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Cost of Reclaiming Pinyon-Juniper Rangeland and its Effect on Cattle Ranch Income

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COST OF RECLAIMING PINYON-JUNIPER RANGELAND AND ITS EFFECT ON CATTLE RANCH INCOME

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
Objectives of study	3
Review of literature	3
Method of procedure	6
Economic frame work	7
Assumptions	10
THE TYPICAL RANCHES	11
Physical setting	12
Land inventories	13
Buildings and improvements	14
Summary of investment	14
Summary of net ranch income	15
TYPICAL RESEEDING PRACTICES	17
Practice A	18
Practice B	20
Practice C	21
Total costs	23
ECONOMIC IMPACT	27
Internal rate of return	30
SUMMARY AND CONCLUSIONS	36
REFERENCES	39
APPENDIX A	40
APPENDIX B	59

LIST OF TABLES

Table		Page
1.	Rangeland vegetative types, Utah	2
2.	Summary of investment by size for typical ranches, 1962	15
3.	Summary of net ranch income by size for typical ranch, 1962	16
4.	The typical ranches per acre costs of reseeding with Method A, 1962	19
5.	The typical ranches per acre costs of reseeding with method B, 1962	21
6.	The typical ranches per acre costs of reseeding with method C, 1962	22
7.	Total cost of reseedings on the small ranch	24
8.	Total cost of reseedings on the medium ranch	25
9.	Total cost of reseedings on the large ranch	26
10.	Increase in annual cost of operation due to reseeding for the three typical ranches, 1962	27
11.	Total operating costs with the depreciation charged for reseeding	28
12.	Annual increase in pounds of marketable calves required to pay for the annual increase in cost due to reseeding, 1962	29
13.	Calculating the internal rate of return for the large ranch using Practice C	32

Table		Page
14.	Internal rate of return for the three typical reseedings when the rancher pays the whole cost of the improvement, 1962	33
15.	Internal rate of return for the three typical reseedings with government payments deducted from the total cost of reseeding, 1962	35
16.	Livestock inventory and investment for typical small, medium, and large ranches, 1962	41
17.	Land inventories for typical small, medium, and large ranches, 1962	42
18.	Investment in buildings and improvements for typical small ranch, 1962	43
19.	Investment in buildings and improvements for typical medium ranch, 1962	44
20.	Investment in buildings and improvements for large ranch, 1962	45
21.	Investment in machinery and equipment for small ranch, 1962	46
22.	Investment in machinery and equipment for medium ranch, 1962	47
23.	Investment in machinery and equipment for typical large ranch, 1962	48
24.	Labor use and costs for typical small ranch, 1962	49
25.	Labor use and costs for typical medium ranch, 1962	50
26.	Labor use and costs for typical large ranch, 1962	51
27.	Forage and feed use and costs for typical small ranch, 1962	52

Table Page

28. Forage and feed use and costs for typical medium ranch, 1962 53

29. Forage and feed use and costs for typical large ranch, 1962 54

30. Crop production and sales for typical small, medium, and large ranches, 1962 55

31. Production and sale of cattle on typical small, medium, and large ranches based on net projected prices 56

32. Costs and expenses of operating typical small, medium, and large ranches, 1962 57

33. Contract price for bulldozing pinyon-juniper . . 60

34. Contract for chaining pinyon-juniper . . . 60

35. Costs of seedbed preparation 61

36. Costs of drilling seed 61

37. Costs of aerial seeding 62

38. Costs of fence 62

39. Annual deferred grazing costs 63

40. Adjusted costs and expenses of operating typical small, medium, and large ranches using Practice A, 1962 64

41. Adjusted costs and expenses of operating typical small, medium, and large ranches using Practice B, 1962 65

42. Adjusted costs and expenses of operating typical small, medium, and large ranches using Practice C, 1962 66

Table Page

43. Increase in income due to the rental of the reseeded land 67

44. Agricultural Stabilization Conservation Program (ACP) payment 67

45. Total ACP payments to the typical small ranch, 1962 68

46. Total ACP payments to the typical medium ranch, 1962 69

47. Total ACP payments to the typical large ranch, 1962 70

INTRODUCTION

There was a period during the early history of Utah when grasses in some areas grew so tall that it hid grazing cattle and sheep from view. However, mismanagement caused this to change and depleted grassland was invaded by noxious weeds, sagebrush, and pinyon-juniper. This deterioration of choice grassland to less desirable range cover was aided by the attitude of stockmen that pasture was available on a first come first serve basis. As a result of such an attitude and the unsatisfactory condition of ranges, the era of free, uncontrolled use of grazing lands came to a close with the introduction of the Taylor Grazing Act in 1934. This act provided for classification of all unappropriated and unreserved lands. Grazing districts were organized and regulations were established for the distribution of grazing permits and the setting of fees to be charged for the use of public lands (9, p. 14). [1]

However, the Taylor Grazing Act was belated and large sections of the state of Utah had turned into sagebrush flats and pinyon-juniper stands--land unable to support the same number of animals it had previously sustained.

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[1] Numbers in parentheses refer to references listed in bibliography.

Today Utah's 48.9 million acres of rangeland can be classified on the basis of range vegetative type (9, p. 65). Of the total acreage, 14.6 million acres, or 29.9%, is classified as pinyon-juniper rangeland, and 7.5 million acres, or 15.3%, is classified as sagebrush rangeland. (Table 1). One means of increasing grass production on these land types is to reseed pinyon-juniper and sagebrush areas. By reseeding it may be possible to increase the carrying capacity of the range, thus allowing ranchers to run more cattle on less acreage due to the increase of desirable forage per acre.

Table 1. Rangeland vegetative types, Utah 1938

Type	Rangeland area	
	acres	percent
	(millions)	(%)
Desert shrub	18.3	37.4
Pinyon-juniper	14.6	29.9
Sagebrush	7.5	15.3
Browse-shrub	3.0	6.1
Broadleaf trees	2.6	5.3
Conifers	1.7	3.5
Grassland	1.2	2.5
Total	48.9	100.0

Controlling and reseeding sagebrush lands has been practiced since 1945; however, controlling and reseeding pinyon-juniper ranges are comparatively new practices.

Pinyon-juniper forms a belt around the mountains in Utah. "It is found in the foothill areas, especially in Southern Utah, at an elevation of 5, 500 to 7, 500 feet. Average rainfall varies from 10-18 inches." (12, p. 3) This pinyon juniper belt is usually located between winter and summer ranges; therefore, by reseeding to an early growing species of grass, it is possible for the rancher to increase the animal unit months (AUM's)[2] and gain flexibility is his operation. Early growing plants reduce the cost of purchased feed and allow some leeway when cattle move from winter to summer ranges. In addition, if there is sufficient moisture, many early growing species of grass will turn green and grow again adding to the supply of fall feed.

Objectives of Study

1. To determine the cost of controlling and reseeding pinyon-juniper infested ranges.
2. To determine the economic impact of reseeding rangeland upon the income of ranchers in Southern Utah.

Review of Literature

The reclaiming of pinyon-juniper infested rangeland has received

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[2] An AUM is the amount of feed required to feed a 1000 pound cow for one month.

a great deal of attention in the last five years. Most of the literature to date has dealt with the description of the various types of pinyon-juniper stands, the type of vegetation found under pinyon-juniper trees, and the means of controlling pinyon-juniper.

Robert R. Humphrey's Special Report No. 2, "Your Range-Its Management," (7) includes several articles about pinyon-juniper and a description of areas that have been invaded recently. This recently invaded rangeland consists of pure juniper and is distinguished by the even age character of the trees. The land is usually severely eroded in this type of stand as there is very little grass understory to protect the soil from the force of beating raindrops. "Invasion of grasslands by juniper and pinyon and the growth of established stands results in: 1) reduced density of perennial grasses and weeds, 2) inferior composition, 3) reduced forage yields, 4) increased erosion. The conclusion that juniper control is needed to correct these detrimental effects is inescapable." (7, p. 18)

Mr. Humphrey proposes that hand chopping, bulldozing, and cabling give the best results in controlling pinyon-juniper and states that the effect of herbicides on these trees is not known, "It will be noted that the control of stands of pinyon-juniper, like that of all woody species, must be put on a maintenance basis. Only in this way can the initial heavy cost of control usually be justified." (7, p. 11)

In another study conducted at the University of Arizona Agricultural

Station by Melvin L. Cotner a comparison of three different methods of controlling pinyon-juniper was made. The three methods were chaining, bulldozing, and burning. In his report of the study, Mr. Cotner offers a brief description of the means of control and the average costs incurred with each control method.

