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Grassland Production Systems Compared with Grain Production: North Central South Dakota

H. R. Allen

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Grassland Production Systems Compared with Grain Production

North Central South Dakota



South Dakota State University
Agricultural Experiment Station
Brookings, South Dakota

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Grassland Production Systems Compared with Grain Production

North Central South Dakota

Herbert R. Allen*

The profitability of seeding cropland to grass has been a problem for farmers and ranchers in North Central South Dakota for several years. Many factors may influence a decision to divert cropland to grazing land for the production of beef. An additional problem arises in reaching a decision concerning pasture grasses to produce and/or a grazing system to establish.

It is the purpose of this publication to present a method and a procedure to use in making an economic analysis of alternative grassland systems for beef production. The returns obtained from grassland may then be compared with returns from grain production on similar type land.

Pasture Programs

This analysis is based on a comparison of three different pasture programs.

- One program is referred to as a full-season pasture program. It is composed of a number of grasses grazed in a series according to their seasonal productivity. Crested wheatgrass is grazed early in the spring. About the middle of May cattle are moved to a pasture with a mixture of smooth brome grass, intermediate wheatgrass and a pasture-type alfalfa. Switchgrass provides warm-season grazing during July and August. The brome grass-intermediate-alfalfa mixture is grazed again for a short period of time before utilizing Russian wildrye in late fall grazing.
- A second pasture program is composed of a mixture of smooth brome grass, intermediate wheatgrass and a pasture-type alfalfa. This is considered a short-season pasture and is grazed on a rotation system throughout the season.
- A third pasture program assumes all grazing is derived from native grassland. Enough cropland is seeded to brome grass and alfalfa to provide the necessary hay to maintain the cow herd.

PASTURE PRODUCTION

Pasture Yields

Table 1 presents production rates for different species of grasses used in the full-season pasture program. Preliminary data show that the full-season

pasture system, made up of a series of grasses, provides an average of 1.62 AUM's of grazing from each acre of land in the system.

The data in Table 1 are employed to arrive at acreage requirements per animal unit as shown in Table 2. For example, data from Table 1 show that 8 acres of crested wheatgrass provides grazing for 10 animal units. This is .8 of an acre per animal unit as revealed in Table 2. Table 2 further shows the number of calendar days of grazing obtained each month from the several different grasses in the full-season pasture system. It should be noted that the days of grazing obtainable from each type of grass will vary from season-to-season. The data, as shown in Table 2, represent the production obtainable in a normal grazing season. It is also shown in Table 2 that it requires 1 acre of hayland to provide the hay and 4 acres of pastureland to provide the grazing necessary for 1 animal unit.¹ This is a total of 5 acres per animal unit.

Table 1. Pasture Production in AUM's of Grazing from Several Grass Species Employed in a Full-Season Pasture System

Pasture	Acres	Cows	Calves	Animal Units	Acres per A.U.	Days Grazed	AUM's of Grazing
Crested							
Wheatgrass	8	10	0	10	.8	40	13.333
Brome grass-Intermediate							
Wheatgrass-Alfalfa	12	10	8	10	1.2	65	21.667
Switchgrass	6	6	6	6	1.0	40	8.0
Russian							
Wildrye	8	8	8	8	1.0	45	12.0
Total	34				4.0	190	55.0

AUM's of grazing per acre = $55 \div 34 = 1.62$

Source: Charles R. Krueger, Raymond A. Moore, and Lawrence B. Embury, preliminary unpublished data from Pasture Research Center, Norbeck, South Dakota.

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¹One A.U. (animal unit) is equal to 1,000 lbs. of liveweight, or one cow and calf.

Table 2. Forage Production and Land Requirements Per Animal Unit as Obtained From a Full-Season Pasture Program

Pasture	Acres of Pasture		Tons of Hay	DAYS OF GRAZING PER ANIMAL UNIT							Total
	Hayland	Acres		April	May	June	July	Aug.	Sept.	Oct.	
Cresed Wheatgrass	---	.8	---	13	27	---	---	---	---	---	40
Brome-Intermediate	---	---	---	---	---	---	---	---	---	---	---
Wheatgrass-Alfalfa	---	1.2	---	---	4	30	6	16	9	---	65
Switchgrass	---	1.0	---	---	---	---	25	15	---	---	40
Russian Wildrye	---	1.0	---	---	---	---	---	---	21	24	45
Brome-Alfalfa	1.0	---	1.8	---	---	---	---	---	---	---	---
TOTAL	1.0	4.0	1.8	13	31	30	31	31	30	24	190

Source: Charles R. Krueger, Raymond A. Moore, and Lawrence B. Embry, preliminary unpublished data from Pasture Research Center, Norbeck, South Dakota.

Full-Season Pasture

Assuming 100 acres of land that could be established in a full-season pasture system, the following land use program may be employed. Such a land use program will provide all the forage requirements for a beef cow herd of 17 cows under the production rates set forth in Tables 1 and 2.

Crop Description	Acres
Crested Wheatgrass	16
Brome-Int. Wheatgrass-Alfalfa	24
Switchgrass	20
Russian Wildrye	20
Total Pastureland	80
Bromegrass-Alfalfa for Hay	20
Total Acres	100

Each cow in the herd will result in 1.15 animal units of grazing if replacement heifers are calved at two years of age. The 1.15 animal units were calculated as follows:

1 cow	= 1.00 A.U.
1/25 of a bull	= .05 A.U.
16% of a yrkg. heifer	= .10 A.U.
Total	= 1.15 A.U.

The preceding A.U. for each cow unit could vary somewhat depending upon culling practices. If heifers are calved as three-year olds, it will be necessary to add 0.13 animal units for maintaining two-year-old replacement heifers.

The assumption of calving at two years of age results in the following conditions:

- (1) 5 acres per A.U. x 1.15 A.U. per cow = 5.75 acres per cow to obtain all forage requirements.
- (2) 100 acres ÷ 5.75 = 17.4 cow units that can be maintained on 100 acres of land. This may be rounded off to 17 cows per 100 acres.

Based upon data presented in Table 1 and upon the preceding analysis of animal units, it seems reasonable to expect that the full-season pasture system will require about 5.88 acres per cow. This will provide all the forage needed to maintain the beef cow herd and allow some grazing for the calf.

Short-Season Pasture

Bromegrass-intermediate wheatgrass-alfalfa used as a short-season pasture has provided 130 days of grazing at the Pasture Research Center, Norbeck, South Dakota. Data on production rates for short-season pastures are presented in Table 3. The number of acres required to support 10 cows will vary from season-to-season; however, a normal requirement is about 28 acres.

