

For Check Out Only!

An Economic Analysis of
GRAZING FEE LEVELS
ON FEDERAL RANGE LANDS

F. LARRY LEISTRITZ
EDWARD V. DUNN

DEPARTMENT OF AGRICULTURAL ECONOMICS
Agricultural Experiment Station
North Dakota State University
Fargo, North Dakota



FORWARD

In January of 1969 the Bureau of the Budget announced a revision in the method of establishing grazing fees on the Federally-owned rangelands in the western United States. The proposal, if implemented, would result in an increase in grazing fees. As might be expected, the new proposal has caused concern among users of the Federal lands as to the methods employed in establishing fees.

Members of five local grazing associations use Federal rangelands in North Dakota. All five local associations are represented by the North Dakota Grazing Association. In November of 1970 the North Dakota Grazing Association requested that the Department of Agricultural Economics of the North Dakota State University investigate the probable effects of the proposed increase in grazing fees on stockmen who use Federal lands and on the North Dakota economy.

Because of increased interest by the public in the use of Federal lands, background information on the administration of Federal rangelands and the use of federal rangelands by stockmen is presented in this report to permit a fuller understanding of the grazing fee situation. It is the intent of the authors of this report that the information presented within will make a worthwhile contribution to leasing arrangements on Federal rangelands in North Dakota.

TABLE OF CONTENTS

	<u>Page</u>
Highlights	v
Introduction	1
Administration of Federal Rangelands	2
The Range Livestock Industry	4
Proposal for Increased Grazing Fees	5
Purpose and Objectives	6
Review of Literature: Resources, Costs and Returns of Cattle Ranches	7
Costs and Returns on Cattle Ranches Using Public Land in the Western States	7
Costs and Returns on Cattle Ranches in the Mountain Areas of Colorado	11
Costs and Returns on Cattle Ranches in North Central Washington	12
Costs and Returns on Southwestern North Dakota Commercial Beef Cattle Ranches	14
Costs and Returns on Cattle Ranches of Sheyenne Valley Grazing Association, North Dakota	14
Effect of Increased Grazing Fees on Incomes and Resource Returns of Cattle Ranches	18
Sheyenne Valley Cattle Ranches	18
Cattle Ranches Using Public Land in the Western States	19
Conclusions and Implications	20
Impact of Increases in Grazing Fees on the Regional Economy of a Range Livestock Producing Area	20
The Impact of Grazing Fee Increases on the North Dakota Economy	21
Factors to be Considered in Establishing a Grazing Fee Formula	23
Goals of the Federal Government	25
Goals of the Stockmen	26

Analysis of the Grazing Fee Formula Proposed by the Federal Government 28

 Economic Forces Affecting Agricultural Land Prices and Rental Rates in the Northern Plains 29

 Empirical Investigation of Forces Influencing Rental Rates 32

An Alternative Method for Establishing a Grazing Fee Formula 33

 Proposed Grazing Fee Formula 35

 Implications of the Proposed Grazing Fee Formula 37

Bibliography 38

Appendix 43

LIST OF TABLES

Table Number

1 Costs and Returns on Cattle Ranches Using Public Land in the Western States 9

2 Costs and Returns on Cattle Ranches in the Mountain Areas of Colorado 12

3 Costs and Returns on Cattle Ranches in North Central Washington 13

4 Costs and Returns on Southwestern North Dakota Commercial Beef Cattle Ranches, 1966 15

5 Returns to Operator Resources Per Brood Cow, Cow-Calf Ranches of Sheyenne Valley Grazing Association, 1967-1970 17

6 Rate of Return on Ranch Operator Investment with Various Levels of Operator Equity and Grazing Fees, Sheyenne Valley Grazing Association, 1967-1970 19

7 Estimated Reductions in Gross Receipts Resulting from Estimated Decrease in Livestock Sector Income, North Dakota 23

8 Value of Farm Real Estate Per Acre and Net Farm Income Per Acre, Northern Plains and United States, 1950-1967 30

9 Net Share Rent and Net Cash Rent as a Percentage of Land Value, United States, 1959-1965 31

APPENDIX TABLES

<u>Table Number</u>		<u>Page</u>
1	Comparison of Federally-Owned Land with Total Acreage of States as of June 30, 1967	44
2	Federally-Owned Land Administered by Forest Service and Bureau of Land Management, Plains and Western States, 1967	46
3	Cash Receipts from All Farm Products Marketed from Livestock and Percent of Total Receipts by Source, 1969, by States . . .	47
4	Resources, Costs, and Returns Per Brood Cow, Cow-Calf Ranches, Sheyenne Valley Grazing Association, 1967-1970	48

HIGHLIGHTS

The general purpose of this study was to gain insights into the economic implications of a proposed increase in grazing fees on rangelands owned by the Federal government. The specific objectives of this study were: (1) to examine the resources, costs and returns of cattle ranches in North Dakota and other western states, (2) to estimate the effect of increased grazing fees on the income and resource returns of North Dakota livestock producers, (3) to estimate the impact of the proposed increase in grazing fees on the North Dakota economy, and (4) to examine the various alternative methods which could be used in establishing a grazing fee formula.

Cattle ranches of North Dakota and other western states were found to have large capital investments relative to net ranch income. A characteristic common to all of the ranches studied was a low rate of return to operator and family labor and invested capital. The return to labor and capital generally tended to increase as ranch size increased among ranches of the same type, but even on the larger ranches, returns were not equal to those obtained on relatively secure investments in other sectors of the economy.

Grazing fees paid for the use of Federal rangelands are a direct operating cost for a ranch operator. Therefore, in the short run, an increase in grazing fees will be fully reflected in higher operating costs and lower net ranch income. The ranches obtaining the largest proportion of their feed from Federal rangeland would experience the largest proportionate decline in net ranch income from a given increase in grazing fees.

The total impact of the proposed increase in grazing fees on the North Dakota economy was estimated to be a decrease in gross receipts of all sectors of approximately \$1.3 million. The total reduction is the sum of a direct reduction of livestock sector income of \$378,500 and secondary or indirect decreases in gross receipts which total approximately \$918,850, considering all sectors.

A grazing fee formula developed in this report as a possible alternative to the formula proposed by the Federal government considers the following factors:

- (1) The productivity of the grassland.
- (2) The price of range livestock.
- (3) The costs of producing range livestock.
- (4) A return to the stockmen's labor and capital resources consistent with their "fair market value."

AN ECONOMIC ANALYSIS OF THE EFFECT OF
INCREASED GRAZING FEES ON THE NATIONAL
GRASSLANDS OF NORTH DAKOTA

By

F. Larry Leistritz and Edward V. Dunn*

INTRODUCTION

The Federal government presently owns about one-third of the nation's land area. The Federally-owned lands are located in all states, but the greatest acreages are found in the western states and Alaska.¹ In several western states more than half of the total land area is in Federal ownership. For example, 86.4 percent of the land area of Nevada is Federally-owned.² For Utah, the corresponding figure is 66.6 percent.³ Federal land ownership is substantial in other western states as well. In North Dakota only 4.7 percent of the total land area is Federally-owned; but this still amounts to 2,101,410.3 acres of land in Federal ownership.⁴

The range livestock industry has long been a major user of public lands in the United States. Although much of the public domain passed into private ownership during the settlement period, public lands are still an important source of forage for the western range livestock industry.⁵ In 1960 Federal rangelands provided 24 million animal unit months of feed. This was about 18 percent of the total feed units used by livestock ranches

*The authors are Assistant Professors of Agricultural Economics at North Dakota State University.

¹United States Department of the Interior, Bureau of Land Management, Public Land Statistics, 1968, United States Government Printing Office, Washington, D.C., 1969, p. 10.

²Ibid.

³Ibid.

⁴For more information concerning Federal land ownership, see Appendix Table 1.

⁵For an excellent account of the historical development of the range livestock industry, see Gray, James R., Ranch Economics, Iowa State University Press, Ames, Iowa, 1968, pp. 16-21.

with grazing permits.⁶ Currently, public rangelands are estimated to furnish 12 percent of the total forage used by range livestock in the western states.⁷

The relative importance of Federal range as a source of feed varies among ranching areas and among ranches in a given area. In general the importance of Federal range as a source of feed depends upon the duration of the grazing period and the proportion of the livestock herd grazed on Federal range.⁸

ADMINISTRATION OF FEDERAL RANGELANDS

The Federal rangelands are administered primarily by two agencies-- the Forest Service, United States Department of Agriculture; and the Bureau of Land Management, United States Department of the Interior. The Forest Service administers the lands included in the National Forests and National Grasslands, while the Bureau of Land Management (BLM) administers, under the Taylor Grazing Act, vast acreages of land which are used primarily for grazing. The Federal rangelands can be classified into public domain lands and acquired lands. The public domain lands are those which have never been patented into private ownership, while the acquired lands are those which have been repurchased by the government from private owners. The lands administered by these Federal agencies in the Northern Plains Area include a higher proportion of acquired land than is found in the other western states.⁹

The Federal rangelands of North Dakota are administered primarily by the Forest Service as a part of the National Grasslands program. Three National Grasslands are located in North Dakota. The largest of the Grasslands is the Little Missouri National Grassland, located in Slope, Golden Valley, Billings, and McKenzie counties. This Grassland encompasses about 1,033,000 acres and provided about 362,000 animal unit months of grazing in 1970.¹⁰ The Sheyenne National Grassland, located in Ransom and Richland

⁶Caton, D. D. (Project Leader), Effects of Changes in Grazing Fees and Permitted Use of Public Rangelands on Incomes of Western Livestock Ranches, ERS 248, United States Department of Agriculture, Washington, D.C., 1965, p. 1.

⁷Public Land Law Review Commission, One-Third of the Nation's Land, a report to the President and to the Congress by the Public Land Law Review Commission, Washington, D.C., 1970, p. 105.

⁸Caton, D. D. (Project Leader), ERS 248, op. cit., p. 1.

⁹For detailed information concerning lands administered by the Forest Service and BLM, see Appendix Table 2.

¹⁰Unpublished Forest Service papers provided by Mr. Don Nelson, District Forest Ranger, Custer National Forest, Lisbon, North Dakota.

counties, consists of about 71,000 acres of grassland and provided approximately 63,000 animal unit months of grazing in 1970.¹¹ The Cedar River National Grassland, located in Sioux and Grant counties, includes about 6,700 acres of rangeland, which provided 2,564 animal unit months of grazing in 1969.¹² Nearly 90 percent of the land included in North Dakota's three National Grasslands is acquired land that was formerly in private ownership.¹³

The conditions under which stockmen are permitted to use the public lands for grazing obviously are crucial to the range livestock industry. Grazing use of Federal rangelands is controlled primarily by the Bureau of Land Management, Department of the Interior; and the Forest Service, Department of Agriculture. Both agencies have established comprehensive regulations governing the season of grazing use, the number of livestock which may be grazed, and the fee to be paid for the privilege of grazing.

Fees for grazing on lands included in the National Forests were first adopted in 1905. Grazing permits for specific numbers of animals for a specific number of months (i.e., a specific number of animal unit months) were issued to ranch operators with "base property" sufficient to support the livestock when they were not on the public land.¹⁴ The Taylor Grazing Act, passed in 1934, provided for a similar system of control over grazing for the Federal lands now administered by the Bureau of Land Management.¹⁵

Since the grazing permit system was put into effect, grazing fees have been increased periodically. In recent years several studies of grazing fees have been undertaken, and the Bureau of the Budget has recently proposed a change in both the level of grazing fees and the basis on which fees will be established.¹⁶ An increase in grazing fees may have significant implications not only for the ranchers who use Federal rangelands, but also for

¹¹Ibid.

¹²Information from unpublished Forest Service Grazing Statistical Report, provided by Mr. George A. Myles, Agricultural Economist, United States Forest Service, Denver, Colorado.

¹³These acquired lands were purchased as part of Land Utilization Projects established during the 1930's. The main objective of the Land Utilization Program was to remove from farming certain types of land which were submarginal for that use. For further information concerning the Land Utilization Program, see Grest, Edward G., "The Range Story of the Land Utilization Projects," Journal of Range Management, Vol. 6, pp. 44-50, January, 1953, and Wooten, H. H., The Land Utilization Program, 1934 to 1964, Agricultural Economics Report No. 85, United States Department of Agriculture, Washington, D.C., 1965.

¹⁴Public Land Law Review Commission, op. cit., p. 105.

¹⁵Ibid., p. 106.

¹⁶Ibid., p. 117.

other sectors of the local economies of ranching areas. To determine the probable effects of an increase in grazing fees on the users of public lands, it is necessary to briefly survey the western range livestock industry.

THE RANGE LIVESTOCK INDUSTRY

The livestock industry is one of the oldest and largest industries in the United States. Its beginning dates back to the exploration of the North American Continent by Cortez in 1519-21,¹⁷ and since that time it has played a vital and dramatic role in the history and development of the United States.

