture rent/lease (18)	ALUM	0.0	0.0	0.0	23.4	193.2	246.7	248.8	263.2	173.0	4.1	4.2	10.5%	
Grain	Bu	14.1		1.89	27	0.04	State land lease (18)	ALUM	0.0	0.0	2.8	17.6	61.3	65.9	68.4	101.7	11.4	0.0	0.0	3.0%	
Other feed	Ton	0.0		0.00	0	0.00	Deeded rangeland (18)	ALUM	28.7	32.8	41.4	85.2	403.2	479.1	559.2	564.4	352.4	164.7	32.4	24.6%	
Salt and mineral	Cwt	260.2		4.62	1202	1.62	Irrigated pasture (18)	ALUM	0.0	0.0	0.0	0.0	0.0	90.1	107.1	24.2	24.2	0.0	0.0	2.6%	
Feed source:							Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	359.6	624.6	186.0	8.7%	
Protein supplement (5)	Ton	15.2		227.39	3456	4.65	Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Grain	Bu	14.1		1.89	27	0.04	Hay	TON	248.3	272.6	292.0	290.7	54.8	16.2	16.1	15.5	0.0	0.0	185.5	33.7%	
Other feed	Ton	0.0		0.00	0	0.00	Grain	Bu	4.9	4.1	3.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Salt and mineral	Cwt	260.2		4.62	1202	1.62	Protein supplement	Ton	3.0	3.5	2.1	2.1	0.0	0.0	0.0	0.0	0.0	1.3	2.5	0.0%	
Marketing Month:							Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.0	0.0	0.0%		
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.2	0.0	0.0%		
Yearling steers	Head	0.0	0.0	4.5	0.0	0.0	Yearling steers	Head	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	2.7	0.1	0.0%		
Yearling heifers	Head	0.0	0.0	1.6	0.0	0.0	Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.5	2.1	0.0%		
Cull cows	Head	0.0	0.0	0.0	0.0	0.0											88.0	20.4	0.0%		

For notes, see Table 35

12

TABLE 5

Budget for Typical Region 1 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM									
PRODUCTION:							CASH COSTS, continued															
Bred cows (1)	Head	743					Veterinary & med	Dol			3828	5.15										
Annual cow loss	Head	19					Hired trucking	Dol			1897	2.57										
Cows culled	Head	110					Marketing (6)	Dol			1897	2.57										
Calves born alive	Head	642					Hired labor	Hrs	4542	4.06	18428	24.80										
Calves lost birth to weaning	Head	24					Fuel and lubricants	Dol			4990	6.78										
Steer calves weaned	Head	300					Repairs	Dol			7046	9.48										
Sold as weaners	Head	210					Interest on operating capital (9)	Dol	62973.4	0.14	8733	11.75										
Lost after weaning	Head	2					Total variable expenses				120372	162.01										
Sold as yearlings	Head	89					FIXED EXPENSES															
Heifer calves weaned	Head	301					General farm overhead (7)	Dol			7407	9.97										
Sold as weaners	Head	109					Taxes (8)	Dol			6645	8.97										
Lost after weaning	Head	4					Insurance	Dol			2537	3.43										
Sold as yearlings	Head	58					Total fixed expenses				17509	23.27										
Kept for herd replacement(2)	Head	130					Total cash expenses				137881	185.57										
Bulls	Head	33					OTHER COSTS															
SALES:							Family labor(10)	Hrs	3547	4.06	14399	19.38										
Steer calves	Head	210	435	69.34	63342		Capital replacement (11)	Dol			21790	29.33										
Heifer calves	Head	109	400	60.31	29292		Interest on investment other than land (12)	Dol			63970	86.10										
Yearling steers	Head	89	745	62.40	33663		Land interest (13)	Dol			251692	301.05										
Yearling heifers	Head	58	697	57.03	33055		Total other costs	Dol			457809	435.86										
Cull cows	Head	110	994	34.56	37788		TOTAL ALL COSTS	Dol			457809	616.16										
Total sales					193843	260.89	Return above variable costs	Dol			73471	98.88										
CASH COSTS:							Return over cash costs	Dol			35962	47.52										
National Forest	AM	943.1		1.47	1386	1.87	Return above cash costs and family labor	Dol			41563	55.94										
Bureau of Land Management	AM	745.1		1.47	1099	1.47	Return to total investment (14)	Dol			19773	26.61										
Private pasture lease	AUM	1405.7		0.47	11819	1.91	Return above all costs (15)	Dol			-267879	-360.54										
Other pasture lease (3)	AUM	1170.7		0.47	4388	3.91	Total Forest Service grazing in region	AM	1400254													
State land lease	AUM	403.7		0.47	1438	1.93	Cows in region	Head	1103158													
Irrigated pasture	AUM	349.7		0.47	1588	1.93	Forage Dependency (16)															
Hay produced	TON	1092.6		30.82	33572	48.13	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)			
Hay purchased	TON	258.8		52.39	13559	18.25	National Forest (17)	AM	11.7	10.6	8.7	7.6	60.6	91.7	199.3	201.6	193.7	83.8	62.1	11.7	9.0%	
Total Forage Costs (4)	AUM	13379.0			68937	92.78	Bureau of Land Mgt. (17)	AM	11.4	11.4	8.0	25.4	215.0	209.3	56.5	56.5	52.4	47.0	27.7	12.5	7.2%	
Protein supplement (5)	Ton	15.2		229.80	3493	4.70	Pasture rent/lease (18)	AUM	0.0	0.0	0.0	23.4	195.2	246.1	247.7	248.8	263.2	173.0	4.1	4.5	10.5%	
Grain	Ton	14.1		2.44	34	0.05	State land lease (18)	AUM	3.0	2.7	2.8	17.6	61.3	65.9	68.4	68.7	101.7	11.4	0.0	0.0	3.0%	
Other feed	Ton	0.0		0.00	0	0.00	Deeded rangeland (18)	AUM	28.7	32.8	41.4	83.2	403.2	499.1	551.1	559.4	564.4	352.3	164.7	32.4	23.6%	
Salt and mineral	Cwt	260.2		4.23	1101	1.48	Irrigated pasture (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	20.5	0.0	0.0	0.0%	
							Crop residue (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	359.6	624.6	186.0	0.0	0.0%
							Other pasture lease (18)	AUM	0.0	0.0	0.0	0.0	15.3	16.2	16.0	16.1	15.5	13.0	0.0	0.0	0.0	0.0%
							Hay	Ton	248.3	272.6	295.1	290.7	54.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
							Grain	Ton	2.6	3.1	3.6	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
							Protein supplement	Ton	3.3	3.5	3.1	2.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
							Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Marketing Month:							Marketing Month:															
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.0	0.0	0.0			
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.2	0.0	0.0			
Yearling steers	Head	0.0	0.0	4.5	0.0	0.0	Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.5	0.0	0.1			
Yearling heifers	Head	0.0	0.0	1.6	0.0	0.0	Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3	0.0	0.1			
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.0	0.0	20.4			

For notes, see Table 35

Table 6-- Region 1 sensitivity analysis summary

Typical Ranch Size:
743 Bred Cows
943.1 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent AM/ranch				
0%	0.0	\$14.32	\$70,009	611
25%	235.8	\$11.99	\$72,896	634
50%	471.6	\$10.65	\$75,372	654
75%	707.3	\$9.68	\$78,365	715
90%	848.8	\$9.68	\$78,873	729
100%	943.1	\$7.87	\$79,373	737
110%	1037.4	\$7.19	\$79,928	740
125%	1178.9	\$7.19	\$80,755	746
150%	1414.7	\$7.19	\$82,132	756

1980 to 1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent AM/ranch				
0%	0.0	\$14.55	\$67,636	612
25%	235.8	\$13.12	\$70,630	624
50%	471.6	\$12.94	\$73,401	622
75%	707.3	\$11.40	\$75,896	614
90%	848.8	\$11.40	\$77,300	609
100%	943.1	\$9.49	\$78,173	607
110%	1037.4	\$9.49	\$78,946	610
125%	1178.9	\$6.34	\$79,721	620
150%	1414.7	\$6.34	\$80,869	638

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 2: The Rocky Mountain Region

Most of the Forest Service grazing in region 2 is concentrated in Colorado and Wyoming. The average ranch size in 1979 was large, 594 head of bred cows. This typical ranch is smaller than that of region 1, but uses more FS grazing. Ranches in region 2 sell approximately 40 percent of their steer calves as yearlings. The ranches in region 2 obtain 18.1 percent of their forage from Federal lands: 12.3 percent from Forest Service lands and 5.8 percent from BLM. The ranches in region 2 are less dependent upon hay than those in region 1 (tables 7, 8, and 9).

The LP solutions for optimal herd size are the same for 1986 and 1980-86 average prices, 522 head of bred cows, 72 head fewer than the number of cows in the budgets. The optimal solutions use less rented land than the budgets and purchase no hay. Forest Service grazing is valued at \$3.12/AM given 1986 prices, and \$3.21/AM given 1980-86 average prices. These are the lowest values for Forest Service AM of all the eight regions.

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$6.23/AM based on 1986 prices and \$8.01/AM based on 1980-86 average prices.

The sensitivity analysis shows that the value of FS grazing increases almost five times as its availability drops to zero. The optimal herd size is less sensitive than the value of grazing to changes in FS grazing. FS grazing represents 12 percent of the annual forage supply. Under 1986 prices, eliminating FS grazing decreases the herd by only 9 percent. With 1980-86 average prices, eliminating FS grazing decreases the optimal herd size 12 percent (table 10).

Incorporating longrun variable costs into the LP runs had a significant effect on the optimal solution. Under both 1986 and 1980-86 prices, no FS grazing would be used. The optimal herd sizes are cut to 86 head for 1986 prices and 66 head for 1980-86 prices. Ranchers would be able to pay less than 1 cent per AM for FS grazing under both sets of prices.

TABLE 7

Budget for Typical Region 2 Cow-Calf Ranch
Baseline 1982, ERS (Gee) Budget

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM								
PRODUCTION:							CASH COSTS, continued														
Bred cows (1)	Head	594					Veterinary & med	Dol				3345	5.63								
Annual cow loss	Head	15					Hired trucking	Dol				3131	5.27								
Cows culled	Head	69					Marketing (6)	Dol				1700	2.88								
Calves born alive	Head	536					Hired labor	Hrs	3199		4.22	13502	22.08								
Calves lost birth to weaning	Head	32					Fuel and lubricants	Dol				8302	13.70								
Steer calves weaned	Head	256					Repairs	Dol				8300	13.97								
Sold as weaners	Head	146					Interest on operating capital (9)	Dol	55173.1		0.15	8559	14.41								
Lost after weaning	Head	2					Total variable expenses					107106	180.31								
Sold as yearlings	Head	101					FIXED EXPENSES														
Heifer calves weaned	Head	252					General farm overhead (7)	Dol				4513	7.60								
Sold as weaners	Head	89					Taxes (8)	Dol				4450	7.83								
Lost after weaning	Head	3					Insurance	Dol				3089	5.12								
Sold as yearlings	Head	76					Total fixed expenses					12202	20.54								
Kept for herd replacement(2)	Head	85					Total cash expenses					119308	200.86								
Bulls	Head	28					OTHER COSTS														
Steer calves	Head	149	423	67.80	42734		Family labor(10)	Hrs	4637		4.22	19570	32.95								
Heifer calves	Head	89	392	58.95	20546		Capital replacement (11)	Dol				26229	44.16								
Yearling steers	Head	101	781	60.86	48006		Interest on investment other than land (12)	Dol				58981	99.29								
Yearling heifers	Head	75	676	58.50	29660		Land interest (13)	Dol				224938	378.68								
Cull cows	Head	78	967	36.48	27516		Total other costs	Dol				329718	555.08								
Total sales					168482	283.64	TOTAL ALL COSTS	Dol				448859	755.65								
CASH COSTS:							Return above variable costs	Dol				61376	103.33								
National Forest	AM	1006.5		1.86	1872	3.15	Return over cash costs	Dol				49174	82.77								
Bureau of Land Management	AM	509.4		1.86	949	1.60	Return above cash costs and family labor	Dol				29604	49.84								
Private pasture lease	AUM	747.9		9.90	7404	12.47	Return to total investment (14)	Dol				3375	5.68								
Other pasture lease (3)	AUM	515.6		1.29	665	1.12	Return above all costs (15)	Dol				-280544	-472.30								
State land lease	AUM	172.7		1.56	269	0.45	Total Forest Service grazing in region	AM	2170567												
Irrigated pasture	AUM	342.0		4.48	1532	2.58	Cows in region	Head	1280990												
Hay produced	TON	784.8		39.48	30984	52.16	Feed source:														
Hay purchased	TON	165.3		66.06	10920	18.38	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)		
Total Forage Costs (4)	AUM	10766.5			54594	91.91	National Forest (17)	AM	0.2	0.2	0.1	0.0	29.3	134.5	238.9	247.8	236.4	107.1	11.5	0.5	12.33
Protein supplement (5)	Ton	32.1		207.17	6650	11.20	Bureau of Land Mgt. (17)	AM	25.7	25.5	25.5	35.6	72.3	72.4	55.3	54.3	33.9	26.8	28.8	5.82	
Grain	Bu	12.3		2.60	32	0.05	Pasture rent/lease (18)	AUM	7.3	10.9	15.7	23.6	96.9	111.8	108.2	110.6	111.9	82.5	54.9	13.6	6.92
Other feed	Ton	0.0		0.00	0	0.00	State land lease (18)	AUM	1.4	1.5	1.7	3.4	27.7	29.0	27.5	27.8	26.0	18.8	6.2	1.7	1.62
Salt and mineral	Cwt	208.8		4.44	928	1.56	Deeded rangeland (18)	AUM	41.4	68.8	93.2	204.3	525.6	594.3	489.3	500.1	484.4	411.6	295.4	167.6	36.02
Feed source:							Irrigated pasture (18)	AUM	0.0	0.0	0.0	0.0	36.0	51.5	57.5	49.5	39.8	47.0	30.5	30.5	3.22
Protein supplement (5)	Ton	32.1		207.17	6650	11.20	Crop residue (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	138.8	262.3	108.1	4.82
Grain	Bu	12.3		2.60	32	0.05	Other pasture lease (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Other feed	Ton	0.0		0.00	0	0.00	Hay	TON	188.4	200.4	208.3	186.6	47.0	0.0	0.0	0.0	0.0	0.0	9.5	109.9	29.42
Salt and mineral	Cwt	208.8		4.44	928	1.56	Grain	Bu	1.8	1.9	2.0	2.0	1.9	0.0	0.0	0.0	0.0	1.0	1.0	1.6	0.02
Marketing Month:							Protein supplement	Ton	6.5	6.5	6.5	5.6	1.7	0.0	0.0	0.0	0.0	0.0	1.3	4.5	0.00
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	Marketing Month:														
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.2	70.3	33.7			
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.7	44.0	18.4			
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	75.1	5.5			
Marketing Month:							Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	65.9	11.0			
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	22.0	46.8	0.5				