One animal unit grazed for 130 days will require 4.33 AUM's of grazing (130 ÷ 30). There will be 235 days during which hay must be fed. This will require 2.44 tons of hay per animal unit. On the basis of 1.15 animal units for each cow in the herd, it will require a total of 4.98 AUM's of grazing and 2.8 tons of hay to support one beef cow unit. This will require 1.55 acres of land to provide the hay and 3.21 acres to provide the grazing for each beef cow unit. To produce the necessary forage, about 67% of the land must be in grazing and 33% in hayland. On this basis, 100 acres of land will carry 21 cows.

Native Grass

Table 3 shows that native pasture has produced .77 AUM's of grazing per acre. It has provided 170 calendar days of grazing.

One A.U. grazed on native pasture for 170 days utilizes 5.67 AUM's of grazing (170 ÷ 30). This leaves 195 days of supplemental feeding requiring 2.02 tons of hay per animal unit. On the basis of 1.15 animal units for each beef cow in the herd it will require 2.3 tons of hay and 6.52 AUM's of grazing per cow unit in the herd.

Table 3. Pasture Production on Bromegrass-Intermediate Wheatgrass-Alfalfa and Native Grass Used as Short-Season Pastures

Pasture	Acres	Tons Hay Per Acre*	A.U.	Acres per A.U.	Days Grazed	AUM's per Acre
Native	100	---	13.6	7.35	170	.77
Brome-Int.-Alf.	28	.75	10	2.8	130	1.55

*One-half the grazing land harvested for hay under rotational grazing. Source: Charles R. Krueger, Raymond A. Moore and Lawrence B. Embry, preliminary unpublished data from Pasture Research Center, Norbeck, South Dakota.

**Table 4. Establishment and Maintenance Costs per Acre for Pasture Crops
in a Full-Season Pasture Program**

Item	Crested Wheatgrass	Bromegrass Intermediate Wheatgrass Alfalfa	Switchgrass	Russian Wildrye	Bromegrass- Alfalfa for Hay
Establishment Costs:					
Machine Ownership*	\$ -----	\$ -----	\$ -----	\$ -----	\$ -----
Machine operations (gas, fuel, oil, grease and repairs)	2.86	2.86	2.86	2.86	2.86
Grass seed	2.00	7.66	6.00	10.50	4.65
Companion crop seed	-----	0.96	-----	-----	0.96
Chemicals	-----	-----	-----	-----	-----
Fertilizer	6.21	6.21	6.21	6.21	6.21
Harvest Costs:					
Companion crop†	-----	4.00	-----	-----	4.00
Hay crop	-----	-----	-----	-----	-----
Total Costs	\$11.07	\$21.69	\$15.57	\$19.57	\$18.68
Returns:					
Value of companion crop	-----	10.83	-----	-----	10.83
Government cost share payments	3.50	6.31	6.25	8.50	4.80
Total Returns	\$ 3.50	\$17.14	\$ 6.25	\$ 8.50	\$15.63
Net Establishment Cost	\$ 7.57	\$ 4.55	\$ 9.32	\$11.07	\$ 3.05
Ten-year average cost‡	\$ 0.76	\$ 0.57	\$ 0.93	\$ 1.11	\$ 0.38
Annual Costs:					
Chemical	-----	-----	0.70	-----	-----
Fertilizer	5.76	‡	3.84	5.76	-----
Hay harvest	-----	-----	-----	-----	3.44
Average Annual Cost	\$ 6.52	\$ 0.57	\$ 5.47	\$ 6.87	\$ 3.82

*No ownership costs are charged against pasture establishment. These are assumed to be borne by the cropping program. If the acres of cropland are reduced, it may be logical to charge grassland with some of the ownership costs. See Appendix Table 3 for ownership costs.

†Cost for custom combining.

‡Bromegrass-Alfalfa grassland is depreciated over an 8-year life for purposes of this analysis.

‡In some instances, over the life of the pasture, it may be necessary to make fertilizer application to maintain pasture productivity.

If all grazing is assumed to come from native pasture and all hay from cropland, the above conditions will require 8.46 acres of native pasture for each 1.28 acres of bromegrass-alfalfa hay (based on 1.8 ton yield per acre). Following this further, it will require an amount of cropland equal to 15.13% of native pasture to be used for hay production. Approximately 87 acres of native pasture and 13 acres of bromegrass-alfalfa hay will be needed to support 10 cows.

Establishment and Maintenance Costs

Table 4 presents establishment and maintenance costs for pasture crops in a full-season pasture program. Costs in this table are based upon management practices carried out at the Pasture Research Center, Norbeck, South Dakota and upon machine costs calculated for the necessary machine operations. It is very important for individual farm and ranch operators to recognize that no single cost figure for pasture establishment can be presented as representative of all situations. Large and significant variations can exist between individual farms or ranches. Table 4 presents the cost structure that can be used as a guide for determining establishment costs on an individual farm or ranch. The data in Table 4 are the cost data assumed in this analysis. Detailed specifications for arriving at the costs as revealed in Table 4 are presented in Appendix Tables 3 and 4. Cultural practices

for the establishment of pasture grasses can vary considerably. If clean stubble is used for a seedbed, there is not much expense involved in seedbed preparation (4). A satisfactory seedbed can be prepared in many ways. Machine costs, as presented in Table 4, represent only the variable costs (fuel, oil, grease and repairs) to plow, disk, harrow and plant with a seeder that has depth control. If custom hiring is used, one may substitute custom hiring costs for the machine costs in estimating cost of establishment. Additional factors that may cause variation in establishment costs include: fertilizer recommendations (based on a soil test), companion crops are not always necessary, weed problems differ between farms, the life span of pastures may vary from those assumed in this analysis and government cost sharing may or may not be available.

Total establishment costs, as shown in Table 4, represent machine costs, seed, weed control chemicals and fertilizer plus the harvesting cost for an oats companion crop. To arrive at net establishment costs, total establishment costs are reduced by the value of the companion crop and government cost share payments. The net establishment costs are amortized over a reasonable period of time. In this analysis, brome-grass-intermediate wheatgrass- alfalfa is assumed to have an eight-year life and all other pasture grasses

have an assumed ten-year life. Annual maintenance costs, made up of weed control chemicals and fertilizers, are added to the establishment cost to arrive at the average annual cost of establishment and maintenance. It varies from 57 cents per acre for brome-grass-intermediate wheatgrass-alfalfa up to \$6.87 per acre for Russian wildrye.

The data in Table 4 are the basis for the following pasture costs for a full-season pasture on 100 acres of land.