There were approximately 109.7 million cattle and calves of all types on farms and ranches in the United States on January 1, 1969. In this year the total inventory value of beef cattle alone was estimated to be \$17.4 billion.¹⁸ The total cash receipts to ranchers from the marketings of beef cattle and calves in 1968 were estimated at \$11.3 billion.¹⁹

Beef cattle production was widely dispersed throughout the United States before the turn of the Twentieth Century. In more recent years, however, the raising of feeder cattle has become more concentrated in the western range regions of the United States. The range regions producing a majority of the feeder cattle include the Northern Great Plains, Southern Great Plains, Southwest, and the Intermountain States.²⁰

The range livestock industry is an important and dynamic segment of American agriculture, providing a means for effectively utilizing the forage produced on the arid lands of the western states. The western range livestock industry is an important source of feeder animals for feedlots throughout the West and Midwest.²¹

The range livestock industry has a substantial influence on the regional economy of the Plains and Western States. In North Dakota sales of cattle and calves produced receipts of \$185 million in 1969. This

¹⁷Williams, W. F., and T. T. Stout, Economics of the Livestock-Meat Industry, The MacMillan Company, New York, 1964, p. 3.

¹⁸Ibid., p. 29.

¹⁹Ives, J. R., The Livestock and Meat Economy of the United States, AMI Center for Continuing Education, American Meat Institute, Ann Arbor, Michigan, 1966, p. 42.

²⁰Ibid., p. 24.

²¹Public Land Law Review Commission, One-Third of the Nation's Land, a report to the President and to the Congress by the Public Land Law Review Commission, Washington, D.C., June, 1970, p. 105.

represents nearly 25 percent of North Dakota's total receipts for all farm products sold in 1969.²² In several other western states, livestock has an even greater relative importance. In South Dakota, for instance, cattle and calves accounted for 51.7 percent of total agricultural receipts in 1969, while sheep and lambs accounted for another 2.1 percent. Montana obtained 54.7 percent of its total 1969 agricultural receipts from sales of cattle and calves and another 2.4 percent from sheep and lambs. Wyoming obtained an overwhelming 67 percent of its agricultural receipts from cattle and calves in 1969. (Appendix Table 3 provides more detailed information concerning receipts from range livestock.)

PROPOSAL FOR INCREASED GRAZING FEES

In 1969 the Forest Service and Bureau of Land Management adopted a new fee system. The system provides for increases in the general level of grazing fees and also for a change in the basis on which grazing fees are determined.²³ The new fee system was the result of several years of deliberation and study. In 1959 the Bureau of the Budget issued Circular A-25, which called for lease rates for Federally-owned resources to be based upon the fair market value of those resources. In 1964 the Bureau of the Budget issued a study report which recommended that grazing fees be based on the economic value of the use of public lands to users and that the economic value should be set by an appraisal that would provide a fair return to the government and equitable treatment to the users.²⁴ An inter-agency study group recommended the new fee system in 1967, and the system was then adopted in 1969.

The new fee system adopted in 1969 has two major points of difference from previous systems. First, the level of grazing fees would be increased substantially under the new fee system. For instance, grazing fees on the Little Missouri National Grassland in western North Dakota could increase from \$0.70 per AUM in 1970 to \$1.55 per AUM in 1972.²⁵ Second, private land

²²United States Department of Agriculture, Economic Research Service, Farm Income Situation, FIS 216, United States Government Printing Office, Washington, D.C., July, 1970.

²³Ibid., p. 117.

²⁴Forest Service, Grazing Fees on National Forest Range, CI Report No. 3, United States Department of Agriculture, Washington, D.C., 1969, p. 4.

²⁵The 1972 grazing fee figure is taken from the report made by representatives of the Forest Service to the North Dakota Grazing Association on November 16, 1970, at Dickinson, North Dakota. The grazing fee of \$1.55 per AUM in 1972 is an estimate, assuming that the index of private land lease rates is used to adjust the basic grazing fee and that private land lease rates are the same in 1971 as in 1970. A beef price index was reported to possibly be an acceptable alternative to the private lease rate index. If the beef price index were used as the adjusting factor and if beef prices were the same in 1971 as in 1970, the 1972 grazing fee would be \$1.65 per AUM.

lease rates would be the only factor considered in adjusting the grazing fee from year to year. Previously, livestock prices were considered in adjusting the fee. Grazing fees are to be based on what the Bureau of the Budget calls the "fair market value" of grazing. This fair market value is defined as the difference between total costs of operating on private leased lands and total nonfee costs of operating on public lands.²⁶ The basic grazing fee has been determined as the private land lease rate for 1966, less adjustments for differences in costs of using public lands as opposed to private lands. Since private landlords typically maintain the fences and water facilities and the public landlord does not, the nonfee costs of using public lands are generally higher than the corresponding costs of using private lands. The basic grazing fee for 1966 has been computed as \$1.23 per AUM, averaged over the entire western United States. The basic grazing fee is adjusted annually by an index of the previous year's private lease rates;²⁷ so if private land lease rates increase, the grazing fee will also increase.

PURPOSE AND OBJECTIVES

The proposal for increased grazing fees for future years raises a number of questions. The stockman may wonder what effect the new fee schedule will have on his income. Community leaders and local businessmen in range livestock areas have asked how great the impact of increased fees on the area economy will be. In addition, agricultural leaders may ask whether the new grazing fee formula offered by the administrative agencies is in accord with the goals of the livestock producers and of the Federal government. The general question, then, is whether an alternative grazing fee formula would produce results more nearly aligned with the goals of the interested parties. It is possible that the grazing fee formula being proposed by the Federal government may be the most equitable method that could be used to establish grazing fees. However, a study is needed to determine the equitability of the proposed formula and to provide answers to the questions posed.

The specific objectives of this study are:

1. To examine the resources, costs, and returns of cattle ranches in North Dakota and other western states.
2. To estimate the effect of increased grazing fees on the income and resource returns of ranchers in North Dakota.
3. To estimate the impact of the proposed increase in grazing fees on the economy of North Dakota.
4. To examine the alternative methods which could be used in establishing a grazing fee formula.

²⁶Forest Service, CI Report No. 3, op. cit., p. 6.

²⁷Ibid.

REVIEW OF LITERATURE:
RESOURCES, COSTS, AND RETURNS OF CATTLE RANCHES

A number of researchers have studied the costs and returns associated with range livestock production. Several studies are reviewed in this section. These studies involve ranches in eight states: North Dakota, Colorado, California, Washington, Idaho, Utah, New Mexico, and Arizona.

A characteristic common to all the ranches is a large capital investment relative to net ranch income. Investment per brood cow or per animal unit can usually be expected to vary inversely with the proportion of total feed requirements supplied by Federal lands or leased private lands among ranches of the same general type located in the same area.

A second characteristic common to all the ranches is a low rate of return to the resources employed, especially to operator and family labor and invested capital. None of the ranches studied provided returns to labor and capital equal to the returns to be expected from these resources in most other sectors of the economy. The return to invested capital generally tended to increase as ranch size increased among ranches of the same type. However, even on the larger ranches, returns were not equal to the returns that could be expected from relatively secure investments in other sectors of the economy. One effect of the low level of returns in ranching has been a substantial decline in the number of ranches in recent years.

COSTS AND RETURNS ON CATTLE RANCHES
USING PUBLIC LAND IN THE WESTERN STATES

A report released in 1965 summarized the results of a study of costs and returns in ranching conducted by Caton and a joint study group.²⁸ The study group included researchers from the Economic Research Service and the Forest Service, both of the United States Department of Agriculture; from the Bureau of Land Management of the United States Department of the Interior; and from the Montana State College; the Utah State University; and the University of Arizona. The study covered ranches using public land in the Northern Great Plains and the 11 Western States. Ranch budgets were used to estimate the income of 85 representative ranches. Sixty-nine of these ranches were cattle ranches and the other 16 were sheep ranches. Grazing fee levels approximating the 1961-62 levels for Forest Service and Bureau of Land Management lands were used in preparing initial budgets. Operator and family labor were valued at the prevailing wage rates for hired ranch labor. From the 69 cattle ranches that were budgeted, 17 have been selected for detailed

²⁸Caton, D. D. (Project Leader), Effects of Changes in Grazing Fees and Permitted Use of Public Rangelands on Incomes of Western Livestock Ranches, ERS 248, United States Department of Agriculture, Washington, D.C., 1965.

review in this section. These 17 ranches were selected on the basis of two criteria: first, that as many range regions as possible be represented and, second, that ranches of several different sizes be examined for each region. Ranches from California, Idaho, Utah, New Mexico, and Arizona were selected for review. The following discussion is a brief summary of the joint study group report.

The figures in Table 1 describe the investment, costs, and returns for 17 representative ranches. Ranch size is defined in terms of animal units per ranch. Each of the five groups of ranches is representative of a particular ranching area.

All of the ranches used public lands administered by the Forest Service or the Bureau of Land Management (BLM) for part of their annual grazing needs. The ranches representative of the mountain area of north central California used Forest Service lands for summer grazing. Their Forest Service grazing permits ranged from 180 animal unit months (one animal unit month or AUM = one animal unit for one month) for the smallest ranch to 580 animal unit months (AUM) for the largest ranch. The three ranches representative of the Northern Intermountain Area of southern Idaho used BLM lands for spring, summer, and fall grazing. Their permits ranged from 318 AUM's for the smallest ranch to 3,354 AUM's on the largest ranch. The three ranches representative of the Intermountain Area of southeastern Utah used BLM lands for fall, winter, and spring grazing and also used Forest Service lands for summer grazing. Their permits for grazing on Federal lands ranged from 466 AUM's for the smallest ranch to 3,160 AUM's for the largest ranch.

The three ranches representative of the Southern Desert Area of southwestern New Mexico used BLM lands for grazing during the entire year. The three ranches, which ranged in size from 68 animal units to 423 animal units, had grazing permits which ranged from 452 AUM's for the smallest ranch to 2,631 AUM's for the largest ranch. The four ranches representative of the Southwest Desert Area of southern Arizona used BLM lands for grazing during the entire year. These ranches ranged in size from 170 animal units to 725 animal units and their grazing permits ranged from 1,690 AUM's to 7,206 AUM's.

Investment in the ranches ranged from \$38,488 for the 68 animal unit ranch in New Mexico to \$422,385 for the 725 animal unit ranch in Arizona. Net ranch income ranged from a high of \$10,768 for the 694 animal unit ranch in Idaho down to a negative \$1,244 for the 68 animal unit ranch in New Mexico. Three of the 17 ranches had negative net ranch incomes, meaning that their total receipts were less than their cash costs and depreciation.

The return to capital and management is obtained by subtracting a charge for operator and family labor from the net ranch income. The return to capital and management is positive for only 5 of the 17 ranches. To obtain the rate of return on investment, the return to capital and management is divided by the total ranch investment. The highest rate of return on investment was for the 694 animal unit ranch in Idaho. This ranch had a 2.58 percent return on investment.

TABLE 1. COSTS AND RETURNS ON CATTLE RANCHES USING PUBLIC LAND IN THE WESTERN STATES.

Item	Unit	Mountain Area of California			Intermountain Area (Southern Idaho)			Intermountain Area (Southeastern Utah)			
		Size of Ranch--Animal Units			Size of Ranch--Animal Units			Size of Ranch--Animal Units			
		69 AU	120 AU	235 AU	420 AU	72 AU	233 AU	694 AU	87 AU	236 AU	466 AU
Owned Land	Acre	810	1,055	2,664	4,336	423	1,273	3,592	540	1,045	1,330
Leased Land	Acre	420	480	0	3,024	51	540	1,334	0	0	1,128
Total Land	Acre	1,230	1,535	2,664	7,360	474	1,813	4,926	540	1,045	2,458
AUM's in Grazing Permit	No.	180	300	400	580	318	1,070	3,354	466	1,635	3,160
Investment	Dollars	51,403	78,654	151,044	220,843	49,018	111,901	271,874	60,094	123,790	227,107
Gross Income	Dollars	4,870	8,457	16,834	30,683	6,612	14,421	37,908	5,019	11,768	23,695
Cash Costs	Dollars	3,794	5,846	11,331	21,573	3,081	8,316	20,113	3,618	6,737	14,643
Depreciation	Dollars	1,577	2,148	3,090	4,729	1,543	3,258	7,027	1,536	2,868	4,089
Net Ranch Income ^a	Dollars	-501	463	2,413	4,381	1,988	2,847	10,768	-135	2,163	4,963
Operator and Family Labor Charge	Dollars	3,135	3,705	3,420	3,420	2,428	5,603	3,735	3,800	4,950	6,200

Return to Capital and Management^b Dollars -3,636 -3,242 -1,007 961 -440 -2,756 7,033 -3,935 -2,787 -1,237

Rate of Return on Investment^c Percent -7.1 -4.1 -0.7 0.4 -0.89 -2.46 2.58 -6.54 -2.25 -0.54

- continued -

TABLE 1. COSTS AND RETURNS ON CATTLE RANCHES USING PUBLIC LAND IN THE WESTERN STATES. (CONTINUED)

Item	Unit	Southern Desert Area (Southwestern New Mexico)				Southwest Desert Area (Southern Arizona)			
		Size of Ranch--Animal Units				Size of Ranch--Animal Units			
		68 AU	182 AU	423 AU	450 AU	170 AU	250 AU	450 AU	725 AU
Owned Land	Acre	1,157	1,850	4,331	120	120	320	480	
Leased Land	Acre	733	2,495	6,366	4,800	7,120	12,780	26,540	
Total Land	Acre	1,890	4,345	10,697	4,920	7,240	13,100	27,020	
AUM's in Grazing Permit	No.	452	1,208	2,631	1,690	2,485	4,472	7,206	
Investment	Dollars	38,488	64,694	149,344	97,113	142,681	263,131	422,385	
Gross Income	Dollars	3,288	9,808	21,193	6,839	10,307	18,164	29,321	
Cash Costs	Dollars	2,430	4,947	12,150	3,949	5,035	11,129	18,698	
Depreciation	Dollars	2,102	3,147	5,802	598	1,147	1,998	3,034	
Net Ranch Income ^a	Dollars	-1,244	1,714	3,240	2,292	4,125	5,037	7,589	
Operator and Family Labor Charge	Dollars	1,488	2,232	2,232	2,500	5,000	5,000	2,500	
Return to Capital and Management ^b	Dollars	-2,732	-518	1,008	-208	-875	37	5,089	
Rate of Return on Investment ^c	Percent	-7.09	-0.80	0.67	-0.21	-0.61	0.01	1.20	

^aNet ranch income = gross income less cash cost and depreciation.