For notes, see Table 35

16

TABLE 8

Budget for Typical Region 2 Cow-Calf Ranch
Updated to 1986 Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM					
PRODUCTION:							CASH COSTS, continued											
Bred cows (1)	Head	594					Veterinary & med	Dol			3740	6.30						
Annual cow loss	Head	15					Hired trucking	Dol			3271	5.51						
Cows culled	Head	69					Marketing (6)	Dol			1937	3.26						
Calves born alive	Head	536					Hired labor	Hrs	3199	4.67	14940	25.15						
Calves lost birth to weaning	Head	32					Fuel and lubricants	Dol			3322	5.59						
Steer calves weaned	Head	252					Repairs	Dol			8739	14.71						
Sold as weaners	Head	149					Interest on operating capital (9)	Dol	55173.1	0.12	6983	11.76						
Lost after weaning	Head	2					Total variable expenses				97360	163.91						
Sold as yearlings	Head	101					FIXED EXPENSES											
Weifer calves weaned	Head	252					General farm overhead (7)	Dol			4169	7.02						
Sold as weaners	Head	89					Taxes (8)	Dol			4034	6.79						
Lost after weaning	Head	3					Insurance	Dol			2636	4.44						
Sold as yearlings	Head	76					Total fixed expenses				10839	18.25						
Kept for herd replacement(2)	Head	85					Total cash expenses				108199	182.15						
Bulls	Head	28					OTHER COSTS											
SALES:							Family labor(10)	Hrs	4637	4.67	21656	36.46						
Steer calves	Head	149	423	69.64	43992		Capital replacement (11)	Dol			25610	43.11						
Weifer calves	Head	89	392	61.11	21320		Interest on investment other than land (12)	Dol			48123	81.02						
Yearling steers	Head	101	781	58.49	46137		Land interest (13)	Dol			183527	308.97						
Yearling heifers	Head	75	676	57.18	28990		Total other costs	Dol			279916	469.56						
Cull cows	Head	78	967	34.67	26150		TOTAL ALL COSTS	Dol			386988	651.49						
Total sales					166489	280.28	Return above variable costs											
CASH COSTS:							Return over cash costs	Dol			69129	116.38						
National Forest	AM	1006.5		1.35	1359	2.29	Return above cash costs and family labor	Dol			58290	98.13						
Bureau of Land Management	AM	509.6		1.35	688	1.16	Return to total investment (14)	Dol			11024	18.56						
Private pasture lease	ALN	747.9		8.40	6282	10.58	Return above all costs (15)	Dol			-220626	-371.42						
Other pasture lease (3)	ALN	515.6		1.09	562	0.92	Total Forest Service grazing in region	AM	2170567									
State land lease	ALN	173.7		1.19	206	0.35	Cows in region	Head	1280990									
Irrigated pasture	ALN	342.0		3.80	1300	2.19	Forage Dependency (16)											
Hay produced	TON	784.8		32.22	27115	45.65	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Hay purchased	TON	165.3		57.82	9558	16.09	0.2	0.2	0.1	0.0	29.3	134.5	238.0	247.8	236.4	107.1	11.5	0.5
Total Forage Costs (4)	ALN	10766.5			47068	79.24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Protein supplement (5)	TON	32.1		197.21	6330	10.66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grain	BU	10.0		2.30	28	0.46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other feed	TON	0.0		0.00	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salt and mineral	CRT	208.8		4.80	1002	1.69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feed source:																		
National Forest (17)	AM	0.2		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bureau of Land Mgt. (17)	AM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture rent/lease (18)	ALN	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
State land lease (18)	ALN	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deeded rangeland (18)	ALN	4.1		66.1	270	65.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated pasture (18)	ALN	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crop residue (18)	ALN	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other pasture lease (18)	ALN	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hay	TON	188.0		20.0	3760	64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grain	BU	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Protein supplement	TON	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other feed	TON	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marketing Month:																		
Steer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Weifer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yearling steers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yearling heifers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cull cows	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

For notes, see Table 35

17

TABLE 9

Budget for Typical Region 2 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COU	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COU								
PRODUCTION:							CASH COSTS, continued														
Bred cows (1)	Head	594					Veterinary & med	Dol			3365	5.66									
Annual cow loss	Head	15					Hired trucking	Dol			3075	5.18									
Cows culled	Head	69					Marketing (6)	Dol			1717	2.89									
Calves born alive	Head	536					Hired labor	Hrs	3199	4.27	13678	23.03									
Calves lost birth to weaning	Head	32					Fuel and lubricants	Dol			5468	9.21									
Steer calves weaned	Head	252					Repairs	Dol			8209	13.82									
Sold as weaners	Head	149					Interest on operating capital (9)	Dol	55173.1	0.14	8020	13.50									
Lost after weaning	Head	2					Total variable expenses				100952	169.95									
Sold as yearlings	Head	101					FIXED EXPENSES														
Heifer calves weaned	Head	252					General farm overhead (7)	Dol			4612	7.76									
Sold as weaners	Head	89					Taxes (8)	Dol			4473	7.53									
Lost after weaning	Head	3					Insurance	Dol			2924	4.92									
Sold as yearlings	Head	76					Total fixed expenses				12009	20.22									
Kept for herd replacement(2)	Head	85					Total cash expenses				112961	190.17									
Bulls	Head	28					OTHER COSTS														
SALES:							Family labor(10)	Hrs	4637	4.27	19801	33.34									
Steer calves	Head	149	423	69.49	43797		Capital replacement (11)	Dol			25206	42.43									
Heifer calves	Head	89	392	59.66	20814		Interest on investment other than land (12)	Dol			55265	93.06									
Yearling steers	Head	101	781	60.07	47384		Land interest (13)	Dol			210767	354.83									
Yearling heifers	Head	75	676	57.04	28919		Total other costs	Dol			311039	523.63									
Cull cows	Head	78	967	36.01	27161		TOTAL ALL COSTS	Dol			423821	713.50									
Total sales					168075	282.95	Return above variable costs	Dol			67123	113.00									
CASH COSTS:							Return over cash costs	Dol			55114	92.79									
National Forest	AM	1006.5		1.47	1480	2.49	Return above cash costs and family labor	Dol			35313	59.45									
Bureau of Land Management	AM	509.4		1.47	749	1.26	Return to total investment (14)	Dol			10107	17.02									
Private pasture lease	ALUM	747.9		9.41	7038	11.85	Return above all costs (15)	Dol			-255925	-430.85									
Other pasture lease (3)	ALUM	515.6		1.23	634	1.07	Total Forest Service grazing in region	AM	2170567												
State land lease	ALUM	172.7		1.41	244	0.41	Cows in region	Head	1280990												
Irrigated pasture	ALUM	342.0		4.26	1457	2.45	Feed source:														
Hay produced	TON	784.8		36.24	28441	47.88	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)		
Hay purchased	TON	165.3		60.64	10024	16.88	0.2	0.2	0.1	0.0	29.3	134.5	238.9	247.8	236.4	107.1	11.5	0.5	12.3%		
Total Forage Costs (4)							ALUM	10766.5			50066	84.29	72.4	55.3	53.3	54.3	33.9	29.8	28.8	5.8%	
Protein supplement (5)	Ton	32.1		199.30	6398	10.77	7.3	10.9	15.7	23.6	96.9	111.8	108.2	110.6	111.9	82.5	54.9	13.6	6.9%		
Grain	Bu	12.3		2.98	37	0.06	1.4	1.2	1.7	3.4	27.7	29.0	27.8	26.0	18.8	6.2	6.2	1.7	1.6%		
Other feed	Ton	0.0		0.00	0	0.00	41.4	68.8	93.2	204.3	525.6	594.3	489.2	500.1	484.4	411.6	295.6	167.6	36.0%		
Salt and mineral	Cwt	208.8		4.40	919	1.55	0.0	0.0	0.0	0.0	36.0	51.5	57.5	49.5	39.8	47.0	30.6	30.5	3.2%		
Protein supplement (5)							ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	6.4	138.8	262.3	108.1	0.0	4.8%
Grain	Bu	1.8		1.2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%		
Other feed	Ton	6.2		6.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.6	0.0%		
Salt and mineral	Ton	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	4.5	0.0%		
Marketing Month:							ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Steer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.2	70.3	33.7			
Heifer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.7	44.0	18.4			
Yearling steers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	72.1	5.5	0.0			
Yearling heifers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	62.9	11.0	0.0			
Cull cows	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	46.8	0.5	0.0			

For notes, see Table 35

18

Table 10--Region 2 sensitivity analysis summary

Typical Ranch Size:

5% Bred Cows
1006.5 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$14.73	\$57,671	480
25%	251.6	\$14.73	\$61,036	480
50%	503.3	\$14.73	\$64,402	480
75%	754.9	\$11.54	\$67,539	515
90%	905.9	\$5.33	\$68,738	513
100%	1006.5	\$3.12	\$69,026	522
110%	1107.2	\$3.12	\$69,204	523
125%	1258.1	\$2.42	\$69,399	531
150%	1509.8	\$2.42	\$69,652	552

1980 to 1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$15.28	\$56,007	460
25%	251.6	\$15.28	\$59,483	468
50%	503.3	\$15.13	\$63,009	480
75%	754.9	\$15.13	\$66,675	498
90%	905.9	\$3.88	\$67,814	513
100%	1006.5	\$3.21	\$68,023	522
110%	1107.2	\$3.21	\$68,198	523
125%	1258.1	\$1.62	\$68,309	531
150%	1509.8	\$1.62	\$68,347	553

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 3: The Southwestern Region

The typical ranch size in Forest Service region 3 in 1979 was large, 534 head of bred cows. The ranches in region 3 sell most of their calves as weaners. The ranches in region 3 are highly dependent on Federal grazing. They obtain 45.6 percent of their forage from Forest Service lands, and 8.6 percent from BLM. Grazing is available year round, and the ranches in region 3 depend on hay for only 3.7 percent of their forage (tables 11, 12, and 13).

FS grazing is available year round in region 3. The permitted AM's are highest in September and lowest in April. Compared with other regions, however, the availability of Forest Service grazing is relatively uniform throughout the year.

The LP solutions for optimal herd size are the same for 1986 and 1980-86 average prices: 479 head of bred cows. This is 55 head less than the number of cattle in the budgets. The optimal solutions use less rented land than the budgets and purchase no hay. Forest Service grazing is valued at \$8.83/AM given 1986 prices, and \$9.01/AM given 1980-86 average prices (table 14).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$12.07/AM based on 1986 prices and \$12.84/AM based on 1980-86 average prices.

Of all the regions, region 3 shows the least variability in the value of Forest Service grazing at differing levels of availability. Between 0 and 150 percent availability, the value of Forest Service grazing declines by less than \$1.00 for both sets of prices. The value of Forest Service grazing may be less sensitive to changes in availability because of the uniform supply of forage from other sources throughout the year.

Adding longrun variable costs to the LP problem changes the optimal solutions dramatically. Given 1986 prices, the optimal number of cows is 141, and no Forest Service grazing is used. If the grazing fee is eliminated, all the Forest Service grazing is used and the optimal number of cows increases to 365. Forest Service grazing has a longrun value of less than 1 cent per AM.

Under 1980-86 prices and longrun variable costs, no Forest Service grazing is used. No cattle are raised at all. Forest Service grazing has no value.

TABLE 11

Budget for Typical Region 3
Baseline 1982, ERS

Cow-Calf Ranch
(See) Budget

PRODUCTION:					CASH COSTS, continued										
ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM		
Bred cows (1)	Head	534					Veterinary & med	Dol				1263	2.37		
Annual cow loss	Head	17					Hired trucking	Dol				1500	5.58		
Cows culled	Head	54					Marketing (6)	Dol				1224	5.33		
Calves born alive	Head	436					Hired labor	Hrs	3362		4.82	16202	30.34		
Calves lost birth to weaning	Head	30					Fuel and lubricants	Dol				5454	10.03		
Steer calves weaned	Head	203					Repairs	Dol				4590	8.60		
Sold as weaners	Head	161					Interest on operating capital (9)	Dol	28580.0		0.15	4313	8.08		
Lost after weaning	Head	1					Total variable expenses					62143	116.37		
Sold as yearlings	Head	41					FIXED EXPENSES								
Heifer calves weaned	Head	203					General farm overhead (7)	Dol				3882	7.27		
Sold as weaners	Head	97					Taxes (8)	Dol				3724	5.10		
Lost after weaning	Head	2					Insurance	Dol				4456	4.54		
Sold as yearlings	Head	33					Total fixed expenses					6033	16.91		
Kept for herd replacement(2)	Head	71					Total cash expenses					71175	133.29		
Bulls	Head	39					OTHER COSTS								
SALES:							Family labor(10)	Hrs	2023		4.82	9742	18.24		
Steer calves	Head	161	405	67.77	44190		Capital replacement (11)	Dol				19863	37.20		
Heifer calves	Head	97	368	57.17	20409		Interest on investment other than land (12)	Dol				52184	97.72		
Yearling steers	Head	41	614	61.96	15598		Land interest (13)	Dol				137618	257.71		
Yearling heifers	Head	33	645	65.16	13869		Total other costs	Dol				219407	410.87		
Cull cows	Head	54	874	37.25	17581		TOTAL ALL COSTS	Dol				290629	544.25		
Total sales					111647	209.08	Return above variable costs	Dol				49504	92.71		
CASH COSTS:							Return over cash costs	Dol				40472	75.79		
National Forest	AM	3622.2		1.86	6737	12.62	Return above cash costs and family labor	Dol				30730	57.55		
Bureau of Land Management	AM	626.4		1.86	1225	6.43	Return to total investment (14)	Dol				10867	20.35		
Private pasture lease	AUM	597.0		6.26	3737	7.00	Return above all costs (15)	Dol				-178935	-335.08		
Other pasture lease (3)	AUM	18.1		0.00	0	0.00	Total Forest Service grazing in region	AM	2437298						
State land lease	AUM	389.5		1.20	467	0.88	Cows in region	Head	359317						
Irrigated pasture	AUM	0.0		0.00	0	0.00									
Hay produced	TON	36.3		37.67	1373	6.27									
Hay purchased	TON	67.3		75.80	5101	9.55									
Total Forage Costs (4)	AUM	9264.1			18714	35.04									
Protein supplement (5)	Ton	33.3		243.21	8099	15.17									
Grain	Bu	0.0		0.00	0	0.00									
Other feed	Ton	0.0		0.00	0	0.00									
Salt and mineral	Cwt	187.2		5.25	982	1.84									
Feed source:			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
National Forest (17)	AM	282.7	278.0	271.8	237.1	267.3	340.7	351.0	352.0	357.3	308.8	288.1	287.4	45.63	
Bureau of Land Mgt. (17)	AM	68.8	73.7	77.1	51.3	33.4	22.4	23.1	23.0	23.0	24.2	24.2	24.2	8.63	
Pasture rent/lease (18)	AUM	26.4	29.4	31.7	41.3	46.0	52.3	53.8	53.8	53.8	47.0	41.3	41.3	6.42	
State land lease (18)	AUM	14.4	16.1	17.4	21.3	23.5	26.3	27.6	28.0	27.0	26.0	25.0	24.6	4.24	
Deeded rangeland (18)	AUM	171.6	188.0	207.1	322.5	381.6	464.8	493.9	493.9	493.9	448.8	417.6	417.6	30.85	
Irrigated pasture (18)	AUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Crop residue (18)	AUM	1.1	0.6	1.0	1.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.24	
Other pasture lease (18)	AUM	0.8	0.6	0.9	1.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.42	
Hay	TON	12.8	13.2	12.9	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	26.4	30.9	
Grain	Bu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Protein supplement	Ton	8.4	8.0	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Marketing Month:															
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	133.6	30.1	0.0	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.0	16.9	0.0	
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	1.4	0.0	
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	1.8	0.0	
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.1	9.4	0.0	

For notes, see Table 35

TABLE 12

Budget for Typical Region 3 Cow-Calf Ranch
Updated to 1986 Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM						
PRODUCTION:							CASH COSTS, continued												
Bred cows (1)	Head	534					Veterinary & med	Dol			1412	2.66							
Annual cow loss	Head	17					Hired trucking	Dol			1445	2.70							
Cows culled	Head	54					Marketing (6)	Dol			1420	2.66							
Calves born alive	Head	436					Hired labor	Hrs	3362	5.33	17917	33.55							
Calves lost birth to weaning	Head	30					Fuel and lubricants	Dol			2704	5.08							
Steer calves weaned	Head	203					Repairs	Dol			4633	8.65							
Sold as weaners	Head	161					Interest on operating capital (9)	Dol	28580.0	0.12	3519	6.59							
Lost after weaning	Head	1					Total variable expenses				57136	107.00							
Sold as yearlings	Head	41					FIXED EXPENSES												
Heifer calves weaned	Head	203					General farm overhead (7)	Dol			3506	6.72							
Sold as weaners	Head	97					Taxes (8)	Dol			3523	6.43							
Lost after weaning	Head	2					Insurance	Dol			3105	5.74							
Sold as yearlings	Head	33					Total fixed expenses				8054	15.08							
Kept for herd replacement(2)	Head	71					Total cash expenses				65190	122.08							
Bulls	Head	39					OTHER COSTS												
SALES:							Family labor(10)	Hrs	2023	5.33	10783	20.19							
Steer calves	Head	161	405	69.61	45389		Capital replacement (11)	Dol			19394	36.32							
Heifer calves	Head	97	348	59.26	21153		Interest on investment other than land (12)	Dol			42577	79.73							
Yearling steers	Head	41	614	59.54	14989		Land interest (13)	Dol			112283	210.27							
Yearling heifers	Head	33	645	63.69	13556		Total other costs	Dol			185037	346.51							
Cull cows	Head	54	874	35.40	16707		TOTAL ALL COSTS	Dol			250268	468.67							
Total sales					111794	209.35	Return above variable costs	Dol			54658	102.36							
CASH COSTS:							Return over cash costs	Dol			42604	87.27							
National Forest	AM	3622.2		1.35	4890	9.16	Return above cash costs and family labor	Dol			35821	67.08							
Bureau of Land Management	AM	696.4		1.35	940	1.76	Return to total investment (14)	Dol			16427	30.76							
Private pasture lease	AUM	597.0		5.31	3170	5.94	Return above all costs (15)	Dol			-138433	-259.24							
Other pasture lease (3)	AUM	18.1		0.00	0	0.00	Total Forest Service grazing in region	AM	2437298										
State land lease	AUM	389.5		0.92	358	0.67	Cows in region	Head	359317										
Irrigated pasture	AUM	0.0		0.00	0	0.00	Feed source:												
Hay produced	TON	36.2		32.97	1203	2.25	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
Hay purchased	TON	67.3		66.34	4465	8.36	292.7	278.0	271.8	237.1	267.3	340.7	351.0	352.0	357.3	308.8	288.1	287.4	45.6%
Total Forage Costs (4)	AUM	9264.1			15027	28.14	68.8	73.3	77.1	50.3	73.4	53.4	53.1	52.8	54.9	54.9	51.8	54.2	8.6%
Protein supplement (5)	Ton	33.3		231.51	7709	14.44	26.4	29.4	31.7	41.5	46.0	92.3	103.8	106.0	47.9	47.3	11.3	13.4	6.4%
Grain	Bu	0.0		0.00	0	0.00	14.4	16.1	17.4	23.4	26.6	26.3	27.2	28.3	69.7	69.7	30.6	32.0	6.2%
Other feed	Ton	0.0		0.00	0	0.00	171.6	188.6	207.1	322.2	381.3	264.8	253.7	260.8	250.8	248.8	147.6	160.2	30.8%
Salt and mineral	Cwt	187.2		5.68	1063	1.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%