When the trees were chained, the average acreage cleared was 1,485 and with a low cost of $.62 per acre and a high cost of $10.67 per acre, the average cost was $2.06 per acre.

Bulldozing pinyon-juniper cost an average of $4.53 per acre with a cost range of $.78 to $12.39 per acre. The average bulldozing project involved 793 acres and ten projects utilizing hand labor as a follow-up measure averaged $5.21 per acre.

Cost of burning trees varied greatly because construction of a fire line varied with the terrain and the presence of natural fire barriers. With no need for the construction of fire lines, one project cost $.11 per acre; another project requiring the construction of five miles of fire line cost $.66 per acre.

In the University of Arizona study all seeding was done with an airplane. Depending upon the acreage involved, cost of the plane varied from $.25 to $.75 per acre (2).

The Bureau of Land Management reports the costs of controlling and reseeding on four pinyon-juniper projects as $10.97, $13.60, $11,68, and $15.88 per acre. The inclusion of fence cost, trouble in chaining,

and plowing sagebrush land all contributed to the differences in these costs. Each of the four projects was chained and seeded with crested or intermediate wheatgrass. The carrying capacity of the projects was increased from 30 acres per AUM to 5 acres per AUM, and in one case, only 2.8 acres were required to support (one) AUM after treatment (1).

Method of Procedure

Three different sized ranches "built" by Dr. N. K. Roberts and C. Kerry Gee (8) as part of another study were adjusted to bring costs and returns up to 1962 levels, thereby making them workable for this study. Some adjustments were also made in the size and type of equipment on these ranches. Also, the ranches were updated by the use of price indexes and additional cost information from secondary sources when ever necessary.

In order to determine necessary costs and physical requirements for reseeding pinyon-juniper infested land, primary datum for this study was obtained from a purposive sampling of ranchers who had removed and reseeded pinyon-juniper stands. Also, data dealing with pinyon-juniper removal and reseeding were obtained from the Forest Service and the Bureau of Land Management and used to help determine costs and physical requirements.

Using the accumulated data, three typical reseeding practices were built employing various methods of removing competitive shrubs and

applying seed. The costs of each reseeding were incorporated into the financial structure of the typical ranches by the use of a budgeting procedure. By comparing the ranchers' cost and income before and after reseeding practices, it was possible to determine the internal rate of return and increased benefits the rancher could expect to receive by removing pinyon-juniper stands and reseeding the land from which the stand had been removed.

Economic Framework and Conceptual Solution

The production function which expresses diminishing returns provided the theoretical model by which a solution to the pinyon-juniper problem could be tested. This function is a third degree curve and can be expressed in mathematical terms as $Y = a+bx+cx^2 -dx^3$. The constants a, b, c, and d are different numerically, but once assigned a value, they do not change until new assumptions or new data indicate a change. In the formula, x is the input variable and usually increases or decreases in successive steps; Y is the output variable and changes in response to X.

The four constants indicate that the slope of a line will change three times: the a + bx segment of the formula is a straight line; the cx^2 will change the straight line to a curved line with a positive slope that increases at an increasing rate; the third change in the line is indicated by $-dx^3$ which causes the slope of the curve to increase at a decreasing rate. As the value of x increases, $-dx^3$ causes the curve to change from a positive to a negative slope.

If this curve is plotted graphically, the vertical, or Y, axis will be marked off in units of output. The horizontal, or X, axis will be marked off in units of input. Thus, the third degree curve, or production function, will show the relationship between inputs and outputs.

Using the total product curve, a marginal product and an average product can be derived. The marginal product curve shows how much each additional unit of input will increase total output. It is computed by taking the addition in total output and dividing by the addition in total input. This is done for each unit of input to obtain a continuous curve. The average product curve is derived by dividing total output at each level of input by the total number of inputs used. When total, marginal, and average product curves are plotted graphically, or with the use of mathmatics it is possible to divide the total product curve into three stages of production.

Stage I is an area where marginal product is above and is pulling up average product. It is an area of irrational production because total product is increasing at an increasing rate. This means that each additional unit of input that is added will increase total product more than the previous unit. At the point where the average and marginal product curves intersect, Stage I ends and Stage II begins.

Stage II is the area of economic importance --- it is here where economic returns can be maximized. Also, it is here where resources cannot be arranged to obtain a greater product with the same resources or arranged to obtain the same product with less resources. If the exact,

or optimum, point of production is to be defined, it is necessary to have such choice indicators as prices and costs.

Stage III begins when the total product is at its highest point and marginal product is equal to zero. The Stage III area of production is irrational because it is possible to reduce the amount of resources used and increase total product. Marginal product becomes negative in this stage, so instead of each additional unit of input adding to total product, it reduces or subtracts from total product.

For this study the vertical, or Y, axis is a measure of animal unit months. The inputs necessary to improve the range are the variable factors, and they are measured on the X, or horizontal, axis. These units of inputs are evenly distributed over the entire reseeding project.

The relationship of animal unit months and range improvement is expressed by the total product curve, or the production function. In order to arrive at any economic solution for the pinyon-juniper problem at least two points on the production function must be found. One point will represent infested range; the second point will indicate what can be expected when the range is improved. The exact location of these points with respect to the stages of production is not known. These points can only be defined by determining what the price of inputs and outputs are during the time the range is improved.

It is expected that the pinyon-juniper infested range is in Stage I in relation to carrying capacity and that by reseeding, the carrying capacity

or AUM's, of the range can be increased into the area of Stage II.

Assumptions

This study assumed the ranges were in Stage I or Stage II as far as production of desirable forage was concerned; that all factors necessary for a sucessful reseeding were present in the quantities necessary to assure the unqualified success of growth and reproduction of plants; that, the production function was a continuous curve and realizing that available data provided only one or two points on the production function; that pinyon-juniper stands were found in sufficient size and location to allow all possible forms of control to be applied; that stands were on privately owned land and located in such a manner that the land could be withdrawn from use without interfering with normal operation of the ranch; and that ranchers on the three typical ranches cleared one-third of their private rangeland.

THE TYPICAL RANCHES

The point of reference, or constant, for relating and interpreting data collected from ranchers who had removed and reseeded pinyon-juniper stands is the typical ranches. The typical ranches -- small, medium, and large -- are the composite ranches "built" by Dr. N. K. Roberts and C. Kerry Gee, who constructed these ranches using information obtained from questionnaires distributed to Utah ranchers to determine the factors common to a given size ranch. The most frequently recurring characteristics as reported by the ranchers were used by Roberts and Gee to formulate the theoretical typical ranch. The ranch type population as indicated in the survey work of Roberts and Gee was stratified on the basis of size. Each sized typical ranch was "built" on the basis of information provided by actual ranches covered in the survey work.

These typical ranches, as formulated by Roberts and Gee, used public land year round in conjunction with some private land. The small sized typical ranch had fifty breeding cows on it and represented the mode, or most frequently occurring size based on the number of operators. The medium sized ranch had a breeding herd of one-hundred and fifty cows. The large sized ranch had a breeding herd of three hundred cows. Each of these ranches were based on the mode, or most frequently occurring size herd.

Although there was wide variation in size among the typical ranches, they were in close agreement in their physical location, management practices, and internal structure. The typical ranch as it was "built" by Roberts and Gee was made up of the following elements: physical setting, land inventories, buildings, and improvements, machinery and equipment. These factors along with a summary of net ranch income are meant to represent the theoretical typical ranch and its potential for dealing with the pinyon-juniper problem. On the following pages the salient aspects of the four afore mentioned elements are described in greater detail. As previously stated, these typical ranches were updated with price indexes to make them workable for this study on reseeding pinyon-juniper infested rangeland.