^bReturn to capital and management = net ranch income less operator and family labor charge. Computed by author.

^cRate of return on investment = return to capital and management divided by total investment. Computed by author.

Source: Caton, D. D. (Project Leader), Effects of Changes in Grazing Fees and Permitted Use of Public Rangelands on Incomes of Western Livestock Ranches, ERS 248, United States Department of Agriculture, Washington, D.C., 1965.

COSTS AND RETURNS ON CATTLE RANCHES IN THE
MOUNTAIN AREAS OF COLORADO

A recent study by Nelson and Skold examines costs and returns on cattle ranches in the mountain areas of Colorado.²⁹ The study concerned ranches in Delta, Gunnison, Jackson, Park, Pitkin, and Routt counties of Colorado. Ranches in this area are characterized by relatively small amounts of meadowland, usually irrigated, coupled with rangeland of various types. Rangelands include privately owned land and public grazing land administered by the Forest Service and Bureau of Land Management.

Twenty-six ranches were included in the study. These ranches were divided into five size groups on the basis of animal units per ranch. Animal unit equivalents were computed as follows: one cow = 1.0 animal unit (AU); one calf = 0.3 AU; one yearling = 0.67 AU; one bull = 1.4 AU; and one horse = 1.25 AU.³⁰ Ranches in Group I had less than 170 animal units; Group II--170 to 219.9 animal units; Group III--220 to 319.9 animal units; Group IV--320 to 519.9 animal units; and Group V--more than 520 animal units. Average animal units per ranch for the respective groups were: Group I--74 AU; Group II--181 AU; Group III--254 AU; Group IV--321 AU; and Group V--764 AU.

The results of the study are summarized in Table 2. The return to operator labor, capital and management, or net ranch income, varies from a negative \$1,685 for the smallest size group (Group I--74 AU) to \$7,709 for Group III (254 AU). The return to capital and management was determined by valuing operator and family labor at the prevailing wage rates for hired ranch labor. The return to capital and management was greater than zero for only two of the five size groups (Groups II and III).

Total investment per ranch ranged from \$59,970 for Group I ranches to \$622,256 for Group V. Return to capital and management as a percent of total investment ranged from a negative 5.71 percent for Group I to 1.99 percent for Group III.

When interest on total investment was imputed at a rate of 6 percent, return to operator labor and management was negative for all size groups, ranging from -\$4,679 for Group III to -\$36,807 for Group V. It could be concluded that ranches in Group III were most efficient since they had the smallest negative return to operator and family labor.

²⁹Nelson, C. Alan and Melvin D. Skold, Resources, Costs and Returns on Cattle Ranches in the Mountain Areas of Colorado by Size of Ranch, Technical Bulletin 101, Colorado State University, Fort Collins, Colorado, 1970.

³⁰Ibid., p. 8.

TABLE 2. COSTS AND RETURNS ON CATTLE RANCHES IN THE MOUNTAIN AREAS OF COLORADO.

Item	Size of Ranch--Animal Units				
	74 AU	181 AU	254 AU	321 AU	764 AU
Total Receipts	\$ 6,199	\$ 16,192	\$ 21,255	\$ 22,987	\$ 63,398
Total Operating Expenses	7,879	12,239	13,546	23,555	62,870
Return to Labor, Capital, and Management	-1,680	3,953	7,709	-568	528
Labor Charge ^a	1,740	3,600	3,600	3,600	2,340
Return to Capital and Management	-3,420	353	4,109	-4,168	-1,812
Return to Capital and Management as a Percent of Total Investment	-5.70%	0.23%	1.99%	-1.60%	-0.29%
Total Investment	\$59,970	\$155,074	\$206,471	\$259,914	\$622,256
Capital Charge (6%) ^b	3,598	9,304	12,388	15,595	37,335
Return to Labor and Management ^c	-5,278	-5,351	-4,679	-16,163	-36,807

^aOperator and family labor valued at hired ranch labor wage rates.

^bCapital charge was computed by the author by taking 6.0 percent of the "total investment" figure.

^cReturn to labor and management was computed by the author by subtracting the capital charge (6.0 percent of total investment) from the return to labor, capital, and management.

Source: Nelson, C. Alan and Melvin D. Skold, Resources, Costs and Returns on Cattle Ranches in the Mountain Areas of Colorado by Size of Ranch, Technical Bulletin 101, Colorado State University, Fort Collins, Colorado, 1970.

COSTS AND RETURNS ON CATTLE RANCHES IN
NORTH CENTRAL WASHINGTON

The resource requirements, costs, and returns of cattle ranches in Washington were studied by Rogers.³¹ North central Washington, especially

³¹Rogers, Leroy F., Budget Data for the Range Cattle Industry in North Central, Northeastern and South Central Washington, Circular 494, Washington State University, Pullman, Washington, 1968.

Okanogan County, is one of the leading ranching areas of the state. Ranches in the area typically use public lands administered by the Forest Service for part of their summer grazing requirements. Budgets were constructed for four different ranch sizes in north central Washington based on information from a survey of ranchers. Animal units were used as the measure of ranch size, and the ranches budgeted ranged from 88 to 754 animal units.

The results of the study are summarized in Table 3. The return to operator labor, capital and management, or net ranch income, varies from \$1,916 for the smallest ranch to \$18,556 for the largest ranch. The return to capital and management was determined by valuing operator and family labor at prevailing hired labor wage rates (operator labor was classified as supervisory labor). The return to capital and management was positive only for the two largest ranches.

TABLE 3. COSTS AND RETURNS ON CATTLE RANCHES IN NORTH CENTRAL WASHINGTON.

Item	Size of Ranch--Animal Units			
	88 AU	213 AU	356 AU	754 AU
Total Receipts	\$ 7,426	\$ 17,210	\$ 27,894	\$ 56,363
Total Operating Expenses	5,510	13,983	20,154	37,807
Return to Operator Labor, Capital, and Management	1,916	3,227	7,740	18,556
Operator Labor Charge ^a	6,000	6,000	6,000	6,000
Return to Capital and Management	-4,084	-2,773	1,740	12,556
Return to Capital and Management as a Percent of Total Investment	b	b	0.8%	2.9%
Total Investment	\$68,895	\$131,274	\$206,306	\$428,657

^aBased upon prevailing wage rates for supervisory ranch labor.

^bRates not calculated because return was negative.

Source: Rogers, Leroy F., Budget Data for the Range Cattle Industry in North Central, Northeastern, and South Central Washington, Circular 494, Washington State University, Pullman, Washington, 1968.

COSTS AND RETURNS ON SOUTHWESTERN
NORTH DAKOTA COMMERCIAL BEEF CATTLE RANCHES

Beef cattle are produced in virtually all areas of North Dakota. However, the major beef cattle ranching area in the state is the area south and west of the Missouri River.³² A study was conducted by Dunn in 1968 to determine the costs and returns on southwestern North Dakota ranches.³³ Sixty-five ranch operators were interviewed and the costs and returns from beef cattle production in 1966 were obtained from each. The 65 ranches were divided into four size groups for purposes of analysis. The size of the cow herd was used as the measure of ranch size.

The results of the study are summarized in Table 4. Ranches in Group I had 0-99 brood cows, Group II includes those having 100-199, Group III contains herd sizes from 200-399, and Group IV includes all ranches having 400 or more brood cows. The average herd size for all ranches is 203 cows.

Table 4 shows that capital investments in ranching are substantial. All four ranch size groups have an average investment per brood cow in excess of \$1,000. Total annual cost per cow is also high for all ranch sizes. Group III ranches have the lowest total annual cost per cow (\$139).

When interest on investment of 6.0 percent is included as a part of the fixed costs, total receipts fail to cover total costs (excluding operator and family labor). Thus, the return to operator and family labor and management is negative for all four ranch size groups.

COSTS AND RETURNS ON CATTLE RANCHES
OF SHEYENNE VALLEY GRAZING ASSOCIATION, NORTH DAKOTA

The Sheyenne National Grassland is located in Ransom and Richland counties of southeastern North Dakota. In 1970, 107 permittees used the grassland for summer grazing. The average permit size was 98 animal units, and the grazing fee was \$1.11 per AUM.

A recent study examines costs and returns on cattle ranches of the Sheyenne Valley Grazing Association.³⁴ The product prices and input costs

³²North Dakota Crop and Livestock Reporting Service, op. cit., p. 58.

³³Dunn, Edward, V., Cost-Size Relationships of Southwestern North Dakota Commercial Beef Cattle Ranches, unpublished M.S. thesis, North Dakota State University, Fargo, North Dakota, 1968.

³⁴Leistritz, Larry, Edward Dunn, and Jerome Johnson, An Economic Analysis of a Proposed Grazing Fee Formula for Members of the Sheyenne Valley Grazing Association, a report prepared for members of the Sheyenne Valley Grazing Association by the Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1970.

TABLE 4. COSTS AND RETURNS ON SOUTHWESTERN NORTH DAKOTA COMMERCIAL BEEF CATTLE RANCHES, 1966.

Item	Ranch Size--Number of Brood Cows			
	Group I (0-99)	Group II (100-199)	Group III (200-399)	Group IV (400 +)
Average Number of Brood Cows	78	141	272	486
Average Acres Per Ranch Used for Cattle Production	1,414	3,722	6,582	11,351
Average Capital Investment Per Brood Cow	\$ 1,177	\$ 1,102	\$ 1,074	\$ 1,023
Fixed Cost Per Cow ^a	111	102	95	101
Variable Cost Per Cow	65	54	44	65
Total Annual Cost Per Cow	176	156	139	166
<hr/>				
Total Receipts from Beef Cattle Per Ranch	\$10,800	\$20,050	\$36,501	\$67,004
Total Fixed Cost Per Ranch ^a	8,678	14,341	25,718	49,132
Total Variable Cost Per Ranch	5,077	7,651	12,105	31,543
Returns to Operator and Family Labor and Management Per Ranch	-2,955	-1,942	-1,322	-13,671

^aIncludes interest on investment of 6.0 percent.

Source: Dunn, Edward V., Cost-Size Relationships of Southwestern North Dakota Commercial Beef Cattle Ranches, unpublished M.S. thesis, North Dakota State University, Fargo, North Dakota, 1968.

used in the analysis reflect the conditions prevailing from 1967 through 1970, a period of relatively high cattle prices. The physical input-output coefficients used in the analysis reflect resource levels and production practices common among Association members. Superior management is assumed. Feeder

calves were assumed to be sold in the fall after weaning; steer calves weighing 400 pounds and selling for \$32/cwt. and heifers weighing 375 pounds and selling for \$30/cwt. Replacement of the cow herd was at a rate of 16 percent and a 90 percent calf crop was assumed.³⁵ One bull was assumed to be used per 30 cows.

In arriving at investment requirements, breeding cattle were valued at the following levels: breeding cows, 3 years and older--\$275; yearling replacement heifers--\$175; and bulls--\$600. Land suitable for grazing and capable of producing 0.9 AUM's of grazing per acre was valued at \$70 per acre, while land suitable for hay production and capable of producing 1.5 tons of native hay per acre was valued at \$100 per acre.³⁶ The results of the analysis are presented in Table 5.

If the ranch operator and family are assumed to furnish all ranch labor (no labor is hired) and all of the capital invested in the business (no money is borrowed), then the return to operator and family labor and capital per brood cow is \$59.31. If labor is charged at \$1.60 per hour, the Federal minimum wage, then the return to capital is \$30.51. The return to capital is 4.35 percent of the total capital employed in production.

Most ranch operators do not furnish all of the capital employed in the ranch business, but rather must borrow some capital. During the period being considered, long-term loans secured by farm mortgages were generally available from commercial sources at interest rates of approximately 7.0 percent. Loans of shorter duration carried higher interest rates. If borrowed capital is employed under these conditions, the rate of return to the operator's own capital is reduced. Table 5 shows the rate of return to the operator's capital when different amounts of capital are borrowed. If 10 percent of the total capital investment were borrowed at an interest rate of 8 percent, the return to the operator's capital would be 3.9 percent. If 20 percent of the total investment were borrowed, the return to the operator's capital would be 3.4 percent; if 40 percent of the total investment were borrowed, the return to the operator's capital would be only 1.9 percent; and if 54 percent of the total investment were borrowed at an interest rate of 8 percent, the return to the operator's capital would be zero. That is, it would require the entire return to investment to pay interest on the borrowed capital.