For notes, see Table 35

22

TABLE 13

Budget for Typical Region 3 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

PRODUCTION:					CASH COSTS, continued										
ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM		
Bred cows (1)	Head	534					Veterinary & med	Dol				1271	2.38		
Annual cow loss	Head	17					Hired trucking	Dol				1355	2.52		
Cows culled	Head	54					Marketing (6)	Dol				1258	2.36		
Calves born alive	Head	436					Hired labor	Hrs	3362		4.88	16413	30.74		
Calves lost birth to weaning	Head	30					Fuel and lubricants	Dol				4599	8.61		
Steer calves weaned	Head	203					Repairs	Dol				4540	8.50		
Sold as weaners	Head	161					Interest on operating capital (9)	Dol	28580.0		0.14	4041	7.57		
Lost after weaning	Head	1					Total variable expenses					58511	109.57		
Sold as yearlings	Head	41					FIXED EXPENSES								
Heifer calves weaned	Head	203					General farm overhead (7)	Dol				3967	7.43		
Sold as weaners	Head	97					Taxes (8)	Dol				4920	9.21		
Lost after weaning	Head	2					Insurance	Dol				2324	4.37		
Sold as yearlings	Head	33					Total fixed expenses					8921	16.71		
Kept for herd replacement(2)	Head	71					Total cash expenses					67432	126.26		
Bulls	Head	39					OTHER COSTS								
SALES:							Family labor(10)	Hrs	2023		4.88	9872	18.49		
Steer calves	Head	161	405	69.46	45291		Capital replacement (11)	Dol				19088	35.75		
Heifer calves	Head	97	368	57.86	20654		Interest on investment other than land (12)	Dol				4896	91.57		
Yearling steers	Head	41	614	61.15	15364		Land interest (13)	Dol				12948	241.48		
Yearling heifers	Head	33	645	63.53	13522		Total other costs	Dol				20504	387.27		
Cull cows	Head	54	874	36.77	17354		TOTAL ALL COSTS	Dol				274279	513.63		
Total sales					112215	210.14	Return above variable costs	Dol				53704	100.57		
CASH COSTS:							Return over cash costs	Dol				44783	83.86		
National Forest	AM	3622.2		1.47	5325	9.97	Return above cash costs and family labor	Dol				34911	65.38		
Bureau of Land Management	AM	626.4		1.47	1024	1.92	Return to total investment (14)	Dol				15823	29.63		
Private pasture lease	AM	597.0		0.95	3552	6.65	Return above all costs (15)	Dol				-162021	-303.41		
Other pasture lease (3)	AM	18.1		0.00	0	0.00	Total Forest Service grazing in region	AM	2437298						
State land lease	AM	389.2		1.09	425	0.80	Cows in region	Head	359317						
Irrigated pasture	AM	0.0		0.00	0	0.00									
Hay produced	TON	29.3		34.58	1269	2.36									
Hay purchased	TON	67.3		69.58	4683	8.77									
Total Forage Costs (4)	AM	9264.1			16270	30.47									
Protein supplement (5)	Ton	33.3		233.97	7791	14.59									
Grain	Bu	0.0		0.00	0	0.00									
Other feed	Ton	0.0		0.00	0	0.00									
Salt and mineral	Cwt	187.2		5.20	973	1.82									
Feed source:			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
National Forest (17)	AM	282.7	278.0	271.8	237.1	267.3	340.7	351.0	352.0	357.3	308.8	288.1	287.4	45.6%	
Bureau of Land Mgt. (17)	AM	68.8	70.2	71.1	50.7	53.6	92.4	92.1	92.0	92.0	79.0	71.0	51.0	8.6%	
Pasture rent/lease (18)	AM	26.4	27.2	27.7	21.5	22.0	32.4	32.1	32.0	32.0	27.3	24.7	24.2	6.4%	
State land lease (18)	AM	16.4	16.1	17.4	21.2	22.0	26.2	25.9	26.0	26.0	22.5	19.7	13.4	6.4%	
Deeded rangeland (18)	AM	171.2	186.1	207.1	322.3	381.0	260.0	251.9	260.0	250.0	248.0	147.0	160.2	30.8%	
Irrigated pasture (18)	AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Crop residue (18)	AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Other pasture lease (18)	AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Hay	TON	12.8	13.2	12.7	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Grain	Bu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Protein supplement	Ton	8.4	8.0	8.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Marketing Month:															
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	133.6	30.1	0.0	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.0	16.9	0.0	
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	1.9	0.0	
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	1.9	0.0	
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.1	9.4	0.0	

For notes, see Table 35

23

Table 14--Region 3 sensitivity analysis summary

Typical Ranch Size:
534 Bred Cows
3622.2 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent	AM/ranch			
0%	0.0	\$9.22	\$29,793	264
25%	905.6	\$8.88	\$36,650	319
50%	1811.1	\$8.88	\$43,471	372
75%	2716.7	\$8.88	\$50,293	425
90%	3260.0	\$8.83	\$54,365	457
100%	3622.2	\$8.83	\$57,079	479
110%	3984.4	\$8.68	\$59,774	500
125%	4527.8	\$8.44	\$63,638	535
150%	5433.3	\$8.44	\$70,047	592

1980 to 1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent	AM/ranch			
0%	0.0	\$9.28	\$29,413	264
25%	905.6	\$9.07	\$36,280	319
50%	1811.1	\$9.07	\$43,135	372
75%	2716.7	\$9.07	\$49,989	425
90%	3260.0	\$9.01	\$54,166	457
100%	3622.2	\$9.01	\$56,898	478
110%	3984.4	\$8.74	\$59,602	500
125%	4527.8	\$8.50	\$63,438	535
150%	5433.3	\$8.50	\$69,799	592

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 4: The Intermountain Region

The typical ranch size in region 4 in 1979 was relatively small, 216 head of bred cows. The ranches in region 4 sell most of their calves as weaners. The ranches in region 4 are not as dependent on Federal land as those in region 3. They obtain 12.5 percent of their forage from the Forest Service and 15.4 percent from BLM. This is the only region where Forest Service permittees are more dependent on BLM grazing than Forest Service grazing. Little grazing is available in the winter; consequently, ranches in region 4 depend on hay for 29 percent of their forage. Forest Service grazing is in greatest supply in the summer and early fall, June-October (tables 15, 16, and 17).

The LP solutions for optimal herd size are the same for 1986 and 1980-86 average prices: 189 head of bred cows, fewer than the number of cattle in the budgets. The optimal solutions use less rented land than the budgets and purchase no hay. Forest Service grazing is valued at \$4.71/AM given 1986 prices, and \$5.48/AM given 1980-86 average prices (table 18).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$5.31/AM based on 1986 prices and \$5.59/AM based on 1980-86 average prices.

The optimal size of the cow herd is relatively insensitive to changes in the availability of Forest Service grazing. Under both sets of prices, eliminating Forest Service grazing, which accounts for over 12 percent of the forage supply, reduces the optimal cow herd by 10 percent. As Forest Service availability declines, the optimal solution adds more rented land and hay to offset some of the loss. Under both 1986 and 1980-86 prices, increasing Forest Service grazing availability by 25 percent above current authorized use decreases the optimal cow herd.

The value of Forest Service grazing is very sensitive to changes in the supply of forage. Decreasing the forage availability from 75 to 50 percent has a large effect on the value of forage in both cases. The maximum ability to pay increases from \$4.74/AM to \$13.94/AM with 1986 prices. The maximum ability to pay increases from \$5.51/AM to 14.24/AM with 1980-86 average prices. Decreasing the availability of Forest Service grazing below 75 percent of the current allotment causes a critical shortage of summer and fall grazing. This shortage makes Forest Service grazing more valuable.

Just as in region 2, adding longrun variable costs to the LP causes the optimal cow herd to drop and Forest Service grazing to be abandoned. The cow herd drops to 29 head for 1986 prices and 9 head for 1980-86 prices. The value of Forest Service grazing drops to less than 1 cent per AM. If the Forest Service grazing fee is eliminated, all Forest Service grazing available will be used. However, the optimal cow herd does not increase significantly.

TABLE 16

Budget for Typical Region 4 Cow-Calf Ranch
Updated to 1986 Prices

PRODUCTION:					CASH COSTS, continued										
ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW		
Bred cows (1)	Head	216					Veterinary & med	Dol				1412	6.54		
Annual cow loss	Head	8					Hired trucking	Dol				568	2.63		
Cows culled	Head	24					Marketing (6)	Dol				286	1.33		
Calves born alive	Head	191					Hired labor	Hrs	1317		4.63	6099	28.24		
Calves lost birth to weaning	Head	11					Fuel and lubricants	Dol				1425	6.60		
Steer calves weaned	Head	89					Repairs	Dol				3138	14.53		
Sold as weaners	Head	59					Interest on operating capital (9)	Dol	15773.8		0.12	2018	9.34		
Lost after weaning	Head	1					Total variable expenses					32664	151.22		
Sold as yearlings	Head	30					FIXED EXPENSES								
Heifer calves weaned	Head	90					General farm overhead (7)	Dol				2250	10.42		
Sold as weaners	Head	34					Taxes (8)	Dol				1649	7.63		
Lost after weaning	Head	1					Insurance	Dol				866	4.01		
Sold as yearlings	Head	22					Total fixed expenses					4765	22.06		
Kept for herd replacement(2)	Head	32					Total cash expenses					37429	173.28		
Bulls	Head	9					OTHER COSTS								
SALES:							Family labor(10)	Hrs	1414		4.63	6548	30.31		
Steer calves	Head	59	417	68.18	16780		Capital replacement (11)	Dol				7845	36.32		
Heifer calves	Head	34	385	58.22	7629		Interest on investment other than land (12)	Dol				15836	73.31		
Yearling steers	Head	30	693	60.22	12520		Land interest (13)	Dol				65404	302.79		
Yearling heifers	Head	22	644	54.80	7762		Total other costs	Dol				95432	442.74		
Cull cows	Head	24	951	34.39	7849		TOTAL ALL COSTS	Dol				133061	616.02		
Total sales					52540	243.24	Return above variable costs	Dol				19876	92.02		
CASH COSTS:							Return over cash costs	Dol				15111	69.96		
National Forest	AM	373.8		1.35	505	2.34	Return above cash costs and family labor	Dol				8563	39.64		
Bureau of Land Management	AM	509.8		1.35	686	3.18	Return to total investment (14)	Dol				718	3.32		
Private pasture lease	ALUM	206.3		6.09	1257	5.82	Return above all costs (15)	Dol				-80521	-372.78		
Other pasture lease (3)	ALUM	192.3		0.00	0	0.00	Total Forest Service grazing in region	AM	23564.68						
State land lease	ALUM	91.0		3.01	274	1.27	Cows in region	Head	1361584						
Irrigated pasture	ALUM	142.8		3.10	443	2.08									
Hay produced	TON	293.0		30.03	8793	41.48									
Hay purchased	TON	54.0		50.61	2733	12.65									
Total Forage Costs (4)	ALUM	3960.3			15433	71.45									
Protein supplement (5)	Ton	6.7		188.33	1271	5.88									
Grain	Bu	0.0		0.00	0	0.00									
Other feed	Ton	0.0		0.00	0	0.00									
Salt and mineral	Cwt	118.6		5.18	614	2.84									
Feed source:			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
National Forest (17)	AM	0.8	0.9	0.8	0.6	3.7	54.4	82.2	96.0	89.4	31.7	1.6	0.0	0.0	12.5%
Bureau of Land Mgt. (17)	AM	24.8	22.1	23.8	40.6	71.7	53.9	26.7	26.0	27.4	12.7	48.4	29.2	29.2	16.2%
Pasture rent/lease (18)	ALUM	1.0	1.1	1.4	4.7	11.1	50.1	24.8	26.7	26.3	12.8	10.4	0.0	0.0	3.2%
State land lease (18)	ALUM	0.0	0.0	8.6	10.1	18.5	17.8	15.1	5.3	16.3	9.7	10.2	0.0	0.0	2.7%
Decided rangeland (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Irrigated pasture (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Hay	TON	70.2	77.0	68.7	60.3	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.2%
Grain	Bu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Protein supplement	Ton	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:															
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.9	37.6	0.0	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	22.2	0.0	
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	1.4	0.0	
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	4.6	5.9	12.9	0.3	

For notes, see Table 35

TABLE 17

Budget for Typical Region 4 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM						
PRODUCTION:							CASH COSTS, continued												
Bred cows (1)	Head	216					Veterinary & med	Dol			1270	5.88							
Annual cow loss	Head	24					Hired trucking	Dol			238	5.47							
Cows culled	Head	24					Marketing (6)	Dol			238	5.47							
Calves born alive	Head	191					Hired labor	Hrs	1317	4.24	5623	12.86							
Calves lost birth to weaning	Head	11					Fuel and lubricants	Dol			2947	13.66							
Steer calves weaned	Head	89					Repairs	Dol			2947	13.66							
Sold as weaners	Head	59					Interest on operating capital (9)	Dol	17197.0	0.14	2550	11.81							
Lost after weaning	Head	30					Total variable expenses				34094	157.84							
Sold as yearlings	Head	30					FIXED EXPENSES												
Heifer calves weaned	Head	30					General farm overhead (7)	Dol			2690	11.53							
Sold as weaners	Head	34					Taxes (8)	Dol			1828	8.47							
Lost after weaning	Head	1					Insurance	Dol			290	1.32							
Sold as yearlings	Head	23					Total fixed expenses				5208	24.12							
Kept for herd replacement(2)	Head	35					Total cash expenses				39372	182.28							
Bulls	Head	9					OTHER COSTS												
SALES:							Family labor(10)	Hrs	1414	4.24	5996	27.76							
Steer calves	Head	59	417	68.03	16744		Capital replacement (11)	Dol			7721	35.74							
Heifer calves	Head	34	385	79.84	7448		Interest on investment other than land (12)	Dol			18886	87.44							
Yearling steers	Head	30	293	61.85	12859		Land interest (13)	Dol			81288	387.72							
Yearling heifers	Head	35	644	77.43	7743		Total other costs	Dol			81288	387.72							
Cull cows	Head	24	951	35.57	8151		TOTAL ALL COSTS	Dol			133524	618.16							
Total sales					52945	245.12	Return above variable costs												
CASH COSTS:							Return over cash costs	Dol			18851	87.27							
National Forest	AM	373.8		1.47	550	2.54	Return above cash costs and family labor	Dol			15575	62.84							
Bureau of Land Management	AM	208.3		1.47	747	6.42	Return to total investment (14)	Dol			-144	-0.67							
Private pasture lease	ALUM	202.3		6.83	1409	2.52	Return above all costs (15)	Dol			-80314	-371.82							
Other pasture lease (3)	ALUM	192.5		0.00	0	0.00	Total Forest Service grazing in region	AM	2356468										
State land lease	ALUM	91.0		2.57	325	1.51	Cows in region	Head	1361584										
Irrigated pasture	ALUM	142.8		7.60	657	3.04	Feed source:												
Hay produced	TON	293.3		33.59	9852	45.61	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
Hay purchased	TON	54.0		53.08	2866	13.27	0.8	0.9	0.8	0.6	3.7	54.4	93.2	96.0	89.4	31.7	1.6	0.9	12.58
Total Forage Costs (4)	ALUM	3960.3			16406	75.95	24.3	22.1	25.3	40.6	71.5	63.9	49.4	44.0	44.7	42.8	48.4	29.2	15.48
Protein supplement (5)							1.0	1.1	1.4	4.7	35.6	50.1	25.8	26.7	26.5	22.7	9.4	1.6	5.28
Grain	Bu	0.0		0.00	0	0.00	0.0	0.0	8.6	10.1	15.9	5.8	5.0	5.3	16.6	13.5	10.2	0.0	2.58
Other feed	Ton	0.0		0.00	0	0.00	5.6	11.8	42.0	74.1	183.5	173.8	151.6	134.4	108.8	97.1	73.1	11.8	27.08
Salt and mineral	Cwt	118.6		4.75	563	2.61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.68
Feed source:							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.98
National Forest (17)	AM	0.8		0.8	0.6	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08
Bureau of Land Mgt. (17)	AM	24.3		22.1	25.3	40.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.28
Pasture rent/lease (18)	ALUM	1.0		1.1	1.4	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.28
State land lease (18)	ALUM	0.0		0.0	8.6	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.58
Deeded rangeland (18)	ALUM	5.6		11.8	42.0	74.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.08
Irrigated pasture (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.68
Crop residue (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.98
Other pasture lease (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08
Hay	Ton	70.2		77.0	69.7	60.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.28
Grain	Bu	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Protein supplement	Ton	2.2		1.8	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Other feed	Ton	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marketing Month:							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Steer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.9	37.6	0.0	0.0
Heifer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	22.2	0.0	0.0
Yearling steers	Head	0.0		0.0	0.5	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	4.1	0.0	0.0	0.0
Yearling heifers	Head	0.0		0.0	0.2	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	2.6	1.4	0.3	0.0
Cull cows	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	5.9	12.9	0.3	0.0