Physical Setting

The typical ranches both as they were developed by Roberts and Gee and as they are interpreted for this study are of necessity governed by their physical setting. Physiographically Utah is divided into three areas --- the high Wasatch and Unitah mountains, the plateau region to the east and south of the Wasatch range, and the basin area extending from the mountains to the western borders of the state. Elevations range from 3,000 feet to heights of 6,000 and 10,000 feet. Precipitation and temperature vary according to the altitude (5).

Between the desert floors and high mountain plateaus, vegetation belts have developed. On the high mountain slopes are conifers, aspens,

many varieties of shrubs, perennial grasses, and forbs (4). Dominating the lower more gentle slopes and high plains are sagebrush, junipers, rabbit brush, and various weeds and mixed grasses (11). Salt brush, shadescale, russian thistle, annual weeds, and perennial weeds comprise much of the desert vegetation.

Though a large portion of the land is fertile, moisture deficiencies limit its use for agricultural purposes. In a few areas rainfall is adequate to permit dry farming, but any form of agricultural activity other than livestock production is limited to selected valleys where irrigation projects are developed.

It is to be assumed that the typical ranches' operations depend upon physical settings such as the aforementioned.

Land Inventories

Land inventories of the typical ranch include irrigated cropland, native and improved meadows, and rangeland (Appendix A, Table 17). In addition to private rangeland, the large typical ranch has leased rangeland. No leasing is done by the small or medium ranch.

Alfalfa and barley are the principal crops grown on the irrigated land. In localized areas other crops predominate but are not grown widely enough to be included as typical. The small ranch with almost twice the acreage of cropland per cow as the medium or large ranch is much more oriented to crop production.

Buildings and Improvements

Little difference is found in inventories, construction, or condition of buildings and improvements among the typical ranches (Appendix A, Tables 18, 19, and 20).

Stock sheds, corrals, feed troughs, and mangers, water troughs, culinary wells, and granaries comprise the major inventory items. Medium and large ranches also have machine sheds and shops. Most of the owned land is under fence. Poles and frame construction are common. Generally, the buildings are old.

The typical Utah cattle rancher lives in town and has his farmstead in the surrounding country which explains the absence of a house in the inventory of the buildings.

Summary of Investment

Total investment of the typical ranch includes the value of the land, grazing permits, buildings and improvements, machinery and equipment, and livestock (Table 2). Total investment by ranch size is as follows: small ranch, $62,483; medium ranch, $125,559; large ranch, $227,020.

Table 2. Summary of investment by size for typical ranches, 1962

Investment	Size of Ranch[a]		
	small	medium	large
	(dollars)	(dollars)	(dollars)
Owned land and permits	40,032	80,690	153,180
Buildings and improvements	2,558	6,824	11,089
Machinery and equipment	10,367	12,474	13,790
Livestock:			
Cattle	9,356	25,316	48,536
Horses	170	255	425
Total Investment	62,483	125,559	227,020

[a] 50, 150, and 300 breeding cow herds, respectively

Summary of Net Ranch Income

The sources of income on the typical ranches are primarily from the sale of cull cows, calves, yearling steers, hay, and grain. Generally, cull cows are old and have some defect. Hay and grain are sold only if there is an excess over that consumed by livestock. Naturally, this excess varies from year to year.

Table 3. Summary of net ranch income by size for typical ranches, 1962

Source of Income	Ranch size		
	small	medium	large
	(dollars)	(dollars)	(dollars)
Cattle sales[a]	4,295	12,925	25,396
Crop sales[a]	1,669	1,612	3,954
Total ranch income	5,964	14,537	29,350
Total operating costs	5,495	10,082	19,065
Net ranch income	469	4,455	10,285

[a] For more detailed information see Appendix A, Tables 30, 31, and 32.

When considering the economic impact net ranch income will be adjusted as the effect of reseeding pinyon-juniper rangeland is budgeted through the incomes and cost structures of the typical ranches.

TYPICAL RESEEDING PRACTICES

The typical ranch as it is incorporated into this study is important only insofar as it relates to data gathered on the reclamation of pinyon-juniper infested rangeland. Primary physical data on type of equipment, time required for the various types of operations involved in reseeding, labor requirements, rate of seed application, and costs for the various operations involved in controlling or removing pinyon-juniper and the subsequent reseeding of this land were obtained from Utah ranchers who had participated in such practices. Costs were obtained from secondary sources whenever necessary.

Utah ranchers reported several methods of controlling pinyon-juniper stands. These methods were either chaining or burning a stand of trees, bulldozing, or manually removing individual trees. Throughout Utah chaining and bulldozing were found to be the most common methods used in removing pinyon-juniper.

Reseeding was usually done either by drilling or aerial broadcasting. The seed most commonly used was crested wheatgrass.

Using the information and methods reported by ranchers, three typical reseeding practices were built. These typical reseedings are as follows; Practice A, pushing the trees and seeding with a drill; Practice B, pushing the trees and seeding by airplane; Practice C, chaining and aerial seeding.

Practice A

In a typical reseeding using Practice A, pushing, or bulldozing, of trees is done by a contractor using a D-8 caterpillar, or its equivalent. Trees are either pushed into piles and allowed to dry or some of the trees may be pushed into gullies to prevent further erosion of land. The piled trees are burned and when necessary are piled and burned again.

After the downed trees are removed, the land is plowed to prepare a seedbed and to kill the young trees that were overlooked in the original bulldozing. A fifty horsepower tractor and a ten foot wheatland plow are used to prepare the seedbed.

A thirty horsepower tractor and a ten foot grain drill are used to plant seed. Crested wheatgrass is seeded at a rate of six pounds per acre and the rancher furnishes the equipment and labor for both seedbed preparation and seeding.

A permanent five strand barb wire fence is built around the project to control use of the land. Cedar posts for the fence are obtained from the trees before they are pushed. The fence right of way and post holes are contracted to people having the necessary equipment. The fence is built as nearly square as possible.

The rancher will loose use of the land for two years while the grass becomes established. This deferred grazing is a cost to the rancher and is handled as part of the total investment in the reseeding.

A charge of $3.50 per AUM per month is made for deferred grazing.

While this is an arbitrary value, it is the average price actually charged by most ranchers.

The per acre costs of Practice A becomes more meaningful when applied to the structure of the typical ranches. These per acre costs are shown in Table 4.

Table 4. The typical ranches per acre costs of reseeding with method A, 1962[a]

Item	Ranch Size		
	small	medium	large
	(cost/acre)	(cost/acre)	(cost/acre)
Contract for pushing trees	14.00	14.00	14.00
Seedbed preparation	.98	.98	.98
Drilling	2.65[b]	2.51[c]	2.51[c]
Fence	7.35	5.48	4.87
Deferred grazing (two years)[d]	.50	.50	.50
Total cost per acre	25.48	23.47	22.86

[a] More detail in Appendix B, Tables 33-39
[b] With a 50 H. P. tractor.
[c] With a 30 H. P. tractor.
[d] Deferred grazing on land with a light stand of trees.

If the land has a heavy, dense stand of trees with no open parks, the charge for deferred grazing in Table 4 is reduced by $. 34 an acre.

Such land supports less animals per acre than land which has open parks located among the trees.

In computing the figures for Table 4, the deferred grazing charge was based on a two year period as opposed to a single year base for the other charges. If the annual charge for deferred grazing is desired, the deferred grazing charge is reduced by one-half. The annual charge for deferred grazing on land with a light stand of trees is found by subtracting $. 34 from $. 50, the charge for land with a light stand of trees, and reducing this amount by one-half.

