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Analysis of the Costs and Returns of Pasturing Irrigated Alfalfa for Beef Production in Utah in 1983

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ANALYSIS OF THE COSTS AND RETURNS OF PASTURING IRRIGATED ALFALFA FOR BEEF PRODUCTION IN UTAH IN 1983

by

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ABSTRACT

Analysis of the Costs and Returns of Pasturing Irrigated Alfalfa for Beef Production in Utah in 1983

by

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The purpose of this study was to analyze the economics of pasturing feeder steers on irrigated alfalfa and compare this alternative to harvesting, storing, and selling alfalfa hay as well as selling standing alfalfa in the field. Available prices, costs and returns were calculated for fall planted wheat as a rotation crop, alfalfa establishment, alfalfa hay, alfalfa sold standing in the field, and pasturing feeder steers of different weight classifications on alfalfa with side roll irrigation.

A case study model farm was developed to examine the cost and returns of each enterprise option. The pasturing of feeder steers on alfalfa was found to have the highest returns to land and management with the exception of the 450 pound weight class. The other enterprise alternative that showed promise was selling alfalfa standing in the field.

(53 pages)

CHAPTER I

INTRODUCTION

The potential of irrigated alfalfa pastures for beef cattle production in intensively farmed regions of Utah needs to be reevaluated. Some of these factors in question include: increasingly unfavorable production economics of other enterprise alternatives, the limiting climatic patterns of the state, and the lack of previous economic analysis of this enterprise.

A little more than a decade ago, poloxalene (poloxethylene-poloxypropylene block polymer), a bloat preventive surfactant, was tested. Its efficacy and practicality was established for ruminant animals feeding on straight legume pastures by E. E. Bartley et al. (1965), L. E. Foote et al. (1968), C. R. Acord (1969, 1970, 1977), L. G. Helmer et al. (1965), and D. A. Stiles et al. (1967).

Prior to the development of poloxalene most irrigated pastures consisted of grass-legume mixtures whose proper proportionality was difficult to maintain for long periods of time. Further, bloating was still costly on all but straight grass swards. However, the advent of poloxalene meant a great boon to cattle producers who fed irrigated pasture during the spring and summer months.

Background of the Problem

Over time, climatic conditions of Utah and economic circumstances in the nation have caused the movement of several agricultural industries (potatoes, sugar beets, beans, sweet corn, etc.) to more suitable areas. These movements have left Utah farmers and ranchers with limited crop rotations of alfalfa hay, small grains (wheat and feed barley), corn silage and pasture. All the crop enterprises except wheat are for livestock feeding enterprises involving beef cattle, dairy cattle, sheep, and hogs. With the development of poloxalene, another enterprise alternative became available to those growing alfalfa. Herein lies the problem.

Problem and Purpose of the Study

Alfalfa growers must decide whether to harvest and possibly store the crop to be sold, feed the alfala, or sell the standing crop. The producer must also determine if it is more profitable to let the animal harvest the alfalfa by pasturing.

The purpose of this study is to analyze the economics of pasturing feeder steers on irrigated alfalfa. Also, a comparative analysis will be made between pasturing irrigated alfalfa, harvesting, storing, and selling alfalfa hay and selling the standing alfalfa in the field.

Further, this preliminary report will present information and demonstrate the analysis procedures which farmers, ranchers, and other investors could use in evaluating the feasibility of this enterprise on their irrigated lands.

The information acquired from this study should be used as a base to promote further research in animal science, plant science, and agri-

cultural economics to substantiate the preliminary findings and to strengthen the economic structure of Utah farms and ranches.

Objectives

The objectives of this study were: 1) to estimate costs of establishing alfalfa using side roll irrigation, 2) to estimate the costs and returns for producing alfalfa hay using side roll irrigation, 3) to estimate the costs and returns for pasturing feeder steers of different weight classifications on alfalfa using side roll irrigation, and 4) to evaluate alfalfa pasture as an enterprise alternative.

CHAPTER II

LITERATURE REVIEW

Although a large body of literature covering a wide variety of agronomic and animal science issues relating to irrigated grass or grass-legume pastures is available, economic studies have not evaluated the costs and returns of pasture management. There are even fewer studies concerning irrigated alfalfa as a pasture crop for beef or dairy cattle or sheep.

This review will briefly discuss the production of beef from alfalfa pasture and the available economic consequences of pasturing beef cattle on alfalfa.

Production of Beef From Alfalfa Pasture

As noted by Acord (1969):

> The idea of grazing beef cattle on irrigated pastures is not new. In an Experiment Station Field Day Report given at Pleasant Grove, Utah, in August, 1959, Lorin E. Harris et al., indicated that from 1249 to 1705 pounds of beef gain per acre could be obtained on such pastures in a growing season. They had found that the amount of production depended largely on the treatment of the pasture and management of cattle (p. 7).

Further, Acord stated, "to produce large gains required pasture with a high legume content, however, which also presented serious bloat problems" (p. 7).

With the efficacy of poloxalene determined, the problems of pasture stand management and bloat control were minimized. So, C. R. Acord, an

Extension Livestock Specialist in Utah, began to study the productivity of alfalfa pastures in Utah.

Using grain as the vehicle for distributing poloxalene, the benchmark study achieved significant results on pastures in Utah Valley (Pasture A) and Heber Valley (Pasture B). The results demonstrated in Table 1 were accomplished using a combination of feeder steers and heifers and two pounds of grain per head per day in 1967 and 1968. In 1969, almost all feeders were heifers and only one pound of grain per head was fed with poloxalene. Pasture B is at a much higher altitude than Pasture A which should account for the differences in beef yields when the number of grazing days are comparable.

TABLE 1.--Pasture production in Utah Valley (A) and Heber Valley (B), 1967-1969.

	Pasture				
	A 1967	A 1968	A 1969	B 1968	B 1969
Total number of cattle	60	69	50	34	25
Total acreage	6.2	8.7	7.0	7.0	5.25
Total grazing days	123	151	150	123	123
Average initial weight (lbs.)	475	530	523	380	502
Average final weight (lbs.)	640	749	748	667.5	771
Average total gain/animal (lbs.)	165	219	225	287.5	269
Average daily gain/animal (lbs.)	1.23	1.50	1.50	2.35	2.19
Total pounds of beef	9915	15111	11257	9775	5989
Total pounds of beef/acre	1599	1736	1608	1369	1141

SOURCE: C. R. Acord, 1970, Alfalfa pastures compare favorably with grass-legume pastures and other field crops in Utah, Utah Science, 31:7-10; and C. R. Acord, 1969, Beef production on irrigated pastures, Utah Science, 30:7-9.

Other areas of the West have reported similar results. For example, partners of a cattle feeding operation in Muleshoe, Texas backgrounded feeder steers with a beginning weight of 500 pounds on irrigated (center pivot) alfalfa and achieved 1900 pounds of beef per acre (Cope 1974).

In May 1979, a study published in Successful Farming reports the results of an irrigated (center pivot) alfalfa pasture grazing program adopted by two Kansas feeders. Using 100 acres of a three-year-old alfalfa stand, under center pivot irrigation and 500 pound feeder steers, they produced approximately 2 pounds per head per day. They also predicted that 1500 pounds of beef per acre could be produced the next year.

Dr. E. G. Johnson reported to Kester (Kester 1983) that he obtained close to 1200 pounds of beef per acre from steers weighing about 600 pounds on a ". . . less-than-average stand of third-year Flemish variety alfalfa" (p. 30). The grazing cycle took about 36 days and Dr. Johnson found that this cycle best fit the "normal growth curve of alfalfa." This timing is somewhat different from the 25-day cycle found to be most affective for Holstein heifers (Stroupe et al. 1978) and the 30-day timing reported by Acord (1970). Carcass data were shown to be better for steers grazed versus steers fed in drylot (see Table 2). Dr. Johnson believes that with experience he can obtain 1900 pounds of beef per acre.