For notes, see Table 35

Table 18--Region 4 sensitivity analysis summary

Typical Ranch Size:
216 Bred Cows
373.8 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$13.94	\$16,046	170
25%	93.5	\$13.94	\$17,223	177
50%	186.9	\$13.94	\$18,400	184
75%	280.4	\$4.74	\$19,393	189
90%	336.4	\$4.74	\$19,583	189
100%	373.8	\$4.71	\$19,710	189
110%	411.2	\$3.02	\$19,850	187
125%	467.3	\$3.02	\$19,896	187
150%	560.7	\$1.91	\$20,014	194

1980 to 1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$14.24	\$15,138	170
25%	93.5	\$14.24	\$16,303	177
50%	186.9	\$14.24	\$17,469	184
75%	280.4	\$5.51	\$2,200	189
90%	336.4	\$5.51	\$12,390	189
100%	373.8	\$5.48	\$18,809	189
110%	411.2	\$3.82	\$18,913	188
125%	467.3	\$3.82	\$19,028	187
150%	560.7	\$1.88	\$19,041	188

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 5: The Pacific Southwest Region

Forest Service region 5 consists of California and Hawaii. Only California has forests with Forest Service grazing budgets. The typical ranch in 1979 had 775 cows. Approximately one-third of the calves are sold as yearlings. The typical ranch in region 5 is not highly dependent on Forest Service grazing. Forest Service grazing provides 6.9 percent of the forage. BLM grazing provides another 6.9 percent. Forest Service grazing is in greatest supply in the summer and early fall, June-October. The seasonal availability of Forest service grazing is not as uniform as in region 2, but it is more uniform than in either regions 1 or 4. There is a fair supply of year round grazing. Hay provides 19.3 percent of the ranch's forage (tables 19, 20, and 21).

The LP solutions show that optimal herd size is below the budgeted herd size for both sets of prices. The herd size and returns are lowest for the 1980-86 average prices. The value of Forest Service grazing is \$3.79/AM based on 1986 prices and \$4.28/AM based on 1980-86 average prices (table 22).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$5.63/AM based on 1986 prices and \$5.64/AM based on 1980-86 average prices.

The optimal size of the cow herd is relatively insensitive to changes in the availability of Forest Service grazing. This insensitivity is caused by the low dependency on Forest Service grazing. Like region 4, the value of Forest Service grazing makes a large jump when availability is reduced. For region 5, this jump occurs between 90 and 75 percent availability. The maximum ability to pay increases from \$3.79 to \$13.29 for 1986 prices, and from \$4.76 to \$13.45 for 1980-86 average prices. This jump in the value of forage occurs because decreasing Forest Service grazing availability below 90 percent of current use causes a critical shortage of summer and early fall grazing in region 5.

When longrun variable costs are added under both sets of prices, the optimal cow herd drops. Under 1986 prices, only 429 of the available 761 Forest Service AM's are used. If the grazing fee is dropped below \$1.18, then all the allocated Forest Service grazing will be used. If the grazing fee is set below \$1.18 under 1986 prices, 429 head of cows is the optimal herd size. Under 1980-86 average prices, the optimal solution uses no Forest Service grazing. Lowering the grazing fee to \$1.17 or lower will cause all available Forest Service grazing to be used. The optimal cow herd is 385.

TABLE 19

Budget for Typical Region 5 Cow-Calf Ranch
Baseline 1982, ERSCow-Calf Ranch
(Gee) Budget

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM						
PRODUCTION:							CASH COSTS, continued												
Bred cows (1)	Head	775					Veterinary & med	Dol				4083	5.27						
Annual cow loss	Head	19					Hired trucking	Dol				1811	2.31						
Cows culled	Head	117					Marketing (6)	Dol				1613	2.08						
Calves born alive	Head	687					Hired labor	Hrs	3850		4.56	17519	22.49						
Calves lost birth to weaning	Head	52					Fuel and lubricants	Dol				3083	3.92						
Steer calves weaned	Head	322					Repairs	Dol				7055	9.10						
Sold as weaners	Head	216					Interest on operating capital (9)	Dol	60895.1		0.15	9106	11.75						
Lost after weaning	Head	2					Total variable expenses					117662	151.82						
Sold as yearlings	Head	100					FIXED EXPENSES												
Heifer calves weaned	Head	322					General farm overhead (7)	Dol				8368	10.80						
Sold as weaners	Head	92					Taxes (8)	Dol				12770	16.28						
Lost after weaning	Head	88					Insurance	Dol				2498	3.16						
Sold as yearlings	Head	136					Total fixed expenses					143305	185.01						
Kept for herd replacement(2)	Head	42					Total cash expenses					143305	185.01						
Bulls	Head	42					OTHER COSTS												
SALES:							Family labor(10)	Hrs	2995		4.56	13652	17.62						
Steer calves	Head	216	474	65.12	66697		Capital replacement (11)	Dol				22019	28.41						
Heifer calves	Head	94	443	62.35	59227		Interest on investment other than land (12)	Dol				70051	90.39						
Yearling steers	Head	100	761	61.15	22854		Land interest (13)	Dol				272437	351.53						
Yearling heifers	Head	88	696	65.18	35794		Total other costs	Dol				476159	607.95						
Cull cows	Head	117	955	37.94	212055	273.59	TOTAL ALL COSTS	Dol				528735	682.24						
Total sales					212055	273.59	Return above variable costs												
CASH COSTS:							Return over cash costs	Dol				94373	121.77						
National Forest	AM	760.7		1.86	1415	1.83	Return above cash costs and family labor	Dol				54998	70.96						
Bureau of Land Management	AM	819.7		1.86	1524	1.97	Return to total investment (14)	Dol				32979	42.55						
Private pasture lease	AUM	1629.6		9.45	15403	19.88	Return above all costs (15)	Dol				-309510	-399.37						
Other pasture lease (3)	AUM	387.8		2.89	2286	2.92	Total Forest Service grazing in region	AM	621023										
State land lease	AUM	20.1		2.20	44	0.06	Cows in region	Head	632724										
Irrigated pasture	AUM	247.4		4.25	1052	1.36	Feed source:												
Hay produced	TON	780.3		36.75	28456	36.72	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
Hay purchased	TON	47.2		71.17	3357	4.33	7.9	8.5	17.0	31.8	63.1	117.6	160.2	164.6	140.2	35.0	6.1	8.6	6.9%
Total Forage Costs (4)	AUM	14308.7			53537	69.08	38.1	51.5	57.8	99.5	130.2	99.2	78.1	76.5	67.4	40.7	41.9	41.7	6.9%
Protein supplement (5)	Ton	65.1		232.80	15151	19.55	113.0	131.5	153.6	155.4	205.9	196.3	198.3	164.9	126.4	92.9	35.3	56.1	11.4%
Grain	Bu	0.0		0.00	0	0.00	0.0	0.0	0.0	0.0	3.9	4.3	4.7	3.5	3.5	0.0	0.0	0.0	0.1%
Other feed	Ton	24.1		0.00	0	0.00	105.7	114.6	192.8	418.1	837.5	470.5	619.7	627.1	610.5	407.8	135.8	103.6	32.5%
Salt and mineral	Cwt	267.9		6.69	1792	2.31	0.0	0.0	0.0	32.0	65.1	37.9	38.2	38.4	35.9	0.0	0.0	0.0	1.7%
Feed source:							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
National Forest (17)	AM	7.9		8.5	17.0	31.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Bureau of Land Mgt. (17)	AM	38.1		51.5	57.8	99.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Pasture rent/lease (18)	AUM	113.0		131.5	153.6	155.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
State land lease (18)	AUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Deeded rangeland (18)	AUM	105.7		114.6	192.8	418.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Irrigated pasture (18)	AUM	0.0		0.0	0.0	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Crop residue (18)	AUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other pasture lease (18)	AUM	74.1		79.7	130.3	187.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Hay	TON	173.8		190.4	162.5	86.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Grain	Bu	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Protein supplement	Ton	17.0		15.2	15.2	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other feed	Ton	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Steer calves	Head	0.0		0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Heifer calves	Head	0.0		0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Yearling steers	Head	0.0		0.0	0.0	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Yearling heifers	Head	0.0		0.0	0.0	27.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Cull cows	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%

For notes, see Table 35

TABLE 21

Budget for Typical Region 5 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM								
PRODUCTION:							CASH COSTS, continued														
Bred cows (1)	Head	775					Veterinary & med	Dol			4188	5.38									
Annual cow loss	Head	117					Hired trucking	Dol			1778	2.28									
Cows culled	Head	117					Marketing (6)	Dol			1651	2.11									
Calves born alive	Head	687					Hired labor	Hrs	3850	4.62	17777	22.81									
Calves lost birth to weaning	Head	59					Fuel and lubricants	Dol			5192	6.61									
Steer calves weaned	Head	216					Repairs	Dol			8978	11.44									
Sold as weaners	Head	216					Interest on operating capital (9)	Dol	58276.6	0.14	8129	10.49									
Lost after weaning	Head	19					Total variable expenses				111163	143.44									
Sold as yearlings	Head	100					FIXED EXPENSES														
Heifer calves weaned	Head	323					General farm overhead (7)	Dol			8552	11.04									
Sold as weaners	Head	323					Taxes (8)	Dol			12391	15.85									
Lost after weaning	Head	28					Insurance	Dol			2211	2.83									
Sold as yearlings	Head	99					Total fixed expenses				13411	17.29									
Kept for herd replacement(2)	Head	13					Total cash expenses				13841	178.01									
Bulls	Head	42					OTHER COSTS														
SALES:							Family labor(10)	Hrs	2995	4.62	13830	17.85									
Steer calves	Head	216	476	66.74	68364		Capital replacement (11)	Dol			21160	27.38									
Heifer calves	Head	59	443	69.01	40859		Interest on investment other than land (12)	Dol			66785	85.59									
Yearling steers	Head	100	761	69.26	69260		Land interest (13)	Dol			68818	88.24									
Yearling heifers	Head	88	696	69.26	60939		Total other costs	Dol			206573	265.16									
Cull cows	Head	117	955	37.45	41832		TOTAL ALL COSTS	Dol			451428	582.53									
Total sales					211975	275.51	Return above variable costs														
CASH COSTS:							Return over cash costs	Dol			10810	138.08									
National Forest	AM	760.7		1.47	1118	1.44	Return above cash costs and family labor	Dol			7562	9.74									
Bureau of Land Management	AM	619.7		1.47	1209	1.55	Return to total investment (14)	Dol			48572	62.35									
Private pasture lease	ALIN	1429.6		8.29	14296	18.99	Return above all costs (15)	Dol			-232490	-299.99									
Other pasture lease (3)	ALIN	587.8		2.53	2874	3.68	Total Forest Service grazing in region	AM	621023												
State land lease	ALIN	20.1		2.00	40	0.05	Cows in region	Head	632724												
Irrigated pasture	ALIN	267.4		4.04	1080	1.39	Feed source:														
Hay produced	TON	780.7		33.46	26122	33.71	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)		
Hay purchased	TON	47.2		65.33	3082	3.98	National Forest (17)	AM	7.9	8.5	17.0	31.8	63.1	117.6	160.2	164.6	140.2	35.0	6.1	8.6	6.98
Total Forage Costs (4)	ALIN	14308.7			49289	63.60	Bureau of Land Mgt. (17)	AM	38.1	51.5	57.8	99.5	130.2	99.2	78.1	76.5	67.4	45.7	41.9	41.9	6.98
Protein supplement (5)	TON	65.1		223.95	14575	18.81	Pasture rent/lease (18)	ALIN	113.0	131.5	153.6	155.4	205.9	196.3	198.3	164.9	126.4	92.9	35.3	56.1	11.42
Grain	BU	0.0		0.00	0	0.00	State land lease (18)	ALIN	0.0	0.0	0.0	0.0	3.9	4.3	4.7	3.5	3.5	0.0	0.0	0.0	0.0
Other feed	TON	23.1		0.00	0	0.00	Deeded rangeland (18)	ALIN	105.7	114.6	192.8	418.1	837.5	470.5	619.7	627.1	610.5	407.8	135.8	103.6	32.52
Salt and mineral	OUT	287.9		6.63	1776	2.29	Irrigated pasture (18)	ALIN	0.0	0.0	0.0	32.0	65.1	37.9	38.2	38.4	35.9	0.0	0.0	0.0	1.78
Feed source:							Crop residue (18)	ALIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	37.0	15.9	4.12
Other pasture lease (18)	ALIN	75.1		79.7	130.3	187.6	Other pasture lease (18)	ALIN	173.8	190.4	162.5	86.8	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.02
Hay	TON	0.0		0.0	0	0.00	Hay	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.37	
Grain	BU	0.0		0.0	0	0.00	Grain	BU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Protein supplement	TON	17.0		15.2	9.7	0.00	Protein supplement	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other feed	TON	0.0		0.0	0	0.00	Other feed	TON	0.0	0.0	0.0	0.0	0.0	0.0	24.1	0.0	0.0	0.0	0.0	0.0	
Marketing Month:							Steer calves	Head	0.0	0.0	0.0	0.0	5.3	8.3	1.6	0.0	3.7	105.5	75.5	0.0	
Steer calves	Head	0.0		0.0	0.0	0.0	Heifer calves	Head	0.0	0.0	0.0	0.0	4.0	19.0	0.9	0.0	1.1	46.6	39.4	0.0	
Heifer calves	Head	0.0		0.0	0.0	0.0	Yearling steers	Head	0.0	0.0	0.0	18.5	0.0	16.0	0.0	0.0	28.0	24.8	13.1	0.0	
Yearling steers	Head	0.0		0.0	0.0	0.0	Yearling heifers	Head	0.0	0.0	0.0	27.8	0.0	0.0	0.0	0.0	19.4	11.9	0.0		
Yearling heifers	Head	0.0		0.0	0.0	0.0	Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.6	17.9	0.0		
Cull cows	Head	0.0		0.0	0.0	0.0															

For notes, see Table 35

Table 22--Region 5 sensitivity analysis summary

Typical Ranch Size:
775 Bred Cows
760.7 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$15.11	980,866	767
25%	190.2	\$14.44	991,450	722
50%	380.3	\$13.29	995,956	735
75%	570.5	\$13.29	996,384	749
90%	684.6	\$3.79	997,111	751
100%	760.7	\$3.79	997,297	752
110%	836.7	\$3.79	997,484	753
125%	950.8	\$3.79	997,763	755
150%	1141.0	\$3.64	998,226	758

1980 to 1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$15.31	985,383	767
25%	190.2	\$14.44	987,864	722
50%	380.3	\$14.44	990,292	735
75%	570.5	\$13.45	992,684	749
90%	684.6	\$4.76	993,439	765
100%	760.7	\$4.28	993,631	727
110%	836.7	\$4.28	993,822	769
125%	950.8	\$3.69	994,971	718
150%	1141.0	\$3.69	994,436	767

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 6: The Pacific Northwest Region

The typical ranch in 1979 in region 6 had 783 cows. Approximately half of the calves are sold as yearlings. The typical ranch in region 6 is not highly dependent on Forest Service grazing. Forest Service grazing provides 7.6 percent of the forage. BLM grazing provides 3.4 percent. Forest Service grazing is in greatest supply in the summer and early fall, June-September. Hay provides 27.7 percent of the ranch's forage (tables 23, 24, and 25).