Practice B

Contractors are hired to push pinyon-juniper stands with a D-8 caterpillar, or an equivalent of this machine. Trees are either pushed into gullies or left on the land to deteriorate. Aerial seeding by a hired airplane is done either early in the morning or in the evening when the wind is at a minimum. Crested wheatgrass is seeded at a rate of eight pounds per acre. This higher rate of seed application is to compensate for seed either eaten by birds and rodents or blown off the intended place of seeding.

A permanent five strand barb wire fence is constructed to control use of the reseeded area. Cedar posts for the fence are obtained from the trees before they are pushed. Fence right of way and post holes are contracted.

Deferred grazing is practiced for a period of two years and the charge is computed on the same basis as deferred grazing in Practice A.

Table 5 shows the per acre reseeding costs for each of the typical ranches when Practice B is used to reclaim pinyon-juniper infested land.

Table 5. The typical ranches per acre costs of reseeding with method B, 1962[a]

Item	Ranch Size		
	small	medium	large
	(cost/acre)	(cost/acre)	(cost/acre)
Contract for pushing trees	14.00	14.00	14.00
Aerial seeding	2.63	2.63	2.63
Fence[b]	7.35	5.48	4.87
Deferred grazing[c]	.50	.50	.50
Total cost per acre	24.48	23.61	22.00

[a] More detail in Appendix B, Tables 33-39.
[b] Fence as nearly square as possible.
[c] Deferred grazing on land with a light stand of trees.

Practice C

Two D-8 caterpillars and an anchor chain are used to remove pinyon-juniper. Removal by this method is contracted. The trees are chained in only one direction and then left on the land to decay. Trees

that are left in rows or piles provide protection for seedlings and act as a trap for snow, thereby improving the moisture condition. Again a permanent five strand barb wire fence is built to protect the reseeding project. Deferred grazing is practiced for two years.

Table 6 shows the per acre reseeding costs for each of the typical ranches when Practice C is used to reclaim pinyon-juniper.

Table 6. The typical ranches per acre costs of reseeding with method C, 1962[a]

Item	Ranch Size		
	small (cost/acre)	medium (cost/acre)	large (cost/acre)
Contract for chaining	4.00	4.00	4.00
Aerial seeding	2.63	2.63	2.63
Deferred grazing[b]	.50	.50	.50
Fence[c]	7.35	5.48	4.87
Total cost per acre	14.48	12.61	12.00

[a] More detail in Appendix B, Tables 33-39.
[b] Deferred grazing on land with a light stand of trees.
[c] Fence as nearly square as possible.

If the land has a heavy stand of trees on it, the cost of deferred grazing is decreased by $.34.

Total Costs

The total costs incurred by the typical ranchers using either methods A, B, or C depends upon the number of acres that are to be reclaimed. It is assumed that the ranchers are willing to clear one-third of their privately owned rangeland, so the small rancher clears 133 acres, the medium rancher 267 acres, and the large rancher 250 acres. Tables 7, 8, and 9 show the total costs incurred by the typical small, medium, and large ranches, respectively, when they use the typical reseedings. These costs will be used in determining the economic impact of reclaiming pinyon-juniper rangeland.

Table 7. Total cost of reseedings on the small ranch

Item	Practices A	Practices B	Practices C
	(dollars)	(dollars)	(dollars)
Tree removal	1,862	1,862	532
Seedbed preparation	131		
Seed drilled	353		
Aerial seeding		350	350
Fence	977	977	977
Sub-total	3,323	3,189	1,859
Deferred Grazing [a]			
Heavy	22	22	22
Total [b]	3,345	3,211	1,881
Partial	64	64	64
Total [c]	3,387	3,253	1,923

a Cost of deferred grazing for two years.
b Total includes cost of deferred grazing heavy.
c Total includes cost of deferred grazing light.

Table 8. Total cost of reseedings on the medium ranch

Item	Practices		
	A	B	C
	(dollars)	(dollars)	(dollars)
Tree removal	3,738	3,738	1,068
Seedbed preparation	262		
Seed drilled	670		
Aerial seeding		702	702
Fence	1,463	1,463	1,463
Sub-total	6,133	5,903	3,233
Deferred Grazing [a]			
Heavy	42	42	42
Total [b]	6,175	5,945	3,275
Partial	134	134	134
Total [c]	6,266	6,036	3,366

a Cost of deferred grazing for two years.
b Total includes cost of deferred grazing heavy.
c Total includes cost of deferred grazing light.

Table 9. Total cost of reseedings on the large ranch

Item	Practices		
	A	B	C
	(dollars)	(dollars)	(dollars)
Tree removal	3,500	3,500	1,000
Seedbed preparation	236		
Seed drilled	628		
Aerial seeding		658	658
Fence	1,217	1,217	1,217
Sub-total	5,581	5,375	2,875
Deferred Grazing [a]			
Heavy	36	36	36
Total [b]	5,616	5,411	2,910
Partial	126	126	126
Total [c]	5,707	5,501	3,001

a Cost of deferred grazing for two years.
b Total includes cost of deferred grazing heavy.
c Total includes cost of deferred grazing light.

ECONOMIC IMPACT

Operating costs and income of the typical ranches were adjusted so that the costs and income attributed to the reseeding practices were included in the cost and revenue structure of the typical ranch.

Reseeding pinyon-juniper rangeland increased the annual costs of operation on each of the three typical ranches. The amount of increase is shown in Table 10. The increase in annual cost is figured by depreciating the total cost of the reseeding. Annual depreciation was figured using the straight line method of depreciation and a useful life of thirty years.

Table 10. Increase in annual cost of operation due to reseeding for the three typical ranches, 1962

	Practice					
	Practice A		Practice B		Practice C	
Ranch	heavy	light[a]	heavy	light[a]	heavy	light[a]
	(dollars)		(dollars)		(dollars)	
Small	111	113	107	108	63	64
Medium	206	209	198	201	109	112
Large	187	190	180	183	97	100

[a] Refers to the density of the trees.

The increase in annual cost changed each ranch's total operating cost. Total operating costs for the three typical ranches, which includes the depreciation of the reseeding when the stand of trees was heavy and light, is shown in Table 11.

Table 11. Total operating costs with the depreciation charged for reseeding [a]

	Practices					
	Practice A		Practice B		Practice C	
Ranch	Heavy	Light	Heavy	Light	Heavy	Light
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Small	5, 606	5, 608	5, 602	5, 603	5, 557	5, 559
Medium	10, 288	10, 291	10, 280	10, 283	10, 191	10, 194
Large	19, 252	19, 255	19, 245	19, 248	19, 162	19, 165

[a] Tables 40, 41, and 43 Appendix B for more detail

Reseeding increased the carrying capacity of the small ranch from 9 AUM's to 35 AUM's, the medium ranch from 19 AUM's to 70 AUM's, and the large ranch from 19 AUM's to 66 AUM's. When the trees were dense, the carrying capacity before reseeding was 3, 6, and 5 AUM's for the small, medium, and large ranch respectively. After the area was reseeded the carrying capacity of the reseeded range was 35, 70, and 66 AUM's for the small, medium, and large ranches respectively (Appendix B, Table 39).

In order for a rancher to pay for reclaiming pinyon-juniper rangeland, he must realize an increase in income directly attributable to the reseeding. This increase in income may come from increasing the number of marketable calves or from leasing the reseeded land for pasture.

The return that ranchers received for leasing land was $3.50 per AUM per month. It should be noted that this is an arbitrary figure and assumed to be a minimum figure. By leasing the reseeded land, net annual ranch income for the small, medium, and large ranch was increased $123, $245, and $231 respectively.

The increase in marketable beef that is required to pay for the increase in annual costs is shown in Table 12.

Table 12. Annual increase in pounds of marketable calves required to pay for the annual increase in cost due to reseeding, 1962

		Practices					
	1962[a]	Practice A		Practice B		Practice C	
Ranch	Prices	Heavy	Light	Heavy	Light	Heavy	Light
	dollars	hundred lbs.		hundred lbs.		hundred lbs.	
Small	25.35	4.39	4.46	4.22	4.26	2.45	2.52
Medium	26.35	7.82	7.93	7.51	7.63	4.14	4.25
Large	26.37	7.09	7.21	6.83	6.94	3.68	3.79

[a] Average Price for heifer and steer calves.