All of the grazing experiments below were done in an effort to find a more profitable way to harvest alfalfa or to offer an enterprise alternative to farmers and ranchers with limited opportunities for profitability. However, the consequences of implementing alfalfa pasturing are mostly economic and have not been evaluated to date.

TABLE 2.--Carcass yield data.

	Average Hot Carcass (yield %)	Choice No.	%	Good No.	%	Y-2 No.	%	Y-3 No.	%	Y-4 No.	%
Fed Controls	63.55	59	74.5	20	25.5	38	48	38	48	3	4
Grazed	62.00	57	71	23	29	44	53.5	38	46.5		

SOURCE: W. Kester, 1983, Nearly 1200 pounds of beef gain per acre grazing alfalfa, Beef, June, pp. 30-34.

Economic Consequences of Pasturing Beef Cattle on Irrigated Alfalfa

Estimates of the net returns per acre for irrigated alfalfa pasture ranged anywhere from approximately $6.00 (Heinemann and Rogers 1973) to $380.00 (Kester 1983). Cope (1974) got about $200.00 net returns per acre. Acord (1970) got close to $165.00 and Duren (1973) got around $305.00 net returns per acre. The difference in time and analysis technique create some confusion in being able to draw any useful conclusions from the available information.

Kester (1983) provided the only comparison between haying and pasturing. However, his study leaves many questions to be answered and could not be considered an in-depth economic analysis.

The most thorough and reliable economic analysis was done by Heinemann and Rogers (1973). However, there is no haying comparison. The analysis is not current and the beef production results were way below the norm when compared to other studies cited. The cost and returns study by Acord (1970) contained a number of inconsistencies which hindered its reliability as a conclusive economic analysis, The lack of

useful economic analysis of pasturing alfalfa and comparative enterprise alternative analysis may contribute to the lag of adoption alfalfa grazing.

CHAPTER III

RESULTS AND DISCUSSION

A case study approach is utilized in this study to provide a framework for relating the relevant information and applying the analytical procedures used. This is a preliminary evaluation which should be followed by a more rigorous study because the analysis does not represent actual, existing operations. The information used in this study was obtained from the following sources: research trials in Utah; observations of producers from various states as reported in popular agricultural magazines; extension and experiment station bulletins from Utah, Idaho, Washington, and Nevada; several United States Department of Agriculture cost-returns and marketing publications; area agricultural suppliers; and, "reasoned conjecture" (Vomocil et al. 1972).

The Farm Model

Forage and livestock management practices must be of highest quality to achieve maximum profits per acre. As a result, 160 acres of Class I irrigated soil (Table 3) was chosen to represent the model farm.

The simulated farm assumed genetically superior varieties of alfalfa and winter wheat in a six year crop rotation system. This system should produce 6 tons of alfalfa and 95 bushels of winter wheat per acre (Davis and Wheeler 1982). Both higher and lower levels of production could be obtained with greater units of inputs but this may not be as profitable.

TABLE 3.--Description of Class I irrigated land in Utah.

Land Class	Description
Irrigated:	
Class I	Soil: More than 40 inches deep, surface heavy sandy loam to light silty clay loam. High water-holding capacity. Moderately rapid permeability. Not affected by salt or alkali.
	Slope: Level or nearly level. None to slight erosion hazard.
	Drainage: Well to moderately well-drained. No standing water table within 40 inches of surface.
	Climate: Suitable for production of fruit, truck, field, small grain, and forage crops. Growing season--150 or more days.
	Overflow or Flooding: None

SOURCE: L. H. Davis and R. Wheeler, 1982, Crop enterprise budgets for farm and ranch planning in Utah, Utah Agricultural Experiment Station Research Report No. 74, Logan, Utah.

Further, for this case, it is assumed that all land will be rotated within the same year which is against traditional practices.

All crops are to be irrigated with a side roll system which will apply approximately 28 acre inches of water per acre per year (see Table 4). Water for the irrigation system which is assumed to consist of a 60 horsepower pump, 2640 feet of 8 inch plastic mainline, and four laterals of 1254 feet in length is assumed to be delivered to the pump by a canal system. Table 4 describes the general features of the irrigation system and analyzes the costs (Willet, Dunford, and Wright 1982) of its use.

TABLE 4.--Irrigation system cost analysis worksheet

A. GENERAL FEATURES OF THE SYSTEM	
1. Source of Water: /X/ Surface	
/__/ Underground	
Well depth _____ ft.	
Pumping water lift _____ ft.	
2. Type of distribution system	sideroll
3. Acres irrigated by system	160
4. Average annual gross inches applied per acre	27.6
5. Total gross acre-inches applied annually (line 3 x line 4)	4416
6. Pumping rate in gallons per minute (GPM)	1200
7. Hours system is used annually (450/line 6 x line 5) .	1656
8. Pumping head: (feet)	
a. Vertical distance pump lifts water	0
b. Friction loss in mainline = 2640 feet of length of pipe or hose, divided by 100 (100 for pipe, 660 for hose), times .672 friction loss coefficient (Table 1)	17.74
c. Elevation between pump discharge and entrance to distribution system (+ or -)	0
d. Operating pressure (psi) at entrance to distribution system 45 (Table 2) x 2.31	103.95
e. Total pumping head (add lines a, b, c, d)	121.69
9. Electric motor size (horsepower) for powering pumping plant:	
a. Multiply line 8e times line 6	146028
b. Multiply 3960 times .60 efficiency of pump and drive unit (Table 3)	2376
c. Required motor horsepower = line 9a divided by line 9b	16.5

TABLE 4.--Continued

d. For center pivot multiply ____ number of towers times ____ horsepower per tower	0
e. Add lines 9c and 9d	61.5

B. CAPITAL INVESTMENT AND ANNUAL OWNERSHIP COSTS

Item in System	Useful Life (Table 4)	Initial Investment	Amortization Factor at 11% Interest (Table 5)	Annual Depreciation and Interest Cost (col. 2 x col. 3)
	Column 1 Years	Column 2 Dollars	Column 3	Column 4 Dollars
Grouting, casing, well, pump test	--	--	--	--
Pump, vertical turbine:				
Bowls	--	--	--	--
Column, discharge assembly, etc.	--	--	--	--
Pump, centrifugal	15	6000	.1391	834.60
Electric motor and controls	--	--	--	--
Mainline: pipe, risers, valves	20	11000	.1256	1381.60
Lateral system	10	22000	.1698	3735.60
Open ditches				
Reservoirs				
TOTAL	--	39000	--	5951.80

1. Total initial capital investment (sum of column 2)	$39000.00
2. Total annual depreciation and interest (sum of column 4) .	5951.80
3. Annual property tax and insurance cost (line 1 x .022) . .	858.00
4. Total annual ownership cost (line 2 + line 3)	6809.80

TABLE 4.--Continued

C. AINUAL OPERATING COSTS

1. Pumping energy cost

a. Variable cost 1656 (line A-7) times 60 (line A-9c or 93), times .746, times $074 per KWH) . . $ 5485.07

b. Service charge = ____ horsepower (line A-9c or 9e), times $____ service charge per horsepower . $ 0

c. Total . . . . . $ 5485.07

2. Repair and maintenance cost

a. Initial investment in distribution system (Section B) . . . . . $ 33000

b. Initial investment in pump, motor, and controls (Section B) . . . . . $ 6000

c. Line a plus line b, times ____ average annual gross inches applied per acre (line A-4) . . . . $ 143.04

d. Total repair and maintenance cost (line c times .0006 coefficient from Table 6) . . . . . $ .85

