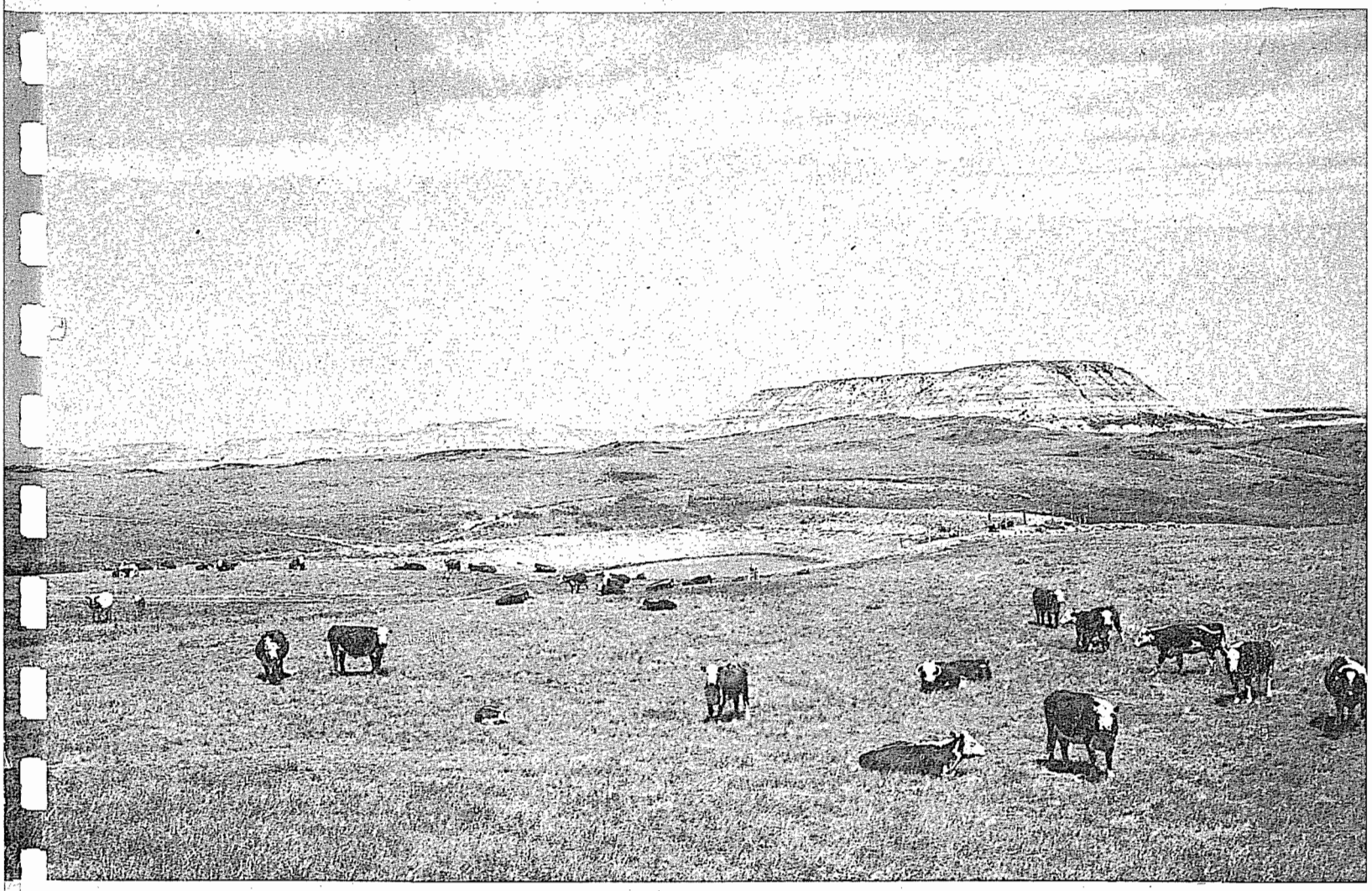
Ag. Econ. Report No. 37

September 1964

AN ECONOMIC ANALYSIS OF

ALTERNATIVE METHODS FOR ESTABLISHING GRAZING RENTALS

ON STATE SCHOOL LANDS IN NORTH DAKOTA



BY

JAMES I. MCDOWELL AND JEROME E. JOHNSON

Department of Agricultural Economics
NORTH DAKOTA STATE UNIVERSITY
Fargo, North Dakota

ACKNOWLEDGMENT

The authors gratefully acknowledge the generous cooperation received from the many people contacted in the preparation of this report. The following have helped make this report possible: the Commissioner and personnel of the North Dakota Land Department, representatives of the North Dakota cattlemen and stockmen's associations, department directors and personnel of land departments in the western states, and personnel of the Bureau of Land Management of the United States Department of Interior, the Forest Service, and other divisions of the United States Department of Agriculture, the United States Army Corps of Engineers, the United States Bureau of Indian Affairs, the United States Fish and Wildlife Service, state agricultural experiment stations, and departments of agricultural economics. The report would not have been possible without the assistance of the livestock producers who were interviewed as to their uses of public lands and ranching operations. Meetings with North Dakota Land Department personnel and the Grazing Associations provided information which was extremely helpful in preparing this report.

FOREWORD

In October of 1963 the North Dakota Board of Universities and School Lands proposed a new method for establishing grazing fees on school land. This would have increased grazing fees. Some users objected to the announced increase in fees. Other users indicated no objections to the higher fees but did not believe the proposal was based on sound principles. As a result the Board decided to continue the current system for another year while an impartial, unbiased analysis was made of the present system, the Board's proposal, and alternatives. The Department of Agricultural Economics of the North Dakota State University was asked to conduct this study.

A discussion of findings and implications is presented in this report. Specific recommendations are made regarding the desirability of the various alternatives. Finally, suggestions are offered to improve leasing arrangements.

The report is available to the public. Hence, it must also present general background information on leasing laws and procedures to permit an understanding of the leasing situation. We trust this report will make a worthwhile contribution to leasing arrangements on public lands in North Dakota.

Fred R. Taylor

Fred R. Taylor, Chairman
Department of Agricultural Economics

TABLE OF CONTENTS

An Economic Analysis of
ALTERNATIVE METHODS OF ESTABLISHING GRAZING RENTALS
on State School Lands in North Dakota

by
James I. McDowell and Jerome E. Johnson*

The State Land Department manages 890,241 acres of school and institutional endowment land, which it leases to North Dakota farmers and ranchers. This acreage includes 844,699 acres of grant land and 45,542 acres of acquired land. The Enabling Act, under which North Dakota was admitted to the Union, granted federal lands to the state for the support of common schools and thirteen other state institutions. Subsequently, the state acquired additional acreages through mortgage foreclosures on farm real estate loans which had been made from the permanent school funds.

At a conservative value of $30 per acre, the Department is the steward of lands worth over 26.5 million dollars. During the 1962-1964 biennium the Department obtained over $804,419.51 in grazing land rentals, or $402,209.75 per year from the leasing program.

Income is earned from the investment of permanent funds, which come from the sale of the endowment lands and oil and gas royalties. The income derived from these investments and from the grazing and mineral leases is apportioned to public schools and institutions. The management and leasing of state school lands are of importance to every citizen of the state; were it not for these rentals and investment earnings, state and local taxes would have to be higher than they are.

The best of the land originally granted to the schools and institutions has been sold, and all that remaining is grassland. In addition, a large portion of the acquired lands is grassland. It is these lands that are used only for grazing which are the subject of this economic report.

---

*Assistant professors of agricultural economics
Cover photo courtesy of Soil Conservation Service, USDA

THE PRESENT SYSTEM: A REVIEW OF LAWS AND LEASING PROCEDURES

The North Dakota Constitution authorizes the Board of University and School Lands[1] to lease school lands under the laws adopted by the legislature. Requirements for grazing leases are that: (1) Each lease must be let at public auction, (2) no lease can be made for more than five years, and (3) rentals must be paid in advance.

Methods of Establishing Minimum Rentals. The Board of University and School Lands is required by law to establish a minimum rental on grazing lands to be leased, but the amount of these rentals and the method of their determination is left to the discretion of the Board. This minimum is subject to review and change as the Board deems necessary. Under former laws the county board of appraisal[2] was required to appraise the land with the minimum rental on grazing lands set at 0.5 percent of the average appraised value for the county. In modern times this policy was never followed.

For some time prior to 1953 the minimum grazing rental was 15 cents per acre. In 1953 it was raised to 25 cents per acre and has so remained.[3] All grazing lands leased by the Board are subject to this 25-cent minimum except submarginal land in the west.[4] These lands are leased at a minimum rental equal to one-half or three-fourths of the 25-cent minimum depending upon the grazing condition.

Leasing Procedure and Length of Lease. Notice of leasing sale must be given weekly for three weeks prior to the lease auction by advertisement in a legal newspaper published nearest to the land and also in the official county newspaper. Leases are sold at public auction held at the courthouse or at whatever place the District Court convenes. At the time the lease is sold, the lessee must pay a year's rental in advance. If several bids are advanced on tracts, the highest bidder receives the lease. If the lease on a tract is not sold at auction, the Board may later lease it by private negotiation, but not for less than the stipulated minimum rental. Rentals are payable to the state land commissioner for years following the first. Normally, leases are for five years, although those granted in 1963 were for one year only. When rentals are not paid on the due date, the lease is considered void and may be leased at a later date to someone else. In addition to the rental, the lessee must also pay a fee of $1.50 for a one-year lease or $3 for a longer term lease at the time the lease is granted.

Improvements. Lease holders are allowed to place improvements such as dugouts, wells, dams, and fences on the land. They should obtain written permission

---

[1]The Board consists of the governor, secretary of state, state auditor, attorney general, and superintendent of public instruction. The secretary is the Commissioner of University and School Lands.

[2]The county board of appraisal consists of the county superintendent of schools, the county auditor, and the chairman of the board of county commissioners.

[3]Except for the period of time when the Board was issuing leases under the 1963 proposal.