16 acres of Crested Wheatgrass.....	\$104.32
24 acres of Brome-Int. Wht.-Alf.	13.68
20 acres of Switchgrass.....	109.40
20 acres of Russian Wildrye.....	137.40
20 acres of Brome-Alf. for hay.....	76.40
Total Direct Costs	\$441.20

BEEF COW ENTERPRISE

Production Assumptions

The returns that may be realized from a beef cow herd depend upon the level of production efficiency attained and prices received. Many factors may influence the level of production efficiency. Experience at the Pasture Research Center indicates that an early spring pasture will permit calving on pasture and frequently results in saving one or two more calves out of a 100 cow herd. When the shorter season pastures are used, cows are calved in dry lot. Weather conditions sometimes become very unfavorable for calving in dry lot. The assumption is therefore made in this analysis that a 93% calving rate is attainable on full-season pastures relative to a 92% calving rate on short-season pastures.

Animal science studies on pasture utilization by beef cows have further indicated that the pasture series system produces calves that are 10 lbs. heavier at weaning time than calves produced on shorter season pastures (2). This difference in weaning weight is also assumed for purposes of this analysis.

Additional assumptions made in arriving at the costs and returns for the beef cow enterprise are based upon long-term normal expectations under management that is assumed to be average or slightly above average. The beef cow budget, presented in Table 5, assumes a 92% calf crop, feeder calves sold in October, replacements first calved as 2-year olds, 16% of replacements are raised and one bull per 25 cows. Data for this table are derived from work completed by Aanderud, Barber and Dahl (3).

Price assumptions used in beef production are based upon prices received for choice feeder calves at the Omaha market. Monthly prices received for choice steer feeder calves and choice heifer feeder calves at the Omaha market for the years 1961-70 are presented in Tables 1 and 2 of the Appendix. Prices for steer feeder calves sold during October have averaged \$32.89 per cwt. in the recent five-year period of 1966-70. Heifer prices averaged \$29.54 per cwt.—\$3.35 per cwt. under the feeder steer prices—during the same period. It must be recognized, however, that grade and quality of feeder cattle can greatly influence the price received. Price data presented in

Table 5. Costs and Returns for One Beef Cow Unit, Feeder Calf Sold, October, Replacements First Calve as 2-Year Olds, 92 Percent Calf Crop, 16 Percent Replacements Raised, One Bull Per 25 Cows; Two Livestock Market Price Levels

Item	10 Year Ave. Price	5 Year Ave. Price
	Price	Price
Steer calves	32c	34c
Heifer calves	29c	31c
Cull heifers	26c	28c
Cull cow	16c	18c
Receipts:		
46% of 425 lb. steer	\$ 62.56	\$ 66.47
28% of 375 lb. heifer	30.45	32.55
2% of 600 lb. cull heifer	3.12	3.36
15% of 1000 lb. cull cow	24.00	27.00
Total Receipts	\$120.13	\$129.38
Operating Expenses:		
Grain, mineral and supplement	\$ 13.75	\$ 13.75
Breeding charge	4.00	4.00
Vet., Mktg. and Equip. repairs	6.34	6.34
General Overhead (tel., elect., etc.) ..	3.00	3.00
Total Operating Expenses	\$ 27.09	\$ 27.09
Income over direct cost	\$ 93.04	\$102.29
Property taxes, insurance, and depreciation on bldgs. and equipment	7.92	7.92
Return to labor, capital and management	\$ 85.12	\$ 94.37
Interest on operating capital (7% of \$300 and \$313)	21.00	21.91
Return to land, labor and management ..	\$ 64.12	\$ 72.46

Source: Guidebook for Planning a Farm or Ranch Business, Extension Circular No. 633 (Rev.) Cooperative Extension Service, South Dakota State University, U.S.D.A., December, 1970.

the Appendix Tables represents the daily mean of the range of quotations. It is not uncommon for price quotations on choice grade feeder cattle to range \$3.00 between the daily high and low quotations. This would be about \$1.50 above and below the daily mean.

It is also important to recognize the great range in prices between favorable and unfavorable price periods. Prices received during 1966-70 were relatively more favorable than during 1961-65. It is not assumed to be a wise course of action to plan on the basis of the most favorable price period. Therefore, the costs and returns in this analysis are computed under two price levels. One is based upon the recent five-year average price and the other upon the recent ten-year average price.

It is further assumed that the quality of feeder cattle will be such as to command a price in the upper quartile of the range of daily quotations for the month of October. Specifically, this results in selecting a five-year average price of \$34 per cwt. for choice feeder steers and \$31 per cwt. for choice feeder heifers. Specialized markets for sale of calves as breeding stock or as "brand name" feeder cattle are not considered. Prices for feeder calves during the ten-year period 1961-70 were selected in the same manner as for the recent five-year period. This results in \$32 per cwt. for steers and \$29 per cwt. for heifers.

**Table 6. Annual Operating Capital Requirements
Per Cow Unit**

Item	10-Year Ave. Price	5-Year Ave. Price
Average cow value	\$200.00	\$210.00
1/25 bull @ \$600	24.00	24.00
Replacement heifers (16% of \$235 and \$250)	37.60	40.00
Other direct costs (.5 x \$13.34)	6.67	6.67
Grain and forage (.2 x grain, pasture and forage costs)	variable	variable
Land tax (.2 x taxes on land required per cow)	variable	variable
Property taxes and insurance (.2 x \$6.10)	1.22	1.22
Buildings and equipment	16.00	16.00
Total (excluding land tax and feed capital)	\$285.49	\$297.89

Table 6 presents the annual operating capital requirements per cow unit. Annual capital is defined as being the total capital required times the portion of a year that the capital is employed. This procedure permits interest charges to be found by multiplying the total annual capital by the interest rate. Table 6 shows that capital requirements per cow unit considering taxes on land and capital for grain and forage costs vary with the land use system. Land in native grass is assumed to have a lower value than land suitable for crop production. Total operating capital, as presented in Table 6, does not include capital for land taxes, grain or forage.

Costs and Returns in Beef Production

Costs and returns for beef cow herds are presented on the basis of the number of cows that can be supported on 100 acres of land under each of the three different land use treatments. Data on the three systems are presented in Tables 7, 8, and 9. It should be noted that the returns in Table 7 are computed on the basis of a 1 percent larger calf crop and 10 lbs. heavier sale weight per calf than for the other land use systems. These results are based upon experience at the Pasture Research Center as explained previously under the discussion on production assumptions. Table 7 contains data for the full-season pasture system.