3. Moving costs (except labor) for distribution system

Center Pivot. Multiply hours system used annually ____ (line A-7) times ____ number of towers in lateral, times .426, times $____ price of electricity ($/KWH), times ____ moving cost coefficient (coefficient = 1 for electric drive, 1.015 for hydraulic oil drive, 0 for hydraulic water drive) . $ 0

Side Roll. Multiply hours system used annually 1656 (line A-7) times 1 number of auxiliary power units, times $ .98 power unit cost (fuel, repairs, lub.) per hour (Table 7) . . . . . $ 1622.88

Traveling Gun or Boom. Multiply hours system used annually ____ (line A-7) times number of auxiliary power units, times .03, times $____ power unit cost (fuel, repairs, lub.) per hour (Table 7) . . . $ 0

TABLE 4.--Continued

Hand Move or Stationary Gun or Boom. Multiply hours system used annually ____ (line A-7) times ____ number of laterals, booms, or guns, times 10, times $____ tractor cost (all costs) per hour of operation (Table 7)	$ 0
4. Labor Costs	
Center Pivot, Solid Set or Permanent Set. Multiply total gross acre-inches applied annually ____ (line A-5) times $____ wage rate ($/hr.), times ____ labor hours per acre-inch (=.04 center pivot, .08 solid set, .03 permanent set)	$ 0
Side Roll, Hand Move, Stationary or Traveling Gun Boom. Multiply acres irrigated 160 (line A-3) times 6 number of annual irrigations, times .3 labor hours per acre per irrigation (= .3 side roll, .7 hand move, .2 traveling gun or boom, .4 stationary gun or boom, times $ 5.00 wage rate ($/hr.)	$ 1440.00
5. Total annual operating cost (line 1c + line 2d + line 3 + line 4)	$ 8548.80

D. COST SUMMARY

1. Total annual system ownership and operating cost = $ 6809.80 (line B-4) plus $ 8548.80 (line C-5) .	$15358.60
2. Total annual cost per acre $ 15358.60 (line D-1) divided by 160 acres (line A-3)	$ 95.99
3. Total annual cost per net acre-inch $ 15358.60 (line D-1) divided by 4416 acre-inches (line A-5) divided by .70 irrigation system application efficiency (= .80 center pivot; .70 side roll, hand move, solid set, permanent set and stationary gun; .75 traveling gun)	$ 2.44

SOURCE: G. S. Willett, R. W. Dunford, and M. A. Wright, 1982, Estimating irrigation pumping and sprinkler system costs, Washington State University, Cooperative Extension Service Bulletin No. 1166, Pullman, Washington; and B. Bullen, 1983, Bullen farm equipment company, personal communication.

The technical input coefficients and price of the system were provided by Bill Bullen, an area irrigation equipment supplier.

The pasture and subsequent fence layout as seen in Figure 2 was designed by the author to fit the conditions of this study. The 160 acres was divided in half by the irrigation mainline with an 8 acre temporary holding and pregrazing feeding area held out of the middle of the quarter section. The 8 acre piece with a gate at each end will be pastured in the same manner as the other rotational pastures such that the entire 160 acres will be in production. The remaining 152 acres is divided into two 76 acre pastures and surrounded by a permanent 5-strand barb wire boundary fence of metal posts and railroad tie corners and bracing. A 5-strand fence was selected because of the extreme cattle pressure to be exerted.

Each 76 acre pasture is subdivided into six 12.67 acre rotational pastures by a moveable electric fence. Rotational pastures are supplied with water and feed supplement (molasses, vitamins, minerals and poloxalene) in moveable tanks. Also, each rotational pasture can be entered and exited through a 14-foot gate. Each of the six rotational pastures are to be grazed by 400 feeder steers for five days. This allows each pasture to be rested 30 days to complete a regrowth cycle of the alfalfa (Acord 1977).

The electric fence was developed in New Zealand some twenty-five years ago (Atmore 1983) and marketed in the United States by the Waterford Corporation during the past ten years. The fence is constructed using fiberglass posts and 3-strands of plastic coated 6-strand stainless steel wire on reels for long life and minimal labor requirements. This

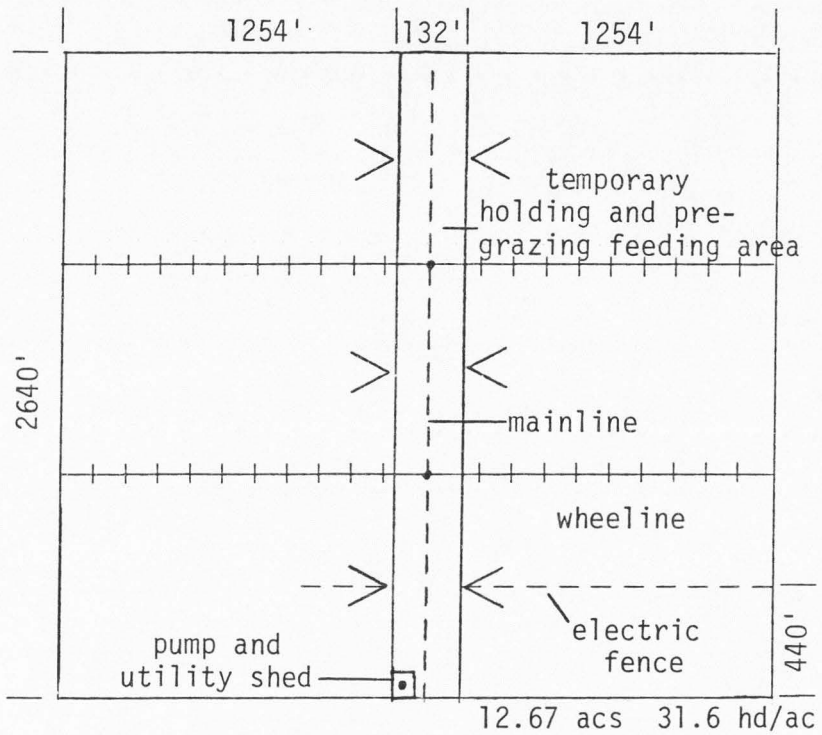

Fig. 1. The case study farm model layout.

type of electric fence was selected over conventional methods because of its proven cost savigs (Atmore 1983).

Crossbred feeder steers that weighed from 300 to 600 pounds were grazed and evaluated in this study. The feeder steers are assumed to gain 2.5 pounds per day for 120 days (Acord 1970) and to be stocked at five head per acre irrespective of their beginning weight class. These assumptions translate into 1500 pounds of beef produced per acre which is the assumed production level used in this study.

Though crossbred feeder steers are known to gain better than straight bred feeder steers because of heterosis, there is no specific data available to determine the ability of different weight classes to produce beef from alfalfa pasture. Further, the carrying capacity of alfalfa pasture for different weight classes is undetermined. Moreover, the same problems exist for feeder heifers. The above assumptions are questionable because of the lack of specific research results. However, given the results of Acord and others it is fairly well established that between 1000 pounds and 2000 pounds of beef per acre can be expected. Therefore, it is not unreasonable to choose a middle of the road figure of 1500 pounds of beef produced per acre.

Timing appears to be a key to successfully managing beef cattle grazing pure stands of alfalfa. According to Acord (1970) alfalfa should be irrigated every 14 to 21 days. In addition, the USDA-SCS (1975) has described the problem associated with the timing of the first spring grazing.

> ...the optimum time to graze or mow most plants is at the end of the rapid growth period or about the time of late bud or early flowering. The first spring grazing each year must be started before this stage is reached or most of the pasture area will have to be mowed for hay to keep the plants from

> getting too mature. The time to start spring grazing of legume-grass pastures is normally based on the growth stage of the legume; alfalfa 10-14 inches,... (p. 2).