³⁵The 90 percent calf crop is to be interpreted as 90 calves weaned per 100 cows bred (confirmed by fall pregnancy test).

³⁶Mr. Joe Milton, Secretary-Treasurer of the Sheyenne Valley Grazing Association, and Mr. Don Nelson, District Forest Ranger, Custer National Forest, furnished much of the necessary information concerning prevailing production practices and land values.

TABLE 5. RETURNS TO OPERATOR RESOURCES PER BROOD COW, COW-CALF RANCHES OF SHEYENNE VALLEY GRAZING ASSOCIATION, 1967-1970.

Total Receipts Per Brood Cow	\$115.83
Total Direct Costs Per Brood Cow	32.22
Total Fixed Costs Per Brood Cow	15.23
Return to Capital, Labor and Grazing Permit	68.38
Grazing Costs (Fee and Other Expenses)	9.07
Return to Capital and Labor Per Brood Cow	59.31
Labor Charge (18 Hours @ \$1.60 Per Hour)	28.80
Return to Capital Per Brood Cow	30.51
Capital Investment Per Brood Cow	701.49
Return to Capital (Percent)	4.35

Case I - Operator Has 100 Percent Equity:

Capital Borrowed Per Cow	\$ 0.00
Return to Operator's Capital (Percent)	4.35

Case II - Operator Has 90 Percent Equity:

Capital Borrowed Per Cow	70.15
Interest on Borrowed Capital (@ 8 Percent)	5.61
Return to Operator's Capital	24.90
Return to Operator's Capital (Percent)	3.9%

Case III - Operator Has 80 Percent Equity:

Capital Borrowed Per Cow	140.30
Interest on Borrowed Capital (@ 8 Percent)	11.22
Return to Operator's Capital	19.29
Return to Operator's Capital (Percent)	3.4%

Case IV - Operator Has 60 Percent Equity:

Capital Borrowed Per Cow	280.60
Interest on Borrowed Capital	22.45
Return to Operator's Capital	8.06
Return to Operator's Capital (Percent)	1.9%

Case V - Operator Has 46 Percent Equity:

Capital Borrowed Per Cow	381.37
Interest on Borrowed Capital	30.51
Return to Operator's Capital	0.00
Return to Operator's Capital (Percent)	0.0%

EFFECT OF INCREASED GRAZING FEES ON
INCOMES AND RESOURCE RETURNS OF CATTLE RANCHES

In this section the effect of increased grazing fees on Sheyenne Valley ranches is examined. The analysis of Caton and the joint study group³⁷ concerning this subject is also examined. Both studies led to similar conclusions. In summary, both studies regarded grazing fees paid for the use of Federal rangelands as a direct operating cost for a ranch operator, the same as cash outlays for purchased feed or hired labor. In the short run, an increase in grazing fees can be expected to be fully reflected in higher total operating costs and, hence, in lower net ranch income. The magnitude of the impact of an increase in grazing fees on net ranch income would depend upon the relative importance of Federal rangeland as a source of feed. The ranches obtaining the largest proportion of their feed from Federal rangeland would logically be affected the most from an increase in grazing fees.

SHEYENNE VALLEY CATTLE RANCHES

The ranches of the Sheyenne Valley Grazing Association typically use the Sheyenne National Grassland for a six-month summer grazing period. A ranch using the Sheyenne National Grassland for all of its summer grazing would obtain about half of its total feed requirements from Federal land.

Because increases in grazing fees are reflected in higher operating costs, increased grazing fees reduce net ranch income. If the return to invested capital is computed as a residual after deducting a charge for operator and family labor from the net ranch income, the rate of return to the operator's investment can be expected to vary inversely to the level of the grazing fee.

The returns to the ranch operator's investment with different assumed levels of operator equity and grazing fees are presented in Table 6. Five levels of operator equity are shown: 100 percent, 90 percent, 80 percent, 60 percent and 46 percent. Four levels of grazing fees are shown: \$1.11 per AUM, \$1.42 per AUM, \$1.65 per AUM, and \$2.00 per AUM. The rate of return to operator investment ranges from 4.35 percent, when the equity level is assumed to equal 100 percent and the grazing fee is assumed to be \$1.11 per AUM, to 0.39 percent when equity is assumed to be 60 percent and the grazing fee is assumed to be \$2.00 per AUM.

³⁷Caton, D. D. (Project Leader), ERS 248, op. cit., p. 1.

TABLE 6. RATE OF RETURN ON RANCH OPERATOR INVESTMENT WITH VARIOUS LEVELS OF OPERATOR EQUITY AND GRAZING FEES, SHEYENNE VALLEY GRAZING ASSOCIATION, 1967-1970.

Operator Equity (percent)	Grazing Fee Per AUM (\$)	Return to Operator Investment Per Brood Cow (\$)	Operator Investment Per Brood Cow (\$)	Rate of Return on Operator Investment (percent)
100	1.11	30.51	701.49	4.35
100	1.42	28.28	701.49	4.03
100	1.65	26.62	701.49	3.79
100	2.00	24.10	701.49	3.43
90	1.11	24.90	631.34	3.94
90	1.42	22.67	631.34	3.59
90	1.65	21.01	631.34	3.32
90	2.00	18.49	631.34	2.92
80	1.11	19.29	561.19	3.43
80	1.42	17.06	561.19	3.03
80	1.65	15.40	561.19	2.74
80	2.00	12.88	561.19	2.29
60	1.11	8.06	420.89	1.91
60	1.42	5.83	420.89	1.38
60	1.65	4.17	420.89	0.99
60	2.00	1.65	420.89	0.39
46	1.11	0.00	320.12	0.00
46	1.42	-2.23	320.12	-0.70
46	1.65	-3.89	320.12	-1.22
46	2.00	-6.41	320.12	-2.00

Source: Computed from Table 5.

CATTLE RANCHES USING PUBLIC LAND IN THE WESTERN STATES

The joint study group³⁸ also considered the effect of increased grazing fees on operating costs and net ranch incomes. In 1960 the grazing fees on the Bureau of Land Management ranges were approximately \$0.20 per animal unit month, while those on Forest Service ranges were about \$0.60 per animal unit month. The joint study group concluded that, if the 1960 grazing fee on both

³⁸Ibid.

types of range were increased by \$0.20 per animal unit month, the average net ranch income of the 69 cattle ranches they studied would be reduced by \$256 (from \$4,361 to \$4,105). This represents a decrease in net ranch income of 5.9 percent. The reductions in net ranch income on individual cattle ranches studied would vary from \$25 to \$1,699.³⁹ The differences in the effect of grazing fee increases between individual ranches depend primarily on the size of the grazing permit held by the ranch.

If the 1960 level of grazing fees were increased by \$0.80 on both types of ranges, net ranch income on the 69 cattle ranches would be reduced by 23.5 percent.⁴⁰ Ranches in the Intermountain Area (includes parts of Nevada, Oregon, Idaho, Wyoming, Utah, Arizona, and New Mexico) would, as a group, have the greatest absolute reduction in their net ranch income.

CONCLUSIONS AND IMPLICATIONS

Increases in grazing fees lead to higher operating costs on ranches using Federal rangeland. In the short run increases in grazing fees result in decreases in net ranch income. The returns to the ranch operator's resources, labor, and capital also decline as grazing fees are increased, all other things being equal.

In the long run ranch income might be supported by improved production practices which would increase the productivity of owned and leased rangeland.⁴¹ A program of range improvement is limited, however, by the climate, soil, and topography of the area involved and by the costs of range improvement practices. Some ranchers might be able to meet the increased costs by expanding the size of their ranches. However, if some ranches were to be expanded in acreage, others would have to cease operation since an expanding ranch could gain land only from other ranches.

IMPACT OF INCREASES IN GRAZING FEES ON THE REGIONAL ECONOMY OF A RANGE LIVESTOCK PRODUCING AREA

An increase in grazing fees can be expected to be fully reflected in net ranch income in the short run. Opportunities may exist, however, for supporting net ranch income in the long run. A question which arises in connection with decreases in ranch income is the effect of the decrease in ranch income on other businesses in the area. In general, a decrease in ranch income would be expected to lead to a decrease in expenditures by ranchers for production inputs and consumer goods. As nonagricultural businesses would then sell fewer goods and services to the agricultural

³⁹Ibid., p. 18.

⁴⁰Ibid., p. 19.

⁴¹Ibid., p. vi.

sector (the ranchers), nonagricultural income would also be expected to decrease. Thus, an increase in grazing fees can be said to have two effects on the level of total income of the local or regional economy, a direct effect and an indirect effect. The direct or primary effect is a reduction in ranch income. The indirect or secondary effect is a reduction in incomes of other businesses as a result of the initial decrease in ranch income.

A method for quantitatively measuring the secondary effects of an initial change in income of one sector of an economy is provided by input-output analysis.⁴² Input-output analysis provides a basic technique for analyzing the interrelationships among sectors of an economy. Development of an input-output model for a regional economy begins with the tabulation of transactions among the various economic units in the economy. The transactions consist of all expenditures made by the respective economic units to all other firms and households in a given time period. The transactions for all economic units within a particular sector are aggregated to represent the transactions of the entire sector.⁴³ Transactions for all sectors can be arranged into a transaction table or payments matrix.

The transactions table, or payments matrix, is the basic table of input-output analysis. From the transactions table, trade coefficients and interdependence coefficients can be derived. The interdependence coefficients can then be employed to estimate the effects of an initial change in the income of one sector on the income or transactions of other sectors.

THE IMPACT OF GRAZING FEE INCREASES ON THE NORTH DAKOTA ECONOMY

An input-output model for North Dakota has been developed and tested by Sand.⁴⁴ Subsequent testing of the model has been performed by other researchers.⁴⁵ The input-output model can be employed to estimate the total impact of grazing fee increases on the North Dakota economy.

The first step in estimating the total impact of an increase in grazing fees is to estimate the direct or primary impact of increased

⁴²For a more detailed discussion of input-output analysis, see Chenery, H. B. and P. G. Clark, Interindustry Economics, Wiley & Sons, New York, 1964, and Heady, E. O. and W. Candler, Linear Programming Methods, Iowa State University Press, Ames, Iowa, 1963, p. 475.

⁴³Sand, Larry D., Analysis of Effects of Income Changes on Intersectoral and Intercommunity Economic Structure, unpublished M.S. thesis, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1966.

⁴⁴Ibid.

⁴⁵In particular, Senechal, Donald M., unpublished papers, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1970.

grazing fees on net ranch income. To make this estimate, it is assumed that in the short run an increase in grazing fees would produce an equivalent reduction in net ranch income.

In 1970 five grazing associations used the National Grasslands in North Dakota. These associations paid grazing fees for approximately 425,600 animal unit months of grazing. In 1970 the basic grazing fee for four of the associations was \$0.70 per AUM, while the Sheyenne Valley Grazing Association paid a basic fee of \$1.11 per AUM. It has been proposed that in 1972 all five associations pay a fee of approximately \$1.65 per AUM.⁴⁶ Implementation of this proposal would result in a total increase in grazing fees of approximately \$378,500 by 1972 over the amount paid in 1970. Assuming that grazing fee increases are fully reflected as decreases in ranch income, the proposed grazing fee increase would cause a direct or primary reduction of income in the livestock sector of the North Dakota economy of about \$378,500, all other things being equal.⁴⁷

The second step in estimating the total impact of increased grazing fees on the regional economy is to estimate the indirect effects. The North Dakota input-output model is the mechanism used for estimating these indirect effects. Employing the input-output model, an initial decrease of livestock sector income is estimated to lead to a total reduction in gross receipts of \$1,297,355. This total reduction is the sum of the direct or primary effect (\$378,500) and the secondary or indirect effects which totaled \$918,855. Table 7 shows the total of direct and indirect effects by major sectors of the regional economy. The livestock sector shows the largest total gross receipts decrease with a reduction of \$415,113. This total decrease results from the addition of a \$36,613 indirect reduction of gross receipts in the livestock sector to the initial \$378,500 income reduction. The wholesale and retail trade sector has a reduction in gross receipts of \$246,495, while the crops sector has a gross receipts reduction of \$130,950. The household sector experiences a gross receipts reduction of \$313,881.

The impact of the grazing fee increase appears likely to be concentrated most heavily on the local trade areas near the National Grasslands. The major trade areas to be most severely affected would probably be the Williston and Dickinson Trade Areas in western North Dakota because these trade areas contain the Little Missouri and Cedar River Grasslands. The smaller local trade centers located close to the Grasslands would probably be even more severely affected.

⁴⁶This proposal was made by representatives of the United States Forest Service to the North Dakota Grazing Association at a meeting held at Dickinson, North Dakota, November 16, 1970. The \$1.65 figure for 1972 assumes that a beef index would be used as the adjustment device and that beef prices in 1971 would be at the same level as in 1970.

⁴⁷The Cedar River National Grassland was not included in the analysis, and so the income reduction which would result from increased grazing fees is slightly understated. However, the relatively small size of the Cedar River Grassland causes the understatement to be minor.

