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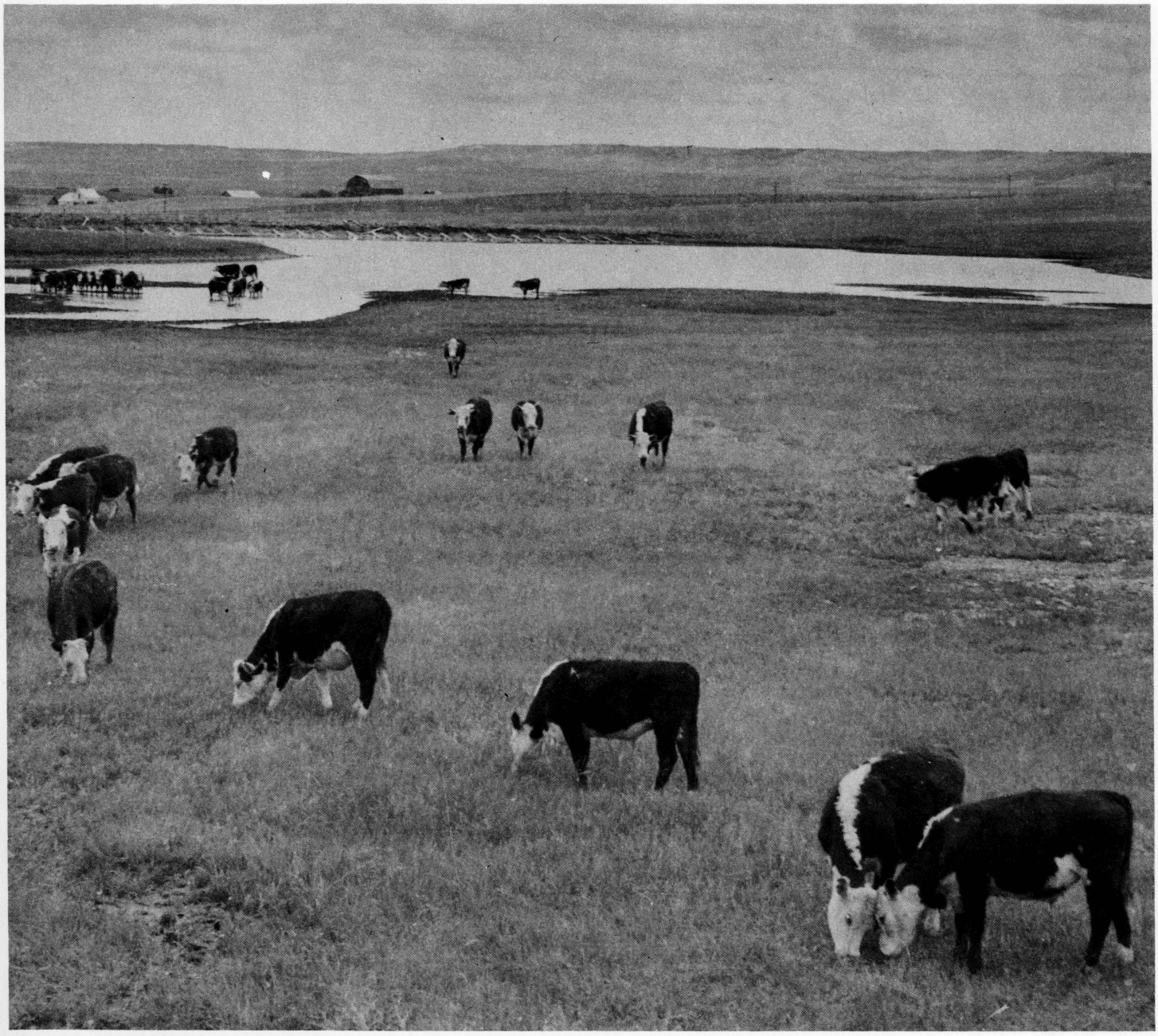

Pasture Systems: Economic Alternatives

R.C. Shane, H.R. Allen, and
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Insufficient income to provide a satisfactory standard of family living is not uncommon among farmers and ranchers in South Dakota. The high cost of land rules out expansion for many. Consequently, they must look for ways to enhance income with their existing resources.