The LP solutions show that optimal herd size is below the budgeted herd size for both sets of prices. In both cases, the optimal herd size is more than 95 percent of the budgeted size. The herd size and returns are lowest for the 1980-86 average prices. The value of Forest Service grazing is \$4.64/AM based on 1986 prices and \$5.91/AM based on 1980-86 average prices (table 26).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$4.92/AM based on 1986 prices and \$4.44/AM based on 1980-86 average prices.

The optimal size of the cow herd is the same for both sets of prices at 0, 50, and 75 percent Forest Service grazing availability. Once Forest Service grazing availability expands beyond 75 percent of current use, the optimal herd sizes diverge. The optimal cow herd for 1986 prices expands as Forest Service grazing expands. The optimal cow herd given 1980-86 average prices contracts once Forest Service grazing availability passes 90 percent of current availability.

Region 6 is unique in that all Forest Service grazing is used under both sets of prices when longrun variable costs are added. With 1986 prices, the optimal cow herd is 549 head and the value of Forest Service grazing is \$3.56. With 1980-86 prices, the optimal cow herd is 499 head and the value of Forest Service grazing is \$2.61.

TABLE 23

Budget for Typical Region 6 Cow-Calf Ranch
Baseline 1982, ERS (Gee) Budget

BUDGET FOR TYPICAL REGION 6 COW-CALF RANCH					BUDGET FOR TYPICAL REGION 6 COW-CALF RANCH									
Baseline 1982, ERS					(Gee) Budget									
ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	
PRODUCTION:														
Bred cows (1)	Head	783					CASH COSTS, continued							
Annual cow loss	Head	31					Veterinary & med	Dol				2226	2.84	
Cows culled	Head	102					Hired trucking	Dol				1541	1.97	
Calves born alive	Head	675					Marketing (6)	Dol				1711	2.19	
Calves lost birth to weaning	Head	40					Hired labor	Hrs	3962		3.41	13507	17.25	
Steer calves weaned	Head	317					Fuel and lubricants	Dol				7971	10.18	
Sold as weaners	Head	130					Repairs	Dol				7891	10.08	
Lost after weaning	Head	4					Interest on operating capital (9)	Dol	62483.1		0.15	9258	11.82	
Sold as yearlings	Head	184					Total variable expenses					130116	166.18	
Heifer calves weaned	Head	318					FIXED EXPENSES							
Sold as weaners	Head	79					General farm overhead (7)	Dol				16694	21.32	
Lost after weaning	Head	6					Taxes (8)	Dol				23116	29.25	
Sold as yearlings	Head	96					Insurance	Dol				4299	5.46	
Kept for herd replacement(2)	Head	131					Total fixed expenses					17270	22.00	
Bulls	Head	39					Total cash expenses					174392	222.98	
SALES:														
Steer calves	Head	130	398	73.27	37910		OTHER COSTS							
Heifer calves	Head	79	347	66.11	17962		Family labor(10)	Hrs	2556		3.41	9754	12.46	
Yearling steers	Head	184	734	85.26	84221		Capital replacement (11)	Dol				22572	28.83	
Yearling heifers	Head	99	664	37.04	37499		Interest on investment other than land (12)	Dol				72302	92.34	
Cull cows	Head	105	930	36.83	38466	273.09	Land interest (13)	Dol				36235	45.74	
Total sales					213833		Total other costs	Dol				20160	25.67	
CASH COSTS:														
National Forest	AM	861.4		1.86	1602	2.05	TOTAL ALL COSTS	Dol				672470	858.84	
Bureau of Land Management	AM	207.8		7.99	1675	2.13	Return above variable costs	Dol				83717	106.92	
Private pasture lease	ALM	1521.8		1.25	11789	15.06	Return over cash costs	Dol				39241	50.12	
Other pasture lease (3)	ALM	1181.6		5.88	6948	8.87	Return above cash costs and family labor	Dol				29487	37.66	
State land lease	ALM	249.1		1.86	501	0.64	Return to total investment (14)	Dol				6915	8.83	
Irrigated pasture	ALM	874.0		5.02	4387	5.60	Return above all costs (15)	Dol				-464909	-593.75	
Hay produced	TON	969.0		36.84	35508	45.00	Total Forest Service grazing in region	AM	745349					
Hay purchased	TON	262.8		70.16	18438	23.55	Cows in region	Head	677511					
Total Forage Costs (4)	AUM	14829.4			80122	102.33								
Protein supplement (5)	Ton	9.6		223.85	2149	2.74								
Grain	Bu	0.0		0.00	0	0.00								
Other feed	Ton	0.0		0.00	0	0.00								
Salt and mineral	Cwt	272.9		6.67	1821	2.33								
Feed source:														
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
National Forest (17)	AM	9.7	9.6	11.6	15.1	32.9	149.3	191.0	196.4	173.9	48.5	12.1	11.3	7.6%
Bureau of Land Mgt. (17)	AM	3.3	3.1	16.9	80.2	89.7	50.1	43.0	40.4	35.5	28.5	16.0	14.2	3.2%
Pasture rent/lease (18)	ALM	1.3	2.1	3.1	159.8	250.9	249.2	258.4	263.6	259.7	76.2	11.0	5.8	10.4%
State land lease (18)	ALM	0.0	0.0	0.1	3.4	44.8	51.8	56.4	57.1	52.9	2.0	0.3	0.3	1.8%
Deeded rangeland (18)	ALM	87.2	130.4	167.7	500.1	788.9	682.1	661.7	693.1	638.9	424.1	273.2	128.8	35.0%
Irrigated pasture (18)	ALM	0.0	0.0	0.0	2.3	145.0	153.6	173.8	181.2	212.8	1.9	3.8	1.6	5.0%
Crop residue (18)	ALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	497.3	621.1	40.2	8.0%
Other pasture lease (18)	ALM	0.5	0.8	1.2	2.6	3.9	3.6	3.3	3.5	3.4	2.3	2.1	0.5	0.2%
Hay	TON	274.0	291.1	296.7	121.3	6.8	0.0	0.0	0.0	0.0	0.0	8.2	233.7	27.7%
Grain	Bu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Protein supplement	Ton	3.0	2.2	1.9	1.2	0.2	0.0	0.0	0.0	0.0	0.0	0.2	1.9	0.0%
Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:														
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.2	1.9	126.3	0.0	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.3	76.5	0.0	
Yearling steers	Head	0.0	0.0	0.0	2.1	0.0	0.0	21.9	2.9	82.4	35.5	0.0	0.0	
Yearling heifers	Head	0.0	0.0	0.0	1.3	0.2	0.1	10.7	2.0	68.2	3.1	10.0	0.5	
Cull cows	Head	0.0	0.0	0.0	0.3	0.0	0.0	0.2	1.3	23.0	7.5	44.9	1.4	

For notes, see Table 35

TABLE 24

Budget for Typical Region 6 Cow-Calf Ranch
Updated to 1966 Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW							
PRODUCTION:							CASH COSTS continued													
Bred cows (1)	Head	783					Veterinary & med	Dol			2486	3.17								
Annual cow loss	Head	105					Hired trucking	Dol			1254	1.60								
Cows culled	Head	61					Marketing (6)	Dol			14936	19.08								
Calves born alive	Head	610					Hired labor	Hrs	3962	3.77	14936	19.08								
Calves lost birth to weaning	Head	317					Fuel and lubricants	Dol			4160	5.32								
Steer calves weaned	Head	317					Repairs	Dol			8308	10.61								
Sold as weaners	Head	130					Interest on operating capital (9)	Dol	62483.1	0.12	7554	9.65								
Lost after weaning	Head	187					Total variable expenses				116306	148.54								
Sold as yearlings	Head	318					FIXED EXPENSES													
Heifer calves weaned	Head	318					General farm overhead (7)	Dol			15420	19.69								
Sold as weaners	Head	9					Taxes (8)	Dol			20623	26.61								
Lost after weaning	Head	29					Insurance	Dol			4028	5.17								
Sold as yearlings	Head	151					Total fixed expenses				39521	50.47								
Kept for herd replacement(2)	Head	39					Total cash expenses				155827	199.01								
SALES:							OTHER COSTS													
Steer calves	Head	130	398	75.26	38940		Family labor(10)	Hrs	2556	3.77	9636	12.31								
Heifer calves	Head	9	447	68.69	18624		Capital replacement (11)	Dol			22039	28.15								
Yearling steers	Head	187	734	60.12	81196		Interest on investment other than land (12)	Dol			58991	75.34								
Yearling heifers	Head	99	664	69.75	34628		Land interest (13)	Dol			325970	418.31								
Cull cows	Head	105	930	35.00	34178		Total other costs	Dol			416436	532.10								
Total sales					209586	267.67	TOTAL ALL COSTS	Dol			567147	726.33								
CASH COSTS:							Return above variable costs													
National Forest	AM	861.4		1.35	1163	1.49	Return over cash costs	Dol			93280	119.13								
Bureau of Land Management	AM	407.8		1.35	551	0.70	Return above cash costs and family labor	Dol			53759	68.66								
Private pasture lease	ALUM	1541.1		0.49	10002	12.77	Return to total investment (14)	Dol			44123	56.35								
Other pasture lease (3)	ALUM	181.6		4.99	5896	7.53	Return above all costs (15)	Dol			-362877	-463.44								
State land lease	ALUM	269.1		1.42	382	0.49	Total Forest Service grazing in region	AM	745349											
Irrigated pasture	ALUM	876.0		4.26	3723	4.76	Cows in region	Head	677511											
Hay produced	TON	969.0		32.24	31241	39.90	Forage Dependency (16)													
Hay purchased	TON	262.8		61.40	16136	20.61	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
Total Forage Costs (4)	ALUM	14829.4			69093	88.24	National Forest (17)	AM	9.7	9.6	11.6	15.1	32.2	169.3	191.0	196.4	173.9	68	12.1	11.3
Protein supplement (5)	Ton	9.6		213.08	2046	2.61	Bureau of Land Mgt. (17)	AM	3.3	3.1	16.6	80.3	288.9	50.1	23.0	40.4	70.5	20.5	16.9	14.3
Grain	Bu	0.0		0.00	0	0.00	Pasture rent/lease (18)	ALUM	0.0	0.0	3.1	159.8	250.9	249.1	258.4	263.6	259.7	258.0	11.0	0.0
Other feed	Ton	0.0		0.00	0	0.00	State land lease (18)	ALUM	0.0	0.0	0.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Salt and mineral	Cwt	272.9		7.21	1968	2.51	Deeded rangeland (18)	ALUM	87.0	130.0	167.7	500.1	788.0	684.1	681.7	693.1	658.0	424.0	273.0	128.0
Feed source:							Irrigated pasture (18)													
Grain	Ton	27.0		29.0	296.7	3.76	Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Protein supplement	Ton	0.0		0.00	0	0.00	Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other feed	Ton	0.0		0.00	0	0.00	Hay	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Marketing Month:							Grain													
Steer calves	Head	0.0		0.00	0	0.00	Protein supplement	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Heifer calves	Head	0.0		0.00	0	0.00	Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Yearling steers	Head	0.0		0.00	0	0.00	Marketing Month:													
Yearling heifers	Head	0.0		0.00	0	0.00	Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	65.2	1.9	126.3	0.0		
Cull cows	Head	0.0		0.00	0	0.00	Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
							Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
							Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
							Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

For notes, see Table 35

37

TABLE 25

Budget for Typical Region 6 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM								
PRODUCTION:							CASH COSTS, continued														
Brad cows (1)	Head	783					Veterinary & med	Dol			2237	2.86									
Annual cow loss	Head	31					Hired trucking	Dol			1336	1.83									
Cows culled	Head	105					Marketing (6)	Dol			3748	4.79									
Calves born alive	Head	675					Hired labor	Hrs	3962	3.45	13583	17.43									
Calves lost birth to weaning	Head	40					Fuel and lubricants	Dol			6847	8.74									
Steer calves weaned	Head	317					Repairs	Dol			7804	9.97									
Sold as weaners	Head	130					Interest on operating capital (9)	Dol	62483.1	0.14	8675	11.08									
Lost after weaning	Head	4					Total variable expenses				122313	156.21									
Sold as yearlings	Head	184					FIXED EXPENSES														
Heifer calves weaned	Head	318					General farm overhead (7)	Dol			17961	21.79									
Sold as weaners	Head	79					Taxes (8)	Dol			22238	28.40									
Lost after weaning	Head	4					Insurance	Dol			4489	5.73									
Sold as yearlings	Head	99					Total fixed expenses				43788	55.93									
Kept for herd replacement(2)	Head	131					Total cash expenses				166101	212.13									
Bulls	Head	39					OTHER COSTS														
SALES:							Family labor(10)	Hrs	2556	3.45	8818	11.26									
Steer calves	Head	130	398	75.10	38857		Capital replacement (11)	Dol			21692	27.70									
Heifer calves	Head	79	344	66.90	18181		Interest on investment other than land (12)	Dol			67747	86.52									
Yearling steers	Head	184	734	61.73	83397		Land interest (13)	Dol			374552	478.10									
Yearling heifers	Head	99	664	55.61	36556		Total other costs	Dol			472509	603.59									
Cull cows	Head	105	930	36.35	35496		TOTAL ALL COSTS	Dol			632724	808.08									
Total sales					212487	271.38	Return above variable costs														
CASH COSTS:							Return over cash costs	Dol			90174	115.16									
National Forest	AM	861.4		1.47	1266	1.62	Return above cash costs and family labor	Dol			46386	59.24									
Bureau of Land Management	AM	407.8		1.47	599	0.77	Return to total investment (14)	Dol			15876	20.28									
Private pasture lease	ALUM	1541.1		5.28	11219	14.33	Return above all costs (15)	Dol			-426223	-544.35									
Other pasture lease (3)	ALUM	1181.6		5.59	6605	8.44	Total Forest Service grazing in region	AM	745349												
State land lease	ALUM	269.1		1.62	435	0.56	Cows in region	Head	677511												
Irrigated pasture	ALUM	874.0		4.77	4169	5.33	Forage Dependency (16)														
Hay produced	TON	269.0		33.92	32772	41.85	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
Hay purchased	TON	262.8		64.41	16927	21.82	National Forest (17)	AM	2.7	0.0	11.6	15.1	28.2	149.3	191.0	196.4	171.0	46.0	12.0	11.3	7.63
Total Forage Costs (4)	ALUM	14829.4			74012	94.52	Bureau of Land Mgt. (17)	AM	0.0	0.0	16.0	150.0	249.0	240.0	240.0	240.0	240.0	240.0	240.0	10.42	
Protein supplement (5)	Ton	9.6		215.34	2067	26.64	Pasture rent/lease (18)	ALUM	0.0	0.0	0.1	1.4	3.4	4.4	4.4	4.4	4.4	4.4	4.4	0.00	
Grain	BU	0.0		0.00	0	0.00	State land lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Other feed	Ton	0.0		0.00	0	0.00	Deeded rangeland (18)	ALUM	8.0	130.0	167.7	500.0	784.0	680.0	680.0	680.0	420.0	270.0	120.0	31.00	
Salt and mineral	Cwt	272.9		6.61	1804	2.30	Irrigated pasture (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Feed source:							Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Marketing Month:							Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Hay	TON	27.0	29.0	29.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	27.00	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	Grain	BU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00		
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	Protein supplement	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00		
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	Other feed	TON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00		
Cull cows	Head	0.0	0.0	0.0	0.0	0.0								Forage Dependency (16)							
							Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.63	
							Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.42	
							Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
							Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	
							Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	

For notes, see Table 35

38

Table 26--Region 6 sensitivity analysis summary

Typical Ranch Size:

783 Bred Cows

861.4 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$13.46	\$89,880	651
25%	215.4	\$12.78	\$92,371	681
50%	430.7	\$12.78	\$94,832	715
75%	646.1	\$12.78	\$97,294	749
90%	775.3	\$5.62	\$98,483	758
100%	861.4	\$4.64	\$98,773	760
110%	947.5	\$4.64	\$99,056	760
125%	1076.8	\$4.64	\$99,482	761
150%	1292.1	\$4.64	\$100,191	761

1980 to 1986 Prices and Costs

Forest service grazing availability (1)		Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)
Percent	AM/ranch			
0%	0.0	\$13.65	\$87,706	651
25%	215.4	\$11.92	\$90,032	680
50%	430.7	\$11.92	\$92,282	715
75%	646.1	\$11.92	\$94,534	749
90%	775.3	\$6.50	\$95,811	753
100%	861.4	\$5.91	\$96,223	751
110%	947.5	\$5.66	\$96,589	750
125%	1076.8	\$5.66	\$97,130	749
150%	1292.1	\$5.66	\$98,034	748

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 8: The Southern Region

The operations in region 8 tend to be small with high fixed costs. The typical herd in 1979 had 56 bred cows. Small cow/calf operations are common in this region. Few producers in this region have access to Federal grazing land. Those who do, however, are highly dependent upon it: 38.3 percent of their forage comes from the Forest Service, and 2 percent from BLM. Most of the calves in this region are sold as weaners (tables 27, 28, and 29).