[4]Submarginal lands is a common term used to describe grazing conditions within the Badlands area.

of the Land Commissioner before doing so. If they do not secure this permission, they cannot remove the improvements or receive compensation for them if the land later is sold or leased to someone else. If improvements are placed on the state land under permit and the lease is cancelled, the lessee has ninety days to remove the improvements, such as fences and windmills, if it can be done without damage to the land. In the case of dams, dugouts, and other permanent facilities that cannot be removed without damaging the land, the buyer pays the lessee a "reasonable value" for all permanent facilities placed on the land with the written consent of the Commissioner. "Reasonable value" is based on the acquisition cost and depreciation--not to exceed ten years. If the buyer and lessee are unable to agree on a reasonable value for improvements, it is determined by a board composed of the commissioner or someone he designates and a person appointed by each of the parties in disagreement.

Sale of Lands. When an individual wants to purchase state land, he may make an offer to purchase. The commissioner requests the county board of appraisers to appraise the tract. A notice of sale is published in the official newspaper for the three weeks prior to sale in the case of original grant lands and for two weeks prior to sale in the case of non-grant lands. The sale is to the highest bidder at public auction held at the courthouse or at the place where district court convenes. No bid may be accepted, however, if it is less than the appraised value. Purchase of the lands is subject to confirmation by the Board. Terms of sale are one-fifth down and annual payments of not less than 6 percent of the purchase price. Each annual payment is divided between interest and principal as follows: an amount not less than 3 percent per year of the unpaid principal is credited to interest and the balance credited on the purchase price. The credit to interest has been 4 percent for several years.

Miscellaneous Provisions. State lands cut into pieces by highways, railway rights of way, etc. may be leased as separate tracts. Thus the Board has tracts of less than 160 acres to lease. The minimum rental for these small tracts is also 25 cents per acre.

Any person who willfully makes a successful bid at a leasing sale and then fails or refuses to make the first year's annual payment on the day of the sale is guilty of a misdemeanor. This is considered fraudulent bidding with a penalty of up to one year in the county jail, a fine of not more than $500, or both.

The statutes also stipulate legal procedures for trespass upon lands controlled by the Department. Any person who commits willful trespass upon these lands shall be liable in triple damages, but single damages only shall be recovered if the tresspass was casual and involuntary. Willful trespass is a misdemeanor with punishment of up to one year in the county jail, up to $500 fine, or both. Willful trespass is said to occur when a person willfully and purposely cuts or destroys timber, mows, cuts, or removes grass, injures buildings, fences, or other improvements, or cultivates grazing land. Casual trespass occurs when a person involuntarily damages these lands.

PROBLEMS ASSOCIATED WITH THE PRESENT LEASING SYSTEM

The present system for leasing state land poses many problems for users of the land, for the public of North Dakota, and for the Board itself.

Problems of the Users. Among the many problems faced by those who rent state lands are tenure risks, problems associated with using lands within grazing areas administered by the Forest Service, spite bidding, lack of improvements on state lands, differing grazing capacities on lands rented at the same rate per acre, and activities of speculative operators who obtain leases at high prices and then drop these leases if market conditions change.

Tenure risks are among the problems most often indicated by users of state land. These risks arise from the short duration of state leases and the fact that state land is always subject to sale. The user frequently must bid competitively against "outsiders" for the use of land which is an integral part of his operating unit. There is a continual danger that someone will force the land to be put up for sale, and in order to keep a workable unit, he may be forced to purchase the land at a price far beyond what he considers to be its true value.

In certain western portions of the state the use of state lands is controlled by the use of surrounding Federal LU land[5] because the state and federally owned lands usually are not fenced separately.[6] When the cattle are removed from LU land, they must also be removed from state land, but the annual rental on state land must be paid regardless of the months grazed or grazing capacity. Cattlemen object to this since in most cases they cannot use the state land on a year-round basis; and in periods of drought when they cannot graze LU land, they must still pay rent for the state land.

Also, according to the LU agreement between cattlemen and the federal government, only three-fourths of the rated grazing capacity may be utilized and individual herd sizes are restricted to 350 head or less.

"Spite" bidding is a problem in some areas of the state. A person with no intention of using the land will bid on it at the lease auction to make the current user pay a higher rental. In some cases spite bidding is by self-appointed protectors of the public interest who feel that rentals on state land should be at least as high as property taxes on surrounding privately owned land. In other cases where rentals have been bid up above the levels of property taxes, the motivation may be jealousy or revenge.

Lack of improvements on state land is a problem to many users. Even though the user holds a five-year lease, he hesitates to improve the land because this might make the tract more attractive to a prospective purchaser. Many users do not realize that they can be compensated for improvements when the land is sold if they had written permission to place improvements on it although this is read at the leasing sale. Other users would not object to higher rentals if the state constructed improvements and made an effort to care for the land.

Some producers object to the uniform minimum rental rate per acre for all tracts despite their widely differing grazing capacities because the uniform rate discriminates against users of the poorer lands and benefits users of the more productive lands. The one-half and three-fourths rates in the Badlands merely reduce this inequity somewhat.

---

[5]"LU land" is the commonly used term for "submarginal" lands purchased under the Federal Land Utilization Program which are under the USDA-Forest Service management.

[6]Often these are referred to as "captive lands" meaning that although they are owned by the state, they are, in effect, under the management and regulation of the Forest Service.

"Speculators" and "outsiders"[7] obtaining leases on state lands were considered a problem by many users. They particularly objected to the speculator who would obtain a lease at a high rate per acre and then drop it the following year if market conditions changed. Local stockmen who attempted to "pick up" these dropped leases on an individual negotiation basis often found the Land Department wanting more than the required minimum rental, since the prior lease had been at a higher price.

Problems of the Board and the Public. Since grant lands are specifically for support of schools and state institutions, the Board has a dual role as manager: (1) to protect and maintain the value and productivity of the land over time and (2) to obtain the maximum cash income from the rentals. In this respect the Board may be doing less than it could. First, it makes no effort to improve the land and increase its productivity; and secondly, it continues to lease land at rates considerably lower than can be earned by selling the land.

The Land Department's problem with the current system is that leased land yields significantly fewer dollars than land which has been sold and the proceeds invested at 4 percent per year (see Table 1). The Land Department prefers to hold land as an investment for the future; yet if it sells land at prices above appraised value and invests the proceeds at 4 percent, more dollars are returned to the schools and institutions for whom the investment is intended.

TABLE 1. COMPARISON OF AVERAGE ANNUAL RENTAL PER ACRE ON LEASED STATE LAND AND AVERAGE RETURN FROM STATE LANDS SOLD WITH RETURNS INVESTED AT 4 PERCENT, 1952-1964

Period	Leased Lands Average Annual Rental	Sold Lands Average 4% Return
	dollars per acre	
7-1-52 to 6-30-54	0.255	---
7-1-54 to 6-30-56	0.316	0.970
7-1-56 to 6-30-58	0.355	1.502
7-1-58 to 6-30-60	0.395	1.642
7-1-60 to 6-30-62	0.430	1.653
7-1-62 to 6-30-64	0.455	2.284

In the 1962-1964 biennium the leased lands returned an average of 45½ cents per acre while the investment in funds received from the sale of lands yielded an average of more than $2.28 per acre, or more than quadruple that of the rental returns per acre. Additionally, the sold lands were immediately placed on the tax roles and thereby contributed to local services. However, the conclusion should not be drawn that all land, if sold, would return this average, since only the most demanded land has been sold.

Table 2 shows that the selling prices per acre for the sold lands were considerably above the appraised valuations established by the county boards of appraisal and Land Department field appraisers. In fiscal 1963, for instance,

[7]A speculator is an individual who purchases livestock in an attempt to take advantage of changing market conditions. An outsider is someone whose farm or ranch is located at some distance from the state land.

the average appraised valuation was $39.37 per acre while the average selling price was $59.92. This indicates either that the appraisals on "offered" lands are conservative or that buyers are willing to pay more than the valuation to obtain the use of the land.

TABLE 2. APPRAISED VALUE OF STATE LAND TRACTS SOLD AND SELLING PRICE PER ACRE, 1956-1964

Period	Appraised Value*	Selling Price
	dollars per acre	
7-1-56 to 6-30-57	25.43	38.92
7-1-57 to 6-30-58	27.82	34.15
7-1-58 to 6-30-59	32.68	44.69
7-1-59 to 6-30-60	30.06	38.13
7-1-60 to 6-30-61	31.25	42.21
7-1-61 to 6-30-62	32.64	40.36
7-1-62 to 6-30-63	42.65	52.66
7-1-63 to 6-30-64	39.37	59.92

*As appraised by the county board.

Another problem facing the Board is that 40 percent of the leases will come up for renewal in October, 1964, rather than the usual one-fifth. There will be twice as many leases to sell with a limited staff. If the current one-year lease system is repeated in the future, it will become increasingly difficult to sell all the leases in the time period provided.

The Commissioner has suggested sending reminders to current users when their payments become due. This would eliminate some dropping of current leases because the user forgets to send in his annual payment.

Another problem for the Board is the fact that many farmers and ranchers not using state lands have complained about the low lease rates paid by users. Even so, they will not bid on leases, for they do not want to antagonize their neighbors. Still they believe the land should rent at a higher rate.

Currently the Land Department follows a policy of not sharing in improvements to land under its control since it is not specifically authorized to do so. This is a problem because it means the state is not actively taking steps towards maintaining or increasing the future value of this land. The Land Department may revoke leases if the land is abused, but it cannot place improvements such as wells, dugouts, or dams on the land. The user may do this if he so desires, but he obtains no help from the state. However, the Soil Conservation Service will help users make improvements on a cost-sharing basis. Additionally, users are assured compensation for improvements when someone else leases or buys the land when permission is obtained from the Land Department to place the improvements on the land.

GRAZING RENTALS AND PROCEDURES EMPLOYED ELSEWHERE

The first objective of this study is to discuss leasing procedures, rentals, and methods of determining rentals on public lands in other states, on federal

lands, on railway lands, and on privately owned lands in North Dakota.

Grazing or Carrying Capacity. The grazing or carrying capacity of the land is an important factor which most states, federal agencies, and private individuals specify in their grazing leases. North Dakota does not. Yet, this may lead to overgrazing unless users are extremely good managers and recognize the long-run effects of it.