TABLE 7. ESTIMATED REDUCTIONS IN GROSS RECEIPTS RESULTING FROM ESTIMATED DECREASE IN LIVESTOCK SECTOR INCOME, NORTH DAKOTA.^a

Sector	Reduction in Gross Receipts
Crops	\$ 130,950
Livestock	415,113
Wholesale and Retail Trade	246,495
Service	32,748
Transportation, Communications and Public Utilities	14,651
Construction	90,860
Finance, Insurance and Real Estate	34,412
Total Business Sectors	965,229
Households ^b	313,881
Government	18,248
Total (All Sectors)	\$1,297,358

^aDecrease in livestock sector income estimated as \$378,500.

^bProprietors' incomes, wages and salaries, and other household receipts.

FACTORS TO BE CONSIDERED IN ESTABLISHING A GRAZING FEE FORMULA

Many different agencies have struggled with the problem of establishing a satisfactory formula for determining grazing fees on public lands.⁴⁸ Intensive studies of grazing fees and grazing land values conducted by Federal agencies and by land grant universities date back more than 40 years.⁴⁹ The many different studies of grazing fees and the fact that a new method for establishing fees is now being proposed suggest that the establishment of grazing fees is a very complex task. The task is complicated by a number of factors. First, since the Federal or State government is the landlord, there may be some question as to what the proper objectives of the government

⁴⁸For a brief review of grazing fee formulas used by different agencies, see McDowell, James I. and Jerome E. Johnson, An Economic Analysis of Alternative Methods for Establishing Grazing Rentals on State School Lands in North Dakota, Agricultural Economics Report No. 37, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1964.

⁴⁹Clawson, Marion, The Western Range Livestock Industry, 1st ed., McGraw-Hill, New York, 1950, pp. 269-276.

should be in its landlord role. The administrative agency could be primarily concerned with resource management and achievement of an optimum level of output from the lands and assess a charge that would be merely sufficient to cover direct administrative costs. On the other hand, the administrative agency could be primarily concerned with obtaining the maximum possible revenue for the public treasury and concern itself with resource management only to the degree of preventing deterioration of the lands.⁵⁰

The concept of multiple use of Federal lands is a second complicating factor. The multiple use concept in basic terms is that Federal range and forest lands have several resource values or are valuable for several uses. The five primary resource values of Forest Service ranges are timber, water, forage, wildlife, and recreation.⁵¹ These public lands are managed with consideration for each of the resource values. Each resource value is important to a particular group of users. It would appear, then, that use charges should be levied on all users on the same basis. If, for instance, the criterion for establishing grazing fees is to be the covering of administrative costs, then users of the timber, water, wildlife, and recreation resource values should also be charged on the basis of the direct administrative costs associated with each use. Such an allocation of administrative costs might prove difficult.

The use of the "fair market value" concept as the basis for user charges could also lead to complications. While the market value of forage and timber could be estimated, the recreation and wildlife resource values might be very difficult to estimate. The market for these resources might be difficult to define or in some cases virtually nonexistent.

A third factor which complicates the problem of establishing grazing fees on public lands is the very high degree of interdependence between public and private lands in many western range areas. Often the public land furnishes the summer grazing for livestock while the private land furnishes the winter feed. Each of the two types of land are absolutely essential to ranch operations as customarily carried on in the area.⁵² Together, the public and private land make well-balanced ranches; separately, their individual values might be considerably reduced. When public and private lands bear a complementary relationship of this type, the marginal

⁵⁰For detailed discussion of the evolution of Federal administrative objectives over time, see Foss, Phillip O., "The Determination of Grazing Fees on Federally-Owned Range Lands," Journal of Farm Economics, Vol. 41, No. 3, August, 1959, pp. 535-547.

⁵¹Forest Service, Grazing Fees on National Forest Range, CI Report No. 3, United States Department of Agriculture, June, 1969, p. 1.

⁵²Clawson, op. cit., p. 254.

value of each type of land may be very difficult to ascertain. The value of summer pasture to a particular ranch, for instance, will depend upon the amount of winter feed available.⁵³

Before a grazing fee formula can be established, it is essential that the goals and objectives of the parties involved be identified. Only then can a formula be designed which will produce results consistent with the goals and objectives of the interested parties.

Many of the more important goals of ranchers and goals of the Federal government which relate to land use have often been stated and are briefly summarized in this section. The following discussion will be confined to those goals which are particularly important with regard to the use of public lands.

GOALS OF THE FEDERAL GOVERNMENT

The goals of the Federal government in its role of proprietor of the Federal rangelands are many and varied. Only a few of the more important goals will be discussed.

The Forest Service includes the following as some of the major objectives of its rangeland management program:⁵⁴

1. To develop the range resources of the public lands and manage them for sustained grazing.
2. To demonstrate sound grassland agriculture and conservation practices.
3. To promote the stability of family ranches and farms in local areas where National Forests and National Grasslands are located.

The Public Land Law Review Commission suggests the following objectives for Federal management of rangelands:⁵⁵

1. To attain maximum economic efficiency in the production and use of forage.
2. To support regional economic growth.
3. To conserve and improve range resources to the extent that is feasible.

⁵³Ibid., pp. 254-255.

⁵⁴Forest Service, CI Report No. 3, op. cit., p. 1.

⁵⁵Public Land Law Review Commission, op. cit.

4. To protect environmental quality and provide habitat for wildlife.

Fair market value is recommended by the Public Land Law Review Commission as the basis for grazing fees.⁵⁶

GOALS OF THE STOCKMEN

The goals of the Federal government and the stockmen are generally quite compatible. The major difference between these two parties is in the order of priority of the goals.

The stockmen may be interested in achieving all of the same goals as the Federal government; but unless the stockmen are able to achieve the primary goal of economic solvency, they will not be able to attain the other goals specified. By necessity, income becomes the most important goal to the stockmen. In other words, the ranching operation must first survive as a business before other values associated with ranching can be realized by the rancher and his family.⁵⁷

While income is certainly not the only goal of stockmen, it is an important one. Although stockmen may be willing to accept returns to their labor, capital and management which are considerably lower than those realized in other sectors of the economy (and examination of the costs and returns on cattle ranches indicates that they have been doing so), a certain minimum level of income is needed to meet business commitments and provide for an adequate level of family living. In addition, all stockmen would prefer to receive returns to their resources which would be comparable to returns in other businesses.

Conservation apparently is a high level goal for many stockmen as it is for the Federal government. Much progress has been made since the dark and dusty days of the 1930's, and the economic value of soil conservation practices has been convincingly demonstrated to farmers and ranchers.

The protection and enhancement of environmental quality is also an important goal to stockmen. The rangeland environment of pure air and unspoiled natural beauty is one of the important "fringe benefits" of the ranching occupation.

⁵⁶Public Land Law Review Commission, op. cit. PLLRC defines fair market value in terms similar to those used by the Bureau of the Budget (i.e., rates for private leases less adjustments).

⁵⁷For an excellent discussion of the goals and values of farmers and ranchers, see Tweeten, Luther G., Foundations of Farm Policy, University of Nebraska Press, Lincoln, Nebraska, 1970, pp. 1-25.

Stockmen as a group also appear to believe that greater efficiency is a desirable goal. They subscribe to the agricultural belief that "it is good to make two blades of grass grow where one grew before."⁵⁸ Thus, they are predisposed to favor programs to increase the carrying capacity of public rangelands.

As has been mentioned earlier, the goals of the stockmen and the Federal proprietor are generally quite compatible. Both the stockmen and the Federal agencies would appear to agree that conservation and improvement of rangelands is a proper objective. Both groups also appear to agree on the desirability of maintaining environmental quality. In fact the only major conflict of interest appears to involve the grazing fee level and the method of establishing the fees.

Information presented earlier indicates that at recent levels of product and input prices, range livestock producers are not able to earn returns on their labor, management, and capital resources which even approach the returns commonly obtained in other sectors of the economy. While ranchers may not be motivated entirely by considerations of profit and resource returns, they no doubt do believe that they should be able to obtain a fair rate of return to their resources.

A fair return to a resource, be it land, labor, capital, or management, is difficult to define. The word "fair" often connotes equity or justice. A fair return might, then, be regarded as an estimate of the return that the resource should receive in order that equitable results be obtained as between resources or resource owners. Since the concepts of equity and justice are not readily quantifiable, attempts to determine fair returns usually make use of market values.

Two different market values may be relevant in considering equitable returns to resources: purchase price and salvage price. The purchase price or acquisition price of a resource is the price which a firm would have to pay to acquire that resource. The salvage price or opportunity cost of a resource is the return which could be obtained from a resource by shifting it from its current use to its best alternative use. These two prices may be identical for some resources and considerably different for others.⁵⁹ A strong case could probably be made for either of the two prices as the relevant "fair" rate of return.

⁵⁸Ibid., p. 8.

⁵⁹For further discussion of these concepts, see Hathaway, Dale E., Government and Agriculture, The MacMillan Company, New York, 1963, and Tweeten, Luther G., "Theories Explaining the Persistence of Low Resource Returns in a Growing Farm Economy," American Journal of Agricultural Economics, Vol. 51, No. 4, November, 1969, pp. 798-817.

In defining the "fair market value" of grazing use of public lands as the private land lease rate less an adjustment for differences in services provided, the Bureau of the Budget and the Forest Service appear to favor acquisition price as the measure of fair returns.⁶⁰ The studies reviewed earlier indicated that western livestock ranches did not obtain returns to operator and family labor, management, and invested capital which even approached the acquisition price of these resources during the last decade.

The information available on costs, returns, and incomes in cattle ranching appears to indicate that the total receipts from most ranching operations are simply not sufficient to allow all resources to earn returns equal to their "fair market value" or acquisition price. Thus, both the stockman and the government may need to accept something less than "fair market value" for their resources if a grazing fee compromise acceptable to both parties is to be achieved.

ANALYSIS OF THE GRAZING FEE FORMULA PROPOSED
BY THE FEDERAL GOVERNMENT

The grazing fee formula proposed by the Federal government is based upon lease rates on privately owned grazing lands. The base grazing fee for public land users is established by subtracting from the lease rates on privately owned grazing lands the costs incurred by users of public lands which are not incurred by lessees of privately owned grazing lands. The users of public lands typically incur costs for maintaining fences and water facilities which would be paid by the landlord under the terms of a typical private lease. The base grazing fee was established on the basis of data collected by the Statistical Reporting Service in 1966. When the data collected in 1966 were averaged over the entire western United States, a base grazing fee for 1966 of \$1.23 per animal unit month was obtained.

The base grazing fee is adjusted annually by an index of the preceding year's private land lease rates. This index has 1966 as its base year.

Stockmen find the proposed grazing fee formula to be objectionable for several reasons. Perhaps the most important objection of the stockmen is their concern over the use of the private land lease rate index as the adjustment factor in the formula. Before the desirability of the private land lease index as a factor in the formula is evaluated, the economic forces affecting rental rates and prices of agricultural land should be examined.

⁶⁰Forest Service, op. cit.

ECONOMIC FORCES AFFECTING AGRICULTURAL LAND PRICES
AND RENTAL RATES IN THE NORTHERN PLAINS⁶¹

In the years since 1945 farmland prices in the United States have risen steadily to levels higher than ever before attained. The official United States Department of Agriculture report series, Farm Real Estate Market Developments,⁶² reports that the index of average farm real estate values per acre for the 48 adjacent states was 46 in 1945 and rose to 160 in 1967. In 1948 the index surpassed the previous high which had been attained in 1920.

The rapid and steady increase in land values during the past two decades has been of special interest because of the tendency of land values per acre to rise more rapidly than net farm income per acre. Between 1950 and 1967, land values per acre more than doubled while net farm income per acre increased only 15 percent. This difference in the trend of land values and net farm income has been cause for considerable interest and some concern on the part of both economists and others interested in the land market. Table 8 shows indexes of farm real estate value per acre and net farm income per acre for the United States and also shows the index of farm real estate value per acre for the four Northern Plains States.

A study by Scofield⁶³ indicates a strong relationship between net farm income and land prices in a given time period. However, net farm income is less adequate as an explanation of land price variations over time. Since 1950, net farm income has not kept pace with increases in land prices.

On the average, the income rate of return to farm real estate has generally been lower than corresponding returns to nonfarm investments in recent years, but land price increases have resulted in substantial capital gains on farm real estate. If current capital gains cause buyers to form expectations of substantial capital gains in the future, then buyers may be willing to pay high prices for land even though income returns to land are very low.

Net rental returns from farmland are difficult to estimate, especially returns from share renting. However, the United States Department of Agriculture provides estimates of the net rental return to farmland for the years

⁶¹The major portion of the discussion presented in this section is derived from a study made by Leistritz, Fredrick L., Simulation Analysis of the Farm Real Estate Market and Farm Enlargement in Southwest Nebraska, unpublished Ph.D. thesis, Department of Agricultural Economics, University of Nebraska, Lincoln, Nebraska, 1970.

⁶²United States Department of Agriculture, Economic Research Service, Farm Real Estate Market Developments, CD-70, United States Government Printing Office, Washington, D.C., 1968.