For some, more intensive pasture management is an opportunity to increase income from their beef cow operations. This bulletin (1) investigates the economic feasibility of several pasture improvement systems and (2) estimates the impact of various productivity levels on returns to labor and management.

Pasture systems in the study

The emphasis in beef cow pasture management is on "system." Pasture management includes feeding year-round and the use of one or more pastures. "A (pasture) system is usually composed of two or more components and may include preserved forage as well as pasturage."(4) The following pasture system yield data were obtained at the Pasture Research Center near Norbeck in Faulk County, South Dakota, where average annual rainfall is 17.5 inches.

Native pasture[1]

Native pasture consisted mainly of cool-season grasses such as Kentucky bluegrass, western wheatgrass, blue grama, and green needlegrass. They provided an average of 172 continuous grazing days per year and produced 0.96 AUM's[2] per acre.

Short-season pasture

The short-season pasture system consisted of a mixture of 'Teton' pasture alfalfa, 'Achenbach' smooth bromegrass, and 'Oahe' intermediate wheatgrass. This pasture system provided an average of 130 continuous grazing days per year and produced 1.33 AUM's per acre.

Full-season pasture

The full-season pasture system used a series of pastures designed to provide season-long quality forage. This series consisted of the same alfalfa-grass mixture as the short-season pasture for late spring to early summer and late summer grazing. It also provided separate pastures of 'Nordan' crested wheatgrass for early spring grazing, 'Summer' switchgrass for midsummer pasturage, and 'Vinal' Russian wildrye for fall grazing. This pasture series provided 194 grazing days and produced 1.74 AUM's per acre.

Interseeded pasture

Derscheid and Johnson define interseeding as "the seeding of a legume and/or a more productive grass into a permanent grassland with minimum tillage of the existing sod."(3) Pastures used for this analysis were native pastures interseeded with 30-inch rows of 'Travois' pasture type alfalfa. This pasture system provided 150 continuous grazing days per year and produced 1.07 AUM's per acre.

Data for the native, full season, and short-season pastures were obtained over an 8-year period from 1967 to 1974. The interseeded data was collected in 1977. In each instance the pasture system was supplemented with hay and grain during the non-grazing season.

Results

The economic analysis of the four pasture systems was based on the availability of 100 acres of land which met the grazing and tame hay requirements of the cow units carried.[3] Carrying capacity of the land changed

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[1] Pasture system descriptions were taken from two sources—Krueger and Green and Derscheid and Johnson.

[2] AUM = Animal unit month which is the feed required by an animal unit for one month.

[3] One cow unit consists of the following:

1 cow	= 1.0 A U
1/25 bull	= .05 A U
16% yearling heifer	= .10 A U
Total	= 1.15 A U

with tame hay yields but in differing proportions per pasture system because of the difference in grazing days per system. Tame hay yields were varied in the analysis to simulate a manager's decision to produce tame hay on land of differing quality. The calf-crop percentage was also varied to show several management schemes.

Numerous other physical and economic variables were held constant.[4] For example, cattle prices were held at $58 and $54 per hundredweight for steer and heifer calves, respectively.

In all instances the costs and returns were calculated as typical for a farm or ranch in the research area and were not the costs actually incurred under research conditions at the Norbeck Pasture Research Center.