The LP solutions show that optimal herd size is below the budgeted herd size for both sets of prices. However, for 1986 prices, the optimal herd size is 54 head, which is only 2 head less than the 56 cows in the budget. For 1980-86 prices, the optimal cow herd is 47 head. The value of Forest Service grazing is \$6.96 based on 1986 prices and \$8.35 based on 1980-86 average prices (table 30).

LP problems were run which required the herd size to be maintained at 1979 levels. The value of Forest Service grazing under this scenario is \$9.62/AM based on 1986 prices and \$13.31/AM based on 1980-86 average prices.

After adding longrun variable costs, the optimal cow herd under both sets of prices is zero. This is due to the high fixed costs in region 8. No Forest Service grazing would be used even if it were free.

TABLE 27

Budget for Typical Region 8 Cow-Calf Ranch
Baseline 1962, ERS (Gee) Budget

ITEM		UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM						
PRODUCTION:								CASH COSTS, continued												
Bred cows (1)	Head		56					Veterinary & med	Dol				262	4.67						
Annual cow loss	Head		2					Hired trucking	Dol				52	0.90						
Cows culled	Head		2					Marketing (6)	Dol				354	6.33						
Calves born alive	Head		43					Hired labor	Hrs	38		1.51	58	1.04						
Calves lost birth to weaning	Head		2					Fuel and lubricants	Dol				920	16.43						
Steer calves weaned	Head		20					Repairs	Dol				644	11.50						
Sold as weaners	Head		18					Interest on operating capital (9)	Dol	2426.0		0.15	359	6.42						
Lost after weaning	Head		2					Total variable expenses					5985	106.88						
Sold as yearlings	Head		2					FIXED EXPENSES												
Weifer calves weaned	Head		21					General farm overhead (7)	Dol				689	12.30						
Sold as weaners	Head		11					Taxes (8)	Dol				422	7.54						
Lost after weaning	Head		0					Insurance	Dol				474	8.46						
Sold as yearlings	Head		0					Total fixed expenses					1585	28.29						
Kept for herd replacement(2)	Head		2					Total cash expenses					7570	135.18						
Bulls	Head		2					OTHER COSTS												
SALES:								Family labor(10)	Hrs	762		1.51	1152	20.57						
Steer calves	Head		18	342	66.45	4325		Capital replacement (11)	Dol				1976	35.29						
Weifer calves	Head		11	494	59.26	2040		Interest on investment other than land (12)	Dol				5222	93.25						
Yearling steers	Head		5	253	59.26	792		Land interest (13)	Dol				20448	369.07						
Yearling heifers	Head		5	587	53.81	948		Total other costs	Dol				2918	518.17						
Cull cows	Head		5	765	39.84	1524		TOTAL ALL COSTS	Dol				36588	653.35						
Total sales						9629	171.95	Return above variable costs												
CASH COSTS:								Return over cash costs	Dol				3644	65.06						
National Forest	AM		290.3		1.86	540	9.64	Return above cash costs and family labor	Dol				2059	36.77						
Bureau of Land Management	AM		19.1		1.86	36	0.63	Return to total investment (14)	Dol				-1069	-19.09						
Private pasture lease	ALIN		80.0		7.07	566	10.11	Return above all costs (15)	Dol				-26959	-481.41						
Other pasture lease (3)	ALIN		0.0		0.00	0	0.00	Total Forest Service grazing in region	AM	211108										
State land lease	ALIN		0.0		0.00	0	0.00	Cows in region	Head	40717										
Irrigated pasture	ALIN		0.0		0.00	0	0.00	Feed source:												
Hay produced	TON		26.9		39.23	1056	18.85	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
Hay purchased	TON		5.5		73.21	403	7.19	13.0	13.0	14.5	20.4	25.1	30.9	31.6	33.1	32.3	29.6	23.3	23.6	38.3%
Total Forage Costs (4)	ALIN		904.7			2600	46.43	9.9	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0%
Protein supplement (5)	Ton		2.8		223.29	630	11.25	4.5	4.6	4.5	7.5	7.7	8.0	8.0	8.0	7.8	7.7	7.3	4.5	8.8%
Grain	Bu		0.0		0.00	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other feed	Ton		0.0		0.00	0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Salt and mineral	Cwt		18.2		5.87	107	1.91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:																				
Steer calves	Head		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	11.9	2.2	0.0	0.0	0.0
Weifer calves	Head		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	7.1	1.3	0.0	0.0	0.0
Yearling steers	Head		0.0	0.5	0.0	0.0	0.6	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.0	0.0
Yearling heifers	Head		0.0	0.5	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.8	1.1	0.0	0.0	0.0	0.0
Cull cows	Head		0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.2	1.2	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

For notes, see Table 35

41

TABLE 28

Budget for Typical Region 8 Cow-Calf Ranch
Updated to 1985 Prices

PRODUCTION:					CASH COSTS, continued									
ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	
Bred cows (1)	Head	56					Veterinary & med	Dol				285	5.08	
Annual cow loss	Head						Hired trucking	Dol				36	1.00	
Cows culled	Head						Marketing (6)	Dol				376	4.72	
Calves born alive	Head	42					Hired labor	Mrs	38		1.72	66	1.78	
Calves lost birth to weaning	Head						Fuel and lubricants	Dol				413	7.38	
Steer calves weaned	Head	28					Repairs	Dol				62	11.22	
Sold as weaners	Head	28					Interest on operating capital (9)	Dol	1988.1		0.13	263	4.78	
Lost after weaning	Head						Total variable expenses					4876	87.87	
Sold as yearlings	Head	2					FIXED EXPENSES							
Heifer calves weaned	Head	21					General farm overhead (7)	Dol				576	18.25	
Sold as weaners	Head	21					Taxes (8)	Dol				454	8.18	
Lost after weaning	Head						Insurance	Dol				389	9.89	
Sold as yearlings	Head	1					Total fixed expenses					1537	27.45	
Kept for herd replacement(2)	Head	2					Total cash expenses					6413	114.51	
Bulls	Head	2					OTHER COSTS							
SALES:							Family labor(10)	Mrs	762		1.72	1313	25.45	
Steer calves	Head	18	362	75	4916		Capital replacement (11)	Dol				2883	37.28	
Heifer calves	Head	11	324	63	2325		Interest on investment other than land (12)	Dol				4527	88.85	
Yearling steers	Head	1	663	75	75		Land interest (13)	Dol				18661	313.25	
Yearling heifers	Head	1	587	75	934		Total other costs	Dol				26286	474.72	
Cull cows	Head	5	765	38	1463		TOTAL ALL COSTS	Dol				33155	592.85	
Total sales					10383	185.41	Return above variable costs	Dol				587	98.34	
CASH COSTS:							Return over cash costs	Dol				3978	78.98	
National Forest	AM	299.3		1.1	392	7.00	Return above cash costs and family labor	Dol				2857	47.45	
Bureau of Land Management	AM	19.1		1.1	26	0.46	Return to total investment (14)	Dol				576	10.25	
Private pasture lease	ALM	80.0		5.5	465	8.38	Return above all costs (15)	Dol				-2264	-483.83	
Other pasture lease (3)	ALM	0.0		0.0	0.0	0.00	Total Forest Service grazing in region	AM	211180					
State land lease	ALM	0.0		0.0	0.0	0.00	Cows in region	Head	48717					
Irrigated pasture	ALM	0.0		0.0	0.0	0.00								
Hay produced	TON	26.9		31.0	857	15.30								
Hay purchased	TON	5.5		59.2	327	5.84								
Total Forage Costs (4)	ALM	904.7			2066	36.90								
Protein supplement (5)	Ton	2.8		283.38	576	10.25								
Grain	Bu	0.0		0.0	0	0.00								
Other feed	Ton	0.0		0.0	0	0.00								
Salt and mineral	Cwt	18.2		6.28	114	2.04								
Feed source:														
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)
National Forest (17)	AM	13.0	13.0	14.5	20.4	25.1	30.9	31.6	33.1	32.3	29.6	23.3	23.6	38.3%
Bureau of Land Mgt. (17)	AM	9.9	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8%
Pasture rent/lease (18)	ALM	4.5	4.6	4.5	7.5	7.7	8.0	8.0	8.0	7.8	7.7	7.3	4.5	8.8%
State land lease (18)	ALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Deeded rangeland (18)	ALM	19.4	21.8	16.9	35.9	32.7	36.2	36.1	36.5	38.3	32.2	22.9	23.1	38.9%
Irrigated pasture (18)	ALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Crop residue (18)	ALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other pasture lease (18)	ALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Hay	TON	6.9	7.1	7.9	0.9	0.0	0.0	0.0	0.0	0.0	0.5	2.1	0.6	11.9%
Grain	Bu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Protein supplement	Ton	0.6	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.6	0.6%
Other feed	Ton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:														
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	11.9	2.2	0.0	0.0	
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	7.1	1.3	0.0	0.0	
Yearling steers	Head	0.0	0.0	0.0	0.0	0.6	0.7	0.0	0.0	0.3	0.6	0.0	0.0	
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.8	1.1	0.0	0.0	
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	0.3	1.2	1.2	0.7	0.5	0.0	0.0	

For notes, see Table 35

42

TABLE 29

Budget for Typical Region 8 Cow-Calf Ranch
1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE		ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE		FORRAGE DEPENDENCY (166)
					VALUE	VALUE/CON						VALUE	VALUE/CON	
Variable Costs:														
Feed (1)	AM	907.7			265	46.84	CASH COSTS, continued							
Protein supplement (5)	Ton	2		261.04	737	13.15	Veterinary & feed	Dol				307	5.49	
Grain	Bu	1666		0.00	0.00	0.00	Hired trucking	Dol				451	7.68	
Other feed	Ton	1666		0.00	0.00	0.00	Marketing (6)	Dol				424	7.42	
Salt and mineral	Cwt	1666		6.86	12.00	2.23	Hrs Labor	Hrs	38	1.82		70	1.25	
							Fuel and lubricants	Dol				874	15.41	
							Repairs	Dol				74.1	1.32	
							Interest on operating capital (9)	Dol	2678.7	0.19		936	16.65	
							Total variable expenses					6477	116.01	
							FIXED EXPENSES							
							General farm overhead (7)	Dol				806	14.37	
							Taxes (8)	Dol				606	10.86	
							Insurance	Dol				98	1.75	
							Total fixed expenses					1810	32.98	
							Total cash expenses					8287	149.00	
							OTHER COSTS							
							Family labor (10)	Hrs	782	1.82		198	3.59	
							Capital neglect (11)	Dol				2307	41.19	
							Interest on investment other than land (12)	Dol				879	15.85	
							Land interest (13)	Dol				500	9.03	
							Total other costs	Dol				3804	68.05	
							TOTAL ALL COSTS	Dol				12191	217.05	
							Return above variable costs	Dol				5777	104.22	
							Return over cash costs	Dol				3980	71.80	
							Return above cash costs and family labor	Dol				2205	39.57	
							Return to total investment (14)	Dol				-102	-1.82	
							Return above all costs (15)	Dol				-3286.1	-58.80	
							Total Forest Service grazing in region	AM	2111008					
							Cows in region	Head	407717					
Feed sources:														
National Forest (17)	AM	13		13.00	13.00	0.23	JUN							38.3%
Bureau of Land Mgt.	AM	13		4.20	4.20	0.07	JUL							2.0%
State Land Lease	AM	13		4.50	4.50	0.08	AUG							8.8%
Other land lease	AM	13		0.00	0.00	0.00	SEP							0.0%
Other pasture (18)	AM	13		0.00	0.00	0.00	OCT							0.0%
Other pasture (19)	AM	13		0.00	0.00	0.00	NOV							0.0%
Other pasture (20)	AM	13		0.00	0.00	0.00	DEC							0.0%
Hay	Ton	6		7.50	7.50	0.13								111.9%
Grain	Bu	6		0.00	0.00	0.00								
Protein supplement	Ton	6		0.70	0.70	0.01								
Other feed	Ton	6		0.00	0.00	0.00								
Marketing Month:														
Steer calves	Head	0		0.00	0.00	0.00								
Heifer calves	Head	0		0.00	0.00	0.00								
Weaning steers	Head	0		0.50	0.00	0.00								
Weaning heifers	Head	0		0.50	0.00	0.00								
Cull cows	Head	0		0.00	0.00	0.00								

For notes, see Table 35

43

Table 30--Region 8 sensitivity analysis summary

Typical Ranch Size:
56 Bred Cows
290.3 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent	AM/ranch			
0%	0.0	\$9.97	\$3,204	30
25%	72.6	\$9.94	\$3,829	36
50%	145.2	\$9.94	\$4,454	43
75%	217.8	\$9.57	\$5,072	49
90%	261.3	\$6.96	\$5,382	52
100%	290.3	\$6.96	\$5,545	54
110%	319.4	\$6.88	\$5,701	56
125%	362.9	\$6.88	\$5,943	58
150%	435.5	\$6.88	\$6,344	63

1980 to 1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent	AM/ranch			
0%	0.0	\$10.04	\$3,277	24
25%	72.6	\$9.90	\$3,882	30
50%	145.2	\$9.90	\$4,469	37
75%	217.8	\$9.33	\$5,037	49
90%	261.3	\$8.35	\$5,346	47
100%	290.3	\$8.35	\$5,535	47
110%	319.4	\$7.48	\$5,702	51
125%	362.9	\$7.48	\$5,950	53
150%	435.5	\$7.02	\$6,346	56

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Region 9: The Eastern Region

The operations in region 9 tend to be small. The typical herd has 107 bred cows. The producers in this region who use Federal forage are not very dependent, 10.7 percent of their forage comes from the Forest Service, and none from BLM. Most of the calves in this region are sold as yearlings. Forest Service grazing is in greatest supply between June and September. Little grazing is available in the winter. These farms depend on hay for 30.3 percent of their forage (tables 31, 32, and 33).

For region 9, the optimal cattle herd for both price levels is the budgeted cattle herd, 107 head. Under 1986 prices, each unit of Forest Service grazing added between 0 and 166.3 AM is worth \$15.83/AM. Units over 100 AM are worth \$13.19/AM. The price switches at 166.3 AM. With 1980-86 average prices, the value of Forest Service grazing also switches at 166.3 AM. The grazing is worth \$16.25/AM for levels below 100 percent of current use and \$14.57 for levels above 100 percent. Region 9 has the highest values for Forest Service grazing (table 34).

After adding longrun variable costs, the optimal cow herd size for 1986 prices is 59 head. Given 1986 prices, all Forest Service grazing is used. The grazing has a value of \$1.38/AM, 3 cents more than the grazing fee. With 1980-86 average prices, the optimal herd size is zero. If the grazing fee is lowered to 82 cents or lower, all Forest service grazing will be purchased. Optimal herd size is only three head. Three head is the largest number of cows that can be supported without buying or raising any hay. Because cattle raising is a secondary enterprise in this region, it is not unreasonable for cattle producers to make very large cuts in the cow herd and still remain in business.