The states of Arizona, Montana, Nebraska, New Mexico, Utah, Washington, and Wyoming, as well as most federal agencies, use a formula to establish the grazing capacity of the lands. Sample areas are studied for forage content to establish the amount of forage per acre. The forage per acre and available water supply are used in determining the grazing capacity. The states of Idaho and Oregon employ range examiners to establish grazing capacity at their discretion. Only Colorado and North Dakota pay little attention to the grazing capacity. Instead, they rely on the user not to overgraze. California, where state grazing lands are interspersed with those of the Bureau of Land Management (BLM), uses grazing capacity estimates of the BLM.

Grazing capacity is generally expressed in animal unit months (AUMs). An animal unit month is the quantity of forage sufficient to provide maintenance and normal growth for one animal unit for a period of one month. An animal unit is variously defined by different agencies. The state of Washington considers it as one cow and calf, one bull, one dry two-year old or older, or one and a half yearling steers or heifers. Montana defines it as one cow, one horse, five sheep, or five goats. The U.S. Fish and Wildlife Service bills all cattle over eighteen months of age as one animal unit each, those six to eighteen months of age as three-fourths animal unit each, and those under six months as one-fourth animal unit each. Animal unit is defined by the Forest Service and BLM to be one head of cattle over six months of age or five sheep over six months of age at the time the animals are placed on the grass. Thus, there appears to be no single definition of what constitutes an AUM. This is emphatically pointed out by Wesley Calef in Private Grazing and Public Lands when he states:

> "...It must be understood that an animal unit month does not represent an actual weight of forage. Clearly, poor cattle on lush pasture will use much more forage than cattle on very poor range. Neither is it a measure of grazing effect on forage production. A hundred a.u.m.'s of grazing on a piece of range in poor condition might seriously impair future productivity, whereas a hundred a.u.m.'s of grazing on another range would have no effect on productivity. The animal unit month is simply a convenient device for expressing the concept of a given number of cattle grazing for a given number of days." (3:41)[8]

Methods for Determining Grazing Rentals. Leasing rentals are usually granted on an AUM basis, but a few states use a per acre charge. North Dakota is one of these. Land agencies may consider many factors in establishing grazing rentals per acre or animal unit month. Some, such as North Dakota, employ uniform unit rates while others follow formulas which allow the grazing rental to vary from year to year.

Flat Rentals. Minimum or flat rentals are usually based upon such factors

---

[8]All literature cited is identified by a number in the "Literature Cited and Selected References below and the page number location therein.

as public opinion, administrative inclinations, land quality, availability of water, accessibility of lands, comparative private leasing agreements, rentals charged by other agencies, and reserve or revenue requirements of the state (20:Appendix). Some states, such as Colorado, Utah, and Nebraska utilize flat rentals involving the capitalized value of the land.

Flexible Rentals. Flexible or formula rentals are usually established as a combination of some of the above factors and beef cattle prices. The price of feeds which are substitutes can also be used in these formulas. Some of the formulas utilized are as follows:

(1) Washington:
AUM rental = L x G x S x P/M

where L = proportion of average stockman's investment in land (established at 40 percent)

G = average gain for a four-month grazing season (established at two hundred pounds)

S = landlord's fair share of gross land income (established at 30 percent)

P = average price of beef cattle sold in Washington during previous year

M = number of months of grazing

(2) Montana:
AUM rental = 32¢ + 2P $\pm$ 10¢ AUM adjustment

where P = last year's average beef prices per pound in Montana and +10¢ AUM adjustment is for grazing capacities greater than 19 AUMs annually per 640 acres and -10¢ for grazing capacities of 14 or fewer AUMs annually per section

(3) U.S. Fish and Wildlife Service--North Dakota, South Dakota and Nebraska:
AUM rental = .0952P

where P = average price of beef cattle per cwt., previous year

.0952 = (2.00/21.00) with $2.00 equal to private lease per AUM, and $21.00 is the average beef price per cwt. in the base year, 1962

(4) BLM:
AUM rental = 10¢ + P

where P = average of sheep and cattle prices per pound in eleven western states for the previous year

(5) Alberta, Canada:
Acre rental = X(250P/GC)

where X = fair share to landlord (12½% north, 16% midsection, and 20% south)

250 = gain from grass

P = average price per pound of all but choice cattle for July-December of previous year

GC = grazing capacity in acres/head/year

(6) Arizona:
Annual rental/head = .22P

where P = average Arizona cattle prices per cwt. for previous year

If the above formulas were modified to be applicable to North Dakota conditions, grazing rentals would vary from $0.32 to $3.62 per AUM for the 1964 grazing season (see Table 3). The Alberta formula would return the most to the state while the BLM rental is considerably less than the others.

TABLE 3. RENTALS ESTABLISHED BY SIX FORMULAS MODIFIED FOR AVERAGE NORTH DAKOTA CONDITIONS*

Formula Used by:	Washington	Montana	USF+WS	BLM	Alberta	Arizona
Type of rental	AUM	AUM	AUM	AUM	Acre	Yearly
Rental yielded--1964 grazing season	$1.45	$0.87	$2.13	$0.32	$2.13	$4.93
Rental Converted to AUM	$1.45	$0.87	$2.13	$0.32	$3.62	$0.99

*Modifying assumptions: five-month grazing season, 270-pound gain, cattle prices in terms of average annual steer and heifer prices, landlord's fair share of 30 percent, 1.7 acres per AUM.

Comparison of Public Agency and Private Rentals. Table 4 illustrates the relationship existing between public agency grazing rentals and rentals on privately owned land. Only two of the land agencies queried establish grazing rentals somewhat comparable to levels of private rentals. These are the Nevada Game and Fish Department and the U.S. Fish and Wildlife Service. In the other cases a wide difference exists between private grazing rates and rentals on publicly owned grazing land. Even the Northern Pacific Railway and Anaconda Copper Company charged significantly less per AUM than did private individuals (19:30).

Why are grazing rentals on public lands lower than on private lands? First, the improvements are usually less on public lands. Secondly, public lands are often inaccessible and of no value unless used with adjoining privately owned lands having a good water supply. Finally, transportation and trailing costs to public lands are sometimes a major expense. Probably the major factor is that often these lands lack improvements which users must make in order to achieve best use of the lands. The improvements, chiefly fences and water developments, are costly to the user. A South Dakota study indicated that these costs varied from 60 cents per AUM for a relatively small herd to less than 35 cents per AUM for a herd of more than 300 head (7:Appendix)

But these factors only partially explain the differences between the private and public grazing rentals. It is possible that public lands are under priced, which may be because a large portion is affixed to some private ranch property. Also, grazing is only one of the uses of these lands and the grazer should not bear the full cost of using them. Other interests, chiefly recreational and wildlife, also utilize public lands; however, the value to the public of the recreational benefits is difficult to assess although it is generally concluded that recreational interests are becoming more important. This increases the alternative cost to users for the privilege of grazing these areas. Another possibility is that private grazing lands are over priced. This might occur if speculative interests were present or if users were optimistic regarding livestock prices. It is generally concluded, however, that grazing leases on public lands are under priced.

Also it must be remembered that goals of these leasing agencies differ. Rent on LU lands is low because those lands were established to stabilize local economies.

TABLE 4. COMPARISON OF GRAZING RENTALS ON PUBLIC AND PRIVATE LANDS

Leasing Agency	Average Grazing Rental/AUM*	Private Rental/AUM* In the Same Area
Anaconda Copper Company	$0.40	$2.00
BLM	0.30	1.50-2.50
Idaho	0.40	1.50-2.50
Montana	0.76	2.00-3.50
Nevada	1.50	2.00
North Dakota**	0.60	2.00-3.00
Northern Pacific Railway	0.80	2.00
South Dakota**	0.90	3.00
Standing Rock Indian Agency		
Permitted Lands	1.25-2.00	2.00-3.00
Leased Lands	1.00-2.00	2.00-3.00
U.S. Army Corps of Engineers-- Garrison	0.30-1.50	2.00-3.00
U.S. Fish and Wildlife Service-- North Dakota, South Dakota, and Nebraska	2.00	2.00-3.00
U.S. Forest Service	0.60	2.00-3.50
U.S. Indian Service--Average	0.90	2.50-3.50
Washington	1.16	1.50-2.50
Wyoming	0.75	3.00

*Estimated from data obtained from the leasing agencies.
**Western part of state only--based on three acres/AUM.

Fish and Wildlife Lands were established for the benefit of game animals and birds, and livestock grazing is considered secondary and unimportant to the use of these lands. Consequently, grazing rentals are high compared to other agencies. The goal of the State Land Department is to maximize, over time, the stream of income to the common schools and other state institutions. The Corps of Engineers leases land to ranchers as long as it is consistent with the goal of flood control and the prevention of soil erosion.

Allowances for Improvements. The federal agencies have traditionally used a part of the grazing rental for range improvements. A portion of the grazing rentals collected on BLM-LU lands is returned to the users in the form of improvements. The recent 10-cent per AUM increase in BLM rentals is earmarked for this purpose. Most improvements are undertaken on a cost-sharing basis with the user. Some of the Forest Service grazing rental goes for improvements.

Only two states contribute monetarily to improving state grazing lands. Washington shares the costs of improvements with ranchers on a 50-50 basis. Since 1959 it has used 35 to 50 percent of the annual grazing rentals for improvements. Idaho gives the lessee improvement credits for reseeding and fencing via lower grazing rentals.

Most states permit the user to make improvements, but he usually assumes the risk of having the rental bid up when the lease comes up for renewal. Some states, such as Montana, Wyoming, and North Dakota circumvent this by stipulating that the one who places the improvements on the land must be compensated for them if another user succeeds in obtaining the lease.

Length of Tenure and Lease Reservations. The common term for grazing leases among agencies surveyed was ten years. California, Nevada, and New Mexico use five-year leases. Colorado leases for two, four, six, eight, or ten years. Washington leases for an eight-year period. The leasing period in Nebraska is twelve years. The longest lease allowed was eighteen years in Utah. Forest Service leases are for ten years, and BLM leases can be up to ten years. Leases on Indian lands are commonly five years in duration. Alberta grants twenty-year leases and Saskatchewan, thirty-three-year leases.