⁶³Scofield, William H., "Land Prices and Farm Income Relationships," Agricultural Finance Review, Vol. 25, May, 1963, pp. 13-22.

TABLE 8. VALUE OF FARM REAL ESTATE PER ACRE AND NET FARM INCOME PER ACRE, NORTHERN PLAINS AND UNITED STATES, 1950-1967.

Year	Index of Average Value of Farm Real Estate, United States (1957-59 = 100)	Index of Net Farm Income Per Acre, United States (1957-59 = 100)	Index of Average Value of Farm Real Estate, Northern Plains States ^a (1957-59 = 100)
1950	65	110	70
1951	75	129	79
1952	82	121	87
1953	83	105	90
1954	82	101	87
1955	85	93	90
1956	89	93	91
1957	95	93	93
1958	99	112	100
1959	106	95	107
1960	111	100	109
1961	112	108	110
1962	118	110	116
1963	123	110	120
1964	131	103	126
1965	139	126	134
1966	150	138	144
1967	160	127	155

^aNorthern Plains States are Kansas, Nebraska, South Dakota, and North Dakota.

Source: United States Department of Agriculture, Economic Research Service, Farm Real Estate Market Developments, CD-70, April, 1968, and Farm Income Situation, Supplement No. 203, August, 1966, United States Government Printing Office, Washington, D.C.

1959-1965.⁶⁴ Table 9 shows the ratio of estimated net rent to value of farm real estate for 1959-1965 for the United States. The ratio is fairly constant over time, which would indicate that the rise in net rents has been keeping pace with the rise in land values in recent years. An increasing percentage of net farm income is apparently being capitalized into land values

⁶⁴For a description of the methods used in estimating net rental returns to farmland, see United States Department of Agriculture, Parity Returns Position of Farmers, Report to the Congress of the United States, 1967.

TABLE 9. NET SHARE RENT AND NET CASH RENT AS A PERCENTAGE OF LAND VALUE, UNITED STATES, 1959-1965.

Year	Ratio of Net Rent to Value		
	Share (percent)	Cash (percent)	Combined ^a (percent)
1959	5.5	4.6	5.4
1960	5.6	4.7	5.4
1961	6.4	4.4	6.0
1962	6.4	4.5	6.1
1963	6.4	4.2	6.0
1964	5.9	4.2	5.5
1965	5.9	4.1	5.5

^aThis figure was calculated by weighing the share and cash rent to value ratios by the relative amounts of rented land operated by each of these two classes of tenants.

Source: United States Department of Agriculture, Parity Returns Position of Farmers, Report to the Congress of the United States, 1967, p. 55.

and rents. Rising net rents may help to explain rising land prices, but the forces causing rents to rise at a faster rate than net farm income are still in need of clarification.

When a farm firm seeks to acquire additional land resources, it has two main alternatives--buying the land or renting it. If the land is purchased, its services are acquired for many future production periods, while if the land is rented, its services are contracted by the firm for a limited period of time, usually one year, but often with options to renew the rental contract annually.⁶⁵

In the case of the rental market, the demand for land should be based upon the marginal value product of land. If the firm employed only one

⁶⁵One year is the standard term of lease in most farming areas, including the Great Plains Area. However, the average term of tenure (the time that a given tenant occupies a given tract of rented land) is considerably longer than one year because many one-year leases are renewed.

resource, the firm's demand for land would be identical to the marginal value product. Since firms in fact employ more than one resource, the firm's demand for any one of those resources will differ from the marginal value product because of the resource substitution which occurs in response to changes in relative prices. The greater the degree of substitutability between resources, the greater will be the elasticity of resource demand, other things being equal.⁶⁶

EMPIRICAL INVESTIGATION OF FORCES INFLUENCING RENTAL RATES

A recent study of land prices and net rents in a wheat producing area of the Great Plains revealed a strong relationship between prices and rents.⁶⁷ Multiple regression and simulation analysis were employed to study land prices and rents during the period 1945-1967. The study area was five counties in the wheat-summer fallow area of southwest Nebraska: Cheyenne, Deuel, Keith, Kimball and Perkins counties. Land price and net rent per acre were found to be highly correlated over the 23-year period of study (correlation coefficient, $r = 0.84$). Land price per acre increased more than 300 percent in the study area between 1945 and 1967, rising from \$24.50 per acre in 1945 to \$116.50 per acre in 1967. Net cash rent per acre also increased substantially, rising from \$1.39 per acre in 1945 to \$9.37 per acre in 1967.⁶⁸ Net farm income per acre, on the other hand, showed no distinct trend with respect to time during the period 1945-1967 in the study area.

From the results of the empirical investigation, it was concluded that land prices and net rents have a strong functional relationship. The pressure for individual farm operators to acquire more land and enlarge their farms appeared to be the primary causal force behind the steady and rapid increase in both land prices and net rents. It appears that over time a larger and larger share of the net farm income has been allocated to the land factor. Land is the scarce or limiting resource in many agricultural operations, and an increasing share of net farm income has been capitalized into this scarce resource. However, it must be obvious that agricultural land prices and rents cannot continue their present upward trend indefinitely without support from increases in net farm income. Tweeten points out that, if land prices, rents, and net farm income were to continue their present trends, the entire net farm income soon would not be sufficient to cover the land costs (i.e., land's share of net farm income would exceed 100 percent).⁶⁹

⁶⁶Leftwich, R. H., The Price System and Resource Allocation, Holt, Rinehart, and Winston, New York, 1965, pp. 284-293.

⁶⁷Leistritz, Fredrick L., op. cit.

⁶⁸Ibid., p. 8.

⁶⁹Tweeten, Luther G., Foundations of Farm Policy, University of Nebraska Press, Lincoln, Nebraska, 1970, p. 256.

There also appears to be reason for some doubt whether farm incomes and net rents could be maintained at their current levels without some increase in net farm income, all other things being equal. Currently active farmers may be willing to attribute a near-zero value to their labor and some of their invested capital in determining the price which they can pay for land. Such a low valuation could be justified economically on the grounds that the opportunity cost of these resources is low (i.e., there is no opportunity to employ these resources off the farm or if they can be employed, it would be at a very low rate of return). However, it seems exceedingly doubtful that young men contemplating a future in farming will be willing to place such a low value on their labor and management abilities and other resources. These young men have many attractive alternative employment opportunities, and so the opportunity cost of their labor and management talents is high.

AN ALTERNATIVE METHOD FOR ESTABLISHING A GRAZING FEE FORMULA

Establishing a grazing fee formula which is completely acceptable to the Federal Land Management agencies and also to all public land users is a difficult task. In general a fee formula that would include many factors of a regional or local nature and thus more accurately reflect differences in costs of operation between ranching areas would also be a formula which would be more costly and difficult to administer. However, with the advent of electronic computers and advanced computer programs, more sophisticated methods of establishing equitable fee rates are now feasible.

In light of the apparent objections or inadequacies involved in using private land lease rates as a basis for determining the fair market value of public grazing land (discussed in the previous section), an alternative approach for establishing grazing fees is offered for consideration in this section.

An adjustment factor which immediately suggests itself as a substitute for the private land lease index is an index of range livestock prices. As has been discussed previously, in a competitive market a firm's demand for a resource will be closely related to the marginal value product of the resource. The marginal value product of a resource is often defined as marginal physical product of the resource multiplied by the price of the product produced. An alternative definition of marginal value product is that it is the increase in the net income or net revenue of a firm that results from the use of one additional unit of the resource. Applying the marginal value product concept to the use of rangeland, an increase in the price of livestock, other things remaining constant, would indicate that the value of grazing to the stockmen has increased. It would also indicate that the user could afford to pay more for the grazing privileges without reducing the returns to his own resources.

Livestock prices are reported using specifically defined Federal standards that are uniform throughout the nation. Livestock is also sold in large volumes so that the prices paid can be expected to accurately reflect the value of the livestock sold. Land, on the other hand, is considerably more heterogenous and is sold in a much smaller volume (relative

to the total amount of land used in agricultural production) than livestock, making the land market less responsive to changes in the annual returns of land users. A well-defined method of reporting land rental rates which takes into consideration all of the factors involved in determining land values is also lacking.

The use of livestock prices has one apparent disadvantage from the standpoint of the Federal government in that the income to the Federal treasury from grazing fees would probably fluctuate more from year to year than if private land lease rates were used in adjusting the fees. However, what appears to be a disadvantage to the Federal government is a desirable feature to the stockmen. The fluctuation of grazing fee rates would result in a more stable net return to the public land users because a portion of their cost of production (grazing fees) would vary directly with the prices received for their product. The usefulness of range livestock prices as a factor in the grazing fee formula is not a new concept; the price of range livestock has long been used by both the Bureau of Land Management and the Forest Service in computing grazing fees.⁷⁰

Although livestock prices may be a useful factor in a grazing fee formula, a grazing fee formula which includes only livestock prices may not provide fees which would be equitable among geographic areas. Another adjustment factor which should be considered in the grazing fee formula is the cost of producing range livestock. The cost of producing a product can change over time due to changes in (1) the prices of inputs and (2) the quantity of output produced per unit of input. The prices of inputs for range livestock production have definitely increased in recent years. The quantity of output produced per unit of input has also increased, but not at as rapid a rate as the price of inputs. If the prices of inputs are not constant, a measure of the price of inputs must be included in the formula if a particular level of resource returns is to be maintained over time.

There are at least two alternative methods of establishing the base fee in a grazing fee formula. One possibility would be to determine the base grazing fee by comparing the total cost of grazing on private (leased) lands to the nonfee cost of grazing on public lands. The base fee is established as the difference between the private land lease rate and the nonfee costs of grazing on public lands. This is the method that is used in the formula proposed by the Federal government. In using this approach in establishing the base fee rate it is important that all user costs, including the permit value, be considered in determining the base fee.⁷¹

⁷⁰Roberts, N. K., "Economic Foundations for Grazing Use Fees on Public Lands," Journal of Farm Economics, Vol. 45, November, 1963, pp. 721-732.

⁷¹In particular, consideration must be given to the investment which stockmen who use public lands have made in improvements on the public land and in the commensurable unit which they own. The investment in improvements and in the commensurable unit is often referred to as the permit value. The permit value is a necessary cost of using public grazing lands that should be considered when grazing fees are established.

Another method of arriving at the base fee would be to consider the returns to the resources of the stockman. A level of return to the stockman's labor and capital which is deemed to reflect the "fair market value" of these resources could be determined and the base fee could then be set at the maximum level which would allow the "fair" level of return to be earned.

Both the administrative agencies and the stockmen appear to agree that the grazing fee should be related to the productivity of the grazing land. The productivity of grazing land, meaning the land's capacity to produce forage useful to range livestock, is often expressed in terms of animal unit months of grazing per acre.⁷² Although the animal unit month (AUM) may be less than a perfect measure of the productivity of grazing land, its widespread employment by range managers indicates that it is a very useful measure.⁷³ When a grazing fee formula is established on an AUM basis (i.e., the fee is expressed as dollars per AUM), the differences in productivity of different grazing lands are largely taken into account. On grazing lands where the forage production per acre is very low, as is the case in some of the desert regions, livestock gains and calf crops may be lower than on more productive ranges. In such cases a downward adjustment in the grazing fee per AUM may be needed. McDowell and Johnson⁷⁴ recommend downward adjustments in the grazing fee per AUM in cases of low carrying capacity. Huss⁷⁵ also suggests that the grazing fee per AUM varies directly with the carrying capacity of the range.

PROPOSED GRAZING FEE FORMULA

If the price of range livestock and the prices paid for inputs were included as adjustment factors, a grazing fee formula could be developed which would have the general form:

$$\text{Grazing fee per AUM} = (\text{base}) \times \frac{\text{Index of range livestock prices}}{\text{Index of prices paid for inputs}}$$

⁷²The animal unit month (AUM) of grazing is not a completely standardized measure. For discussion of a proposed change in animal unit equivalents for range cattle, see Vallentine, John F., "An Improved AUM for Range Cattle," Journal of Range Management, Vol. 18, 1965, pp. 346-348.

⁷³For discussion of some of the imperfections of the animal unit month (AUM) as a measure of productivity, see McDowell and Johnson, op. cit.

⁷⁴Ibid, p. 22.

⁷⁵Huss, Donald L., "A Basis for a Conservation Lease of Rangeland on the Edwards Plateau of Texas," Journal of Range Management, Vol. 8, pp. 208-210, 1955.

The level of the grazing fee and, hence, the level of return to the producers' resources will depend upon the value given to the constant "base" term in the formula. Given the price of range livestock and the level of input prices at a particular point in time, the level of the grazing fee will depend upon the value of the base term. The smaller the value of the base, the lower will be the grazing fee at a particular level of cattle prices and input prices. Therefore, the smaller the value of the base coefficient, the higher will be the rate of return to the stockmen's resources (labor, capital, and management), all other things being equal.

The first step in arriving at the level of the base coefficient requires an analysis of the levels of resource returns obtained at different levels of grazing fees on certain "representative" ranches during some base period. The second step is to quantify the concept of a fair return to the stockmen's resources. Once the fair level of return has been specified in dollars per hour for labor and management and percent return on capital, the level of grazing fee per AUM, which would provide this level of return to the stockmen's resources during the base period, can be determined.