TABLE 31

Budget for Typical Region 9 Cow-Calf Ranch
Baseline 1982, ERS (Gee) Budget

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COW								
PRODUCTION:							CASH COSTS, continued														
Bred cows (1)	Head	107					Veterinary & med	Dol			381	3.56									
Annual cow loss	Head	2					Hired trucking	Dol			199	1.86									
Cows culled	Head	12					Marketing (6)	Dol			485	4.53									
Calves born alive	Head	94					Hired labor	Hrs	54	3.68	199	1.86									
Calves lost birth to weaning	Head	5					Fuel and lubricants	Dol			1417	13.24									
Steer calves weaned	Head	44					Repairs	Dol			1138	10.64									
Sold as weaners	Head	15					Interest on operating capital (9)	Dol	8158.9	0.15	1186	11.09									
Lost after weaning	Head	1					Total variable expenses				17868	166.99									
Sold as yearlings	Head	28					FIXED EXPENSES														
Heifer calves weaned	Head	45					General farm overhead (7)	Dol			1510	14.11									
Sold as weaners	Head	15					Taxes (8)	Dol			1157	10.81									
Lost after weaning	Head	0					Insurance	Dol			500	4.68									
Sold as yearlings	Head	17					Total fixed expenses				3167	29.60									
Kept for herd replacement(2)	Head	15					Total cash expenses				21035	196.59									
Bulls	Head	4					OTHER COSTS														
SALES:							Family labor(10)	Hrs	1017	3.68	3744	34.99									
Steer calves	Head	15	429	67.07	4312		Capital replacement (11)	Dol			3033	28.35									
Heifer calves	Head	15	405	56.33	3420		Interest on investment other than land (12)	Dol			9532	89.08									
Yearling steers	Head	28	639	94.47	11536		Land interest (13)	Dol			43356	405.20									
Yearling heifers	Head	17	608	57.51	5944		Total other costs	Dol			59665	527.62									
Cull cows	Head	12	928	38.75	4314		TOTAL ALL COSTS	Dol			80699	754.20									
Total sales					29526	275.94	Return above variable costs														
CASH COSTS:							Return over cash costs	Dol			11658	108.96									
National Forest	AM	166.3		1.86	309	2.89	Return above cash costs and family labor	Dol			8491	79.36									
Bureau of Land Management	AM	0.0		1.86	0	0.00	Return to total investment (14)	Dol			1714	16.02									
Private pasture lease	ALUM	195.6		7.26	1420	13.27	Return above all costs (15)	Dol			-51174	-478.26									
Other pasture lease (3)	ALUM	0.0		0.00	0	0.00	Total Forest Service grazing in region	AM	57079												
State land lease	ALUM	0.0		0.00	0	0.00	Cows in region	Head	36729												
Irrigated pasture	ALUM	0.0		0.00	0	0.00	Feed source:														
Hay produced	TON	145.3		39.50	5621	52.53	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)		
Hay purchased	TON	37.1		50.02	1858	17.36	National Forest (17)	AM	3.2	3.2	6.3	12.7	22.5	27.6	24.4	22.1	21.7	15.3	4.1	3.2	10.7%
Total Forage Costs (4)	ALUM	1974.4			9208	86.06	Bureau of Land Mgt. (17)	AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Protein supplement (5)	Ton	12.9		243.43	3129	29.25	Pasture rent/lease (18)	ALUM	13.5	13.5	13.5	13.5	19.4	19.0	19.0	19.0	19.4	13.5	13.5	13.5	9.9%
Grain	Bu	5.3		0.80	32	3.06	State land lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Other feed	Ton	35.2		9.95	32	3.06	Deeded rangeland (18)	ALUM	0.0	0.0	0.0	69.0	126.1	145.7	155.9	162.5	153.7	96.9	59.8	0.0	49.1%
Salt and mineral	Cwt	37.4		5.23	196	1.83	Irrigated pasture (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Marketing Month:							Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Steer calves	Head	0.0	0.0	0.0	0.0	0.0	Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Heifer calves	Head	0.0	0.0	0.0	0.0	0.0	Hay	Ton	31.8	36.1	50.1	16.5	3.5	0.0	0.0	0.0	0.0	9.7	31.7	30.3%	
Yearling steers	Head	0.0	0.0	0.0	0.0	0.0	Grain	Bu	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.5	0.5	0.7	0.7%	
Yearling heifers	Head	0.0	0.0	0.0	0.0	0.0	Protein supplement	Ton	1.6	1.6	1.1	2.5	0.0	0.0	0.0	0.7	0.7	3.3	0.6	0.6%	
Cull cows	Head	0.0	0.0	0.0	0.0	0.0	Other feed	Ton	5.9	5.9	5.9	5.9	0.0	0.0	0.0	0.0	3.9	5.9	5.9	5.9%	

For notes, see Table 35

46

TABLE 32

Budget for Typical Region 9 Cow-Calf Ranch
Updated to 1966 Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COU	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COU									
PRODUCTION:							CASH COSTS, continued															
Bred cows (1)	Head	107					Veterinary & med	Dol			417	3.90										
Annual cow loss	Head	2					Hired trucking	Dol			215	2.01										
Cows culled	Head	12					Marketing (6)	Dol			511	4.78										
Calves born alive	Head	94					Hired labor	Hrs	54	4.17	226	2.11										
Calves lost birth to weaning	Head	5					Fuel and lubricants	Dol			191	1.79										
Steer calves weaned	Head	44					Repairs	Dol			1155	10.80										
Sold as weaners	Head	15					Interest on operating capital (9)	Dol	6964.5	0.13	917	8.57										
Lost after weaning	Head	1					Total variable expenses				15753	147.22										
Sold as yearlings	Head	28					FIXED EXPENSES															
Heifer calves weaned	Head	45					General farm overhead (7)	Dol			1146	10.71										
Sold as weaners	Head	15					Taxes (8)	Dol			1012	9.45										
Lost after weaning	Head	0					Insurance	Dol			438	4.09										
Sold as yearlings	Head	17					Total fixed expenses				2595	24.26										
Kept for herd replacement(2)	Head	15					Total cash expenses				18348	171.48										
Bulls	Head	4					OTHER COSTS															
SALES:							Family labor(10)	Hrs	1017	4.17	4238	39.61										
Steer calves	Head	15	429	70.62	4540		Capital replacement (11)	Dol			3166	29.59										
Heifer calves	Head	15	405	61.35	3725		Interest on investment other than land (12)	Dol			9075	84.81										
Yearling steers	Head	28	639	66.41	11883		Land interest (13)	Dol			39511	369.26										
Yearling heifers	Head	17	608	59.67	6167		Total other costs	Dol			55989	523.26										
Cull cows	Head	12	928	40.49	4507		TOTAL ALL COSTS	Dol			74337	694.74										
Total sales					30822	288.06	Return above variable costs															
CASH COSTS:							Return over cash costs	Dol			15069	140.84										
National Forest	AM	166.3		1.35	224	2.10	Return above cash costs and family labor	Dol			12474	116.58										
Bureau of Land Management	AM	0.0		1.35	0	0.00	Return to total investment (14)	Dol			5070	47.39										
Private pasture lease	ALUM	195.6		6.18	1208	11.29	Return above all costs (15)	Dol			-43515	-406.68										
Other pasture lease (3)	ALUM	0.0		0.00	0	0.00	Total Forest Service grazing in region	AM	57079													
State land lease	ALUM	0.0		0.00	0	0.00	Cows in region	Head	36729													
Irrigated pasture	ALUM	0.0		0.00	0	0.00	Feed source:															
Hay produced	TON	142.3		33.62	4784	44.71	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Forage Dependency (16)			
Hay purchased	TON	37.1		42.58	1582	14.78	National Forest (17)	AM	3.2	3.2	6.3	12.7	22.5	27.6	24.4	22.1	21.7	15.3	4.1	3.2	10.7%	
Total Forage Costs (4)	ALUM	1974.4			7799	72.89	Bureau of Land Mgt. (17)	AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Protein supplement (5)	Ton	12.9		248.89	3199	29.90	Pasture rent/lease (18)	ALUM	13.5	13.5	13.5	13.5	19.4	19.0	19.0	19.0	19.4	13.5	13.5	13.5	9.9%	
Grain	Bu	5.3		0.38	1	0.01	State land lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Other feed	Ton	35.4		8.98	317	2.96	Deeded rangeland (18)	ALUM	0.0	0.0	0.0	69.0	126.1	145.7	155.9	162.5	153.7	96.9	59.8	0.0	49.1%	
Salt and mineral	Cwt	37.4		5.47	205	1.91	Irrigated pasture (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Marketing Month:							Crop residue (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Steer calves	Head	0.0			0.0	0.0	Other pasture lease (18)	ALUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	
Heifer calves	Head	0.0			0.0	0.0	Hay	TON	31.8	36.1	50.1	16.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.7	30.3%
Yearling steers	Head	0.0			0.0	0.0	Grain	Bu	1.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	
Yearling heifers	Head	0.0			0.0	0.0	Protein supplement	Ton	1.8	1.8	1.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	
Cull cows	Head	0.0			0.0	0.0	Other feed	Ton	5.9	5.9	5.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	

For notes, see Table 35

47

TABLE 33

Budget for Typical Region 9 Cow-Calf Ranch
Updated to 1980 to 1986 Average Prices

ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM	ITEM	UNIT	NUMBER	AVERAGE WEIGHT	PRICE	TOTAL VALUE	VALUE/COM					
PRODUCTION:							CASH COSTS, continued											
Bred cows (1)	Head	107					Veterinary & med	Dol				450	4.20					
Annual cow loss	Head	2					Hired trucking	Dol				234	2.19					
Cows culled	Head	12					Marketing (6)	Dol				605	5.65					
Calves born alive	Head	96					Hired labor	Hrs	54		4.67	253	2.36					
Calves lost birth to weaning	Head	5					Fuel and lubricants	Dol				1587	14.98					
Steer calves weaned	Head	44					Repairs	Dol				1313	12.28					
Sold as weaners	Head	15					Interest on operating capital (9)	Dol	9512.4		0.19	1803	16.85					
Lost after weaning	Head	1					Total variable expenses					20753	193.95					
Sold as yearlings	Head	28					FIXED EXPENSES											
Heifer calves weaned	Head	45					General farm overhead (7)	Dol				1722	16.09					
Sold as weaners	Head	15					Taxes (8)	Dol				1390	12.99					
Lost after weaning	Head	0					Insurance	Dol				601	5.62					
Sold as yearlings	Head	17					Total fixed expenses					3713	34.70					
Kept for herd replacement(2)	Head	15					Total cash expenses					24465	228.65					
Bulls	Head	4					OTHER COSTS											
SALES:							Family labor(10)	Hrs	1017		4.67	4747	44.36					
Steer calves	Head	15	429	81.56	5243		Capital replacement (11)	Dol				3541	33.10					
Heifer calves	Head	15	405	69.40	4214		Interest on investment other than land (12)	Dol				15040	140.57					
Yearling steers	Head	28	639	86.47	15113		Land interest (13)	Dol				5021	47.16					
Yearling heifers	Head	17	608	75.77	7831		Total other costs	Dol				7350	69.19					
Cull cows	Head	12	928	47.82	5324		TOTAL ALL COSTS	Dol				98365	919.30					
Total sales					37725	352.57	Return above variable costs											
CASH COSTS:							Return over cash costs	Dol				16972	158.62					
National Forest	AM	166.3		1.47	244	2.28	Return above cash costs and family labor	Dol				13260	123.92					
Bureau of Land Management	AM	0.0		1.47	0	0.00	Return to total investment (14)	Dol				4971	46.46					
Private pasture lease	ALUM	195.6		8.01	1567	14.64	Return above all costs (15)	Dol				-60590	-566.27					
Other pasture lease (3)	ALUM	0.0		0.00	0	0.00	Total Forest Service grazing in region	AM	57079									
State land lease	ALUM	0.0		0.00	0	0.00	Cows in region	Head	36729									
Irrigated pasture	ALUM	0.0		0.00	0	0.00	Forage Dependency (16)											
Hay produced	TON	142.3		44.96	6399	59.80	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Hay purchased	TON	37.1		56.94	2115	19.77	3.2	3.2	6.3	12.7	22.5	27.6	24.4	22.1	21.7	15.3	4.1	3.2
Total Forage Costs (4)	ALUM	1974.4			10325	96.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Protein supplement (5)	Ton	12.9		290.60	3735	34.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grain	Bu	32.2		1.03	332	3.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other feed	Ton	32.4		11.81	419	4.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salt and mineral	Cwt	37.4		6.08	227	2.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feed source:							Forage Dependency (16)											
National Forest (17)	AM	3.2		3.2	10.24	10.24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bureau of Land Mgt. (17)	AM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasture rent/lease (18)	ALUM	13.5		13.5	181.5	181.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
State land lease (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decided rangeland (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigated pasture (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crop residue (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other pasture lease (18)	ALUM	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hay	Ton	31.8		36.1	50.1	16.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grain	Bu	0.2		0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Protein supplement	Ton	1.2		1.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other feed	Ton	5.9		5.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marketing Month:							Forage Dependency (16)											
Steer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Heifer calves	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yearling steers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yearling heifers	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cull cows	Head	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

For notes, see Table 35

48

Table 34--Region 9 sensitivity analysis summary

Typical Ranch Size:
107 Bred Cows
166.3 Forest Service AM utilized

1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent AM/ranch				
0%	0.0	\$14.26	\$12,813	92
25%	41.6	\$14.26	\$13,349	96
50%	83.1	\$14.26	\$13,886	100
75%	124.7	\$14.26	\$14,422	103
90%	149.7	\$14.26	\$14,764	106
100%	166.3	\$14.26	\$14,959	107
110%	182.9	\$13.19	\$15,156	109
125%	207.9	\$13.19	\$15,451	111
150%	249.4	\$13.19	\$15,943	116

1980 to 1986 Prices and Costs

Forest service grazing availability (1)	Maximum value of FS AM (2)	Returns above variable costs (3)	Bred cows (4)	
Percent AM/ranch				
0%	0.0	\$16.25	\$14,350	92
25%	41.6	\$16.25	\$14,952	96
50%	83.1	\$16.25	\$15,554	99
75%	124.7	\$16.25	\$16,156	103
90%	149.7	\$16.25	\$16,517	105
100%	166.3	\$14.57	\$16,758	107
110%	182.9	\$14.57	\$16,971	109
125%	207.9	\$14.57	\$17,290	111
150%	249.4	\$14.57	\$17,822	115

Notes:

- (1) Percentages are relative to current authorized use and represent a uniform reduction or expansion in seasonal availability of Forest Service grazing.
- (2) Based on shadow price analysis.
- (3) Variable cash costs only.
- (4) Optimal herd size given costs, returns and Forest Service grazing.

Table 35--Notes to budget tables

- (1) January bred-cow inventory.
- (2) Heifers that replace cows lost and cows culled so that breeding herd is maintained.
- (3) Includes leases on Indian lands, industrial forests, grazing associations, and other types of leased lands.
- (4) Tons of hay, and FS and BLM AM's are all converted to AUM's.
- (5) Beef cattle concentrate, 32- to 36-percent protein.
- (6) Includes purchase and sale commission, brand inspection, and health certification.
- (7) General farm expenses including telephone, organizational dues, professional fees and other expenses.
- (8) Includes non-income taxes such as those on real estate, vehicles, and personal property.
- (9) Interest is charged only for the months in which money is borrowed.
- (10) Family labor is priced at the same rate as hired labor. Family labor hours do not include management.
- (11) Assets are valued at current replacement cost.
- (12) Interest on investment is based on actual price paid.
- (13) Interest is based on the current market price of real estate.
- (14) Return above cash costs and family labor less capital replacement.
- (15) Return to total investment less interest on land and investment other than land.
- (16) Proportion of yearly forage consumed supplied by each source.
- (17) An animal month (AM) is a cow with a calf under 6 months old or any animal over 6 months old.
- (18) An animal unit month (AUM) is equal to 300 pounds of total digestible nutrients.

Comparison of Forage Value Estimates

The three accounting stances used in the RPA process (Federal receipts, market value, and ability to pay) can give a wide range of values for grazing. Each has its merits. Each value needs to be interpreted in its own context.

In 1986 and 1987, the Federal grazing fee was set by Executive Order. The fee was set at \$1.35/AM for the 11 Western States. Federal receipts from grazing fees for 1980-87 averaged \$1.47/AM. Several different fee systems have been used in the Eastern States. The Western States fee for the years 1980-85 was set using the Public Rangeland Improvement Act (PRIA) formula. When the PRIA expired on December 31, 1985, the executive branch set the grazing fees for 1986 and 1987 at the 1985 level. The PRIA formula uses the 1969 fee system and a base value of \$1.23. The base fee is modified using the forage value index, collected by the National Agricultural Statistics Service, and is then adjusted for the ability to pay using an index of the costs of nonranch inputs and an index measuring the prices of western cattle 500 pounds and over. The return to the Treasury measures the economic value of Forest Service grazing as determined by the political process.