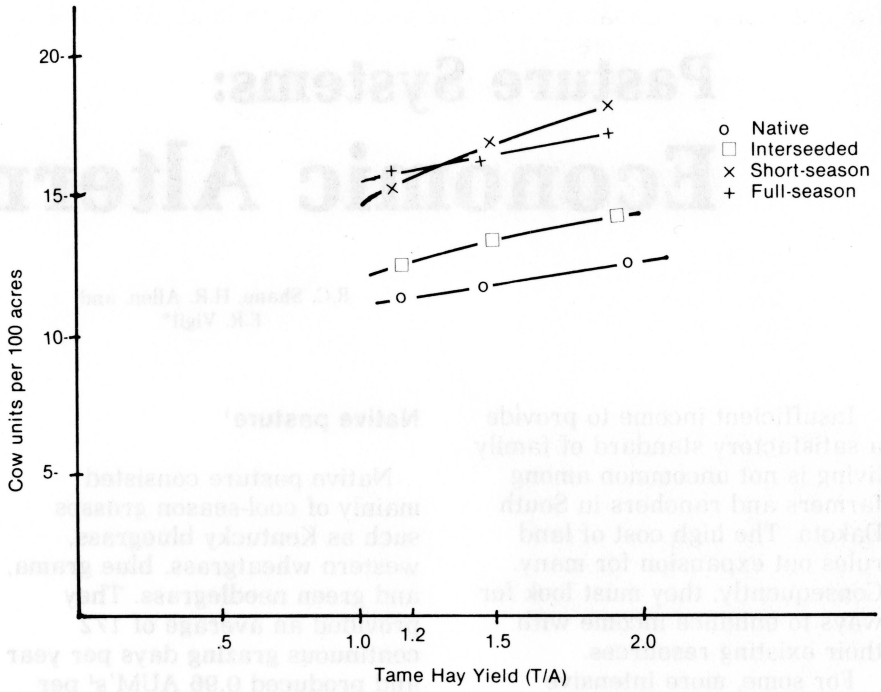

Fig 1. Carrying capacity per 100 acres of alternative pasture systems with varying tame hay yields.

Carrying capacity

As shown in Table 1, the full-season pasture system had the greatest carrying capacity at 15.88 cow units per 100 acres, assuming tame hay yielded 1.2 T/A and the calf crop was 85%. Short-season pastures supplied forage for 15.69 cow units, and native and interseeded pastures carried only 11.31 and 12.77 cow units, respectively.

These differences in carrying capacity arise because the tame pasture systems supply more AUM's per grazing acre. For example, each cow unit on the full- and short-season tame pastures required only 4.38 and 3.81 gazing acres, respectively, while those on the native and interseeded pastures required 6.92 and 5.34 grazing acres per cow unit, respectively.

Because of the 196-day grazing season possible on the full-season tame pasture, more grazing AUM's are produced and less tame hay feeding days are required. Therefore, less tame hay acres are needed. The largest tame hay acreage is required by the short-season pasture system, which also has the shortest grazing period. With these productivity levels, the full-season pasture produces the largest physical quantity of beef.

Carrying capacities for the same farm pasture systems when tame hay is grown on better quality land and productivity is raised from 1.2 to 1.5 T/A are shown in Table 2. The increased tame hay yield allowed carrying capacity to increase on all four pasture systems, ranging from an increase of 0.51 cow units on native pastures to 1.15 cow units on short-season pastures.

Even though the short-season pasture system had the shortest grazing season, it supported more cows than any other pasture system at 16.84 cow units. Native pastures carried only 11.82 cow units per 100 acres.

Short-season pastures produced more beef per acre because of their high grazing yields per acre, thus freeing up more acres for tame hay growing. However, the acreage requirement of the tame hayland complement decreased for all

[4] See Appendix for a list of these variables.

Table 1. Carrying capacity of 100 acres of pasture land, 85% calf crop and tame hay yield of 1.2 T/A.

	Pasture type			
	Native	Inter-seeded*	Short-season	Full-season
Number of cow units supported	11.31	12.77	15.69	15.88
Days grazed	172.00	150.00	130.00	196.00
Days to feed hay	193.00	215.00	235.00	169.00
Grazing acres per cow unit	6.92	5.34	3.81	4.38
Tame hay acres per cow unit	1.92	2.14	2.19	1.53
Total pasture land	78.29	72.69	65.68	75.68
Total hay land	21.71	27.31	34.32	24.32

* Interseeded based on 1 year's results.