Finally, high stocking rates results in relatively heavy concentrations of manure which must be spread by harrowing and leached into the soil with heavy irrigations to prevent stand damage and reduced palatability.

Livestock must be fed alfalfa hay with the feed supplement containing poloxalene at least three days in advance of pasturing on straight alfalfa according to Larry Kennedy (1981) of Smith Kline Animal Products, manufacturers of poloxalene, in a 1981 technical product letter. When on pasture, they must have free access to water and the feed supplement containing poloxalene and be checked regularly to prevent any losses resulting from bloat.

Machinery and equipment complements with their associated costs were based on information obtained from sources listed in Table 29 in the appendix. Moreover, the procedures used by Mohasci, Willett, Wright, and Carkner in 1980 to determine fixed and variable costs for machinery and equipment were used in this study. This procedure was followed strictly, but the investment interest rate was changed to 11 percent. Current machinery and equipment prices were used as indicated in Table 29 in the appendix.

Economic Analysis

Several factors are important in determining the profitability of stocker cattle enterprises on irrigated pasture. Among the more important are: 1) purchase and sale price of animals, 2) pasture and livestock productivity in terms of pounds of beef produced per acre of

pasture, and 3) costs of producing irrigated pasture, the chief feed input (Heinemann and Rogers 1973). These factors are also key in determining whether to harvest the alfalfa by grazing or through some other alternative.

The enterprise budgets for wheat as a rotation crop are found in Tables 5 - 7 and 13. For alfalfa, establishment budgets are found in Tables 8 and 9. Alfalfa hay budgets are found in Tables 10 - 13. Alfalfa sold standing in the field is found in Tables 14 - 16. Budgets for alfalfa pasture with several weight classes of feeder steers are found in Tables 17 - 22. Each enterprise budget is presented with its associated schedule of operations, summaries of production costs and returns and machinery complements.

Cost and return data shown in Tables 5-22 are based on the best information available to the author. These prices and other data along with their origin are further explained in Appendices A through C. It is realized that cultural practices differ among regions and farm operators and that the assumed prices may vary. However, the intention of a preliminary report is to provide a framework for further examination by region and individual operators.

The returns for each enterprise alternative in the present analysis clearly indicates that pasturing feeder steers on afalfa yields more return to land and management than harvesting alfalfa by any other method with one exception. Selling alfalfa standing in the field produced a higher return per acre, $55.90, than did the 450 pound feeder steers. The 450 pound feeder steer weight class returned a negative $27.49 to land and management which was $123.21 lower than the next lowest weight

TABLE 5.--Schedule of operations and selected costs per acre for fall planted wheat with side roll irrigation

Operation	Tooling	Month	Mach. Hours	Labor Hours	Mach. Fixed Cost	Variable Cost: Fuel, Oil Lube, and Repairs	Variable Cost: Mach. Labor	Variable Cost: Service	Variable Cost: Materials	Total Selected Variable Cost	Total Cost
						$					
Disc	105HP, 13' Offset Disc	Sept.	.20	.22	8.42	2.76	1.10	--	--	3.86	12.28
Plow	105HP, 4-16 Plow	Sept.	.56	.62	39.95	9.51	3.10	--	--	12.61	52.56
Pack	6' Packer Used W/Above Oper.	Sept.	.56	--	4.49	.84	--	--	--	.84	5.33
Irrigate	Side Roll, 19 Ac. In.	Sept.-July	--	1.22	28.88	30.15	16.10	--	22.03	36.25	65.13
Fertilize	Custom Fert. App.	Sept.	--	--	--	--	--	4.50	35.20	39.70	39.70
Planting	105HP, 12' Drill	Sept.	.24	.26	16.38	3.60	1.30	--	8.80	13.70	30.08
Pack	13' Packer Used W/Above Oper.	Sept.	.24	--	1.50	.20	--	--	--	.20	1.70
Fert. & Herb.	Custom Fert. (120H N) & Herb.	Apr.	--	--	--	--	--	5.50	39.64	45.14	45.14
Harvest	Custom Combine	July	--	--	--	--	--	32.50	--	32.50	32.50
Hauling	Custom Hauling	July	--	--	--	--	--	6.00	--	6.00	6.00
Pick-up	3/4 Ton		.91	1.00	10.88	7.98	5.00	--	--	12.98	23.86
Total Per Acre			2.70	3.32	110.50	55.04	16.60	48.50	83.64	203.78	314.28

SOURCE: H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

TABLE 6.--Production cost per acre and breakeven selling prices per unit for fall planted wheat with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Variable Costs				
Preharvest				
Custom Fert.	Acre	4.500	1.00	$ 4.50
Nitrogen	Lbs.	.29	200.00	58.00
Phosphate	Lbs.	.20	60.00	12.00
Wheat Seed	Lbs.	.110	80.00	8.80
Custom Fert. & Spray	Acre	5.500	1.00	5.50
Broadleaf Herbicide	Qt.	3.510	1.00	3.51
Broadleaf Herbicide	Oz.	.443	3.00	1.33
Machinery	Acre	4.67	1.00	4.67
Tractors	Acre	20.22	1.00	20.22
Irrigation Machinery	Acre	30.15	1.00	30.15
Labor (Tractor & Machinery)	Hour	5.00	2.10	10.50
Labor (Irrigation)	Hour	5.00	1.22	6.10
Interest on Op. Cap.	Dol.	.13	203.78	26.49
General Overhead	Dol.	.050	230.27	11.51
Subtotal, Pre-Harvest				$203.28
Harvest Costs				
Custom Combine	Acre	32.500	1.00	$ 32.50
Custom Hauling	Tons	2.000	3.00	6.00
Subtotal, Harvest				$ 38.50
Total Variable Cost				$241.78
Breakeven Price, Variable Costs at 100.00 BU./AC				$ 2.42
Fixed Costs				
Machinery	Acre	42.67	1.00	$ 42.67
Tractors	Acre	27.88	1.00	27.88
Irrigation Machinery	Acre	39.95	1.00	39.95
Taxes (Land)	Acre	10.50	1.00	10.50
Land (Net Rent)	Acre	50.00	1.00	50.00
Management Cost	Acre	--	--	26.60
Total Fixed Costs				$197.60
Total Costs				$439.38
Breakeven Price, Total Costs at 94.00 BU./AC				$ 4.63

TABLE 7.--Summary of receipts, costs, and profitability per acre for fall planted wheat with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Gross Receipts from Production				
Wheat	BU.	4.000	95.00	$380.00
1. Total Receipts				$380.00
Less: Total Variable Cost				$241.78
2. Returns Over Variable Costs				$138.22
Less: Machinery Fixed Cost				$110.50
3. Returns to Land and Management				$ 27.72
Less: Returns to Management (7% of Gross Returns)				$ 26.60
4. Gross Returns to Land				$ 1.12
Less: Real Estate Taxes				$ 10.50
5. Net Returns to Land Investment				$ -9.38
6. Rate of Return on Current Market Value of Land (2500 per acre)				% 0

TABLE 8.--Schedule of operations and selected costs per acre for establishing alfalfa hay with side roll irrigation