Internal Rate of Return

The significance of the application and interpretation of data on reclaiming pinyon-juniper infested rangeland as it relates to the typical ranches is more meaningful when given practical application. By comparing the internal rate of return with interest rates available through other investments the rancher is able to determine whether or not he should invest his money in reseeding. The internal rate of return is that rate of return which will equal the present value of the return stream with the initial investment. By using the internal rate of return it is possible to compare the profitability of the three reseeding practices. This procedure is independent of the absolute size of the project and it automatically adjusts for differences in the time pattern of expected cash flow, should any exist. The internal rate of return provides a useful measure by which all types of projects --- large, small, and varying in project life --- can be compared in relative terms. It also presents a method for comparison against the cost of capital in order to judge each project's absolute worth (6).

A minimum annual charge in returns is established by assuming the rancher will rent the reseeded area as pasture at a rate of $3.50 per animal unit month and that the project will last for thirty years.

By using the costs and returns incurred by large ranchers using Practice C, it is possible to demonstrate how the internal rate of return is calculated.

The cost of the project is given as an increased cost in year zero. It is this cost against which the net returns are to be equated. Costs in years one and two represent charges made for deferred grazing. Returns or increased income result from leasing 66 animal unit months for $3.50 per unit.

By using the current value of a dollar table listing the dollar value at different interest rates, multiplying this value by the returns that are forthcoming, and accumulating the total, it is possible to equate costs and returns when the proper rate of interest is found.

Table 13 is an example of how the internal rate of return for the large ranch using Practice C is calculated.

Table 13. Calculating the internal rate of return for the large ranch using Practice C.

Year	Increased costs (dollars)	Increased returns (dollars)	Change in net cash flow (returns-costs) (dollars)	Present[a] value of dollar (dollars)	Present dollar value x net cash flow (dollars)
0	2,910				
1	18		-18	.947	-17.05
2	18		-18	.898	-16.16
3		231	+231	.852	196.81
4		231	+231	.807	186.42
5		231	+231	.765	176.72
6		231	+231	.725	167.48
7		231	+231	.687	158.70
8		231	+231	.652	150.61
9		231	+231	.618	142.76
10		231	+231	.585	135.14
11		231	+231	.555	128.21
12		231	+231	.526	121.51
13		231	+231	.499	115.27
14		231	+231	.473	109.26
15		231	+231	.448	103.47
16		231	+231	.435	100.49
17		231	+231	.402	92.86
18		231	+231	.381	88.01
19		231	+231	.362	83.63
20		231	+231	.343	79.23
21		231	+231	.325	75.08
22		231	+231	.308	71.15
23		231	+231	.292	67.45
24		231	+231	.277	63.99
25		231	+231	.262	60.52
26		231	+231	.249	57.52
27		231	+231	.237	54.75
28		231	+231	.223	51.51
29		231	+231	.212	48.97
30		231	+231	.200	46.20
	TOTAL				2933.74

[a] Present value of a dollar at an interest rate of 5.5 per cent.

Because the interest rates in the value of a dollar table increase in successive steps of one-half per cent above the three per cent value, the internal rate of return is the same when the charge for deferred grazing is made on light or dense stands of pinyon-juniper.

The internal rate of return for the three typical reseeding practices when the rancher pays the whole cost of improvement are shown in Table 14. Because the interest rates in the value of a dollar table increase in successive steps, these are approximate rates of return and not exact values.

Table 14. Internal rate of return for the three typical reseedings when the rancher pays the whole cost of the improvement, 1962

Ranch size	Reseeding Practices		
	Practice A	Practice B	Practice C
	(per cent)	(per cent)	(per cent)
Small	.25	.50	3.50
Medium	.75	1.00	5.00
Large	.75	1.00	5.50

The internal rate of return shown in Table 14 is figured on the basis of the rancher assuming the full cost of reseeding. However, if the rancher signs up at the County Agriculture Stabilization and Conservation Office (ACP), his cost of reseeding can be reduced. The amount

of reduction differs in each country depending upon the distribution of state funds and the participation of the local office. If the money is available, a rancher can participate legally to the extent of $2,500 a year. For some practices, ACP participation is based on a flat rate. In other cases, ACP participation cannot exceed a predetermined amount, that amount being a predefined precentage of the total cost. While the rancher by law may receive $2,500 in ACP payments, in actual fact he might not be able to obtain this amount because payments on either a percentage basis or a flat rate basis keep the ACP payments below maximum amount. The extent of ACP participation in reseeding practices is shown in Table 44, Appendix B.

Assuming that ranchers are able to sign up for the maximum payment of $2,500, the small rancher will be able to reduce his reseeding costs by $1,747, $1,424, and $1,158 for Practices A, B, and C, respectively; the owner of the medium sized ranch will be able to reduce his reseeding cost by $2,500, $2,500, and $2,000 for Practices A, B, and C, respectively; the large rancher will be able to reduce his reseeding costs by $2,500, $2,275, and $1,774 for Practices A, B, and C, respectively (Appendix B, Tables 45-47).

When the charge for deferred grazing is on land with a light, or partial, stand of pinyon-juniper, reseeding done in conjunction with ACP participation will cost the small rancher $1,639, $1,828, and $736; the medium ranch will expend $3,776, $3,776, and $1,366; the large rancher will pay $3,207, $3,227, and $1,227. If the charge for deferred grazing

is on land with a heavy stand of trees, the total cost for Practices A, B, and C can be reduced by $42 on the small ranch and $91 on the medium and large ranches.

Government payments will reduce the costs of reseeding and increase the internal rate of return as shown in Table 15.

Table 15. Internal rate of return for the three typical reseedings with government payments deducted from the total cost of reseeding, 1962

Ranch size	Reseeding Practices		
	Practice A	Practice B	Practice C
	(per cent)	(per cent)	(per cent)
Small	5.0	4.5	14.0
Medium	4.0	4.0	14.0
Large	4.5	4.5	14.0

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the costs of reseeding pinyon-juniper rangeland and the impact of these costs upon net ranch income.

Three typical reseeding practices were "built" using data gathered from ranchers and secondary sources. Pushing the trees and drilling seed, Practice A, was found to be the most costly method of reclaiming pinyon-juniper infested land. Chaining the trees and aerial seeding, Practice C, was the least costly method. Pushing and aerial seeding, Practice B, was intermediate between the other two costs. The costs of reclaiming were exceeded by the expected returns of the projects.

Returns to the rancher were in the form of increased forage and were measured by the increase in animal unit months the range would support. It was assumed that the increase in forage production would be the only return the rancher would receive.

The desirability of reclaiming pinyon-juniper land was determined by calculating the internal rate of return for each method of removal on each of the typical ranches. The internal rate of return was calculated once when ranchers paid the full cost and again when part of the costs were paid by the Agriculture Stabilization and Conservation Program.

The study assumed that the ideal situation was present for a reseeding and that the reseeding was successful. In an actual reseeding practice these assumptions would not prevail and a great deal of uncertainty would be involved. Of course, this must be taken into consideration.

Although increased forage, or animal unit months, was the only measure used in this study to calculate the benefits that would be received by ranchers, in actual practice the rancher and society would both receive other benefits. These benefits --- erosion control, watershed management, and better use of land --- were neither taken into account nor measured in this study.

Based on the internal rate of return principle, this study indicates that it would be sound business practice for the large and medium rancher to reclaim pinyon-juniper rangeland even while absorbing the full costs of Practice C. However, the small rancher would probably find it advantageous to invest his money in some other type of project that would yield him greater returns (Table 14).

The introduction of government aid converted all three reseeding practices into sound business investments for all the ranch sizes and more than doubled the rate of return for Practice C over and above the other two reseeding practices (Table 15).