Table 2. Carrying capacity of 100 acres of pasture land, 88% calf crop and tame hay yield of 1.5 T/A.

	Pasture type			
	Native	Inter-seeded	Short-season	Full-season
Number of cow units supported	11.82	13.51	16.84	16.69
Days grazed	172.00	150.00	130.00	196.00
Days to feed hay	193.00	215.00	235.00	169.00
Grazing acres per cow unit	6.92	5.34	3.81	4.38
Tame hay acres per cow unit	1.54	1.71	1.75	1.22
Total pasture land	81.85	76.89	70.52	79.55
Total hay land	18.15	23.11	29.48	20.45

Table 3. Carrying capacity of 100 acres of pasture land, 92% calf crop and tame hay yield of 2 T/A.

	Pasture type			
	Native	Inter-seeded	Short-season	Full-season
Number of cow units supported	12.38	14.34	18.18	17.59
Days grazed	172.00	150.00	130.00	196.00
Days to feed hay	193.00	215.00	235.00	169.00
Grazing acres per cow unit	6.92	5.34	3.81	4.38
Tame hay acres per cow unit	1.15	1.28	1.31	.92
Total pasture land	85.74	81.61	76.13	83.84
Total hay land	14.26	18.39	23.87	16.16

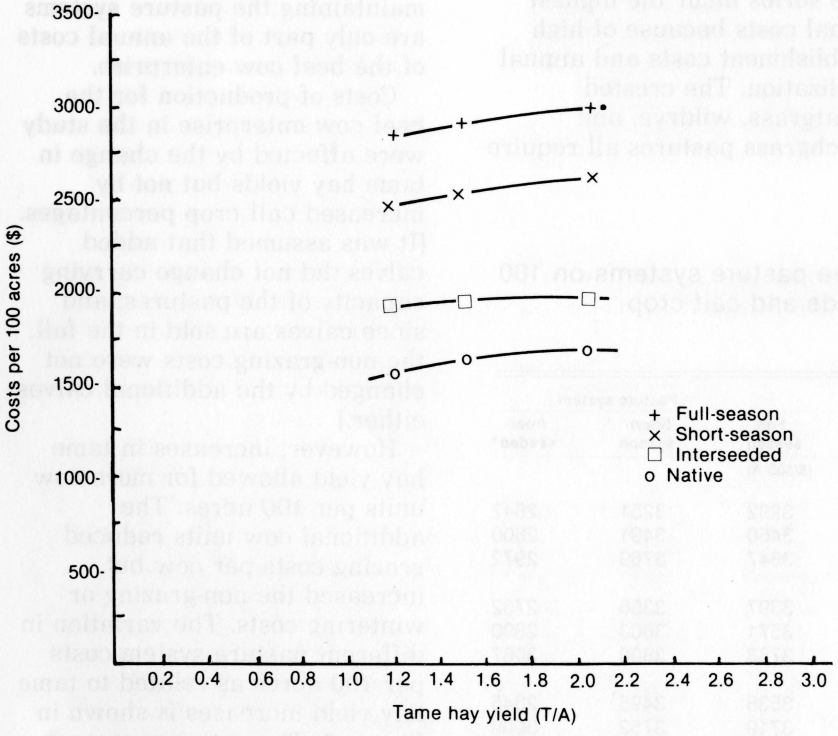

Fig 2. Beef cow-calf enterprise costs per 100 acres, not including return to land investment.

pasture systems because of the increased yield per acre.[5]

Hay land yield was raised to 2 T/A and the calving rate was increased to 92% to represent a third productivity level (Table 3). Compared to a hay yield of 1.5 T/A this productivity level increased carrying capacity by 0.56 cow units on native ranges and 1.34 cow units on short-season pastures. As before, the higher tame hay yield allowed for more pasture acreage and more cow units per 100 acres.