Operation	Tooling	Month	Mach. Hours	Labor Hours	Mach. Fixed Cost	Variable Cost: Fuel, Oil Lube, and Repairs	Variable Cost: Mach. Labor	Variable Cost: Service	Variable Cost: Materials	Total Selected Variable Cost	Total Cost
						----------	$	----------			
Disc (2x over)	105HP, 13' Offset Disc	Aug.	.40	.44	16.83	5.51	2.20	--	--	7.71	24.54
Pack (2x over)	13' Packer Used W/Above Oper.	Aug.	.40	--	2.50	.34	--	--	--	.34	2.84
Fertilization	Custom Application	Aug.	--	--	--	--	--	4.50	10.00	14.50	14.50
Herbicide	Custom Application	Aug.	--	--	--	--	--	4.50	17.84	22.34	22.34
Disc (2x over)	105HP, 13' Offset Disc	Aug.	.40	.44	16.83	5.51	2.20	--	--	7.71	24.54
Pack (2x over)	13' Packer Used W/Above Oper.	Aug.	.40	--	2.50	.34	--	--	--	.34	2.84
Plant	105HP, 12' Drill	Aug.	.24	.26	16.38	3.60	1.30	--	36.00	40.90	57.28
Pack	13' Packer Used W/Above Oper.	Aug.	.24	--	1.50	.20	--	--	--	.20	1.70
Irrigate	Side Roll, 9 AC.IN.	Aug.-Oct.	--	.58	13.68	14.28	2.90	4.78	--	17.18	30.86
Pick-up	3/4 Ton		.40	.44	4.78	3.51	2.20	--	--	5.71	10.49
Total Per Acre			2.49	2.16	75.00	33.29	10.80	9.00	63.84	116.93	191.93

SOURCE: H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

TABLE 9.--Production cost per acre for establishing alfalfa hay with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Variable Costs				
Custom Fert.	Acre	4.500	1.00	$ 4.50
Alfalfa Seed	Lbs.	2.400	15.00	36.00
Phosphate	Lbs.	.200	50.00	10.00
Herbicide	Qt.	8.920	2.00	17.84
Custom Herb. App.	Acre	4.500	1.00	4.50
Machinery	Acre	6.28	1.00	6.28
Tractors	Acre	12.73	1.00	12.73
Irrigation Machinery	Acre	14.28	1.00	14.28
Labor (Tractor & Machinery)	Hour	5.00	1.58	7.90
Labor (Irrigation)	Hour	5.00	.58	2.90
Interest on Op. Cap.	Dol.	.13	80.93	10.52
General Overhead	Dol.	.050	127.45	6.37
Subtotal, Pre-Harvest				$133.82
Total Variable Cost				$133.82
Fixed Costs				
Machinery	Acre	31.32	1.00	$ 31.32
Tractors	Acre	30.00	1.00	30.00
Irrigation Machinery	Acre	13.68	1.00	13.68
Total Fixed Costs				$ 75.00
Total Costs				$208.82

TABLE 10.--Schedule of operations and selected costs per acre for producing alfalfa hay with side roll irrigation

Operation	Tooling	Month	Mach. Hours	Labor Hours	Mach. Fixed Cost	Variable Cost: Fuel, Oil Lube, and Repairs	Variable Cost: Mach. Labor	Variable Cost: Service	Variable Cost: Materials	Total Selected Variable Cost	Total Cost
						$					
Fertilization	Custom Application	Nov.	--	--	--	--	--	4.50	10.00	14.50	14.50
Weed Control	Custom Herb. App.	Apr.	--	--	--	--	--	4.50	24.04	28.54	28.54
Irrigation	Side Roll, 28 AC. IN.	May	--	1.80	42.56	44.43	9.00	--	--	53.43	95.99
Swathing	65HP/14' Windrower	June	.28	.31	29.92	4.41	1.55	--	--	5.96	35.88
Bale	105HP, PTO Baler	June	.37	.41	19.77	5.27	2.05	--	7.50	14.82	34.59
Remove & Stack	Custom Bale Wagon	June	--	--	--	--	--	13.54	--	13.54	13.54
Swathing	65HP/14' Windrower	July	.22	.24	23.51	3.47	1.20	--	--	4.67	28.18
Bale	105HP, PTO Baler	July	.30	.32	16.03	4.27	1.60	--	6.00	11.87	27.90
Remove & Stack	Custom Bale Wagon	July	--	--	--	--	--	10.83	--	10.83	10.83
Swathing	65HP/14' Windrower	Aug.	.17	.19	18.16	2.68	.95	--	--	3.63	21.79
Bale	105HP, PTO Baler	Aug.	.22	.24	11.75	3.13	1.20	--	4.50	8.83	20.58
Remove & Stack	Custom Bale Wagon	Aug.	--	--	--	--	--	8.13	--	8.13	8.13
Pick-up	3/4 Tons		1.05	1.15	12.56	19.21	5.75	--	--	14.96	27.52
Total Per Acre			2.61	4.66	174.26	76.87	23.30	41.50	52.04	193.71	367.97

SOURCE: H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

TABLE 12.--Summary of receipts, costs, and profitability per acre for producing alfalfa hay with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Gross Receipts from Production				
Alfalfa	Tons	72.50	6.00	$435.00
1. Total Receipts				$435.00
Less: Total Variable Cost				$229.83
2. Returns Over Variable Cost				$205.17
Less: Machinery Fixed Cost				$174.26
Prorated Estab. Cost				$ 41.76
3. Returns to Land and Management				$-10.85
Less: Returns to Management (7% of Gross Returns)				$ 30.45
4. Gross Returns to Land Excluding Appreciation				$-41.30
Less: Real Estate Taxes				$ 10.50
5. Net Returns to Land Investment Excluding Appreciation				$-51.80
6. Rate of Return on Current Market Value of Land (2500 per acre)				% 0

TABLE 13.--Machinery complement for fall planted wheat and alfalfa grown under side roll irrigation

Assumed Machinery Prices, Annual Use, and Cost Per Hour of Use

Item	Annual Hours of Use	New[1] Cost	Cost Per Hour of Use: Fixed[2] Cost	Variable[2] Cost	Total Cost
			$		
Wheel Tractor, 105 HP	185	32000	27.88	12.24	40.12
Offset Disc, 13'	65	6900	14.19	1.54	15.73
MB Plow, 4-16, 2-way	20	6500	43.45	4.75	48.20
Packer, 6'	20	1200	8.02	1.50	9.52
Disc Drill, 12'	20	5500	40.38	2.75	43.13
Packer, 13'	45	2100	6.24	.84	7.08
Windrower, 65 HP, 14'	70	34000	106.84	15.76	122.60
PTO Baler	120	14000	25.54	1.99	27.53
Pickup, 3/4 ton	180	11000	11.96	8.77	20.73

SOURCE: [1]H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

[2]S. Mohasci, G. S. Willett, M. A. Wright, and R. W. Carkner, 1980, The cost of owning and operating farm machinery in Washington, Cooperative Extension, Washington State University, Farm Business Management Reports No. EM4035, Pullman, Washington.

TABLE 14.--Schedule of operations and selected costs per acre for alfalfa sold standing in the field with side roll irrigation

Operation	Tooling	Month	Mach. Hours	Labor Hours	Mach. Fixed Cost	Variable Cost: Fuel, Oil Lube, and Repairs	Variable Cost: Mach. Labor	Variable Cost: Service	Variable Cost: Materials	Total Selected Variable Cost	Total Cost
						$					
Fertilization	Custom Application	Nov.	--	--	--	--	--	4.50	10.00	14.50	14.50
Weed Control	Custom Herb. App.	Apr.	--	--	--	--	--	4.50	24.04	28.54	28.54
Irrigation	Side Roll, 28 AC. IN.	May-Oct.	--	1.80	42.56	44.43	9.00	--	--	53.43	95.99
Pick-up	3/4 Tons		1.05	1.15	12.56	19.21	5.75	--	--	14.96	27.52
Total Per Acre			1.05	2.95	55.12	53.64	14.75	9.00	34.04	111.43	166.55