Common lease regulations include the agency's right to grant entry for mineral development, right-of-way, the season of use, type of animals to graze, and hunting and fishing privileges to the general public (20:Appendix). Colorado and Washington provide for renewal of the lease before the expiration date. Nebraska and others reserve the privilege to recall a lease if the user does not comply with basic conservation practices. In Saskatchewan the lease is taxed annually at a rate equivalent to 60 percent of the grazing rental.

Competitive Bidding and Offers. Most states give the element of competition a resemblance of life in their leasing programs. That is, the description of leases coming up for renewal is posted, and individuals bid for them at sealed or public auctions. In some states the bid is a premium offered to obtain the use of the land at a set rental, and in others the bid is offered as the annual rental of the land. Usually the current user has a preferential right to meet the highest bid offered and retain the lease. Nevada and North Dakota grant the lease to the highest bidder without regard to the prior lessee.

Sometimes there are no bids. The leasing agency may accept or solicit an offer for the land. Offers are significant in Colorado, New Mexico, and North Dakota and are usually at rates near the statutory minimums.

Federal agencies and a few states, such as Oregon and Idaho, make the use of the land subject to the ownership of some base property in the area. The lease is not competitively bid on at auction and changes hands only when the ranch or base property changes ownership. In effect, these are perpetual leases.

EVALUATION OF LEASING SYSTEMS

The second objective of this study is to evaluate features of different leasing systems for establishing rentals. It discusses the advantages and disadvantages of the systems from the viewpoint of users, the general public, and the leasing agencies.

Methods of Establishing Rentals. Two general methods of establishing rentals have been discussed. These were a fixed rental per acre or AUM and a rental which varies with carrying capacity and livestock prices. The flat rental system is presented first.

Flat Rental. A fixed per acre leasing rental is uneconomic, for all lands are not of equal productivity and this system may lead to over-grazing. Differences in terrain, grasses, soil types, availability of water, accessibility,

and precipitation occur on school lands. Where a fixed rental per acre prevails, users of lands of low productivity are at a disadvantage competitively with those using more productive lands. This could lead to over-grazing and corresponding conservation problems if users on lands of low productivity increased the numbers of animals carried in an attempt to get as much from the land as did users of more productive lands. This would not happen if users took the long-run view and recognized the detrimental effects of serious over-grazing. However, if users were short-run profit maximizers, over-grazing might occur (Appendix III).

In North Dakota the carrying capacity decreases from east to west. Even within limited areas grazing capacity varies substantially. For instance, school lands leased by the Medora Grazing Association and its members vary from 7 to 106 AUMs per quarter section of land.

The advantage of a flat rental per acre is mainly administrative. It is a simple matter to compute the total rental per lease. The land does not need to be classified according to productivity, and appraisal and forage evaluations are not essential. Policing is unnecessary since the lessor (public agency) has not stated how the land is to be grazed. Administrators can more easily justify higher than comparable federal agency leasing rentals if the rentals are on an acre basis. Also, the public does not share livestock price risks with the users.

Users know in advance how much the lease will cost them. This advantage is usually minor, however, since these rentals usually have been nominal. Also, users paying a flat rate per acre may be encouraged to place improvements on the land in order to increase grazing capacity and lower per unit costs (especially when they are compensated for these improvements if they lose the lease).

Fixed rentals per AUM are more equitable than flat rates per acre, since AUMs consider the land's productivity and also retain many advantages of the fixed per acre rental. However, it means that the land's grazing capacity must be correctly evaluated, and the animal unit must be defined. Also, when leases are granted in AUMs, some policing is necessary to insure that users do not exceed the grazing capacity. Grazing capacity must be re-evaluated periodically, which may mean that producers placing improvements on land pay more for the use of the land as they increase its grazing capacity. When hazards, such as fire and drought, affect ranges, the AUMs may decrease for a time. However, even though administrative costs are greater, the advantages of evaluating the lease according to productivity best protect all the public's interests.

Several methods have been used to establish a flat rental per acre or per AUM. Capitalization of land values and considering corresponding tax rates on adjacent privately owned lands are used. Flat rentals are sometimes calculated by determining private grazing rental and deducting for services not provided by the leasing agency.

The capitalization method essentially attempts to get the landlord's fair share from the land. It requires an appraisal of the land being capitalized and considers net income, hazards, and selling price. Then some arbitrary percentage of the valuation is used as the rental. The system does not subsidize a poor operator nor charge an unfair rental to a good operator. However, it requires constant review to keep abreast of changing economic conditions. The procedure may result in rentals that are seriously distorted upward in periods of economic prosperity by factors not directly associated with the productive capacity of the lands.

The system of establishing grazing rentals according to tax rates on surrounding lands of comparable value has been suggested. This would be administratively difficult since land taxes vary substantially from taxing unit to taxing unit. The method has many problems and will multiply the errors of the property tax system. As a result, users in areas of large quantities of public lands may attempt to keep property taxes low in order to keep rentals low.

Without discussing the many inequities in the property tax system, the fact that the state is able to exact so many dollars per acre in taxes from privately owned lands suggests that this should be the minimum return to the state for publicly owned lands. In addition, the state should receive a return for the capital investment it has in owning the land and something in return for the forage raised. This method has actually been used in Alberta and Saskatchewan, Canada, and in Washington.

The method of pricing public lands according to the rental on corresponding private lands less the dollar value of services normally supplied by the landowner appears to be equitable. Unfortunately, it is difficult to arrive at the market values of private leases and to value the services which the landlord provides. Also, this pricing arrangement means changing the flat rate as the private rentals change. Under this system the state would make allowances in its rental for not providing upkeep and repair on fences, water, and other improvements.

Formula or Variable Rentals. The establishment of rentals on a formula basis in which livestock prices are included has several important advantages over the flat rental. This method provides a logical means of tying the lease rental to the land's productivity and livestock supply and demand conditions. Including beef prices means that users are paying more when the value of the production is high and less when the value is low. The agency is sharing some risk with producers. A formula helps remove the question of partiality by the administrative agency and removes some political elements from the leasing process.

However, the formula method has problems not presented with the flat rate. Deciding what things to include in the formula and how much weight each should carry are definite problems. Such factors as the landlord's fair share and how much gain should normally be produced present difficulties. It is difficult to evaluate subjective things such as "captive lands" and differences in harvest per animal unit with a simple formula. Also, the formula method is hurt by incomplete or inaccurate data and increases the necessity for an accurate determination of grazing capacity.

According to North Dakota law, the lease price must be printed on the lease. If a formula were used, this would create more problems. However, a schedule showing possible livestock prices and consequent lease rentals could be printed on the lease. This would give the user a very close approximation of the rental to be charged. A more acceptable course is to lag the rentals one year. This is now done in several states. Producers will not know in advance the current year's grazing rental, although they will know whether it is higher or lower than last year's.

Short-term leases of five years or less in duration which are tied to livestock prices often cause hardships. Economic conditions may look bright when the leases are offered at auctions, so speculators drive the rentals to high levels. Then a change occurs in livestock prices, and the users may find themselves in a bigger cost-price squeeze.

One argument against variable lease prices is that often when livestock prices are low or falling, the demand for grazing lands is increased because producers are withholding livestock from the market hoping for significant price increases. Livestock can be held on grass for relatively long periods. History indicates that so long as livestock numbers are excessive, livestock prices are low and the cost of holding becomes prohibitive forcing producers to sell.

Combination Rentals. A combination of the variable and fixed methods is possible. An absolute minimum fixed rental is set, and rates vary above this minimum when livestock prices climb to certain levels. The Montana system where the per AUM rental cannot fall below 32 cents even if livestock prices fall excessively is an example. This system combines several of the advantages and eliminates some of the disadvantages of the flat and variable pricing methods.

Length of Tenure. Short leases of five years or less are of a definite disadvantage to the state and the lessee. They tend to encourage the lessee to over-graze and not properly care for the land unless he believes he can obtain the lease again. Incentives to make improvements are reduced because if the user improves the land, someone else may find the tract more desirable than previously and bid it away from him. It takes time to adjust the herd to fit a lease, and about then the user faces another adjustment if he loses the land. The shorter the leasing period, the greater is the administrative difficulty associated with holding leasing auctions.

Leases with very long periods tend to be perpetual in the eyes of users. If the lease is under priced, this gives rise to two basic, closely related problems. First, the value of the lease is capitalized into the value of the owned land, thereby increasing the ranch's value per acre. Individuals purchasing the ranch pay in excess of its productive value. A second problem is that as the value of a ranch holding a lease increases, the value of surrounding lands also rises. Property taxes increase, and the individuals owning land but not holding a lease pay a proportionately greater share of the taxes. Also, after the lease becomes capitalized into an inflated ranch value, the owner is materially damaged if the lease is terminated.

However, a user holding a somewhat longer lease (ten-year or so) tends to be more careful of the range and often makes improvements to increase its grazing capacity. A renewal privilege near the end of the leasing period stabilizes ranching operations by permitting a gradual adjustment if the user should not renew the lease. This would also increase the probability of severe over-grazing if a lease were lost and the current user could graze only one more year.

Improvements. Current systems, whereby leasing agencies do not participate actively in the improvement of lands, are inadequate even if improvements are allowed to be placed on the lands. If leasing agencies want to continue controlling the land and consider the future best interests of their citizens, they should allocate a portion of current rentals for improvements. Otherwise there is a risk of a reduction of productivity and, hence, of the future value of the lands through erosion and over-grazing. This is detrimental to the public interest and to the users. It means a decreasing income flow to the public as the lands deteriorate. The ranching industry would find both grazing capacity and ranch income being reduced. Also, it impairs other uses, such as recreation and flood control.

The prime example of the value of making improvements on a cost-sharing basis is the state of Washington. In four years the capital value of the range lands under its management has increased by an estimated 150 percent (16:272).

Additionally, stockmen report better gains, and the grazing capacity is increasing.

Alternatives to expenditures for conservation and improvements are a continuation of the present system (which is better than a policy of allowing no improvements) or land disposal. Land disposal appears as a simple and obvious solution but in reality is a very thorny problem. Some public lands have multiple uses, and their sale must consider more than current grazing value. Minerals, recreation, wildlife benefits, and flood control must also be considered. Also, the agency must take the long-term view where changes in population and technology may greatly alter their future use and value of the lands.