Given the ideal situation complete with assumptions as outlined in this study, reclaiming pinyon-juniper is both profitable and practical. However, the full extent of the benefits to the rancher is not known and

can be determined only by way of more research and proper evaluation of all benefits related to reseeding practices.

REFERENCES

(1) Burea of Land Management and Forest Service records, unpublished.

(2) Cotner, Melvin L. Controlling Pinyon-Juniper on Southwestern Rangelands, University of Arizona Agricultural Experiment Station Report 210, 1963.

(3) Cotner, Melvin L. and Donald A. Jameson. Cost of Juniper Control: Bulldozing vs. Burning Individual Trees, Rocky Mountain Forest and Range Experiment Station, Station Paper No. 43, 1959.

(4) Ellison, Lincoln. Subalpine Vegetation of the Wasatch Plateau, Utah, Intermountain Forest and Range Experiment Station, Ogden, Utah, 1954.

(5) Encyclopedia Britannica, Vol. 22.

(6) Gardner, B. D. The Internal Rate of Return and Decisions to Improve the Range. Annual Meeting of the Range Committee, WAERC, Laramie, Wyoming, July, 1963 (Mimeographed).

(7) Humphrey, Robert R. (ed.) Your Range--Its Management, University of Arizona, Agricultural Extension Service, Special Report No. 2, 1959.

(8) Roberts, N. Keith and C. Kerry Gee. Cattle Ranches Using Public Ranges Year-Long, Utah State University Agricultural Experiment Station Bulletin 440, 1963.

(9) Ruess, Lawrence A. and G. T. Blanch. Utah's Land Resources, Utah State University Experiment Station Special Report No. 4, 1951.

(10) Stoddart, L. A. Range Resources of Rich County, Utah, Utah Agricultural Experiment Station Bulletin No. 291, 1940.

(11) Stoddart, L. A. Range Lands of Utah County and Their Utilization, Utah Agricultural Experiment Station Bulletin No. 317, 1945.

(12) Vallentine, John F. Important Utah Range Grasses, Utah State University Extension Circular 281, 1960.

APPENDIX A

Table 16. Livestock inventory and investment for typical small, medium, and large ranches, 1962

Class of livestock	Ranch Size: Small Avg. inventory	Small Investment	Medium Avg. inventory	Medium Investment	Large Avg. inventory	Large Investment
	(number)	(dollars)	(number)	(dollars)	(number)	(dollars)
Cattle:						
Cows[a]	50	5,950	150	17,850	300	33,900
Bulls	2	428	6	1,284	15	3,210
Yearling heifers	11	1,298	25	2,950	45	5,310
Heifer calves	12	864	26	1,872	50	3,600
Steer calves	12	816	20	1,360	37	2,516
Sub-total	---	9,356	---	25,316	---	48,536
Horses:						
Saddle	2	170	3	255	5	425
Sub-total	---	170	---	255	---	425
Total investment	---	9,526	---	25,571	---	48,961

[a] 2 years old and over.

The inventory values of cows, yearlings, and calves are based on the 1962 market price at the ranch.

The inventory value of bulls and horses is the market value plus the salvage value divided by two.

Table 17. Land inventories for typical small, medium, and large ranches, 1962

Class of land	Size of ranch					
	Small		Medium		Large	
	Owned (acres)	Leased (acres)	Owned (acres)	Leased (acres)	Owned (acres)	Leased (acres)
Irrigated land:						
Native and improved meadow	90		160		420	
Alfalfa	30		55		100	
Barley	20		30		60	
Rangeland leased or owned:						
Non-federal	400		800		750	1,128
Totals	540		1,045		1,330	1,128
Federal Range Permits:[a]						
	(animal months)		(animal months)		(animal months)	
Bureau of Land Management	268		1,105		2,335	
Forest Service	198		530		825	

[a] Federal range use is calculated on the basis of animal months for all animals over six months of age and does not correspond to AUM's calculated from feeding standards.

Table 18. Investment in buildings and improvements for typical small ranch, 1962

Class of improvement	Description	Number (no.)	Average investment (dollars)
Livestock Facilities:			
Sheds	Pole frame, all wood, dirt floor 20' x 100'	1	753
Corrals	Pole 700' around	2	154
Feed	Manger 128' long wood	1	120
Other	Feed troughs	3	
Watering facilities:			
Stock water	Troughs 100 gal. metal	1	9
	well 100', 4" casing	1	251
	pump, electric	1	125
Crop facilities:			
Granaries	Frame 12' x 14' x 10'	1	326
Stackyard	50' x 100' 5 strand barb wire	1	25
Fences:			
Boundary	4 strand barb	2 mi.	530
Cross	4 strand barb	1 mi.	265
Total investment			2,558

Note: Annual costs are: Depreciation $257
Repairs $147

Table 19. Investment in buildings and improvements for typical medium ranch, 1962

Class of improvement	Description	Number (no.)	Average investment (dollars)
Livestock facilities:			
Sheds	Frame, pole, dirt floor 24' x 80'	1	723
Corrals	Pole 1300'	2	288
Feed	Manger lumber 400'	1	378
Other	Troughs lumber	8	120
Watering facilities:			
Stock water	Troughs 89 gal. metal	2	18
	Well 150' 4" casing	1	376
	Pump, electric	1	125
Crop facilities:			
Granaries	Metal 1500 bu.	1	376
Stackyard	50' x 100' 5 wire	4	100
Other facilities:			
Machine sheds	Frame 26' x 60'	1	1,176
Shop	Frame 220' x 30'	1	1,055
Fences:			
Boundary	Barb 5 wire	5 mi.	1,492
Cross	Barb 5 wire	2 mi.	597
Total investment			6,824

Note annual costs are depreciation $843
repairs $386

Table 20. Investment in buildings and improvements for typical large ranch, 1962

Class of improvement	Description	Number (no.)	Average investment (dollars)
Livestock facilities:			
Sheds	Frame, tin roof 20' x 100' dirt floor	1	753
Corrals	Pole, 2300' of fence	3	507
Feed	Manger 640' rough lumber	1	604
Watering Facilities:			
Stock water	Troughs 98 gal. metal	4	36
	Well 150 4" casing	1	376
	Pump, electric	1	125
Crop facilities:			
Granaries	Tin 1000 bu. each	2	414
Stackyards	50' x 100' 5 wire	2	36
Other facilities:			
Machine sheds	Frame, tin roof 24' x 100'	1	1,809
Shop	Frame 20' x 30'	1	1,055
Fences:			
Boundary	5 wire	10 mi.	2,985
Cross	5 wire	8 mi.	2,389
Total investment			11,089

Note: Annual costs are: depreciation $1161
repairs $ 701

Table 21. Investment in machinery and equipment for typical small ranch, 1962

Item	Description	Number	Average investment
		(No.)	(dollars)
Tractors	50 H.P.	1	1,414
Trucks	1 1/2 ton	1	1,770
Pickup	3/4 ton	1	1,145
Auto (ranch share)	1/2 value		680
Haying equipment			1,776
Tillage equipment			181
Other crop equipment			427
Livestock equipment			217
Shop equipment and small tools			57
Other			64
Total Investment			7,731

Note: Annual costs are: depreciation $1,123
repairs $ 807
operating cost $ 520

Table 22. Investment in machinery and equipment for typical medium ranch, 1962

Item	Description	Number	Average investment
		(no.)	(dollars)
Gas tractor	30 hp	1	1,414
Diesel tractor	50 hp	1	3,000
Trucks		2	2,967
Auto (ranch share)	1/2 value	1	680
Haying equipment			1,773
Tillage equipment			915
Other crop equipment			977
Livestock equipment			520
Shop equipment and small tools			139
Others			89
Total investment			12,474

Note: Annual costs are: depreciation $1,744
repairs $1,019
operating costs $1,103

Table 23. Investment in machinery and equipment for typical large ranch, 1962

Item	Description	Number	Average investment
		(no.)	(dollars)
Gas tractor	30 hp	1	1,414
Diesel tractor	50 hp	1	3,000
Truck		2	2,915
Auto (ranch share)	1/2 value	1	680
Haying equipment			2,312
Tillage equipment			1,221
Other crop equipment			1,220
Livestock equipment			695
Shop equipment and small tools			154
Others			179
Total investment			13,790

Note: Annual costs are:

depreciation	$1,962
repairs	$1,447
operating costs	$1,310

Table 24. Labor use and costs for typical small ranch, 1962

Worker	Number	Labor used	Wage rate [b]	Total cost [c]
	(no.)	(man-months)	($/unit)	(dollars)
Family:				
Operator [a]	1	8	365	2,920
Unpaid family workers [a]	1	4	260	1,040
Sub-total		12		3,960
Hired:				
Day-laborers	1	.5	250	129
Totals		12.5		4,089

[a] Operator and unpaid family labor charged for at the same rate as equivalent hired workers.