SOURCE: H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

TABLE 15.--Production cost per acre and breakeven selling prices per unit for producing alfalfa sold standing in the field with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Variable Costs				
Custom Fert.	Acre	4.50	1.00	4.50
Phosphate	Lbs.	.20	50.00	10.00
Custom Herb. App.	Acre	4.50	1.00	4.50
Broadleaf Herbicide	Qt.	4.44	2.00	8.88
Herbicide	Qt.	3.79	4.00	15.16
Machinery	Acre	9.21	1.00	9.21
Irrigation Machinery	Acre	44.43	1.00	44.43
Labor (Tractor & Machinery)	Hour	5.00	1.15	5.75
Labor (Irrigation)	Hour	5.00	1.80	9.00
Interest on Op. Cap.	Dol.	.13	111.43	14.49
General Overhead	Dol.	.05	125.92	6.30
Total Variable Cost				$132.22
Breakeven Price, Variable Costs at 6.00 Tons/AC				$ 22.04
Fixed Costs				
Machinery	Acre	12.56	1.00	12.56
Irrigation Machinery	Acre	42.56	1.00	42.56
Taxes (Land)	Acre	10.50	1.00	10.50
Prorated Estab. Cost	Acre	41.76	1.00	41.76
Land (Net Rent)	Acre	50.00	1.00	50.00
Management Cost	Acre	19.95	1.00	19.95
Total Fixed Costs				$177.33
Total Costs				$309.55
Breakeven Price, Total Costs at 6.00 Tons/AC				$ 51.59

TABLE 16.--Summary of receipts, costs, and profitability per acre for alfalfa sold standing in the field with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Gross Receipts from Production				
Alfalfa	Tons	47.50	6.00	$285.00
1. Total Receipts				$285.00
Less: Total Variable Cost				$132.22
2. Returns Over Variable Cost				$152.78
Less: Machinery Fixed Cost				$ 55.12
Prorated Estab. Cost				$ 41.76
3. Returns to Land and Management				$ 55.90
Less: Returns to Management (7% of Gross Returns)				$ 19.95
4. Gross Returns to Land Excluding Appreciation				$ 35.95
Less: Real Estate Taxes				$ 10.50
5. Net Returns to Land Investment Excluding Appreciation				$ 25.45
6. Rate of Return on Current Market Value of Land (2500 per acre)				% 1.02

TABLE 17.--Schedule of operations and selected costs per acre for pasturing 600 pound feeder steers on alfalfa with side roll irrigation

Operation	Tooling	Month	Mach. Hours	Labor Hours	Mach. Fixed Cost	Variable Cost: Fuel, Oil Lube, and Repairs	Variable Cost: Mach. Labor	Variable Cost: Service	Variable Cost: Materials	Total Selected Variable Cost	Total Cost
						$					
Irrigation	Side Roll, 28 AC. IN.	May-Oct.	--	1.80[d]	42.56	44.43	9.00	--	--	53.43	95.99
Harrowing	60HP Tractor, 15' Harrow	June-Oct.	.80[a]	.88	11.21	3.75	4.40	--	--	8.15	19.36
Pregrazing Cattle	60HP Tractor, Wagon	May	.27[b]	.30	4.18	1.38	1.50	--	11.76	14.64	18.82
Grazing Cattle	2 Horses	May-Oct.	4.70[b]	5.17	1.03	--	25.85	8.85	402.00	436.70	437.73
Purchasing and Selling Cattle	2 Horses	May-Sept.	.16	.18	.04	--	.90	39.75	1984.10	2024.75	2024.79
Pick-up	3/4 Tons	May-Oct.	1.0[c]	1.1	12.67	8.96	5.50	--	--	14.46	27.13
Boundary Fence	5 strand barbwire	Jan.-Dec.	--	--	6.25	--	--	--	--	--	6.25
Electric Fence	3 wire waterford	May-Oct.	--	--	1.63	--	--	--	--	--	1.63
Livestock Equipment		May-Oct.	--	--	12.95	--	--	--	--	--	12.95
Total Per Acre			6.93	9.43	92.52	58.52	47.15	48.60	2397.86	2552.13	2644.65

SOURCE: [a]G. Meyer, D. Greenwell, and L. Stockton, 1979, Alfalfa hay production costs for Lovelock, Nevada area, Cooperative Extension Service, University of Nevada, Economic Factsheet E-13-79, Reno, Nevada.

[b]USDA, Economics and Statistics Service, 1981, Costs of Producing Livestock in the United States--Final 1979, Preliminary 1980, and Projections for 1981. U.S. Government Printing Office, Washington, D.C.

[c]H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

[d]G. S. Willet, R. W. Dunford, and M. A. Wright, 1982, Estimating irrigation pumping and sprinkler system costs, Washington State University Cooperative Extension Service Bulletin No. 1166, Pullman, Washington.

TABLE 18.--Production cost per acre and breakeven selling prices for pasturing 600 pound feeder steers on alfalfa with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Variable Costs				
Feeder Steers (600-700 lbs.)	Cwt	66.13	30.00	1983.90
Alfalfa Pasture	Ton	47.50	6.00	285.00
Molasses, Salt, Mineral, and Poloxalene	Ton	239.64	.46125	110.53
Alfalfa Hay	Ton	72.50	.125	9.06
Veterinary and Medicine	Cwt	.59	15.00	8.85
Trucking	Cwt	1.89	15.00	28.35
Marketing	Cwt	.76	15.00	11.40
Horses	each	3.04	2.00	6.08
Death loss (1/3 of 1%)	Cwt	67.37	.05	3.37
Machinery	Acre	9.13	1.00	9.13
Tractors	Acre	4.96	1.00	4.96
Irrigation Machinery	Acre	44.43	1.00	44.43
Labor (Tractor & Machinery)	Hour	5.00	2.28	11.40
Labor (Irrigation)	Hour	5.00	1.80	9.00
Labor (Livestock)	Hour	5.00	5.35	26.75
Interest on Op. Cap.	Dol.	.13	2094.43	92.24
General Overhead	Dol.	.05	2644.37	132.22
Total Variable Cost				$ 2776.59
Breakeven Price, Variable Cost at 45 Cwt/AC				$ 61.70
Fixed Costs				
Machinery	Acre	13.40	1.00	13.40
Tractors	Acre	14.66	1.00	14.66
Irrigation Machinery	Acre	42.56	1.00	42.56
Livestock Equipment	Acre	12.95	1.00	12.95
Taxes (Land)	Acre	10.50	1.00	10.50
Land (Net Return)	Acre	50.00	1.00	50.00
Management Cost	Acre	212.22	1.00	212.22
Prorated Alfalfa Estab.	Acre	41.76	1.00	41.76
Boundary Fence	Acre	6.25	1.00	6.25
Electric Fence	Acre	1.63	1.00	1.63
Horses	Acre	1.07	1.00	1.07
Total Fixed Costs				$ 407.00
Total Costs				$3183.59
Breakeven Price, Total Costs at 45 Cwt/AC				$ 70.75

TABLE 19.--Summary of receipts, costs, and profitability per acre for pasturing 600 pound feeder steers on alfalfa with side roll irrigation

	Unit	Price or Cost/Unit	Quantity	Value or Cost
Gross Receipts from Production				
Beef Production	Cwt	67.37	45	$3031.65
Manure Credit[1]				
Nitrogen	lb	.29	67	$ 19.43
Phosphate	lb	.20	78	$ 15.60
Potash	lb	.14	153	$ 21.42
1. Total Receipts				$3088.10
Less: Total Variable Cost				$2776.59
2. Returns Over Variable Cost				$ 311.51
Less: Machinery Fixed Cost				$ 92.52
Prorated Estab. Cost				$ 41.76
3. Returns to Land and Management				$ 177.23
Less: Returns to Management (7% of Gross Returns from Cattle)				$ 212.22
4. Gross Returns to Land				$ -34.99
Less: Real Estate Taxes				$ 10.50
5. Net Returns to Land Investment Excluding Appreciation				$ -45.49
6. Rate of Return on Current Market Value of Land ($2500 per acre)				% 0

SOURCE: [1]Willett, G.S., et al., 1981.