A grazing fee formula of the type described was quantified in a previous study for ranches of the Sheyenne Valley Grazing Association.⁷⁶ If a formula of this type were implemented as the basis for establishing grazing fees on Federal rangelands, the requirements for precise information concerning the resource requirements, costs, and returns of ranches using Federal rangelands would be considerable. First, a number of ranching areas would need to be established. These ranching areas should be delineated on the basis of similarity in resource bases, production practices, and cost structures. Once ranching areas were delineated, basic information on production practices, resources, costs, and returns of representative ranches would be required.⁷⁷

A second major undertaking would be the determination of a "fair" rate of return to stockmen's resources. Some compromise would likely be required to arrive at a rate of return which would be acceptable to the stockmen and also to the Federal land management agencies, which must also consider the alternative uses of Federal rangelands. Once a fair rate of return is agreed upon, the grazing fee level which would allow this level of return to be earned on a representative ranch of a specified size and type could be determined for each ranching area.

⁷⁶Leistritz, Dunn, and Johnson, op. cit., Appendix E.

⁷⁷Much information on the resources, costs, and returns of representative ranches in the western states has been compiled as a part of the cooperative Regional Research Project, W-79, "Economic Analysis of Range and Ranch Management Decisions on Western Livestock Ranches." In each of the 11 western states, one or more ranching areas was delineated. Surveys of ranchers in these areas were then made to obtain basic information on ranch resources and production practices. For more information concerning the research done under Project W-79, see Nelson and Skold, op. cit.

IMPLICATIONS OF THE PROPOSED GRAZING FEE FORMULA

The type of grazing fee formula which has been proposed bears a strong resemblance to the parity price ratio which has a long history of use in agricultural policy.⁷⁸ The traditional parity price ratio is computed by dividing an index of prices received by farmers for crops and livestock by an index of prices paid by farmers for all commodities including interest, taxes, and wage rates. Both indexes have the same base period, usually 1910-1914. The parity price ratio provides a convenient summary of the cost-price relationship facing agriculture as a whole. When considering grazing fees, however, interest is focused on range livestock producers. By substituting an index of livestock prices for the composite index of prices received for all crops and livestock, a more specialized version of the parity price ratio which more accurately describes the cost-price relationship confronting the range livestock industry can be obtained.

Although the parity price ratio is a very useful measure for describing cost-price relationships, agricultural producers are more interested in the level of income and resource returns than in the cost-price relationship, per se. Income parity for agricultural producers has been a primary goal of United States agricultural policy, beginning with the Soil Conservation and Domestic Allotment Act of 1936.⁷⁹ Income parity, or parity of resource returns, implies that incomes of agricultural producers should be similar to those received in other sectors of the economy or that returns to resources in agriculture should be similar to those of resources employed in other sectors. It is readily apparent that the proposed grazing fee formula has as its goal parity of resource returns.

While parity of resource returns is the objective of the formula, price parity is the operating mechanism for adjusting grazing fees from year to year. In the short run, changes in the parity price ratio give a good indication of changes in incomes and resource returns. However, in the long run, changes in output per unit of input (productivity) and structural changes in the agricultural and nonagricultural sectors can change the level of resource returns associated with any given level of the parity price ratio. For instance, an increase in productivity can be expected to lead to an increase in resource returns at a given parity ratio, all other things being equal.⁸⁰ Because of the possibility of such long-run changes in productivity and structure, the formula should be re-evaluated periodically to insure that it continues to fulfill the objective of providing fair returns to resources, or parity of resource returns.

⁷⁸See Tweeten, Luther G., Foundations of Farm Policy, University of Nebraska Press, Lincoln, 1970, pp. 157-167, for a detailed discussion of the parity ratio.

⁷⁹Ibid., p. 303.

⁸⁰Ibid., pp. 157-159.

BIBLIOGRAPHY

- Argow, Keith A., "Our National Grasslands: Dustland to Grassland," American Forests, January, 1962, p. 10.
- Bailey, Warren R., "Necessary Conditions for Growth of the Farm Business Firm," Agricultural Economics Research, Vol. XIX, January, 1967.
- Barlowe, Raleigh, Land Resource Economics, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1958.
- Baumgartner, H. W., "Potential Mobility in Agriculture: Some Reasons for the Existence of a Labor Transfer Problem," Journal of Farm Economics, Vol. 47, February, 1965.
- Boykin, Calvin C., Douglas D. Caton, and Lynn Rader, Economic and Operational Characteristics of Arizona and New Mexico Range Cattle Ranches, ERS 260, United States Department of Agriculture, Washington, D.C., January, 1966.
- Calef, Wesley, Private Grazing and Public Lands, The University of Chicago Press, Chicago, 1960.
- Campbell, H. A. and V. A. Wood, "A Range Land Rental System Based on Grazing Capacity and the Price of Beef," Journal of Range Management, Vol. 4, November, 1951.
- Caton, D. D. (Project Leader), Effects of Changes in Grazing Fees and Permitted Use of Public Rangelands on Incomes of Western Livestock Ranches, ERS 248, United States Department of Agriculture, Washington, D.C., September, 1965.
- Chenery, H. B. and P. G. Clark, Interindustry Economics, Wiley and Sons, New York, 1964.
- Chryst, Walter E., "Land Values and Farm Income: A Paradox?," Journal of Farm Economics, Vol. 47, December, 1965.
- Clawson, Marion, The Western Range Livestock Industry, (1st ed.), McGraw-Hill Book Company, Inc., New York, 1950.
- Davidson, R. D., State and Federal Lands, 1950, With Special Reference to Grazing, Circular No. 909, United States Department of Agriculture, Washington, D.C., May, 1952.
- Dunn, Edward V., Cost-Size Relationships of Southwestern North Dakota Commercial Beef Cattle Ranches, unpublished M.S. thesis, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1968.

- Dutton, W. L., "History of Forest Service Grazing Fees," Journal of Range Management, Vol. 6, 1953, pp. 393-398.
- Forest Service, Grazing Fees on National Forest Range, CI Report No. 3, United States Department of Agriculture, Washington, D.C., June, 1969.
- Foss, Phillip O., "The Determination of Grazing Fees on Federally-Owned Range Lands," Journal of Farm Economics, Vol. 41, August, 1959.
- Gardner, W. Delworth, "Transfer Restrictions and Misallocation in Grazing Public Range," Journal of Farm Economics, Vol. 44, February, 1962.
- Gauger, Louis Kaye, John Muehlbeier, and Kris Kristjanson, Land Sales and Assessed Values in Nebraska, 1930-1952, Agricultural Experiment Station, Miscellaneous Publication No. 3, University of Nebraska, Lincoln, Nebraska, January, 1954.
- Gray, James R., Ranch Economics, The Iowa State University Press, Ames, Iowa, 1968.
- Gray, James R., Production Practices, Costs, and Returns of Cattle Ranches in the Brushland Area of Southwestern New Mexico, Agricultural Experiment Station, Research Report 179, New Mexico State University, Las Cruces, New Mexico, October, 1970.
- Greer, James D., Land Sales, Prices, Values, and Assessed Values in Nebraska, 1930-1968, Agricultural Experiment Station, Bulletin No. 504, University of Nebraska, Lincoln, Nebraska, March, 1969.
- Grest, Edward G., "The Range Story of the Land Utilization Projects," Journal of Range Management, Vol. 6, 1953, pp. 44-50.
- Harris, Grant A. and Wallace R. Hoffman, "Determining Equitable Grazing Fees for Washington Department of Natural Resources Land," Journal of Range Management, Vol. 16, September, 1963.
- Hathaway, Dale E., Government and Agriculture, The MacMillan Company, New York, 1963.
- Heady, Earl O. and Wilfred Candler, Linear Programming Methods, The Iowa State University Press, Ames, Iowa, 1963.
- Herd, R. W. and W. W. Cochrane, "Land Prices and Farm Technological Advance," Journal of Farm Economics, Vol. 48, May, 1966.
- Hooper, Jack F., "Potential for Increases in Grazing Fees," Journal of Range Management, Vol. 20, 1967, pp. 300-304.
- Hurlburt, V. L., "Theory of Supply of Farm Land," Land Economics, Vol. 34, May, 1958.

- Huss, Donald L., "A Basis for a Conservation Lease of Rangeland on the Edward Plateau of Texas," Journal of Range Management, Vol. 8, 1955, pp. 208-210.
- Ives, J. R., The Livestock and Meat Economy of the United States, AMI Center for Continuing Education, American Meat Institute, Ann Arbor, Michigan, 1966.
- Johnson, Bruce B., Larry Leistriz, and James D. Greer, Farm Real Estate Market in Nebraska, Agricultural Experiment Station, Bulletin No. 495, University of Nebraska, Lincoln, Nebraska, September, 1967.
- Kearl, W. Gordon, Comparative Livestock Systems for Wyoming Northern Plains Cattle Ranching, Agricultural Experiment Station, Bulletin No. 504, University of Wyoming, Laramie, Wyoming, September, 1969.
- Kost, William E., "Rates of Return for Farm Real Estate and Common Stock," American Journal of Agricultural Economics, Vol. 50, May, 1968.
- Leftwich, R. H., The Price System and Resource Allocation, (2nd ed.), Holt, Rinehart, and Winston, New York, 1965.
- Leistriz, Fredrick L., Simulation Analysis of the Farm Real Estate Market and Farm Enlargement in Southwest Nebraska, unpublished Ph.D. thesis, Department of Agricultural Economics, University of Nebraska, Lincoln, Nebraska, 1970.
- Leistriz, F. Larry, Edward V. Dunn, and Jerome E. Johnson, An Economic Analysis of a Proposed Grazing Fee Formula for Members of the Sheyenne Valley Grazing Association, a report prepared for the Sheyenne Valley Grazing Association, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, November, 1970.
- Loomer, C. W and V. Webster Johnson, Group Tenure in Administration of Public Lands, Circular No. 829, United States Department of Agriculture, Washington, D.C., December, 1949.
- Martin, William E. and Gene L. Jefferies, "Relating Ranch Prices and Grazing Permit Values to Ranch Productivity," Journal of Farm Economics, Vol. 48, May, 1966.
- McDowell, James I. and Jerome E. Johnson, An Economic Analysis of Alternative Methods for Establishing Grazing Rentals on State School Lands in North Dakota, Agricultural Economics Report No. 37, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, September, 1964.
- Nelson, C. Alan, and Melvin D. Skold, Resources, Costs, and Returns on Cattle Ranches in the Mountain Areas of Colorado by Size of Ranch, Agricultural Experiment Station, Technical Bulletin No. 101, Colorado State University, Fort Collins, Colorado, January, 1970.

- North Dakota Crop and Livestock Statistics, various numbers, North Dakota State University, Department of Agricultural Economics, in cooperation with United States Department of Agriculture, Statistical Reporting Service.
- Public Land Law Review Commission, One-Third of the Nation's Land, a report to the President and to the Congress by the Public Land Law Review Commission, Government Printing Office, Washington, D.C., 1970.
- Renne, R. R., Land Economics, Harper and Brothers, New York, 1947.
- Renshaw, E., "Are Land Prices Too High: A Note on Behavior in the Land Market," Journal of Farm Economics, Vol. 39, May, 1957.
- Reynolds, John E. and John R. Timmons, Factors Affecting Farmland Values in the United States, Agricultural Experiment Station, Research Bulletin No. 566, Iowa State University, Ames, Iowa, February, 1969.
- Roberts, N. K., "Economic Foundations for Grazing Fees on Public Lands," Journal of Farm Economics, Vol. 45, November, 1963.
- Roberts, N. K., "Discovering Grazing Values," Journal of Range Management, Vol. 20, No. 6, November, 1967.
- Rogers, Leroy F., Budget Data for the Range Cattle Industry in North Central, Northeastern, and Southeastern Washington, Agricultural Experiment Station, Circular 494, Washington State University, Pullman, Washington, November, 1968.
- Rogers, Leroy F., Characteristics of the Range Cattle Industry in Nevada, Region I, Southern Nevada, Agricultural Experiment Station, Bulletin No. B5, University of Nevada, Reno, Nevada, September, 1965.
- Rogers, Leroy F. and William C. Helming, Characteristics of the Range Cattle Industry in Nevada, Region II, Western Nevada, Agricultural Experiment Station, Bulletin No. B8, University of Nevada, Reno, Nevada, March, 1966.
- Rogers, Leroy F. and William C. Helming, Characteristics of the Range Cattle Industry in Nevada, Region III, Northeastern Nevada, Agricultural Experiment Station, Bulletin No. B11, University of Nevada, Reno, Nevada, January, 1967.
- Sand, Larry D., Analysis of Effects of Income Changes on Intersectoral and Intercommunity Economic Structure, unpublished M.S. thesis, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1966.
- Scofield, William H., "Land Prices and Farm Income Relationships," Agricultural Finance Review, Vol. 24, August, 1964.
- Senechal, Donald M., unpublished papers, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, 1970.