Some leasing agencies made no expenditures for improvements because users can make these improvements on a cost-sharing basis with the Soil Conservation Service. The argument is that public investments are not necessary, since users can obtain other financial help. However, public leaders should invest in trained personnel and cost-sharing of land improvements where appropriate. One merely needs to study the state of Washington situation to substantiate this.

Competitive Bidding and Private Negotiation. Some argue that competitive bidding at a public auction is the best means of establishing the true value of public grazing lands. This might be so if all potential users attend the auctions and express their valuations openly. However, ranchers seldom bid against neighbors even if they want the lease. It's not only anti-neighborly, but there was an old association rule requiring compensation of the "hurt" or damaged rancher to indicate the older attitude on this. Competitive bidding occurring on a spite basis is of little advantage to society.

One advantage of the competitive bid leasing system is that anyone wanting to use the land has an opportunity to express his desires openly. Also, there is less chance that individuals will be able to influence officials in charge of leasing, and bidding usually returns more revenue to the leasing agency than it would get by private negotiation.

A study of the leasing situation of Montana school lands revealed that less than 4 percent of 5,700 grazing leases were bid competitively (19:37). The average income per acre from these leases was about 42 cents compared to an average for all grazing lands of just over 10 cents an acre.

An examination of North Dakota lease records indicates that a larger percentage was bid on competitively than in Montana. Even so, less than a fourth of the five-year leases let in 1962 by the Board were bid competitively.

Competitive bidding is important. In October 1962 the state leased 147,495 acres on a five-year base and received $66,506.55 in first year rentals. If these lands had all been leased at the minimum fee, the rental received would have amounted to only $36,558.75,[9] or $29,947.80 less. Although only a fourth of the leases were bid competitively, it increased annual rentals by more than 80 percent above the required minimum or to more than 45 cents per acre.

The number and degree of competition for five-year leases let at public auction in 1962 is shown by counties in Figure 1. The degree of competition

---

[9]This is slightly less than 25 cents per acre since some land in McKenzie, Billings, and Slope counties was considered submarginal.

does not differ greatly over the state although some counties in the western (ranching) portion of the state show a somewhat lower ratio than others with an equivalent number of leases. In Bowman County, for instance, there were no competitive bids on twenty-seven tracts of land.

TABLE 5. FREQUENCY DISTRIBUTION BY DEGREE OF COMPETITIVE BIDDING ON NORTH DAKOTA SCHOOL LANDS LET AT PUBLIC AUCTION IN 1962

Indicated Degree of Competition*	Number of Leases	Percent of Total Leases
1.00	742	76.18
1.01-1.99	29	2.98
2.00-2.99	50	5.13
3.00-3.99	33	3.39
4.00-4.99	27	2.77
5.00 and over	93	9.55
Total	974	100.00

*A coefficient of 1.0 indicates the land was let at the minimum rental. Numbers over 1.0 indicate competitive bidding. The size of the coefficient indicates how much greater the lease price was than the required minimum. For instance, a coefficient of 2.0 indicates the leasing price was twice the required minimum. The average coefficient for the leases was 1.82.

The Board also issued three-year and one-year grazing leases for the 1963 grazing season. Three-year leases were issued at public auction on lands that had agricultural as well as grazing uses. The one-year leases were negotiated. These latter leases had not sold at auctions or were dropped by users during the year.

THE BOARD TRIES A NEW SYSTEM

The Board of University and School Lands tried a new leasing system, which it followed from December 1962 until October 1963. The new system placed most rentals on an AUM basis, with rentals raised substantially above previous levels. In most cases only negotiated leases were issued. No auction sales were conducted with this system.

The new minimum rental was to be established in one of two ways. It was to be $1.75 per animal unit month on lands rated by Soil Conservation Service or Forest Service technicians. For lands not so rated it was to be 2½ percent of the appraised value of the land. The minimum rent on grazing lands was not to exceed $160 per quarter section or $1 per acre regardless of grazing capacity or appraised value.

Yields More Income to the State. The negotiated leases returned a much greater revenue per acre than those auctioned in October 1962. The 89 cents per acre average rental on the one-year leases was about twice that of the auctioned leases. And since these lands failed to be leased at auctions or were cancelled by users, it is probable that they included the poorer quality lands. Table 6 shows the percentage of these contracts granted by price ranges. The most frequent price was between $1 and $1.24 per acre. The 122 leases returned over

$14,000 to the public in 1963. If all leases auctioned in October 1962 were subject to the new system, state revenues would have increased markedly. At an average rental of 89 cents per acre the income received would have nearly doubled, and free competitive bidding would have added even more to this increase.

Effect on Purely Ranching Operations. The new system would have increased grazing rentals substantially over previous levels. Accordingly, net incomes would have fallen, but the degree to which this decline affected producers would have varied substantially. Productivity of the producer's herd, the proportion of his pasture which is publicly owned, the length of grazing period, and the availability and accessibility of water on the public lands would all affect the user's net revenue.

TABLE 6. FREQUENCY DISTRIBUTION OF NUMBER OF ONE-YEAR LEASES GRANTED UNDER NEW LEASING SYSTEM BY PRICE PER ACRE, 1963

Price Per Acre	Number of Leases	Percentage of Leases
cents		
25	16*	13.11
26-49	7	5.74
50-74	21	17.21
75-99	24	19.67
100-124	43	35.25
125 and up	11	9.02
Total	122	100.00

*Forestry leases in Bottineau and Rolette counties

A user with only a small amount of state lands and a large quantity of other pasture would be less affected than a user relying heavily on public lands. Smaller ranches would feel the effect to a greater extent than large ranches. The increase in cost per pound of beef produced would be less as the herd productivity increases. Since productivity is less per AUM on lands of low carrying capacity, an increase in grazing costs would affect net incomes proportionately more for users in these areas than for users in more productive lands.

In some areas it is possible to graze for longer periods. Users in the Badlands area commonly graze for seven or eight months while users farther east graze a five to six-month season. If the rental is charged on an AUM basis, the grazing cost per pound of gain is proportionately less in the eastern parts of the state. A mail survey of Badlands ranchers indicates that the average gain on calves was 204 pounds and on yearlings, 172 pounds. This gain is substantially less than that normally achieved in other parts of the state.

Table 7 shows grazing costs in cents per pound of gain associated with two different lengths of grazing seasons, three rates of gain per animal unit, and varying grazing charges per AUM. A user grazing state lands at the current minimum rental would find his cost of gain increased fourfold by the new system regardless of the grazing season length or the pounds of gain per animal unit. If the user were leasing at the current average rental for the state, grazing costs would increase by nearly two and a half times under the new system.

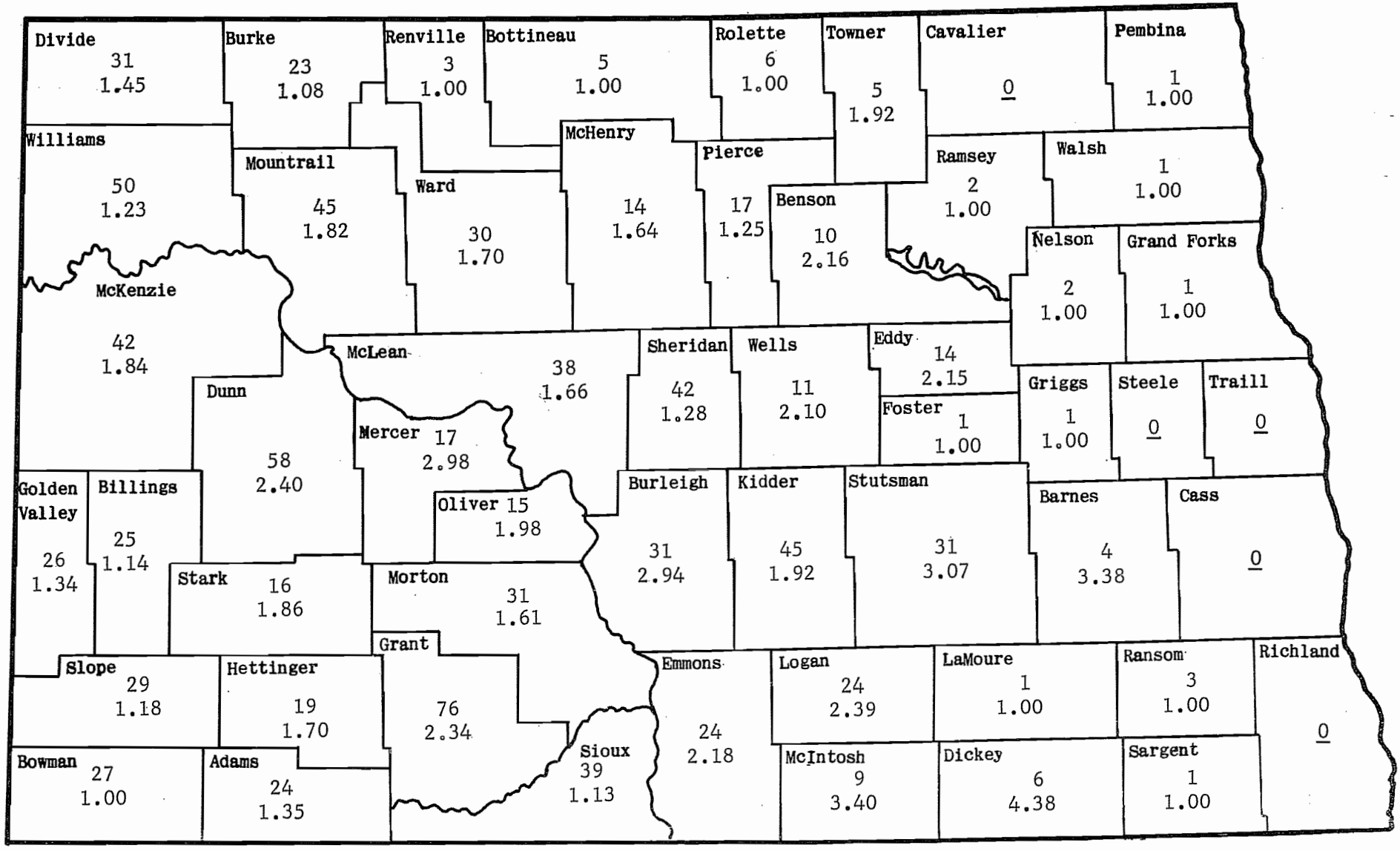


Figure 1. Number of Five-year Leases and Indicated Degree of Competitive Bidding on North Dakota School Lands, October, 1962