The return to labor and management from 100 acres of land is highest for the bromegrass-intermediate wheatgrass-alfalfa pasture. Returns to labor and management are lowest under the full-season pasture program when 1961-70 prices are used. If 1966-70

**Table 7. Costs and Returns from a 17 Unit Beef Cow Herd on
100 Acres of Land Utilizing a Full-Season Pasture System;
Two Livestock Market Price Levels**

Analysis Factors	Price 10-Year Ave.	Price 5-Year Ave.
Cull calves	32c	34c
Heifer calves	29c	31c
Cull heifers	26c	28c
Cull cow	16c	18c
Receipts:		
47% of 435 lb. steer	\$1,112.21	\$1,181.72
28% of 385 lb. heifer	531.45	568.11
2% of 600 lb. cull heifer	53.04	57.12
15% of 1000 lb. cull cow	408.00	459.00
Total Receipts	\$2,104.70	\$2,265.95
Operating Expenses:		
Grain, mineral and supplement	\$ 233.75	\$ 233.75
Pasture and forage costs	441.20	441.20
Breeding charge	68.00	68.00
Vet., Marketing and equip. repairs	107.78	107.78
General overhead	51.00	51.00
Total Operating Expenses	\$ 901.73	\$ 901.73
Income Over Direct Costs	\$1,202.97	\$1,364.22
Property taxes, insurance and depreciation	134.64	134.64
Taxes on land	150.00	150.00
Net Income:		
Return to Land Capital, Operating Capital, Labor and Management	\$ 918.33	\$1,079.58
Interest on operating capital @ 7%	\$ 351.28	\$ 366.02
Interest on land capital (5% x \$10,000)	500.00	500.00
Return to Labor and Management	\$ 67.05	\$ 213.56
Total operating capital	\$5,018.32	\$5,228.92
Total operating capital per acre	50.18	52.28
Hours of labor per acre:		
Livestock labor	1.02	1.02
Hay making labor (per acre on 100 acres) .....	.48	.48
Total hours per acre	1.50	1.50
Return to labor and management per hour	\$ 0.44	\$ 1.42
Return to labor and management per cow	\$ 3.94	\$ 12.56
Return to labor and management per acre	\$ 0.67	\$ 2.14
Percent return on all capital*	4.62%	5.61%

*Labor charged at \$1.50 per hour.

prices are used, it is the native pasture program that exhibits lowest returns. It is significant to note that during rising beef cattle prices the pasture program with highest carrying capacity will gain in economic advantage over any program with a lesser carrying capacity. Returns rise faster than costs for programs with high beef sales per acre. The return to labor and management, under the favorable beef cattle prices of the recent five-year period, vary from \$2.05 per acre for the native grass pasture program to \$7.21 per acre

Table 8. Costs and Returns from a Ten-Cow Herd on 100 Acres of Land Utilizing Native Grass for Pasture and Brome-Alfalfa for Hay; Two Livestock Market Price Levels

Item	10-Year Ave. Price	5-Year Ave. Price
	Steer calves 32c	34c
	Heifer calves 29c	31c
	Cull heifers 26c	28c
	Cull cow 16c	18c
Receipts:		
46% of 425 lb. steer	\$ 625.60	\$ 664.70
28% of 375 lb. heifer	304.50	325.50
2% of 600 lb. cull heifer	31.20	33.60
15% of 1000 lb. cull cow	240.00	270.00
Total Receipts	\$1,201.30	\$1,293.80
Operating Expenses:		
Feed (exclude pasture and hay) ..	\$ 137.50	\$ 137.50
Hay cost on 13 acres	49.66	49.66
Native pasture maintenance cost ..	43.50	43.50
Breeding charge	40.00	40.00
Vet., Marketing, Equip. repair....	63.40	63.40
General overhead	30.00	30.00
Total Operating Expenses	\$ 364.06	\$ 364.06
Income Over Direct Costs	\$ 837.24	\$ 929.74
Property taxes, insurance and depreciation	\$ 79.20	\$ 79.20
Taxes on land	106.50	106.50
Net Income:		
Return to Land Capital, Operating Capital, Labor and Management	\$ 651.54	\$ 744.04
Interest on operating capital @ 7%	\$ 204.56	\$ 213.24
Interest on 13 acres of hayland (5% x \$1,300)	\$ 65.00	65.00
Interest on 87 acres native grass (5% x \$5,220)	261.00	261.00
Return to Labor and Management ..	\$ 120.98	\$ 204.80
Total operating capital	\$2,922.34	\$3,046.34
Total operating capital per acre....	29.22	30.46
Hours of labor per acre:		
Livestock labor .....	.60	.60
Hay making labor (on 100 acres) ..	.31	.31
Total hours per acre .....	.91	.91
Return to labor and management per hour	\$ 1.33	\$ 2.25
Return to labor and management per cow	\$ 12.10	\$ 20.48
Return to labor and management per acre	\$ 1.21	\$ 2.05
Percent return on all capital*	5.45%	6.35%

*Labor computed at \$1.50 per hour.

for the brome-grass-intermediate wheatgrass-alfalfa pasture. The full-season pasture program brought \$2.14 per acre.

When average prices during the recent ten-year period are used, the returns to labor and management are 67 cents per acre for the full-season pasture, \$1.21 per acre for the native grass with brome-grass-alfalfa hay and \$5.45 per acre for the brome-grass-intermediate wheatgrass-alfalfa.

Table 9. Costs and Returns from a 21-Cow Herd on 100 Acres of Land Utilizing Brome-Intermediate Wheatgrass-Alfalfa for Pasture and Brome-Alfalfa for Hay; Two Livestock Market Price Levels

Item	10-Year Ave. Price	5-Year Ave. Price
	Steer calves 32c	34c
	Heifer calves 29c	31c
	Cull heifers 26c	28c
	Cull cows 16c	18c
Receipts:		
46% of 325 lb. steer	\$1,313.76	\$1,395.87
28% of 375 lb. heifer	639.45	683.55
2% of 600 lb. cull heifer	65.52	70.56
15% of 1000 lb. cull cow	504.00	567.00
Total Receipts	\$2,522.73	\$2,716.98
Operating Expenses:		
Grain, mineral and supplement ..	\$ 288.75	\$ 288.75
Hay cost on 33 acres hayland	126.06	126.06
Pasture costs (67 acres)	38.19	38.19
Breeding charge	84.00	84.00
Vet., Marketing and Equip. repair	133.14	133.14
General overhead	63.00	63.00
Total Operating Expenses	\$ 733.14	\$ 733.14
Income Over Direct Costs	\$1,789.59	\$1,983.84
Property taxes, insurance and depreciation	\$ 166.32	\$ 166.32
Land taxes	150.00	150.00
Net Income:		
Return to Land Capital, Operating Capital, Labor and Management	\$1,473.27	\$1,667.52
Interest on operating capital @ 7%	\$ 428.11	\$ 446.34
Interest on land capital (5% x \$10,000)	500.00	500.00
Return to Labor and Management ..	\$ 545.16	\$ 721.18
Total operating capital	\$6,115.84	\$6,376.24
Total operating capital per acre	61.16	63.76
Hours of labor per acre:		
Livestock labor	1.26	1.26
Hay making labor (on 100 acres) .....	.79	.79
Total hours per acre	2.05	2.05
Return to labor and management per hour	\$ 2.66	\$ 3.52
Return to labor and management per cow	\$ 25.96	\$ 34.34
Return to labor and management per acre	\$ 5.45	\$ 7.21
Percent return on all capital*	7.23%	8.31%

*Labor computed at \$1.50 per hour.