[b] Cash wage rate. Board and room values accounted for elsewhere.

[c] Including costs of social security and workman's compensation insurance payments.

Table 25. Labor use and costs for typical medium ranch, 1962

Worker	Number	Labor used	Wage rate[b]	Total cost[c]
	(no.)	(man-months)	($/unit)	(dollars)
Family:				
Operator[a]	1	12	365	4,380
Unpaid family workers[a]	1	3	260	780
Sub-total		15		5,160
Hired:				
Day-laborers	2	1.2	250	316
Totals		16.2		5,476

[a] Operator and unpaid family labor charged for at the same rate as equivalent hired workers.

[b] Cash wage rate. Board and room values accounted for elsewhere.

[c] Including costs of social security and workman's compensation insurance payments.

Table 26. Labor use and costs for typical large ranch, 1962

Worker	Number	Labor used	Wage rate [b]	Total cost [c]
	(no.)	(man-months)	($/unit)	(dollars)
Family:				
Operator [a]	1	12	365	4,380
Unpaid family workers [a]	2	8	260	2,080
Sub-total		20		6,460
Hired:				
Full-time workers	1	8	365	3,050
Totals		28		9,510

[a] Operator and unpaid family labor charged for at the same rate as equivalent hired workers.

[b] Cash wage rate. Board and room values accounted for elsewhere.

[c] Including costs of social security and workman's compensation insurance payments.

Table 27. Forage and feed use and costs for typical small ranch, 1962

Kind of feed	Unit	Total amount fed	Purchases		
			Amount	Price	Cost
		(unit)	(unit)	($/unit)	(dollars)
Alfalfa hay	Ton	60			
Barley	cwt	68			
Protein supplements	cwt	25	25	4.12	103
Salt	cwt	26	26	1.31	34
Total purchased feeds					137
Owned land:					
Irrigated pasture	AUM	102			
Rangeland	AUM	73			
Aftermath grazing	AUM	197			
Sub-total	AUM	372			
Federal Range Permits:					
Bureau of Land Management	AUM	268	268	.19	51
Forest Service	AUM	198	198	.60	110
Sub-total	AUM	466	466		170
Total, Range and Pasture	AUM	838	466		170

Table 28 . Forage and feed use and cost for typical medium ranch, 1962

Kind of feed	Unit	Total amount fed	Purchases		
			Amount	Price	Cost
		(unit)	(unit)	($/unit)	(dollars)
Alfalfa hay	Ton	146.0			
Feed grains	cwt	234.6			
Protein supplements	cwt	42.5	42.5	4.12	175
Salt	cwt	68.1	68.1	1.31	89
Total purchased feeds					264
Owned land:					
Irrigated pasture	AUM	160			
Rangeland	AUM	200			
Aftermath grazing	AUM	100			
Sub-total	AUM	460			
Federal Range Permits:					
Bureau of Land Management	AUM	1105	1105	.19	210
Forest Service	AUM	530	530	.60	318
Sub-total	AUM	1635	1635		528
Total, Range and Pasture	AUM	2095			528

Table 29 . Forage and feed use and costs for typical large ranch, 1962

Kind of feed	Unit	Total amount fed	Purchases		
			Amount	Price	Cost
		(unit)	(unit)	($/unit)	(dollars)
Alfalfa hay	Ton	204			
Feed grains	cwt	720			
Protein supplements	cwt	190	190	4.12	783
Salt	cwt	123	123	1.31	161
Total, purchased feeds					944
Owned land:					
Irrigated pasture	AUM	525			
Rangeland	AUM	300			
aftermath grazing	AUM	200			
Sub-total	AUM	1025			
Leased land:					
Rangeland	AUM	376	376	.50	188
Federal Range Permits:					
Bureau of Land Management	AUM	2335	2335	.19	444
Forest Service	AUM	825	825	.60	495
Sub-total	AUM	3160	3160		939
Total, Range and Pasture	AUM	4561			1127

Table 30. Crop production and sales for typical small, medium, and large ranches, 1962

Ranch size	Crop	Unit	Acres	Average yield (units)	Total production (units)	Sales (units)	Price (dollars)	Value of sales (dollars)
Small	Alfalfa	ton	30	3	90	30	22.50	675
	Barley	cwt	20	25	500	432	2.30	994
	Total Sales							1,669
Medium	Alfalfa	ton	55	3	165	19	22.50	428
	Barley	cwt	30	25	750	515	2.30	1,184
	Total Sales							1,612
Large	Alfalfa	ton	100	3	300	96	22.50	2,160
	Barley	cwt	60	25	1,500	780	2.30	1,794
	Total Sales							3,954

Table 31. Production and sale of cattle on typical small, medium, and large ranches based on net projected prices

Ranch size	Class of cattle	Number sold	Average weight	Total weight	Average price	Total value of sales
		(number)	(pounds)	(cwt)	($/cwt)	(dollars)
Small	Cows	7	1,000	70	12.28	860
	Heifer calves	9	380	34	23.41	796
	Steer calves	8	400	32	27.29	873
	Yearling steers	12	600	72	24.53	1,766
	Total Sales[a]					4,295
Medium	Cows	21	1,000	210	12.49	2,623
	Heifer calves	35	380	133	25.39	3,377
	Steer calves	41	400	164	27.31	4,479
	Yearling steers	18	600	108	22.65	2,446
	Total Sales[a]					12,925
Large	Cows	34	950	323	12.49	4,034
	Heifer calves	73	380	277	25.41	7,039
	Steer calves	85	400	340	27.33	9,292
	Yearling steers	37	600	222	22.66	5,031
	Total Sales[a]					25,396

[a] Value of beef used in the home included as a sale.

Note: Bulls are accounted for as a capital item and neither purchased nor sale shown as current items.

Table 32 . Costs and expenses of operating typical small, medium, and large ranches, 1962

Item	Size of ranch		
	Small (dollars)	Medium (dollars)	Large (dollars)
Cash costs:			
Grazing fees:			
Bureau of Land Management	51	210	444
Forest Service	119	318	495
Land and pasture rent			188
Labor hired	125	300	2,920
Feed purchased	137	264	944
Repairs and maintenance:			
Building & improvements	147	386	701
Machinery and equipment	861	1,019	1,447
Veterinary services and supplies	35	51	376
Taxes:			
Cattle	98	244	483
All other property	516	901	1,734
Seed and fertilizer	206	514	977
Machine operating costs	421	1,103	1,310
Machine hire	145	217	435
Insurance	86	113	113
Utilities[a]	35	240	339
Irrigation water	190	330	740

Table 32 (cont.)

Item	Size of ranch		
	Small	Medium	Large
	(dollars)	(dollars)	(dollars)
Miscellaneous[b]	295	408	546
Total cash costs	3,465	6,618	14,212
Non-cash costs:			
Depreciation:			
Buildings & improvements	257	843	1,161
Machinery & equipment	1,479	1,744	1,962
Bulls[c]	150	619	1,204
Horses[c]	40	60	100
Interest on cash costs	104	198	426
Total non-cash costs	2,030	3,464	4,853
Total operating costs	5,495	10,082	19,065
Operator and family labor	3,960	5,160	6,460
Interest on investment	3,124	6,277	11,351
Total ranch costs and expenses	12,579	21,519	36,876

a Includes electricity, telephone, gas and domestic water.

b Miscellaneous costs include twine.

c Includes bull and horse death losses. Death loss costs are shown here to incorporate these costs without showing one-tenth, or some other fraction of an animal dying. Average death loss is 5 per cent of average investment.