TABLE 20.--Machinery and equipment complements for pasturing 600 pound feeder steers on alfalfa

Assumed Machinery Prices, Annual Use, and Cost Per Hour of Use

Item	Annual Hours of Use	New[1] Cost	Cost Per Hour of Use: Fixed[2] Cost	Variable[2] Cost	Total Cost
			----------$----------		
Wheel Tractor, 60 HP	200	1700	13.70	4.64	18.34
15' Spiketooth Harrow	105	375	.31	.05	.36
Wagon	45	1627	1.77	.48	2.25
Pickup, 3/4 ton	170	11000	12.67	8.96	21.63
Horse	400	800	.22	1.25	1.47

Assumed Equipment Prices and Costs Per Acre of Use[3]

Item	Number of Units	Useful Life in Years	New Cost	Cost Per Hour of Use: Fixed Cost	Variable Cost	Total Cost
				----------$----------		
Boundary Fence	3 miles	25	10360	6.25	--	6.25
Electric Fence	1 mile	20	1310	.86	--	.86
12v RV Battery	4 miles	3	280	.63	--	.63
Battery Charger	1 mile	10	150	.14	--	.14
14' Portable Loading Chute	1 mile	20	1825	1.20	--	1.20
Water Tanks With Valves	8 miles	3	228	4.12	--	4.12
Portable Squeeze Chute	1 mile	10	1390	1.31	--	1.31
Horse Equipment	2 miles	10	1600	1.51	--	1.51
Fiberglass Liquid Supplement Tanks	8 miles	3	2000	4.51	--	4.51

SOURCE: [1]H. R. Hinman, M. A. Wright, and G. S. Willett, 1982, Crop enterprise budgets for the Columbia Basin, Washington, Cooperative Extension Service, Washington State University, Extension Bulletin 1019, Pullman, Washington.

[2]S. Mohasci, G. S. Willett, M. A. Wright, and R. W. Carkner, 1980, The cost of owning and operating farm machinery in Washington, Cooperative Extension, Washington State University, Farm Business Management Reports No. EM4035, Pullman, Washington.

[3]Local Agricultural Equipment Suppliers, 1983.

TABLE 21.--Production cost per acre for pasturing different beginning weight classes of feeder steers on alfalfa with side roll irrigation

	350 lbs.	450 lbs.	550 lbs.	650 lbs.
Variable Costs				
Feeder Steers	1254.23	1610.33	1891.45	2149.23
Other Variable Cost	568.23	568.23	568.23	568.23
Interest on Operating Capital	59.14	74.57	86.75	97.99
General Overhead	94.08	112.66	127.32	140.77
Total Variable Cost	1975.68	2365.79	2673.75	2956.22
Breakeven Price, Variable Cost at Cwt/AC	60.79	63.09	62.91	62.24
Fixed Costs				
Management Cost	150.45	169.13	200.43	224.01
Other Fixed Costs	194.78	194.78	194.78	194.78
Total Fixed Costs	345.23	363.91	398.21	418.79
Total Costs	2320.91	2729.70	3071.96	3375.01
Breakeven Price, Total Costs at Cwt/AC	71.41	72.79	72.28	71.05

TABLE 22.--Summary of receipts, costs, and profitability per acre for pasturing different beginning weight classes of feeder steers on alfalfa with side roll irrigation

	350 lbs.	450 lbs.	550 lbs.	650 lbs.
Gross Receipts from Production				
Beef Production	2149.23	2416.13	2863.23	3200.75
Manure Credit	56.45	56.45	56.45	56.45
1. Total Receipts	2205.68	2472.58	2919.68	3257.20
Less: Total Variable Cost	1975.68	2365.79	2673.75	2956.22
2. Returns Over Variable Cost	230.00	106.79	245.93	300.98
Less: Machinery Fixed Cost	92.52	92.52	92.52	92.52
Prorated Estab. Cost	41.76	41.76	41.76	41.76
3. Returns to Land and Management	95.72	-27.49	111.65	166.70
Less: Returns to Management (7% from Cattle)	150.45	169.13	200.43	224.01
4. Gross Returns to Land Investment Excluding Appreciation	-54.73	-196.62	-88.78	-57.31
Less: Real Estate Taxes	10.50	10.50	10.50	10.50
5. Net Returns to Land Investment Excluding Appreciation	-65.23	-207.12	-99.28	-67.81
6. Rate of Return on Current Market Value of Land ($2500 per acre)	--	--	--	--

class. The additional cost per acre for cattle, interest on operating capital and general overhead coupled with a lower sale price of $2.65 per hundred weight than 350 pound weight class created the negative return to land and management.

The sensitivity of the returns to land and management for alfalfa pasture to various changes are demonstrated in Table 23. Comparing the sensitivity of alfalfa pasture to various changes in alfalfa hay in Table 24 and alfalfa sold standing in the field in Table 25 with changes in beef sale price reveals some slightly different results than achieved in the static analysis.

In the range of sale prices for steers from $40 - $80 per hundred weight, the beginning weight class of 350 pound feeder steers is the most profitable of the options examined. However, from $80 - $100 per hundred weight the 550 pound and 650 pound weight classes are the most profitable with a slight edge in returns to land and management going to the 650 pound weight class.

If the selling price of beef in any of the feeder steer weight classes drops below approximately $65 per hundred weight at a beef per acre production level of 1500 pounds, the alfalfa sold standing in the field priced higher than $40 per ton and the alfalfa hay priced higher than approximately $75 per ton would become viable enterprise alternatives over a narrow range of prices. Furthermore, if the pounds of beef produced per acre drops below 1300 to 1400 pounds and the approximate sale price of $77.50 per hundred weight in all but the 550 pound feeder steer weight class, the alfalfa hay and the alfalfa sold standing in the field become viable alternatives at the same price levels as above.

TABLE 23.--Sensitivity of per acre returns to land and management for grazing alfalfa pasture to various input weight classes of feeder steers, pounds of beef produced per acre, and sale prices of beef per cwt.

	350 Pound Steers			450 Pound Steers			550 Pound Steers			650 Pound Steers		
Pounds of Beef/Acre	1000	1500	2000	1000	1500	2000	1000	1500	2000	1000	1500	2000
Sale Price/cwt												
$40	-1021	-820	-621	-1211	-1011	-810	-944	-1120	-919	-1401	-1201	-1001
50	-746	-495	-246	-886	-636	-385	-569	-695	-444	-976	-726	-476
60	-471	-170	129	-561	-261	40	-194	-270	31	-551	-251	49
70	196	155	504	-236	114	465	182	155	506	-126	224	574
80	79	480	879	89	489	890	557	580	981	299	699	1099
90	354	805	1254	414	864	1315	932	1005	1456	724	1174	1624
100	629	1130	1629	739	1239	1740	1307	1430	1931	1149	1649	2149

TABLE 24.--Sensitivity of per acre returns to land and management for six ton per acre alfalfa hay to various sale prices per ton.

	Total Revenue Per Acre	Total Cost Per Acre	Return to Land and Management Per Acre
Sale Price/Ton			
$50	300	456	-156
60	360	456	-96
70	420	456	-36
80	480	456	24
90	540	456	84
100	600	456	144

TABLE 25.--Sensitivity of per acre returns to land and management for six ton per acre alfalfa sold standing in the field to various sale prices per ton.

	Total Revenue Per Acre	Total Cost Per Acre	Return to Land and Management Per Acre
Sale Price/Ton			
$40	240	240	0
50	300	240	60
60	360	240	120
70	420	240	180

Alfalfa hay is not a viable alternative for this study despite the fact that the higher sale price moves it into consideration. Owning and maintaining the equipment necessary for haying is too costly if the equipment is used only when cattle prices go far enough in the opposite direction of alfalfa hay prices or when the pounds of beef produced per acre significantly declines.