GRAIN ENTERPRISE

Production Assumptions

Corn-wheat production is a most likely alternative to grass on land suitable for crop production. Returns in grain production may fluctuate considerably from year to year depending upon yield levels and prices received. Many factors can influence yield levels—including land capability and variation in weather patterns. The average corn and wheat yields as given by the Crop and Livestock Reporting Service for Faulk and Edmunds Counties are as follows:

Average Yield Per Acre Planted
Corn (bu.) Wheat (bu.)

Five-year ave., 1966-70	35.9	17.9
Ten-year ave., 1961-70	30.3	16.1

For purposes of this analysis the preceding yields are assumed in arriving at costs and returns in grain production.

Table 10 presents the production costs computed for a corn-wheat rotation. Data in this table are based upon information in the **Soil Atlas and Crop Production Guide for North Central South Dakota** (5). Machine costs have been increased from those reflected in the Soil Atlas to reflect current price levels. Total production costs amount to \$17.06 per acre for the corn-wheat rotation.

Table 10. Production Costs Per Acre of Land Utilizing a Corn-Wheat Rotation

Production Costs	Corn	Spring Wheat	Rotation Total	Rotation Average
Machine Ownership	\$ 5.30	\$ 4.90	\$10.20	\$ 5.10
Machine Operation	3.60	3.10	6.70	3.35
Seed	2.85	2.50	5.35	2.68
Fertilizer	4.30	1.76	6.06	3.03
Weed Control	1.70	.50	2.20	1.10
Insect Control	3.47	.14	3.61	1.80
Total Production Costs....	\$21.22	\$12.90	\$34.12	\$17.06

Source: Soil Atlas and Crop Production Guide for North Central South Dakota, Extension Circular No. 660, Cooperative Extension Service, South Dakota State University, and Ten Steps in Planning Your Farm or Ranch Business, Extension Circular No. 632 (Rev.), Updated Cost Figures for Fall-Winter 1970-71.

Returns from Grain Production

Costs and returns for a corn-wheat rotation on 100 acres of land are presented in Table 11. Returns based on a ten-year average yield and on a five-year average yield are included in Table 11. The return

Table 11. Costs and Returns on 100 Acres of Land Utilizing a Corn-Wheat Rotation, Corn Priced at \$1.10, Wheat Priced at \$1.50

	Based on 10-Year Ave. Yield	Based on 5-Year Ave. Yield
Corn yield	30	36
Spring Wheat yield	16	18
Total Returns	\$2,850.00	\$3,330.00
Production costs (from Table 10)	\$1,706.00	\$1,706.00
General overhead (5% of production costs)	85.30	85.30
Crop Insurance (3% of gross value)	85.50	99.90
Taxes on land	150.00	150.00
Total costs	\$2,026.80	\$2,041.20
Return to Land, Operating Capital, Labor and Management (Net Income)	\$ 823.20	\$1,288.80
Interest on Annual Operating Capital (.5 x total costs x .07)	\$ 70.93	\$ 71.44
Interest on Land Capital (5% x \$10,000)	500.00	500.00
Return to Labor and Management	\$ 252.27	\$ 717.36
Annual operating capital per acre	\$ 10.13	\$ 10.21
Hours of labor per acre	2.60	2.60
Return to labor and management per hour	\$ 0.97	\$ 2.76
Return to labor and management per acre	\$ 2.52	\$ 7.17
Percent return on all capital	3.93%	8.15%

to labor and management is \$2.52 per acre when the recent ten-year average yields are assumed and \$7.17 per acre when the recent five-year average yields are assumed. Corn is priced at \$1.10 per bushel and wheat at \$1.50 per bushel.

SUMMARY

A summary of the costs and returns from several land use programs is presented in Table 12. Government cost-share payments are included in this analysis; although, these payments may not be available in all instances. Individual operators will need to recognize these payments whenever they apply.

Assuming the forage production rates as obtained at the Pasture Research Center and prices and yields realized during the recent five-year period, the data in this analysis indicate that net income is highest for land under a brome-grass-intermediate wheatgrass-alfalfa pasture. The net income for 100 acres of this type of pasture land is \$1,667.52. Grain production is next highest with \$1,288.80. A full-season pasture program brings a net income of \$1,079.58 and native pasture brings \$744.04

Net farm income represents a return to operating capital, land capital, labor and management. This is

the net return after subtracting all fixed and variable costs. It is the amount of money available for family living without reducing capital investments. However, the figures as presented in this report have assumed no borrowed money. This means that the return to land, labor, capital and management has no interest payment subtracted. When money is borrowed, interest payments become a direct cash cost and reduce the net farm income.

When a charge for capital is subtracted (thus arriving at a return to labor and management), grain production brings equally high returns under conditions of the recent five-year period. Return to labor and management for grain on 100 acres of land is \$717.36. The brome-grass-intermediate wheatgrass-alfalfa pasture brings \$721.18 followed by the full-season pasture with \$213.56. The native pasture returns \$204.80 to labor and management.

Table 12. Summary of Costs and Returns on 100 Acres of Land Under Several Land Use Programs