Upper = Number of Leases Within County Let in 1962
Lower = Degree of Competitive Bidding with 1.00 equal to minimum rate

TABLE 7. COST PER POUND OF GAIN AT VARIOUS GRAZING RENTALS, TWO LENGTHS OF GRAZING, AND THREE RATES OF GAIN PER ANIMAL UNIT*

Grazing Rental Per AUM	Pounds Gain Per Animal Unit For Five-month Grazing Season			Pounds Gain Per Animal Unit For Seven-month Grazing Season		
	200	270[a]	340	200	270	340
dollars	cents per pound of gain			cents per pound of gain		
3.00	7.50	5.56	4.41	10.50	7.78	6.18
2.50	6.25	4.63	3.68	8.75	6.48	5.15
2.00	5.00	3.70	2.94	7.00	5.19	4.12
1.75	4.38	3.24	2.57	6.13	4.54	3.60
1.50	3.75	2.78	2.21	5.25	3.89	3.09
1.25	3.13	2.31	1.99	4.38	3.24	2.57
1.00	2.50	1.85	1.47	3.50	2.59	2.06
.75[b]	1.88	1.39	1.10	2.63	1.94	1.54
.50	1.25	.93	.74	1.75	1.30	1.03
.43[c]	1.08	.80	.63	1.50	1.11	.89

*The following animal unit equivalents were used: mature cow, 1.0; long yearling, 0.8; weaned calf, 0.6; unweaned calf, 0.4; pregnant heifer, 1.0; five mature sheep, 1.0; and mature horse, 1.5.

[a]Average gain indicated by studies at the Northern Great Plains Field Station, Mandan, North Dakota.

[b]This is approximately the average rental currently being charged assuming a state average of 1.7 acres per AUM and 45 cents per acre per year.

[c]This is the minimum rental currently being charged assuming 25 cents per acre and an average 1.7 acres per AUM. This also approximates current charges to the Badlands area, where carrying capacity averages three acres per AUM and the rental varies from 12.5 cents to 18.7 cents per acre.

However, the current system establishes a very low base, and any increase appears substantial in percentage terms. Also, grazing rent accounts for a very low proportion of the total cost of a ranching operation. In an economic study of the Northern Great Plains cattle ranchers it was found that grazing rent on Forest Service and BLM lands accounted for just over one percent of the cash costs of operation (12:59). When these rentals were increased by 80 cents per AUM, the grazing costs rose to about 6 percent of the cash operating costs.

Currently, livestock producers are facing a cost-price squeeze. The economic study of the Northern Great Plains ranchers utilizing publicly owned BLM and Forest Service lands showed that they earned a return on investment of around 3 percent, with larger units earning a higher return and smaller units, a lower return in terms of 1960 livestock prices (12:42). Increases in grazing rentals at current price levels might eliminate the limited margin of profit which some of these ranch operators are making. Other ranching areas using BLM lands were not so well off, and some showed negative returns.

Ranchers who do not use publicly owned grazing land are probably earning lower returns than those who do. A South Dakota study indicates that the return to management and investment for a 147-cow ranch was 2.3 percent when calves returned $23 per hundredweight and dry cows returned $140 (7:9). At prices similar to ones assumed for the study of Northern Great Plains ranches mentioned above this return would be about one percent. For a 335-cow ranch the return

would have been less than 2 percent with prices similar to those used in the BLM study. At prices below 18 cents per pound the ranches showed negative returns to management and investment.

Effect on Typical Users. A large share of state grazing lands users do not fall into the category of the pure ranching operations described above. Only 440 of the more than fifty thousand commercial farms in 1959 were classified as livestock ranches. Cash crops are more important to many users who add to their farming operations with livestock. The livestock graze areas unfit for cultivation and use stubble, hays, and feed grains, which fit nicely into rotations. Livestock is also an enterprise to utilize surplus family labor during the winter months. It is on these farms where summer forage is often lacking that the use of state land becomes extremely important. These users often will bid the price up substantially to retain or obtain the lease.

A grazing rental increase has a smaller effect on net income when the user has several enterprises, since the cost increase does not apply to all enterprises. Also, users with some cash crop sales currently tend to pay higher average grazing rentals than the purely livestock operations, so an increase would not have as large an effect.

In March 1964 the Department of Agricultural Economics conducted a sample survey of users of state grazing land in five counties where users were expected to have crop sales. The counties involved were Burleigh, Dunn, Hettinger, Kidder, and Stutsman. The average size of land managed was 1,900 acres consisting of 1,300 acres owned, 360 acres leased from the state, and 240 acres leased from others. The average pattern of land use was as follows: pasture land, 1,205 acres; hayland, 275; cash crops, 165; feed crops, 200; and fallow, 55 acres. The investment averages were: land, $42,000; buildings, $16,300; equipment, $14,400; and livestock $28,150 for an average total investment for the users surveyed of $100,450.

TABLE 8. SUMMARY OF SELECTED SURVEY DATA, FIVE NORTH DAKOTA COUNTIES, MARCH 1964

	dollars
State school lease cost per year	220
Land tax per year	590
Annual pasture land upkeep on: owned land	235
leased land	85
Annual range improvements cost	285
Net taxable income	2,670

The average grazing rental per acre was 61 cents on state lands by users in the sample or 16 cents above the state average. However, the grazing land was of above average quality since the average grazing capacity was 1.61 acres per AUM as estimated by the users. On this basis, the average grazing rental per AUM would have been 98 cents. If grazed correctly, the lease would average nearly 225 AUMs. An increase in grazing rentals to $1.75 per AUM would have nearly doubled the user's cost, and net taxable income (see Table 8) would have been reduced from $2,670 to $2, 498.

The typical user estimated the average annual upkeep on the 360 acres of school land was $85, which equals 24 cents per acre or 38 cents per AUM. In

addition, $285 was spent on range improvements, such as new fences, dams, dugouts, and reseeding. However, the largest portion of the latter was on owned land as range improvements on state lands were exceptions to the usual pattern.

Average land tax on the unit was 46 cents per acre. Indications are that the state average land tax on grazing lands is between 30 and 40 cents per acre which would approximate 50 to 60 cents per AUM and compare favorably with land taxes in Montana (19:40). Land taxes, of course, are lower in the western portions of the state where grazing capacity is also lower.

SPECIFIC RECOMMENDATIONS

The previous discussions have dealt with the present leasing system, leasing systems used by other leasing agencies, and problems associated with leasing public lands to the users, the lessors, and the public owners.

This study report offers a method of establishing a rental for state-leased land that is fair to the users and the publics involved. No one method is uniquely superior to some others, but certain criteria led to the method offered below. The important criteria in the selection of the grazing rental formula include charging according to amount of the forage produced, measured in terms of the AUMs available; the user's ability to pay, measured in terms of the average prices of livestock received during the previous year; effects of the formula on the livestock industry, as studied over a typical livestock cycle; the long-run productivity of the land; and administrative feasibility. Both a high and stable level of revenue available to the schools may be desirable but cannot be expected since land productivity annually varies due to rainfall differences and because the ability of the livestock industry to pay varies.

The method offered is significantly superior to other methods previously used. It most nearly meets the economic criteria while retaining administrative feasibility. In contrast, a flat rental formula has the greatest administrative feasibility but least economic justification. The 2½-percent-of-appraised-value method offers less administrative feasibility and no short run economic justification.

The rationale for each of the following recommendations has been provided:

1. The Variable Rental Formula is the Best Method of Establishing Grazing Rentals.

The economic advantages of a variable rental greatly outweigh its administrative problems. The pricing system for public grazing lands should consider not only the value of the forage being used, but also the user's ability to pay as reflected by livestock prices. Additionally, it should consider the state investment in the land being used or the tax returns foregone due to public ownership. The variable pricing system is strongly recommended over other rental establishing methods.

2. Rentals to be Established on an Animal Unit Month Basis.

The level of the grazing rental should be equated to the level of productivity of the land, rather than the number of acres leased or an estimated value of the land. The animal unit month concept measures grazing capacities in terms of the amounts of forage available. Grazing capacities in AUMs should be established for each tract of land leased.

Establishing the grazing capacity and the number of AUMs per tract should be done by qualified personnel, such as Forest Service and Soil Conservation Service technicians.

3. A Simple Formula for Establishing Grazing Rentals is Recommended.

The simple formula recommended is: AUM rental = 50¢ + (5P ± 25%), where P is the average annual price of steers and heifers in North Dakota, and zero to minus 25 percent permits a sliding percentage adjustment up to 25 percent in the rental for differences in grazing capacity. The formula allows the grazing rental to vary somewhat as livestock prices change, and hence the ability to pay changes. The degree of fluctuation in the amount of the rental is reduced by including the 50-cent constant, which represents a conservative estimate of land taxes and administrative cost per AUM. The up to 25 percent sliding percentage adjustment only changes the 5P part of the formula and not the 50 cent tax equivalent part.

The AUM grazing rental should be adjusted for differences in carrying capacity. A sliding percentage adjustment up to 25 percent may be used to reduce the AUM grazing rental as the number of acres per AUM increases beyond 2.5 acres. The amount of this adjustment should vary directly with the lower productivity on the poorer lands. The implementation of the formula and its adjustment for quality differences presents no administrative problems in view of the existing electronic data processing equipment available.

The formula should return to the state an average of about $1.50 per AUM, which appears to be a fair return to the landlord. See Appendix II for a fuller explanation and illustration of this formula over a beef price cycle.

4. Easing the Initial Rental Change Through an Adjustment Period.

It is recommended that the new rentals be established over a period of two years to cushion the changes to the users. Only half of the increase in rentals would be effected the first year, and the rest, the following year.

5. To Continue the Competitive Bidding Feature, but for a Premium.

Competitive bidding should continue as part of the leasing procedure to help guide the pricing of the resource. However, it is recommended that the bidding be for a premium to obtain the lease, which would be in addition to the formula established grazing rental. The advantage to the bidder is that he only pays the premium the first year and not for four more years with their unknown livestock price conditions. This procedure is used successfully in the pricing of mineral leases. In the first year the user would pay a premium to obtain the lease and the first year's AUM formula rental, and in subsequent years only the annual rentals according to the formula.