On the other hand, alfalfa sold standing in the field is an enterprise which could easily be moved into consideration should cattle prices fall. This would be especially true in an area where there was an alternative demand for the alfalfa. A good example of an alternative demand is the dairy industry in Utah.

A basic static and dynamic economic analysis of the alfalfa pasture enterprise indicates that the opportunity to achieve higher returns to land and management is greater than the other two enterprises examined under most conditions.

Chapter IV

CONCLUSIONS AND RECOMMENDATIONS

The objectives of this chapter were to reach some viable conclusions for this preliminary report but most of all to make recommendations for future research for the benefit of farmers and ranchers.

Conclusions

The objectives of this study as enumerated in Chapter I, have been fulfilled. Costs and returns for wheat, alfalfa establishment, alfalfa hay, alfalfa to be sold standing in the field, and alfalfa pastured by several weight classes of feeder steers were calculated. Alfalfa pasture was evaluated as an alternative method of harvesting alfalfa.

It appears that pasturing alfalfa with feeder steers affords Utah farmers and ranchers a profitable enterprise alternative. The returns to land and management are high enough to encourage producers to consider pasturing alfalfa and to encourage further and closer examination by researchers.

Recommendations

Alfalfa pasture should be examined thoroughly to determine the following: 1) its usefulness in the sheep and dairy industries, 2) the varieties best suited for maximum meat production and standlife, 3) the

stocking rates of different weight classes of heifers and steers, 4) the effects of ionophores and implants on productivity, 5) the effects of manure and soil compaction on alfalfa stands, 6) the most advantageous system for irrigating the alfalfa, 7) the effects grazing will have on weed, pest, and disease control, 8) the role the futures market could play in the profitability of the enterprise, 9) the feasibility of finishing feeder steers and heifers to grade choice, and 10) the profit relationship among other beef enterprises. This is not an exhaustive list but rather a brief menu to be expanded by those with varied research interest.

Finally, as more current data becomes available, the budgets herein will become more valuable to producers. Therefore, keeping these budgets up-to-date would seem a useful project for those charged with the responsibility of assisting Utah farmers and ranchers to remain profitable.

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APPENDICES

Appendix A:

Beef Prices Used in Economic Analysis

TABLE 26.--Beef prices used in analyzing various management options for an alfalfa pasture enterprise

Activity	Activity and Description	Price/cwt ($)
Buy	The gross cost of buying 1 cwt of calf at the 1980-82 three-year average price when the calf/yearling weight equals:	
	300-400 pounds	
	Steers	71.67
	Heifers	61.75
	400-500 Pounds	
	Steers	71.57
	Heifers	59.32
	500-600 Pounds	
	Steers	68.78
	Heifers	58.07
	600-700 Pounds	
	Steers	66.13
	Heifers	57.78
Sell	The gross income of selling 1 cwt of calf production at 1980-82 three-year aveage price when the calf/yearling weight equals:	
	600-700 Pounds	
	Steers	66.13
	Heifers	57.78
	700-800 Pounds	
	Steers	64.43
	Heifers	57.78
	Slaughter Steers, Choice 2-4, 900-1100 Pounds	67.37
	Slaughter Heifers, Choice 2-4, 900-1100 Pounds	64.14

SOURCE: USDA, Agricultural Marketing Service, 1983, Livestock and Meat Prices and Receipts at Certain California and Western Area Markets 1982

Appendix B:

Alfalfa Prices Used in Economic Analysis

TABLE 27.--1980-82 average prices per ton for number one alfalfa hay in Utah

Year	Average Price	
	Low	High
1980	69.26	76.21
1981	63.94	70.65
1982	64.07	70.57
Three-year Average Price	65.76	72.48

SOURCE: Utah Department of Agriculture, 1980-1982, Federal-State Market News, Division of Agriculture Development and Marketing in Cooperation With USDA, Livestock Market News.

TABLE 28.--1980-82 average prices per ton for all alfalfa hay in Utah.

Year	Average Price
1980	69.79
1981	67.08
1982	68.45
Three-year Average Price	68.44

SOURCE: Utah Department of Agriculture, 1983, Utah Agricultural Statistics 1983, Salt Lake City, Utah.

Appendix C:

Prices for Other Selected Inputs

TABLE 29.--Prices for other selected inputs

Item	Unit	Unit Price
Class I Irrigated Land (Purchase)	acre	$ 2500.00[1]
Class I Irrigated Land (Net Rent)	acre	$ 50.00[1]
Cost of Operating Capital	%	13.00[2]
Side Roll Irrigation System For 160 Acres	each	$39000.00[3]
Waterford Portable Electric Fence	--	--[3]
Strip Grazers	each	$ 98.00
3-Reel Post	each	$ 13.60
Portable Reels	each	$ 19.50
Live-strand wire (1320 ft. lengths)	each	$ 25.00
54" Fiberglass Post	each	$ 1.42
L-Type Attachments	each	$ .18
12v RV Battery	each	$ 70.00
Battery Charger	each	$ 150.00
Permanent 5-strand Barbwire Boundary Fence	--	--[3]
T-Type Metal Posts	each	$ 2.50
Barbwire (Foreign)	spool	$ 25.45
Railroad Ties	each	$ 8.95
14' Metal Gates and Hardware	each	$ 66.95
48" Fence Stays	hundred	$ 29.10
30d Nails	lb.	$ .60

TABLE 29.--Continued

Item	Unit	Unit Price
Fence Staples	lb.	$ .60
Fence Wire Stretchers	each	$ 19.95
Fence Tool	each	$ 9.95
9-Gauge Wire (100 lb. spools)	each	$ 59.00
Post Tamper	each	$ 29.95
Gloves	pair	$ 13.00
7-inch Treated Posts	each	$ 5.64
Labor	hour	$ 5.00[4]
Land Taxes	acre	$ 10.50[4]
Custom Hay Harvest	ton	$ 25.00[4]
Horse	each	$ 800.00[3]
Tack	each	$ 800.00[3]
Gasoline (Less Tax Credit)	gal.	$ 1.00[3]
Diesel (Less Tax Credit)	gal.	$ 1.00[3]
Interest on Machinery and Equip. Invest.	%	11.00[3]
Veterinary and Medicine	cwt	$ .59[5]
Marketing	cwt	$ 1.89[5]
Trucking	cwt	$ .76[5]
Alfalfa Seed	lb.	2.40[3]
Wheat Seed	lb.	.11[3]
Nitrogen	lb.	.29[3]
Phosphorus	lb.	.20[3]

TABLE 29.--Continued

Item	Unit	Unit Price
Potassium	lb.	.14[3]
Broadleaf Herbicide	qt.	4.44[6]
Herbicide	qt.	3.79[6]
Custom Combining	acre	32.50[6]
Custom Hauling	ton	2.00[6]
Custom Fertilizer and Herbicide App.	acre	4.50[6]
Wheat (Sell)	bu.	$ 4.00[6]
Feed Supplement (Molasses, Minerals, Vitamins, and Poloxalene)	ton	$ 239.64[3]
14' Portable Loading Chute	each	$ 1825.00[3]
Water Tanks With Valves	each	$ 228.00[3]
Portable Squeeze Chute	each	$ 1390.00[3]
Fiberglass Liquid Supplement Tank	each	$ 250.00[3]
General Overhead	%	5.00[6]
Management Cost	%	7.00[6]

SOURCE: [1]S. Poulsen, 1983, Federal Land Bank, Personal Communication.

[2]T. Allen, 1983, Production Credit Association, Personal Communication.

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