Item	Livestock Returns						Returns from Grain Production	
	Based on 1961-70 Ave. Price			Based on 1966-70 Ave. Price			Based on 1961-70	Based on 1966-70
	Full-Season Pasture	Brome-Int. Wht.-Alfalfa	Native Pasture	Full-Season Pasture	Brome-Int. Wht.-Alfalfa	Native Pasture	Average Yields	Average Yields
Net Income	\$918.33	\$1,473.27	\$651.54	\$1,079.58	\$1,667.52	\$744.04	\$823.20	\$1,288.80
Return to Labor and Management \$	67.05	\$ 545.16	\$120.98	\$ 213.56	\$ 721.18	\$204.80	\$252.27	\$ 717.36
Discounted return to labor and mgt. (to allow for time delay in establishment)	\$ 60.96	\$ 484.65	-----	\$ 194.15	\$ 641.13	-----	-----	-----
No. of Cows Supported on 100 Acres of Land	17	21	10	17	21	10	-----	-----
Acres per cow	5.88	4.76	10	5.88	4.76	10	-----	-----
Operating capital per acre	\$ 50.18	\$ 61.16	\$ 29.22	\$ 52.28	\$ 63.76	\$ 30.46	\$ 10.13	\$ 10.21
Hours of Labor per acre	1.5	2.05	.91	1.5	2.05	.91	2.6	2.6
Return to Labor and Management Per hour	\$ 0.44	\$ 2.66	\$ 1.33	\$ 1.42	\$ 3.52	\$ 2.25	\$ 0.97	\$ 2.76
Per cow	\$ 3.94	\$ 25.96	\$ 12.10	\$ 12.56	\$ 34.34	\$ 20.48	-----	-----
Per acre	\$ 0.67	\$ 5.45	\$ 1.21	\$ 2.14	\$ 7.21	\$ 2.05	\$ 2.52	\$ 7.17
Per dollar of all capital*	\$ 0.046	\$ 0.072	\$ 0.055	\$ 0.056	\$ 0.083	\$ 0.064	\$ 0.039	\$ 0.081

*Labor computed at \$1.50 per hour.

Table 12 also presents the returns to labor and management on a per hour, per cow, per acre and per dollar of capital basis for comparison purposes. If one is interested in reducing his labor load or is limited on labor supply, one may wish to choose an activity that brings high returns to labor. If capital is a limiting factor or if capital must be borrowed, the returns to capital may be the most important criteria. Table 12 shows that under conditions of the recent five-year period the return to all capital has been 8.1% for grain production and 8.3% for the brome-grass-intermediate wheatgrass-alfalfa pasture. The native pasture program returned 6.4% while the full-season pasture program returned 5.6% under price and yield assumptions of the recent five-year period.

The figures discussed in the preceding paragraphs do not allow for any time delays in pasture establishment. In estimating returns, it is important to recognize that it will require at least one year delay from time of seeding until time of grazing. This does not allow for possible seeding failures. To illustrate the effect of such delays a discounted return to labor and management is given in Table 12. These figures are

computed on the basis of a one year delay in establishing all pastures. Assuming an eight-year life for brome-grass-intermediate wheatgrass-alfalfa and a one year delay for establishment, it would mean that the income from eight years of pasture production must be amortized over a nine-year period. This results in a 11.1% discount rate. The return to labor and management under price conditions from 1966-70 is reduced from \$721.18 to \$641.13. This would represent an annual average return over a nine-year period. The full season pasture program with a one year delay in establishment and a ten-year life, would result in a 9.09% discount rate. When delays in pasture establishment are considered, the returns from grain production have the greatest advantage. This advantage decreases as pasture longevity increases.

Beef production requires a higher capital investment per acre. It requires from \$50 to \$65 per acre in annual operating capital compared to \$10 to \$12 per acre for grain production. Beef production, however, may be considered as having a lower risk than grain production, and the hours of labor required per acre are lower.

CONCLUSIONS

The brome-grass-intermediate wheatgrass-alfalfa pasture system brings the highest return to labor and management of any of the three pasture programs studied in this analysis. This system provides for more intensive land use and brings a higher return per unit of resources employed. Such a pasture program may also be very competitive with grain production in Central South Dakota. Under prices and yields of the recent five-year period, grain production brought the highest returns to labor and management when consideration is given to time delay in pasture establishment. Under prices and yields of the recent ten-year

period, however, the brome-grass-intermediate wheatgrass-alfalfa pasture system for beef production brought the highest return to labor and management.

It should be recognized that there may be other systems of pasture management that are more profitable than those studied in this analysis. An example might be a single cool-season pasture and a single warm-season pasture used in combination. Another alternative may be a crested-wheatgrass-alfalfa mixture for early spring grazing and later harvested as a hay crop.

It should also be emphasized that small variations from the assumptions made in this analysis can be the determining factor as to which land use program brings the most favorable return. A change of \$1.00 in beef prices or a variation of 10 lbs. per acre in the amount of fertilizer applied to crop production can make the difference between the most profitable or least profitable alternative. Comparable studies on seeding cropland to grass have been made at North Dakota State University. Studies on cropland in Southwestern North Dakota indicated that "... the margin between grass seeding for pasture and cash grains is fairly small" (6).

The conditions influencing a decision in any land

use program are highly variable from farm to farm and also between individuals. The analysis presented here outlines a method and procedure for determining the profitability of a pasture program on your farm or ranch. A work form to determine returns from pastureland is presented in the Appendix.

The results of this analysis indicate that grass production may be competitive with grain production on many farms in North Central South Dakota. Whether or not it is competitive on any individual farm or ranch depends upon the production rates that can be achieved under the conditions that exist and also upon prices received.

REFERENCES

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- (2) Harold King, L. B. Embry, R. A. Moore, G. B. Haiwick, C. R. Krueger and J. E. Olson, *Effects of Level of Wintering and Pasture System on Performance of Beef Females Through Four Calf Crops*, progress report presented at Nobeck Pasture Field Day, July 13, 1971, South Dakota State University, Brookings, South Dakota.
- (3) Wallace G. Aanderud, Myron T. Barber and Mervyn M. Dahl, *Guidebook for Planning a Farm or Ranch Business*, Extension Circular No. 633 (Rev.), Cooperative Extension Service, South Dakota State University, U.S.D.A., December, 1970.
- (4) Raymond A. Moore and Gary B. Haiwick, "Establishing Pasture and Forage Crops," *South Dakota Farm and Home Research*, Vol. XX, No. 2, Agricultural Experiment Station, South Dakota State University, Brookings, Spring 1969, pages 6-9.
- (5) Lyle A. Derscheid and Fred C. Westin, *Soil Atlas and Crop Production Guide for North Central South Dakota*, Extension Circular No. 660, Cooperative Extension Service, South Dakota State University, Brookings, page 37.
- (6) Ronald D. Krenz, LeRoy W. Schaffner and Enrique Valdivia, *Seeding Cropland to Grass in Southwestern North Dakota*, Bulletin No. 470, Agricultural Experiment Station in cooperation with Economic Research Service, U.S.D.A., North Dakota State University, Fargo, North Dakota, November, 1967, page 23.