Measuring the market value of Forest Service grazing is complicated by its nonmarket character. Many permittees obtain their grazing permits based on their historical use of Federal lands. The value of Federal lands must be derived from other sources. Appraisals, private grazing lease rates, comparable costs, economic formulas, and ability to pay have all been used to evaluate the value of public grazing lands. Some of the calculated values of Forest Service grazing are present in table 36.

The private land grazing lease rate (PLGLR) is one approximation of the market value of Forest Service grazing. Grazing fees are considerably lower than the private land lease rate. Private land lease rates are typically 4 to 5 times higher than the Federal grazing fees. The private land lease rate averaged \$6.25/AM in 1986 and \$7.58/AM over the 1980-86 period. Since grazing fees are set by political compromise, it is not surprising that grazing fees and private land lease rates are not comparable. Several reasons have been advanced to justify the difference. One factor is the term of the lease. Federal leases run for 10 years, while private leases usually expire each year. The additional costs of renegotiating leases every year coupled with the value added by the additional flexibility of a private lease make private leases both more valuable and more expensive. Differences in the services provided, ease of access, and Forest Service restrictions on use increase the value of private leases over Federal leases.

The Forest Service also uses "willingness-to-pay" values for grazing in the RPA process. This report contains estimates of the maximum ability to pay based on alternative price/cost scenarios. The maximum ability to pay values vary widely by region and by assumptions on costs and by assumptions on the maintained herd size. As noted in the previous section, the longrun maximum ability to pay is generally less than the grazing fee. Also, the low longrun profitability of cow/calf enterprises suggests that there are pressures which may cause major structural shifts in the cow/calf industry.

ERS used LP problems which allowed the cow herd size to vary when calculating the maximum ability to pay based on longrun costs. In the long run, the size of the cow herd can easily be varied. Short-term maximum abilities to pay

Table 36-Comparison of forage value estimates for 1982, 1986, and 1980-86 averages

Region	Federal grazing fee	Appraised value USDA-FS grazing	Private land grazing lease rate	Shortrun maximum ability to pay for FS grazing	
				Variable herd size	Fixed herd size
Dollars per AM					
1982 prices					
1	1.86	6.71	8.85	9.09	8.80
2	1.86	7.55	9.90	2.00	7.92
3	1.86	5.63	6.26	8.85	14.05
4	1.86	4.90	7.18	5.89	6.14
5	1.86	5.39	9.45	6.55	6.52
6	1.86	5.19	7.45	4.94	6.16
8	NA	3.97	7.07	6.40	11.96
9	NA	3.97	6.18	10.75	10.75
Average	NA	5.93	7.93	6.22	9.00
1986 prices					
1	1.35	5.75	7.51	7.87	7.59
2	1.35	5.75	8.40	3.12	6.23
3	1.35	3.93	5.31	8.83	12.07
4	1.35	4.46	6.09	4.71	5.31
5	1.35	4.84	8.02	3.79	5.63
6	1.35	4.46	6.49	4.64	4.92
8	NA	1.78	5.81	6.96	9.62
9	NA	2.53	6.18	13.67	13.67
Average	NA	4.75	6.74	5.85	7.61
1980-86 average prices					
1	1.47	NA	8.42	9.49	6.56
2	1.47	NA	9.41	3.21	8.01
3	1.47	NA	5.95	9.01	12.84
4	1.47	NA	6.83	5.48	5.59
5	1.47	NA	8.99	3.98	5.64
6	1.47	NA	7.28	6.21	4.44
8	NA	NA	7.63	8.35	13.31
9	NA	NA	8.09	15.24	15.24
Average	NA	NA	7.59	6.49	8.15

NA = Not available

were calculated by two sets of LP problems. The first allowed the size of the cow herd to vary freely. The second set fixed the size of the cow herd at its 1979 level. The LP solutions suggest that the optimal herd size is less than the 1979 herd size in seven of the eight regions.

Maintaining the cow herd at 1979 levels caused increases in the maximum ability to pay for five of the eight regions, while decreasing profitability in seven of the eight regions. The maximum ability to pay increases by more than \$3 in three regions. The value of Forest Service grazing calculated when the cow herd is fixed reflects the costs of replacing Forest Service grazing with other forage sources, or the savings involved in using Forest Service grazing instead of more expensive forages. Those regions with high maximum abilities to pay when the cow herd is fixed are those where outbacks or expansions in Forest Service grazing are met with large expansions or outbacks in the use of hay and private leased grazing.

There is no obvious relationship between a region's maximum ability to pay and the private land lease rate given the assumption that the ranch can adjust the size of the cow herd. The average maximum ability to pay based on shortrun variable costs was \$5.85/AUM in 1985, while the private pasture lease rate averaged \$6.25/AUM. The 1980-86 average values were \$6.49/AUM for Forest Service grazing and \$7.58/AUM for private pasture lease. The typical Forest Service AUM provides an average of over 1.4 AUM/AUM. Consequently, this analysis suggests that Forest Service grazing is less valuable than leased private pasture grazing when a ranch adjusts the herd size in response to changes in costs and returns.

The shortrun maximum ability to pay based on a fixed cow herd is, on average greater than the private land lease rate. However, with a Forest Service AUM providing approximately 1.4 AUM's of forage, the value of Forest Service grazing once again averages slightly lower than the private land lease rate.

The results of this analysis suggest that private pasture lease rates are set close to the shortrun ability to pay. Generally, when longrun variable costs are introduced, ranchers will reduce greatly or eliminate their use of private grazing leases.

For comparison, table B6 provides the appraised values of Forest Service grazing in 1982 and 1985. The maximum ability to pay values are all greater than the appraised values when the cow herd is maintained at 1979 levels. Allowing the number of cows in the herd to vary generally moves the maximum-ability-to-pay prices closer to the appraised values. In two regions, the maximum ability to pay drops below the appraisal.

Conclusions

Based on the short-term ability of ranchers to pay for Forest Service grazing, this study shows that the grazing fee is less than the value of Federal forage. This result is consistent with most other methods of evaluating Federal grazing. However, the longrun profitability of cow/calf operations is low, and the current fee exceeds the longrun ability to pay. The prices currently charged for alternative sources of grazing suggests that grazing is priced based on the shortrun willingness of cattle producers to pay, and not on the longrun profitability of the industry. Consequently, one can

confidently assert that the current grazing fee understates the shortrun value of Forest Service grazing.

Background studies indicate that the linear programming analysis in some regions is sensitive to the assumptions made and methodology employed as one moves from the 1979 base data toward 1986. It is our recommendation that the Forest Service review and possibly update its basic surveys used in forage value analysis.

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Appendix: The Linear Programming Tableau

ERS was asked by the Forest Service to update Gee's calculations of the value of Forest Service grazing. Gee (1) used information from the livestock enterprise budgets to build LP problems. The design of the LP problems used to compute the value of Forest Service grazing closely follows that used by Gee.

This appendix outlines the formulation of the LP problems used for this study. An example shows how the LP problems were generated from the budgets.

An LP problem can be summarized in a table of coefficients called a tableau. Gee created each of his tableaus one at a time, using the same general format. Gee then ran his LP problems on a mainframe computer. Because of improvements in computer software and hardware, this study used a generic format for the tableaus. These tableaus were created from regional budgets.

An example of a tableau is given in appendix table 1. Appendix table 1 is the tableau for region 1, with 1986 prices, based on shortrun variable costs. The columns of the tableau represent the activities available to the decisionmaker. The rows of the tableau represent constraints. These constraints restrict the possible combinations of activities. Linear programming finds the best combination of activities given the constraints. Below, there are lists of the names of the activities and constraints in the generic LP tableau, along with a brief description and details on how the coefficients were generated from the budgets. The activities, or column names, are first.

Columns

COW	This variable represents the head of bred cows in the cow herd.
FORESTFED	The AM of Forest Service grazing utilized.
BLMFED	The AM of Bureau of Land Management grazing utilized.
STATE	The AUM of land rented from the State.
RENT	The AUM of land rented from private individuals.
IRRIGATED	The AUM of irrigated pasture used.
OTHER	The AUM of other land leased.
DEEDFED	The AUM of deeded land grazed.
RES_FED	The AUM of crop residue fed.
JAN_HAY-DEC_HAY	Tons of hay fed in each month. Gee allowed hay to be fed only in the winter months. What constitutes winter feeding varies from one region to the next. Also, nothing stops ranchers from feeding hay in the summer, except the cost. Allowing for year-round hay feeding gives maximum flexibility in dealing with regional differences. Also, if

summer hay feeding is not profitable, the LP solution will not include it.

MAKEHAY	Tons of hay made on the ranch each year.
BUYHAY	Tons of hay bought during the year.
BORROW	The dollars borrowed for livestock production expenses.
SELLHC	The head of weanling heifer calves sold.
SELLSC	The head of weanling steer calves sold.
SELLYH	The head of yearling heifers sold.
SELLYS	The head of yearling steers sold.
SELLCUL	The head of cull cows sold.
RIGHT HAND SIDE	(Right hand side.) This column contains the maximum or minimum levels of constraining factors. This column is not an activity.

Rows

OBJECTIVE	This row is not a constraint. It measures the costs and returns of the activities. These costs and returns are taken from the budget. Cows are charged a cost per head which is the variable cost per head excluding forage costs and interest on operating capital. Forest Service, BLM, State leases, rented lands, and irrigated lands are charged the appropriate per unit fee. No charge is included for deeded land and crop residue. The costs of these grazing sources is fixed. The hay fed in each month is not given a charge. It does cost money to raise hay and purchase hay. A constraint ensures that all hay that is fed is paid for when it is either purchased or produced. The charge on borrowing is the interest rate adjusted for the time the money is borrowed. The return on the sales of calves, yearlings, and culls is based on the value of the stock per head.
FORESTAM	This constraint restricts the total Forest Service grazing used to be less than or equal to the amount in the original budget. The assumption underlying this restriction is that the enterprises on which the budgets are based used all of the Forest Service grazing available to them.

BLMAM, STATEAM, RENTEDAUM, IRRIGATED, DEEEDAUM, CROPRES, MAKEHAY

These constraints are similar to the FORESTAM constraint with the exception that they restrict the grazing on BLM land, State leases, rented lands, irrigated lands, deeded land, crop residue, and the amount of hay raised.

TOTALHAY

This constraint requires the total hay fed from January to December to equal the hay purchased plus the hay grown.

JAN_FEED-DEC_FEED

These 12 constraints represent the minimum feed requirements of the cow herd. These requirements can be met from National Forest, BLM, State lease, private lease, other lease, deeded land, crop residue or hay. The number in the cow column for each of these constraints represents the AUM of forage consumed per cow in each month. The rest of the numbers in a row represent the forage provided by each source. These numbers are negative. The forage provided by each source is subtracted from the forage required by the herd. Each row requires that the total requirement of the herd minus the total feed available be negative.

In this problem, it has been assumed that when a ranch purchases an AM or an AUM of grazing, it purchases that unit of grazing distributed over the year. The unit of grazing from a source is distributed according to the seasonal availability of total grazing from the source. Consider the example tableau. Crop residue provides grazing only in October, November, and December. Of the total AUM provided by crop residue approximately 31 percent is supplied in October, 53 percent in November, and 16 percent in December. Hay can be freely shifted from one month to the next. Each ton of hay provides 3-1/3 AUM.

PRODSC, PRODHC, PRODYS, PRODYH, PRODCULL

These rows restrict the production of steer calves, heifer calves, yearling steers, yearling heifers, and cull cows, respectively. The production of each type of sale animal is required to be proportional to the breeding stock.

FAMILYV

This is an accounting row. This row does not affect the optimal production or use of forages. It simply keeps track of the value of family labor used.

DnCAPR

This is also an accounting row. It keeps track of the depreciation and capital investment per cow.

INTINV

This is also an accounting row. It keeps track of the interest on capital investment per cow.

OPR_INT

This row requires the ranch to borrow money to purchase its grazing and to produce its hay.

TOTALC

This is also an accounting row. This row accounts for fixed costs and longrun variable costs.

The objective row, the accounting rows, and the OPR_INT rows change when prices change. The other rows are physical constraints and are not affected by changes in prices.

Appendix table 1--Linear programming tableau for region 1, 1986 prices, and shorrun variable costs

	COM	FORESTFED	BLMFED	STATE	RENT	IRRIGATED	OTnER	DEEDFED	RES_FED	JAN_HAY	FEB_HAY	MAR_HAY	APR_HAY	MAY_HAY	JUN_HAY
OBJECTIVE	-58.93	-1.35	-1.35	-2.99	-7.51	-4.05	-3.34								
FORESTAM		1													
BLMAM			1												
STATEAM				1											
RENTEDAUM					1										
IRRIGATED						1									
OTHERAUM							1								
DEEDEAUM								1							
CROPRES									1						
MAKEHAY															
TOTALHAY										1	1	1	1	1	1
JAN_FEED	1.185025	-0.01133	-0.01403	-0.00743	0	0	0	-0.00871	0	-3.333					
FEB_FEED	1.300358	-0.01123	-0.01535	-0.00669	0	0	0	-0.00996	0		-3.333				
MAR_FEED	1.407191	-0.00994	-0.01162	-0.00693	0	0	0	-0.01257	0			-3.333			
APR_FEED	1.529430	-0.00940	-0.04620	-0.04361	-0.01667	0	0	-0.02526	0				-3.333		
MAY_FEED	1.657310	-0.08731	-0.39521	-0.15192	-0.13763	0	-0.16522	-0.12245	0					-3.333	
JUN_FEED	1.751136	-0.13040	-0.37816	-0.16332	-0.17532	-0.25764	-0.17494	-0.14550	0						-3.333
JUL_FEED	1.800655	-0.28715	-0.10342	-0.16951	-0.17646	-0.30626	-0.17278	-0.16737	0						
AUG_FEED	1.821718	-0.29214	-0.10402	-0.17026	-0.17724	-0.30826	-0.17386	-0.16989	0						
SEP_FEED	1.741103	-0.26659	-0.09862	-0.25204	-0.18750	-0.06920	-0.16738	-0.17140	0						
OCT_FEED	1.465262	-0.10192	-0.00018	-0.02825	-0.12324	-0.05862	-0.14578	-0.10699	-0.30729						
NOV_FEED	1.186952	-0.05952	-0.03373	0	-0.00292	0	0	-0.05001	-0.53375						
DEC_FEED	1.161199	-0.01133	-0.01501	0	-0.00299	0	0	-0.00983	-0.15894						
PRODSC	-0.28263														
PRODHC	-0.14670														
PRODYS	-0.11978														
PRODYH	-0.07806														
PRODCULL	-0.14804														
FAMILYV	-21.19														
DnCAPR	-29.8														
INTINV	-74.97														
OPR_INT		-1.35	-1.35	-2.99	-7.51	-4.05	-3.34								
TOTALC	-125.96														

59

Appendix table 1--Linear programming tableau for region 1, 1986 prices, and shortrun variable costs, continued

	JUL_HAY	AUG_HAY	SEP_HAY	OCT_HAY	NOV_HAY	DEC_HAY	MAKEHAY	BUYHAY	BORROW	SELLHC	SELLSC	SELLYN	SELLYS	SELLCUL	RIGHT HAND SIDE
OBJECTIVE							-29.38	-49.95	-0.12074	247.08	302.28	398.47	474.42	330.80	
FORESTAM															<= 943.1
BLMAM															<= 742.3
STATEAM															<= 403.5
RENTEDAUM															<= 1403.7
IRRIGATED															<= 349.7
OTHEREAUM															<= 92.6
DEEDEDAUM															<= 3292.7
CROPRES															<= 1170.2
MAKEHAY							1								<= 1090.2
TOTALHAY	1	1	1	1	1	1	-1	-1							= 0
JAN_FEED															<= 0
FEB_FEED															<= 0
MAR_FEED															<= 0
APR_FEED															<= 0
MAY_FEED															<= 0
JUN_FEED															<= 0
JUL_FEED	-3.333														<= 0
AUG_FEED		-3.333													<= 0
SEP_FEED			-3.333												<= 0
OCT_FEED				-3.333											<= 0
NOV_FEED					-3.333										<= 0
DEC_FEED						-3.333									<= 0
PRODSC											1				= 0
PRODHC										1					= 0
PRODYS													1		= 0
PRODYH												1			= 0
PROCCULL														1	= 0
FAMILYV															<= 0
DnCAPR															<= 0
INTINV															<= 0
OPR_INT							-29.38	-49.95	1						= 0
TOTALC															<= 304165

60