- Stevens, Delwin M., Sheep Industry in Wyoming, An Economic Analysis, Agricultural Experiment Station, Bulletin No. 444, University of Wyoming, Laramie, Wyoming, March, 1966.
- Stevens, Delwin M., Mountain Valley Cattle Ranching, An Economic Analysis, Agricultural Experiment Station, Bulletin No. 485, University of Wyoming, Laramie, Wyoming, April, 1968.
- Stoddart, L. A., "What Hope for Grazing on the Public Lands," Journal of Range Management, Vol. 18, No. 3, May, 1965.
- Tweeten, Luther G., "Theories Explaining the Persistence of Low Resource Returns in a Growing Farm Economy," American Journal of Agricultural Economics, Vol. 51, November, 1969.
- Tweeten, Luther G. Foundations of Farm Policy, The University of Nebraska Press, Lincoln, Nebraska, 1970.
- United States Department of Agriculture, Economic Research Service, Farm Real Estate Market Developments, Washington, D.C., periodical.
- United States Department of Agriculture, Parity Returns Position of Farmers, report to the Congress of the United States, Washington, D.C., 1967.
- United States Department of Agriculture, Economic Research Service, Farm Income Situation, FIS 216, Washington, D.C., July, 1970.
- United States Department of the Interior, Bureau of Land Management, Public Land Statistics, 1968, United States Government Printing Office, Washington, D.C., 1969.
- Williams, Willard F. and Thomas T. Stout, Economics of the Livestock-Meat Industry, The MacMillan Company, New York, 1964.
- Wheeler, R. O. and R. J. McConnen, Organization, Cost, and Returns; Commercial, Family Operated Cattle Ranches, Agricultural Experiment Station, Bulletin No. 557, Montana State University, Bozeman, Montana, June, 1961.
- Wooten, H. H., The Land Utilization Program, 1934 to 1964; Origin, Development and Present Status, Agricultural Economics Report No. 85, Economic Research Service, United States Department of Agriculture, Washington, D.C., August, 1965.
- Vallentine, John F., "An Improved AUM for Range Cattle," Journal of Range Management, Vol. 18, 1965, pp. 346-348.
- Van Vuuren, Willem, Agricultural Land Prices and Returns in an Advanced Urban and Industrial Economy, unpublished Ph.D. thesis, Department of Agricultural Economics, University of California, Berkeley, California, 1968.

APPENDIX

APPENDIX TABLE 1. COMPARISON OF FEDERALLY-OWNED LAND WITH TOTAL ACREAGE OF STATES AS OF JUNE 30, 1967.

State	Acreage Owned by the Federal Government			Total	Acreage of State ^a	Percent Owned by Government ^b
	Public Domain	Acquired by Other Methods				
Alabama	27,375.9	1,065,651.8		1,093,027.7	32,678,400	3.345
Alaska	354,165,564.9	16,830.7		354,182,395.6	365,481,600	96.908
Arizona	32,271,810.0	306,347.5		32,578,157.5	72,688,000	44.819
Arkansas	1,073,700.3	2,068,351.1		3,142,051.4	33,599,360	9.352
California	42,157,019.3	2,244,312.9		44,401,332.2	100,206,720	44.310
Colorado	23,165,762.2	1,034,752.5		24,200,514.7	66,485,760	36.400
Connecticut	0	9,343.3		9,343.3	3,135,360	.298
Delaware	0	36,159.9		36,159.9	1,265,920	2.856
District of Columbia	0	11,101.8		11,101.8	39,040	28.437
Florida	323,070.6	3,066,867.3		3,389,937.9	34,721,280	9.768
Georgia	0	2,053,046.6		2,053,046.6	37,295,360	5.505
Hawaii	0	397,463.4		397,463.4	4,105,600	9.681
Idaho	33,208,439.9	770,948.6		33,979,388.5	52,933,120	64.193
Illinois	448.2	501,817.7		502,265.9	35,795,200	1.403
Indiana	240.0	410,965.6		411,205.6	23,158,400	1.776
Iowa	340.8	205,413.1		205,753.9	35,860,480	.574
Kansas	27,295.8	632,584.5		659,880.3	52,510,720	1.257
Kentucky	0	1,199,718.6		1,199,718.6	25,512,320	4.703
Louisiana	22,217.4	1,021,312.2		1,043,529.6	28,867,840	3.615
Maine	0	128,624.5		128,624.5	19,847,680	.648
Maryland	0	186,869.5		186,869.5	6,319,360	2.957
Massachusetts	0	73,413.6		73,413.6	5,034,880	1.458
Michigan	297,526.5	3,002,214.9		3,299,741.4	36,492,160	9.042
Minnesota	1,395,473.9	1,996,830.7		3,392,304.6	51,205,760	6.625
Mississippi	6,666.6	1,557,741.5		1,564,408.1	30,222,720	5.176
Missouri	2,640.3	1,808,404.8		1,811,045.1	44,248,320	4.093
Montana	25,215,004.5	2,447,475.8		27,662,480.3	93,271,040	29.658
Nebraska	251,907.4	453,534.4		705,441.8	49,031,680	1.439

-- continued --

APPENDIX TABLE 1. COMPARISON OF FEDERALLY-OWNED LAND WITH TOTAL ACREAGE OF STATES AS OF JUNE 30, 1967.
(CONTINUED)

State	Acreage Owned by the Federal Government			Total	Acreage of State ^a	Percent Owned by Government ^b
	Public Domain	Acquired by Other Methods				
Nevada	60,564,237.3	158,957.2	60,723,194.5	70,264,320	86.421	
New Hampshire	0	705,355.2	705,355.2	5,768,960	12.227	
New Jersey	0	105,878.0	105,878.0	4,813,440	2.200	
New Mexico	24,984,017.0	1,566,241.6	26,550,258.6	77,766,400	34.141	
New York	0	232,415.5	232,415.5	30,680,160	.758	
North Carolina	0	1,930,724.5	1,930,724.5	31,402,880	6.148	
North Dakota	208,753.4	1,892,656.9	2,101,410.3	44,452,480	4.727	
Ohio	85.0	244,867.8	244,952.8	26,222,080	.934	
Oklahoma	151,812.2	1,249,913.9	1,401,726.1	44,087,680	3.179	
Oregon	30,958,600.4	1,217,916.3	32,176,516.7	61,598,720	52.236	
Pennsylvania	0	589,061.4	589,061.4	28,804,480	2.045	
Rhode Island	0	7,549.6	7,549.6	677,120	1.115	
South Carolina	0	1,130,169.0	1,130,169.0	19,374,080	5.833	
South Dakota	1,613,808.5	1,788,121.2	3,401,929.7	48,881,920	6.959	
Tennessee	0	1,660,242.0	1,660,242.0	26,727,680	6.212	
Texas	0	2,966,368.5	2,966,368.5	168,217,600	1.763	
Utah	34,567,588.2	511,587.8	35,079,176.0	52,696,960	66.568	
Vermont	0	256,648.7	256,648.7	5,936,640	4.323	
Virginia	0	2,180,813.2	2,180,813.2	25,496,320	8.553	
Washington	11,065,450.3	1,495,286.2	12,560,736.5	42,693,760	29.421	
West Virginia	0	967,062.1	967,062.1	15,410,560	6.275	
Wisconsin	9,482.3	1,776,749.4	1,786,231.7	35,011,200	5.102	
Wyoming	28,618,142.3	667,303.0	29,285,445.3	62,343,040	46.975	
Total	706,354,481.4	54,009,987.8	760,364,469.2	2,271,343,360	33.476	

^aDoes not include inland water.

^bExcludes trust properties.

Source: United States Department of the Interior, Bureau of Land Management, Public Land Statistics, 1968. United States Government Printing Office, Washington, D.C., 1969, p. 10.

APPENDIX TABLE 2. FEDERALLY-OWNED LAND ADMINISTERED BY FOREST SERVICE AND BUREAU OF LAND MANAGEMENT, PLAINS AND WESTERN STATES, 1967.

State	Land Administered by Forest Service		Land Administered by Bureau of Land Management		Total Lands Administered	
	Public Domain (acres)	Acquired (acres)	Public Domain (acres)	Acquired (acres)	Total (acres)	by Forest Service and Bureau of Land Management (acres)
Plains States:						
Texas	---	775,292.0	---	---	---	775,292.0
Oklahoma	836.0	286,018.0	9,609.0	---	9,609.0	296,463.0
Kansas	360.0	106,896.0	1,515.0	---	1,515.0	108,771.0
Nebraska	197,578.0	142,180.0	7,923.0	---	7,923.0	347,681.0
South Dakota	1,205,006.0	777,182.0	278,206.0	---	278,206.0	2,260,394.0
North Dakota	103,530.0	1,001,543.5	75,969.0	---	75,969.0	1,181,042.5
Western States:						
Montana	16,656,503.0	14,040.0	6,331,027.0	1,895,357.9	8,226,384.9	24,896,927.9
Wyoming	8,761,998.0	405,572.7	16,671,150.0	9,877.5	16,681,027.5	25,848,598.2
Colorado	13,721,707.0	626,120.7	8,421,934.5	37,538.4	8,459,472.9	22,807,300.6
New Mexico	8,637,534.5	517,268.7	13,207,449.0	232,848.0	13,440,297.0	22,595,100.2
Arizona	11,434,789.9	1,529.8	12,887,158.0	38,847.9	12,926,005.9	24,362,325.6
Utah	7,765,560.0	228,849.7	22,950,794.0	33,184.0	22,983,978.0	30,978,387.7
Idaho	19,924,806.0	416,807.5	12,099,308.0	73,461.4	12,172,769.4	32,514,382.9
Washington	9,434,830.0	265,363.3	273,748.0	---	273,748.0	9,973,941.3
Oregon	14,674,695.0	796,412.1	15,586,723.5	82,215.9	15,668,939.4	31,140,046.5
California	19,667,637.0	321,039.0	15,222,261.0	2.8	15,222,263.8	35,210,939.8
Nevada	5,041,890.0	21,043.0	47,954,475.0	3,357.1	47,957,832.1	53,020,765.1
Total for Plains and Western States						
	137,229,260.4	6,703,518.0	171,979,250.0	2,406,690.9	174,385,940.9	318,318,359.3
United States Total	160,595,285.4	26,168,085.1	473,178,354.0	2,406,936.1	475,585,290.1	662,348,660.6

Source: United States Department of the Interior, Bureau of Land Management, Public Land Statistics, 1968, United States Government Printing Office, Washington, D.C., 1969, pp. 13-16.

APPENDIX TABLE 3. CASH RECEIPTS FROM ALL FARM PRODUCTS MARKETED, FROM LIVESTOCK, AND PERCENT OF TOTAL RECEIPTS BY SOURCE, 1969, BY STATES.

State	Receipts from All Farm Products Marketed (\$1,000)	Receipts from Livestock and Livestock Products (\$1,000)	Percent of Total Cash Receipts from:		
			Livestock and Livestock Products (%)	Cattle and Calves (%)	Sheep and Lambs (%)
North Dakota	744,257	264,997	35.6	24.8	0.8
South Dakota	986,017	802,766	81.4	51.7	2.1
Nebraska	1,933,345	1,399,187	72.4	51.6	0.5
Montana	534,204	352,740	66.0	54.7	2.4
Idaho	631,328	278,892	44.2	26.1	3.9
Wyoming	224,620	188,404	83.8	67.0	8.2
Colorado	1,015,808	795,830	78.3	64.7	3.4
New Mexico	390,322	298,871	76.6	65.7	1.5
Arizona	662,004	369,398	55.8	47.1	0.6
Utah	209,451	166,482	79.5	31.3	8.2
Nevada	76,160	62,702	82.3	65.5	4.5
Washington	774,557	282,874	36.5	13.8	0.3
Oregon	546,175	256,212	46.9	25.4	1.4
California	4,371,260	1,765,820	40.3	19.4	0.6

Source: United States Department of Agriculture, Economic Research Service, Farm Income Situation, FIS 216, United States Government Printing Office, Washington, D.C., July, 1970.

APPENDIX TABLE 4. RESOURCES, COSTS, AND RETURNS PER BROOD COW, COW-CALF RANCHES, SHEYENNE VALLEY GRAZING ASSOCIATION, 1967-1970.

Total Receipts Per Brood Cow		\$115.83
Steer Calf (400 lbs. X \$.32 X 45%)	\$57.60	
Heifer Calf (375 lbs. X \$.30 X 29%)	\$32.63	
Cull Cow (1,000 lbs. X \$.16 X 16%)	\$25.60	
Total Direct Costs Per Brood Cow		\$ 32.22
Total Fixed Costs Per Brood Cow		\$ 15.23
Depreciation	\$ 9.41	
Real Estate Taxes	4.02	
Other Taxes and Maintenance	2.28	
Return to Capital, Labor, and Grazing Permit Per Brood Cow		\$ 68.38
Grazing Costs Per Brood Cow		\$ 9.07
Grazing Fee Per Brood Cow (7.2 AUM X \$1.11)	\$ 7.99	
Other Costs, Maintenance and Improvements	\$ 1.08	
Return to Capital and Labor Per Brood Cow		\$ 59.31
Labor Charge (18 hr. X \$1.60)		\$ 28.80
Return to Capital Per Brood Cow		\$ 30.51
Capital Investment Per Brood Cow		\$701.49
Cattle	\$320.52	
Land and Buildings	302.54	
Machinery	46.43	
Feed	21.00	
Other Direct Costs	11.00	
Rate of Return to Invested Capital (Percent)		4.35%