APPENDIX

Table 1. Choice Steer Feeder Calf Prices, Omaha 300-550 lbs.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
1970	36.25	36.85	37.19	38.50	38.94	38.81	39.00	38.50	38.65	38.08	37.19	36.00	37.83
1969	30.36	30.25	31.38	33.64	36.19	37.38	36.70	35.81	35.69	35.30	35.25	35.80	34.48
1968	29.15	29.19	29.62	29.94	30.15	30.48	30.75	30.75	30.62	30.35	30.50	30.75	30.19
1967	30.00	29.50	29.00	29.00	29.45	30.38	31.00	31.25	31.12	30.38	29.95	30.25	30.11
1966	28.81	29.98	31.46	30.88	30.30	29.75	29.75	29.95	30.69	30.38	30.25	30.06	30.19
5-Year Ave.	30.91	31.15	31.73	32.39	33.00	33.36	33.44	33.25	33.35	32.89	32.62	32.57	32.56
1965	23.74	23.52	23.40	24.61	26.25	27.65	27.75	27.75	27.70	27.75	27.89	28.50	26.38
1964	27.25	27.19	27.00	25.65	25.19	24.75	24.53	24.30	24.35	23.92	24.16	23.56	25.15
1963	32.30	30.98	29.75	29.57	29.30	29.25	29.79	29.69	29.06	28.95	28.50	27.82	29.58
1962	28.88	29.19	28.95	29.00	28.85	28.28	27.56	27.15	27.88	28.41	28.95	28.12	28.44
1961	28.50	28.69	28.69	29.52	29.49	29.12	29.06	29.55	30.69	31.56	33.12	33.12	30.09
10-Year Ave.	29.52	29.53	29.64	30.03	30.41	30.58	30.58	30.47	30.64	30.50	30.57	30.39	30.24

Source: U.S.D.A., Economic Research Service, Livestock and Meat Statistics, Statistical Reporting Service, Washington, D. C. 1961-70.

Table 2. Choice Heifer Feeder Calf Prices, Omaha 300-500 lbs.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
1970	32.28	33.19	33.31	34.85	35.12	34.75	34.75	34.75	34.60	34.50	33.52	32.80	34.04
1969	26.65	26.81	27.94	29.60	31.56	33.12	32.70	32.00	32.00	32.00	32.00	32.00	30.70
1968	25.75	25.50	25.88	26.38	26.65	27.25	27.25	27.25	27.25	27.10	27.12	27.00	26.70
1967	27.25	26.50	26.00	26.00	26.15	26.69	26.38	27.00	26.88	26.31	26.40	26.50	26.50
1966	24.75	26.20	27.86	27.44	27.25	27.00	26.75	26.80	28.25	27.81	27.52	27.28	27.08
5-Year Ave.	27.33	27.64	28.19	28.85	29.34	29.76	29.56	29.56	29.79	29.54	29.31	29.11	29.00
1965	20.25	20.25	20.55	21.22	22.69	22.44	24.50	24.50	24.75	24.75	24.16	24.40	23.01
1964	24.60	24.84	24.25	22.88	22.44	22.25	22.11	21.62	22.00	21.51	21.00	20.37	22.49
1963	28.60	27.65	27.12	27.22	26.71	26.50	27.40	27.38	26.31	26.22	25.75	24.78	26.80
1962	25.19	25.25	25.60	26.00	26.00	25.90	24.81	24.90	25.31	26.14	26.30	26.12	25.63
1961	26.20	26.00	26.00	26.00	26.00	26.00	26.00	27.09	27.75	28.15	29.38	29.25	26.98
10-Year Ave.	26.15	26.21	26.45	26.75	27.05	27.35	27.26	27.32	27.51	27.44	27.31	27.05	26.99

Source: U.S.D.A., Economic Research Service, Livestock and Meat Statistics, Statistical Reporting Service, Washington, D. C. 1961-70.

Table 3. Purchase Cost and Fuel, Oil, Grease and Repairs for Various Machine Operations

Machine Operation	New Cost of Machine*	Fuel Used Per Acre† Gals./ A	Cost/A	Repairs & Service Cost/A	Oil & Grease Cost/A
Plow (4-14's) ..	\$1,400	2.5	\$0.70	\$0.29	\$0.11
Disk (13' tandem)	1,300	.7	0.20	0.12	0.03
Harrow (30' Spiketooth) ..	700	.3	0.08	0.04	0.01
Drill, small grain with grass seeder, fertilizer and packer wheels, 14 ft.	3,800	.5	0.14	0.20	0.02
Drill, small grain, no attachments, 14 ft.	2,200	.5	0.14	0.20	0.02
Mow (once over), 7 ft.	800	.5	0.14	0.30	0.02

*Retail price, F.O.B. Brookings, March 1972. Annual ownership costs include depreciation, taxes, insurance and interest on investment.

†Calculations based on information from Wendell Bowers, Modern Concepts of Farm Machinery Management, Stipes Publishing Co., Champaign, Ill., 1970.

Table 4. Specifications for Computation of Costs Assumed in Pasture Establishment and Maintenance

Seeding rates per acre and seed prices

The following prices were assumed for this analysis. However, prices fluctuate from year to year. Farm operators will need to check on prices with their local supplier.

Crested Wheatgrass: 5 lbs. @ \$0.40 per lb.

Mixture: Smooth Bromegrass: 3.75 lbs. @ \$0.30 per lb.

Oahe, Intermediate Wheatgrass: 5.63 lbs. @ \$0.75 per lb.

Pasture Type Alfalfa: 1.9 lbs. @ \$1.22 per lb.

Switchgrass: 6 lbs. @ \$1.00 per lb.

Russian Wildrye: 7 lbs. @ \$1.50 per lb.

Bromegrass Alfalfa for Hay: 4 lbs. alfalfa @ \$0.66 per lb.

7 lbs. bromegrass @ \$0.28 per lb.

Oats companion crop: 1 bu. oats @ \$0.96 per bu.

Fertilizer

Price: N @ 9.6c/lb.; P @ 9.0c/lb.; K @ 5.5c/lb.

Rate: All seeding establishments assumed to receive 100 lbs. per acre of 10-40-30. It is recognized that this cannot serve as a recommendation for all individual situations. General fertility level (as determined by a soils test), weed problems, and other factors will influence the level of fertilizer application. Annual maintenance application assumed to be: 60 lbs. of N on crested wheatgrass and Russian wildrye, 40 lbs. of N on switchgrass. No maintenance fertilizer is assumed for bromegrass-intermediate wheatgrass-alfalfa. However, some fertilizer may be required in individual situations in order to maintain pasture productivity.

Chemicals

Clipping for weed control during pasture establishment is charged in machine operations. An annual application of 1 lb. of 2,4-D Amine per acre on switchgrass is assumed for this analysis.

WORK FORM TO ESTIMATE RETURNS FROM 100 ACRES OF PASTURELAND AND HAYLAND USED FOR BEEF PRODUCTION

A. Animal Units Per Cow in the Herd:

Enter your figure for the number of A.U. per cow in the herd. If heifers are calved as two-year-olds, you need not enter the A.U. for maintaining two-year-old heifers as replacement stock. The number of A.U. for livestock in the breeding herd based on one bull per 25 cows is given.