6. A Longer Length of Tenure Should be Permitted.

Constitutional revision should be enacted to permit longer term leases. Five-year leases do not give users adequate time to make livestock production adjustments, especially since the livestock price-production cycle averages nine years. The Board has the power to cancel the lease if the land is abused. This recommendation also suggests an increase in manpower to adequately supervise the public lands, but this need has long been apparent to observers.

There is a good case for putting the leases up for renewal during the fourth year of a five-year lease and the eighth year of a ten-year lease instead of at termination. It is recommended that the Board carefully evaluate this proposal since its implementation may be helpful to the range users.

7. Investments in Improvements are Necessary.

The state should actively participate in improvements of the lands which it is managing. Authorizations to share costs of improvements and to divert a portion of the leasing rental for cost-sharing, plus the addition of at least one qualified range management specialist to the land department are minimal changes recommended to protect the public's future interests and use of these lands.

The seven specific recommendations are immediate changes needed in an effort to achieve an economic utilization of the state lands. For the longer run there is a definite need for a thorough analysis of the returns yielded from continued state ownership and leasing of the lands versus sale and investment of the proceeds and other management systems that can be used. Short run expediencies and longer run rationalizations may not yield similar returns to the citizens of the state, and the obvious conflicts and compromises necessary in the management and uses of these lands should be made known to all concerned.

APPENDIX I

PROCEDURE FOR MODIFYING FORMULAE USED IN TABLE 3 TO AVERAGE NORTH DAKOTA CONDITIONS*

Washington:

$$\text{AUM rental} = \frac{L \times G \times S \times P}{M} = \frac{.40 \times 270 \times .30 \times .2240}{5} = 1.45$$

where L = user's investment in land, 40%
G = pounds of gain from grazing, 270 pounds in North Dakota
S = landlord's fair share, 30%
P = average price of steers and heifers per pound in 1963

Montana:

$$\text{AUM rental} = 32¢ + 2P \pm 10¢ = 32¢ + 45¢ + 10¢ = 87¢$$

where P is the average price of steers and heifers per pound in 1963, and the 10¢ adjustment upward is necessary for the higher carrying capacity in North Dakota

United States Fish and Wildlife Service:

$$\text{AUM rental} = .0952P = .0952 \times 22.40 = \$2.13$$

where P is the average price of steers and heifers per hundredweight in 1963

Bureau of Land Management:

$$\text{AUM rental} = 10¢ + P = 32.4¢$$

where P is the average price of steers and heifers per pound in 1963

Alberta, Canada:

$$\text{AUM rental} = S(GP/GC) = .30(270 \times .2240/8.5) = \$2.13$$

where S and G are previously defined, P is the average price of steers and heifers per pound in 1963 and GC = grazing capacity or 8.5 acres/year/cow

Arizona:

$$\text{Annual rental} = .22P = .22 \times 22.40 = \$4.93$$

where P is the average price of steers and heifers per hundredweight in 1963

* Except those prevailing in the Badlands area

APPENDIX II

AUM RENTALS OBTAINED BY APPLYING THE RECOMMENDED FORMULA: SHOWING NORTH DAKOTA CATTLE PRICES BY CLASSES, AND AUM RENTALS YIELDED BY THE RECOMMENDED FORMULA, 1953-1963

Year	Price by Classes of Cattle*				AUM Rental	
	All Beef	Steers + Heifers	Cows	Calves	50¢+5P	50¢+(5P-25%)
	dollars per hundredweight				dollars	
1953	14.30	16.50	9.60	16.20	1.33	1.12
1954	14.40	16.90	9.60	15.70	1.35	1.14
1955	13.60	16.10	9.30	16.10	1.31	1.11
1956	13.40	15.60	9.40	15.70	1.28	1.08
1957	16.00	18.30	11.50	19.70	1.42	1.19
1958	20.90	23.20	16.60	26.60	1.66	1.37
1959	21.20	23.80	15.70	27.60	1.69	1.39
1960	19.40	22.10	13.90	23.60	1.61	1.33
1961	19.50	21.80	14.40	24.60	1.59	1.32
1962	21.10	25.90	14.40	27.30	1.80	1.47
1963	19.90	22.40	13.60	25.30	1.62	1.34
Average	17.61	20.24	12.55	21.67	1.51	1.26

*Source: North Dakota Crop and Livestock Reporting Service

The purpose of the above table is twofold. First, it provides the rationale for using the price of steers and heifers in the formula, and secondly, it shows how the AUM rental will vary as the price of steers and heifers varies.

Calves typically sell for higher prices than steers and heifers. Cow prices are below those received for steers and heifers. All three classes of cattle are commonly sold from North Dakota ranges, and the number of feeder calves or yearlings is much greater than the number of cows. However, the exact proportion of each is difficult to ascertain. This presents problems in determining which price should be used in the grazing formula.

The steers and heifers price was selected for use in the formula even though this price does include some feedlot sales. The price of steers and heifers is less than the calf price but is greater than the all beef or cow price. The calf price is too high to use because of the number of yearlings and cows sold, and the all beef price is too low because of the emphasis it places upon feedlot animals (weight) and cows rather than feeder animals. Since a large portion of the steers and heifers sold are feeder animals rather than grain-fattened slaughter animals, this selection appears logical.

If the recommended formula had been effective during the eleven-year period, the grazing rental would have varied from $1.28 to $1.80 per AUM on good lands. The rental for the 1954 grazing season would have been $1.33, which is computed as follows: $0.50 + 5($0.1650) = $1.33. The price of steers and heifers is lagged one year for use in the formula since price for the grazing season is unknown when the cattle are on the grass.

Less productive lands in the western Badlands area would rent for less since the livestock must move around more to obtain feed and water. The maximum 25 percent adjustment in the formula would mean the average AUM rental on these lands would be about $1.25.

APPENDIX III

SOME THEORETICAL CONSIDERATIONS IN ESTABLISHING GRAZING RENTALS

A review of basic economic theories applicable to establishing grazing fees is offered to explain the logic used in this report. Concepts of production theory, cost, and revenue are presented in this appendix with illustrations approximating actual grazing conditions.

Production Relationships. The production obtained from the grazing land by livestock is their body maintenance and liveweight gain. Production obtained from a fixed quantity of land, say 160 acres of a given quality, will vary with the stocking rate. As the stocking rate increases, the gain will at first increase at a constant rate, then increase at a decreasing rate, and will eventually decrease as the number of animals is increased to the extent that competition for the forage becomes intense. This relationship is illustrated in Figure 2.

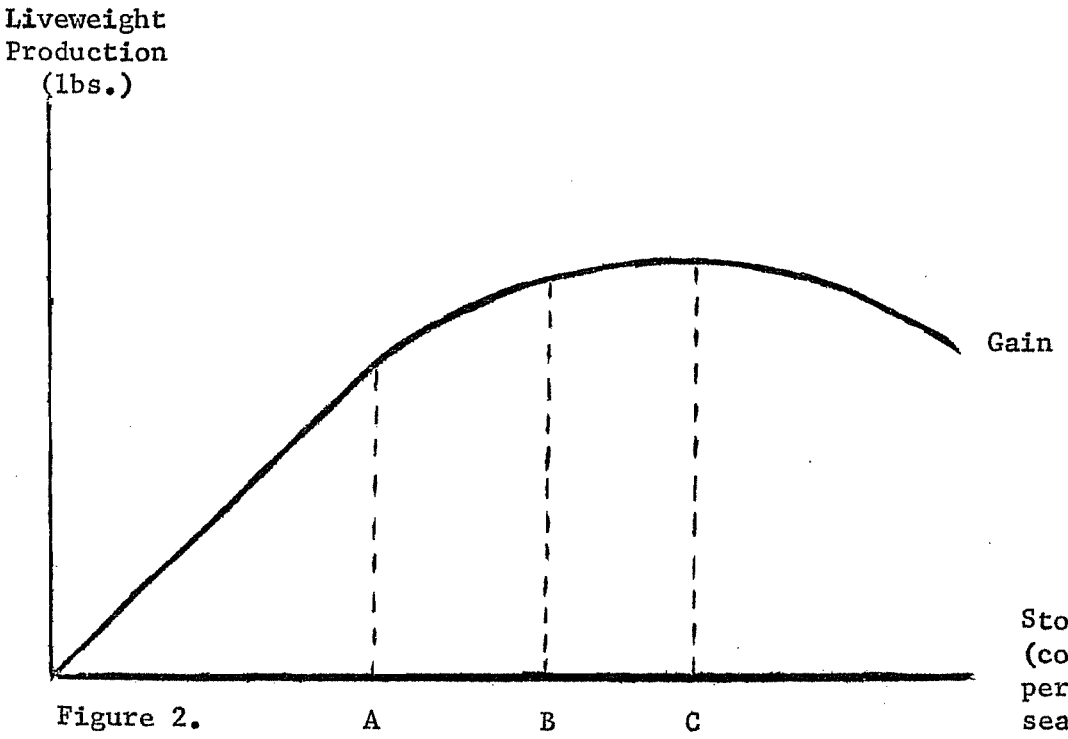


Figure 2.

Production increases at a constant rate until OA cows are placed. Beyond OA production continues to increase but at a declining rate until the point of maximum production is reached with OC number of cows. Over-grazing occurs where the number of cows exceeds OB in number. OB is thus assumed to be the allowable stocking rate.

Total Cost-Revenue Relationships. The number of cows a user should place on the 160 acres would depend upon cost and revenue relationships. The user would get the greatest amount of profit at the stocking rate where the value of total sales exceeds total cost by the largest amount. The revenue received from the grass is the pounds of gain multiplied by the price received. The cost of grazing depends upon the grazing rental and the associated costs of using the lands, such as fencing and water.