APPENDIX B

Table 33. Contract price for bulldozing pinyon-juniper

Ranch size	Acres cleared [a]	Price per acre	Acres cleared per day	Total cost
	(acres)	(dollars)	(acres)	(dollars)
Small	133	14	5	1,862
Medium	267	14	5	3,738
Large	250	14	5	3,500

[a] One-third owned rangeland is cleared.

Table 34. Contract price for chaining pinyon-juniper

Ranch size	Acres cleared [a]	Price per acre [b]	Total cost
	(acres)	(dollars)	(dollars)
Small	113	4	532
Medium	267	4	1,068
Large	250	4	1,000

[a] One-third owned rangeland is cleared.

[b] Ground chained in one direction.

Table 35. Costs of seedbed preparation

	Ranch Size		
	Small	Medium	Large
	Acres cleared		
Item	133	267	250
	(dollars)	(dollars)	(dollars)
Labor cost	60	120	108
Tractor cost	55	110	99
Plow cost	10	20	18
Pick-up cost	6	12	11
Total Cost	131	262	236

Table 36. Costs of drilling seed

	Ranch Size		
	Small	Medium	Large
	Acres cleared		
Item	133	267	250
	(dollars)	(dollars)	(dollars)
Labor cost	60	120	113
Tractor cost	59	80	75
Drill cost	14	28	26
Seed cost	215	433	405
Pick-up cost	5	9	9
Total Cost	353	670	628

[a] The small ranches use a 50 H. P. tractor while the medium and large ranches use a 30 H. P. tractor

Table 37. Costs of aerial seeding

Ranch size	Contract price of airplane	Airplane cost	Seed cost	Total cost
	(dollars/acre)	(dollars)	(dollars)	(dollars)
Small	.47	163	287	350
Medium	.47	125	577	702
Large	.47	118	540	658

Table 38. Costs of fence [a]

Item	Ranch Size		
	Small 2 [b]	Medium 3 [b]	Large 2.5 [b]
	(dollars)	(dollars)	(dollars)
Wire cost	400	600	500
Cost of cedar posts	320	480	400
Labor cost	120	180	150
Machine hire [c]	118	175	144
Pick-up cost	9	14	11
Miscellaneous cost	10	14	12
Total Cost	977	1,463	1,217

[a] Five barb fence.
[b] No. of miles built.
[c] Post holes and fence right of way are contracted out.

Table 39. Annual deferred grazing costs

Ranch size	AUM's before practice	Total [a] charge	AUM's after practice
	(AUM's)	(dollars)	(AUM's)
Light stand			
Small	9	32	35
Medium	19	67	70
Large	18	63	66
Heavy stand			
Small	3	11	35
Medium	6	21	70
Large	5	18	66

[a] This is at the rate charged for pasture rental at $3.50.

Table 40. Adjusted costs and expenses of operating typical small, medium, and large ranches using practice A, 1962

Item	Ranch Size		
	Small	Medium	Large
	(dollars)	(dollars)	(dollars)
Total cash costs [a]	3,465	6,618	14,212
Non-cash costs:			
Depreciation:			
Building and improvements	257	843	1,161
Practice A [b]	113	209	190
Machinery and equipment	1,479	1,744	1,962
Bulls	150	619	1,204
Horses	40	60	100
Interest on cash costs	104	198	426
Total non-cash costs	2,143	3,673	5,043
Total Operating Costs	5,608	10,291	19,255

[a] For itemized list of cash cost see Appendix A, Table 32.

[b] Deferred grazing on land with a light stand of trees. The cost will be reduced by $2 for the small ranch and $3 for the medium and large ranch when deferred grazing is on land with a heavy stand of trees.

Table 41. Adjusted costs and expenses of operating typical small, medium, and large ranches using practice B, 1962

Item	Ranch Size		
	Small	Medium	Large
	(dollars)	(dollars)	(dollars)
Total cash costs [a]	3,465	6,618	14,212
Non-cash costs:			
Depreciation:			
Buildings and improvements	257	843	1,161
Practice B [b]	108	201	183
Machinery and equipment	1,479	1,744	1,962
Bulls	150	619	1,204
Horses	40	60	100
Interest on cash costs	104	198	426
Total non-cash costs	2,138	3,665	5,036
Total Operating Costs	5,603	10,283	19,248

[a] For itemized list of cash cost see Appendix A, Table 32.

[b] Deferred grazing on land with a light stand of trees. The cost will be reduced by $1 for the small ranch and $3 for the medium and large ranch when deferred grazing is on land with a heavy stand of trees.

Table 42. Adjusted costs and expenses of operating typical small, medium, and large ranches using practice C, 1962

Item	Ranch Size		
	Small	Medium	Large
	(dollars)	(dollars)	(dollars)
Total cash costs [a]	3,465	6,618	14,212
Non-cash costs:			
Depreciation:			
Buildings and improvements	257	843	1,161
Practice C [b]	64	112	100
Machinery and equipment	1,479	1,744	1,962
Bulls	150	619	1,204
Horses	40	60	100
Interest on cash costs	104	198	426
Total non-cash costs	2,094	3,576	4,953
Total Operating Costs	5,559	10,194	19,165

[a] For itemized list of cash cost see Appendix A, Table 32.

[b] Deferred grazing on land with a light stand of trees. The cost will be reduced by $1 for the small ranch and $3 for the medium and large ranch when deferred grazing is on land with a heavy stand of trees.

Table 43. Increase in income due to the rental of the reseeded land

Item	Ranch Size		
	Small	Medium	Large
	(dollars)	(dollars)	(dollars)
Original income [a]	5,964	14,537	29,350
Increase in income	123	245	231
Total ranch income	6,087	14,782	29,581

[a] Appendix A, Tables 30 and 31.

Table 44. Agricultural Stabilization Commodity Program (ACP) payment practices, 1962 [a]

Name of Practice	Measured in	Rate of ACP participation
Seed # Min. PLS	(lbs)	(60% not to exceed $2.75)
Seedbed preparation first plowing	acres	$2.00
Drilling	acres	$ .60
Broadcasting or airplane seeding	acres	$ .30
Deferred grazing Spring and fall range	acres	$ .30
Pinyon-juniper removal	acres	50% not to exceed $4.00
Fence	rods	$1.00

[a] $2,500 is the maximum payment allowed to an individual in a period of one year.

Table 45. Total ACP payments to the typical small ranch, 1962[a]

Item	Reseeding practices		
	A	B	C
	(dollars)	(dollars)	(dollars)
Tree removal	532	532	266
Plowing	266		
Seed	189	172	172
Seed drilled	80		
Aerial seeding		40	40
Fence	640	640	640
Deferred grazing	40	40	40
Total	1,747	1,424	1,158

[a] ACP will only pay up to $2,500 in one year to an individual.

Table 46. Total ACP payments to the typical medium ranch, 1962[a]

Item	Reseeding practices		
	A	B	C
	(dollars)	(dollars)	(dollars)
Tree removal	1,068	1,068	534
Plowing	534		
Seed	260	346	346
Seed drilled	160		
Aerial seeding		80	80
Fence	960	960	960
Deferred grazing	80	80	80
Total	3,062	2,534	2,000

[a] ACP will only pay up to $2,500 in one year to an individual.

Table 47. Total ACP payments to the typical large ranch, 1962[a]

Item	Reseeding practices		
	A	B	C
	(dollars)	(dollars)	(dollars)
Tree removal	1,000	1,000	500
Plowing	500		
Seed	243	324	324
Seed drilled	150		
Aerial seeding		75	75
Fence	800	800	800
Deferred grazing	75	75	75
Total	2,768	2,274	1,774

[a] ACP will only pay up to $2,500 in one year to an individual.