Description	Animal Units	Your Figures	
One cow	1.0	_____	
No. of bulls _____ ÷ No. of cows _____ x 1.25	0.05	_____	
16% of a yearling heifer	0.10	_____	Item
16% of a two-year-old heifer	0.13	_____	Number
TOTAL ANIMAL UNITS		_____	(1)

B. Pasture Carrying Capacity:

List all pasture land considered to be a part of the pasture program for the beef cow herd. Land being planned for pasture production may use carrying capacities normally expected. All livestock being grazed may be included in the animal units since the objective is to determine carrying capacity. Animal units may be computed as follows: Cow and calf = 1 A.U.; 1 bull = 1.25 A.U.; weaned calves 400-600 lbs. = .5 A.U.; 600-700 lb. cattle = .65 A.U.; 700-900 lb. cattle = .8 A.U.

Kind of Pasture	Acres	Animal Units	Days Grazed	Acres Per A.U.
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
TOTAL	_____	_____	_____	_____
	B1	B2	B3	B4

C. Land Requirements for Pasture:

	Item Number
Total pasture acres per animal unit (section B4 above)	(2)
Total pasture acres per cow in the herd (item 1 x item 2)	(3)

D. Land Requirements for Hay:

Total days of grazing (section B3 above)	(4)
Total days to feed hay (365 less item 4)	(5)
Tons of hay required per A.U. (item 5 x 0.010377)	(6)
Tons of hay per cow in the herd (item 6 x item 1)	(7)
Hay yield in tons per acre (from your own records)	(8)
Acres of hay per cow in the herd (item 7 ÷ item 8)	(9)
Hay and pasture acres per cow (item 3 plus item 9)	(10)
Percent of land in pasture (item 3 ÷ item 10 x 100)	% (11)
Percent of land in hay (100 less item 11)	% (12)
Number of cows supported by 100 acres of land (100 ÷ item 10 and rounded to the nearest whole number)	(13)

E. Forage Production Costs Per Acre:

	Crested Wheatgrass	Bromegrass Wheatgrass Alfalfa	Switch- grass	Russian Wildrye	Bromegrass Alfalfa for Hay
Establishment costs:					
Machine ownership	\$	\$	\$	\$	\$
Machine operations	2.86	2.86	2.86	2.86	2.86
Grass seed	2.00	7.66	6.00	10.50	4.65
Companion crop seed		0.96			0.96
Chemicals					
Fertilizer	6.21	6.21	6.21	6.21	6.21
Harvest companion crop (grain)		4.00			4.00
Harvest companion crop (hay)					
TOTAL COSTS	\$11.07	\$21.69	\$15.57	\$19.57	\$18.68
Returns:					
Value of companion crop	\$	\$10.83	\$	\$	\$10.83
Gov't. cost share payment	3.50	6.31	6.25	8.50	4.80
TOTAL RETURNS ..	\$ 3.50	\$17.14	\$ 6.25	\$ 8.50	\$15.63
NET ESTABLISHMENT COST	\$ 7.57	\$ 4.55	\$ 9.32	\$11.07	\$ 3.05
Average cost per year of life	\$ 0.76	\$ 0.57	\$ 0.93	\$ 1.11	\$ 0.38
Annual chemical cost			0.70		
Annual fertilizer cost	5.76		3.84	5.76	
Annual hay harvest cost					3.44
TOTAL ANNUAL COST	\$ 6.52	\$ 0.57	\$ 5.47	\$ 6.87	\$ 3.82

YOUR COSTS

Establishment costs:					
Machine ownership	\$	\$	\$	\$	\$
Machine operations					
Grass seed					
Companion crop seed					
Chemicals					
Fertilizer					
Harvest companion crop (grain)					
Harvest companion crop (hay)					
TOTAL	\$	\$	\$	\$	\$
Returns:					
Value of companion crop					
Gov't. cost share payment					
TOTAL RETURNS	\$	\$	\$	\$	\$
NET ESTABLISHMENT COST	\$	\$	\$	\$	\$
Average cost per year of life	\$	\$	\$	\$	\$
Annual chemical cost					
Annual fertilizer cost					
Annual hay harvest cost					
TOTAL ANNUAL COST	\$	\$	\$	\$	\$

H. Annual Operating Capital Per Cow Unit:

	Budget Figures	Your Figures
Average cow value	\$210.00	.....
1/25 bull @ \$600	24.00	.....
Replacement heifers (16% of heifer value)	40.00	.....
Other direct costs (0.5 x \$13.34)	6.67	.....
Grain and supplement (0.2 x item 15)	2.75	.....
Pasture and forage costs (item 14 ÷ item 13 x 0.2)	variable	.....
Tax on pastureland (0.2 x tax on acres in item 3)	variable	.....
Tax on hayland (0.2 x tax on acres in item 9)	variable	.....
Property taxes (0.2 x taxes and insurance cost per cow)	1.22	.....
Buildings and equipment	16.00	.....
TOTAL CAPITAL	variable	Item Number (18)

I. Returns from Beef Production on 100 Acres of Land:

	Your Figures
Income over expenses (item 16 x item 13) .....	.....
Less item 14 .....	.....
Income Over Direct Costs .....	.....
Less property taxes, insurance and depreciation (item 17 x item 13) .....	.....
Less land taxes on 100 acres of land .....	.....
(from your own records)	.....
NET INCOME .....	.....
Less interest on operating capital	(19)
(item 13 x item 18 x ____%)	.....
Less interest on 100 acres of land (____% x land value) ..	.....
RETURN TO LABOR AND MANAGEMENT	(20)
Total operating capital (item 13 x item 18)	(21)
Operating capital per acre (item 21 ÷ 100) .....	.....
Livestock labor per acre (6 hrs. x item 13 ÷ 100) .....	.....
Hay making labor per acre (2.4 hrs. x item 12) .....	.....
Total labor per acre (based on 100 acres)	(22)
Return to labor and management per hour item 20 ÷ (100 x item 22) .....	.....
Return to labor and management per cow item 20 ÷ item 13 .....	.....
Return to labor and management per acre item 20 ÷ 100 .....	.....
Value of labor (100 x item 22 x cost of labor per hr.)	(23)
Return to capital and management (item 19 less item 23) ..	(24)
Value of 100 acres of land (your own records)	(25)
Total capital used (item 21 plus item 25)	(26)
PERCENT RETURN ON ALL CAPITAL (item 24 ÷ item 26) ....	.....