A flat grazing rental per acre encourages over-grazing if users are short run profit maximizers. Figure 3 illustrates this situation. The grazing rental is represented by a cost of OE dollars. If the cost of supplying adequate fencing and water does not vary with the stocking rate, then OD dollars represents this cost. The total cost of grazing is the sum of OE and OD costs or OF dollars. In this instance the user earns the most net dollars by grazing OC cows, which is greater than the allowable stocking rate. However, if the grazing rent is per cow rather than per acre, it is possible that stocking rates consistent with both highest profits and conservation requirements may be achieved. Assuming other costs are as shown below, the total cost of grazing increases as the number of cows grazed increases. In the illustration the highest profit would occur at a stocking rate somewhere between OA and OB cows. Beyond OB the margin of profit diminishes and is negative.

It is possible users will not over-graze at low rates. This would occur if the user were oriented toward long run goals of maintaining maximum profits over time rather than short run profit maximization. This could only be done if the range were not abused and eventually is negative.

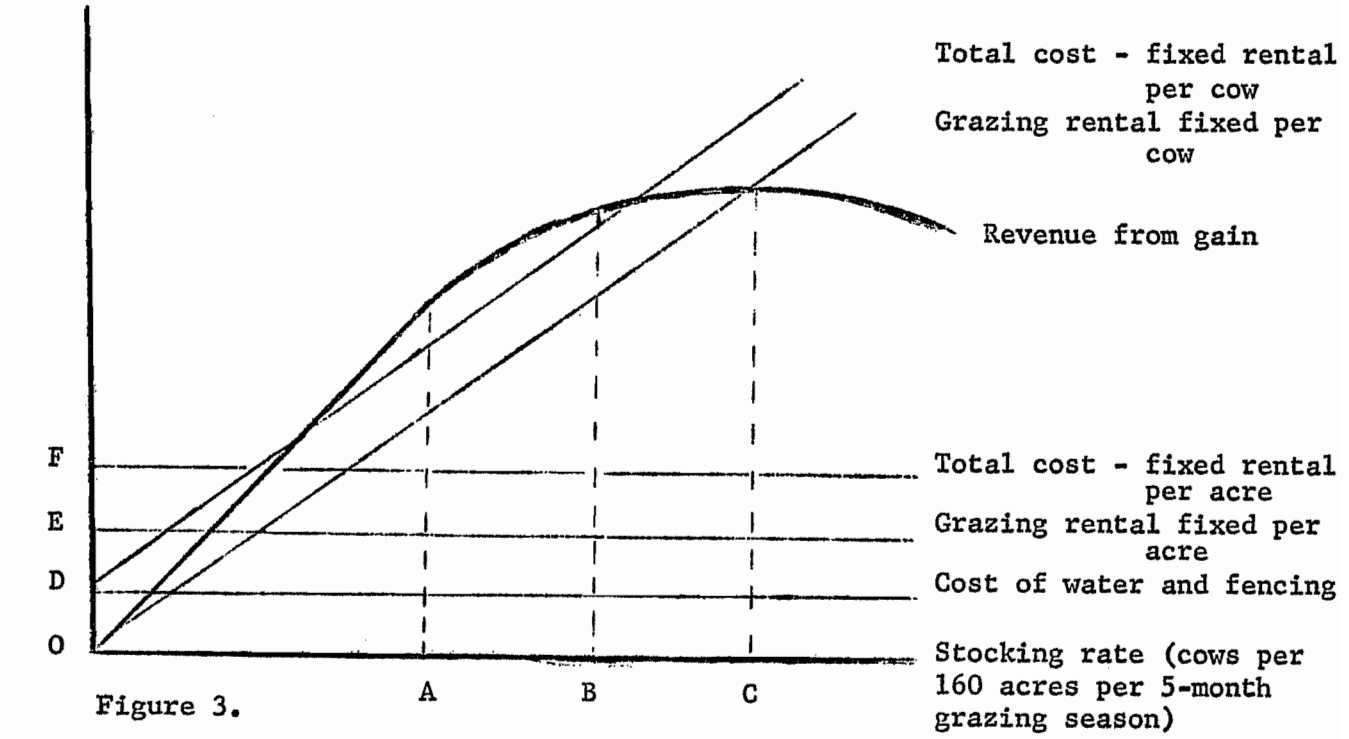


Figure 3.

This analysis presupposes that the AUM grazing rental is correctly priced. If the AUM rental is too low, over-grazing will occur as the total cost line will be proportionately less than illustrated in Figure 3. If the rental is set too high, the land will not be grazed as total cost will exceed total revenue.

LITERATURE CITED AND SELECTED REFERENCES

1. Berry, Russell L. "Flexible Cash Rents on Grazing Lands," South Dakota Farm & Home Research. Vol. 15. No. 2. Spring 1964. p. 12 ff.

2. Biennial Reports of the Commissioner of University and School Lands, various reports. State of North Dakota.

3. Calef, Wesley. Private Grazing and Public Lands. Chicago: The University of Chicago Press, 1960.

4. 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. No. 6. November 1951. pp. 370-74.

5. Clawson, Marion and Burnell Held. The Federal Lands: Their Use and Management. Baltimore: The John Hopkins Press for the Resources of the Future, Inc., 1957.

6. Code of Federal Regulations (Titles on Bureau of Land Management and Forest Service grazing). Washington: U.S. Government Printing Office, 1963.

7. Cornelius, Grant L. Comparison of Alternative Beef Cattle Systems for Western South Dakota Ranches. U.S. Dept. of Agr.-ERS-FPED in cooperation with South Dakota Agr. Expt. Sta. Agricultural Economics Pamphlet 117. February 1964.

8. Davidson, R. D. Federal and State Lands, 1950, with Special Reference to Grazing. U.S. Dept. of Agr. Circular No. 909. May 1952.

9. De Nio, R. M. Principles Governing Grazing Fee Determinations on Lands Administered by the U.S. Forest Service. Prepared for presentation at the 62nd Annual Meeting, Society of American Foresters, Division of Range Management, Atlanta, Georgia. October 23, 1962.

10. Department of the Interior Grazing Decisions, 1936-1958. Washington: U.S. Government Printing Office, 1959.

11. Dutton, W. L. "History of Forest Service Grazing Fees." Mimeo 2508 of February 23, 1953 and published in Journal of Range Management. Vol. 6. No. 6. November 1953.

12. Economic Relationship of Grazing Fees and Permitted Use of Public Rangelands to Net Income of Western Livestock Ranches: A Regional Analysis. U.S. Dept. of Agr.-ERS-FED Administrative Report. No number. Not dated.

13. Foss, Phillip O. "The Determination of Grazing Fees on Federally-Owned Range Lands," Journal of Farm Economics. Vol. 41. No. 3. August 1959. pp. 535-47.

14. Gardner, W. Delworth. "Transfer Restrictions and Misallocation in Grazing Public Range," Journal of Farm Economics. Vol. 44. No. 1. February 1962. pp. 50-63.

15. Gray, James R. and Wylie D. Goodsell. Cattle Ranches: Organization, Costs, and Returns, Southwestern Nonmigratory Grazing Area, 1940-59. U.S. Dept. of Agr.-ERS-FED in cooperation with New Mexico Agr. Expt. Sta. Agricultural Economic Report No. 1. 1961.

16. Harris, Grant A. and Wallace R. Hoffman. "Determining Equitable Grazing Fees for Washington Department of Natural Resources Land," Journal of Range Management. Vol. 16. No. 5. September 1963. pp. 265-72.

17. Loomer, C. W. and V. Webster Johnson. Group Tenure in Administration of Public Lands. U.S. Dept. of Agr. Circular No. 829. December 1949.

18. Martin, William E. and William K. Gross. Cost-Size Relationships for Southwestern Arizona Cattle Ranches. Arizona Agr. Expt. Sta. Technical Bulletin 155. November 1963.

19. Montana Legislative Council. State Lands and Investments. Helena: Montana Legislative Council Report Number 4. November 1960.

20. Morgan, Murray E. Grazing Land Policies in Ten Western States. U.S. Dept. of Interior, Bureau of Land Management. October 1961.

21. North Dakota Crop and Livestock Statistics, various numbers. North Dakota State University-Dept. of Agr. Econ. in cooperation with the U.S. Dept. of Agr.-Statistical Reporting Service.

22. North Dakota Price Trends, 1950-63. U.S. Dept. of Agr.-Statistical Reporting Service in cooperation with the North Dakota State University-Dept. of Agr. Econ. Dept. of Agr. Econ. Ag. Statistics No. 11. January 1964.

23. Roberts, N. K. "Economic Foundations for Grazing Fees on Public Lands," Journal of Farm Economics. Vol. 45. No. 4. November 1963. pp. 721-31.

24. Roberts, N. Keith and C. Kerry Gee. Cattle Ranches Using Public Ranges Yearlong, Income Adjustments to Grazing Fee and Permit Charges. Utah Agr. Expt. Sta. Bulletin 440. February 1963.

25. Roberts, N. K. and E. Boyd Wennergren. The Economics of Administering State Lands for Grazing Use. Utah Agr. Expt. Sta. Bulletin 443. May 1963.

26. Rogler, George A., Russell J. Lorenz, and Herbert M. Schaaf. Progress with Grass. U.S. Dept. of Agr.-ARS in cooperation with North Dakota Agr. Expt. Sta. North Dakota Agr. Expt. Sta. Bulletin No. 439. May 1962.

27. Sarvis, J. T. Grazing Investigations on the Northern Great Plains. U.S. Dept. of Agr.-Northern Great Plains Field Station in cooperation with North Dakota Agr. Expt. Sta. North Dakota Agr. Expt. Sta. Bulletin 308. December 1941.

28. Saunderson, Mont H. Western Land and Water Use. Norman: University of Oklahoma Press, 1950.

29. Taylor, Fred R., et al. North Dakota Agricultural Statistics. North Dakota Agr. Expt. Sta. Bulletin 408 (Revised). February 1962.

30. Taylor, Morris H. and Raymond J. Penn. Management of Public Land in North Dakota. North Dakota Agr. Expt. Sta. Bulletin 312. May 1942.

31. Voelker, Stanley W. Legal Provisions for Administration of State-Owned Land in North Dakota. Unpublished manuscript. January 1945.

32. Voelker, Stanley W. Legal Provisions for the Administration of State School and Endowment Lands in the Northern Great Plains States. Unpublished manuscript. October 1945.

33. Wennergren, E. Boyd and N. K. Roberts. Federal Grant Lands in Utah. Utah Agr. Expt. Sta. Bulletin 437. January 1963.