At all three productivity levels the native pasture system carried the fewest number of cow units, followed by the interseeded pasture systems with about 1.5 to 2.0 cow units more per 100 acres (Fig 1). With lower productivity levels the full-season tame grasses carried the most cow units; at higher productivity levels the short-season pasture carried the largest number of cow units per 100 acres.

Based on these purely physical results, the tame pasture systems appear to be the best alternative for the beef cow enterprise.

Pasture system revenue

As expected, the revenue from each pasture system increased both with increased carrying capacity resulting from higher tame hay yields and with better calf crops. The full season pasture system produced the highest gross revenue regardless of the calf crop percentage when tame hay yielded 1.2 T/A (Table 4). With greater tame hay yields the short-season pasture system yielded the highest revenue.

Native pasture produced the lowest gross revenue with all tame hay yields and calf crop percentages, ranging from $2344

[5] Table 2 indicates an increase in the calf crop percentage also. However, it was assumed that the increased number of calves did not affect pasture carrying capacity.

per 100 acres with 1.2 T/A tame hay and an 85% calf crop to $2759 per 100 acres with tame hay yield of 2.0 T/A and a 92% calf crop. Interseeded pasture had the second lowest revenue for all calf crops and hay yields.

The highest gross revenue from 100 acres was $4051 from short-season pasture when tame hay yields were 2.0 T/A and a 92% calf crop was attained.

Based purely on gross revenue per pasture system, the short-season pasture is the best alternative with high hay yields and the full-season pasture system is best with low hay yields.

Pasture establishment and maintenance costs

Prudent managers know that productive systems which result in high yields may have their large returns wiped out by equally high costs.

A typical farmer or rancher would incur costs for each pasture system as presented in Table 5. The interseeded pasture had the lowest net establishment costs at $4.94 per acre, which is the cost of seeding less government cost-share payments.

All of the tame pastures incur tillage and fertilizer costs in addition to seeding costs. On a per acre basis, the establishment costs were highest for the brome-alfalfa-intermediate wheatgrass pastures at $43.21. However, these pastures were established with a companion crop of wheat valued at $15 per acre. With government cost sharing, the net establishment costs were reduced to $20.21 per acre in the year of establishment.

The fourth section of Table 5 presents the pasture establishment costs calculated on an annual basis (by dividing net establishment cost by years of life). Add yearly maintenance costs to this to arrive at total annual costs per acre for each pasture type.

As expected, the annual costs for native pasture are lowest at $.60 per acre. This cost includes an allowance for clipping of weeds and spot spraying but no fertilizer. The interseeded pasture costs include similar allowances plus a $.25 annual establishment cost for a total of $.75 per acre. The short-season tame pasture annual costs are higher—$3.40 per acre because of fertilization at establishment.

The pastures in the full-season tame series incur the highest annual costs because of high establishment costs and annual fertilization. The crested wheatgrass, wildrye, and switchgrass pastures all require annual fertilization because they do not contain a legume. If a tame pasture system is used, one containing a legume is highly desirable.

The brome-alfalfa hayland costs include mowing, raking, stacking, and stack moving. The cost of $21.09 per acre shown in Table 5 is incurred when tame hay yields are 1.2 T/A. Some economies are realized as yields increase, even though when tame hay yields are 1.5 and 2.0 ton the costs of harvest jump to $22.22 and $25.29 per acre, respectively. All other costs in the table are applicable for each of the three levels of productivity because pasture costs per acre were constant as tame hay yields increased.

Purely from an establishment and maintenance cost standpoint, the native and interseeded pasture systems appear to be the best alternatives for the beef cow enterprise.

Table 4. Revenue derived from alternative pasture systems on 100 acres of land with various tame hay yields and calf crop percentages.

		Pasture system			
Calf crop	Hay yield	Native	Full-season	Short-season	Interseeded*
(%)	(T/A)		($/100 A)		
85	1.2	2344	3292	3251	2647
	1.5	2450	3460	3491	2800
	2.0	2567	3647	3769	2972
88	1.2	2419	3397	3356	2732
	1.5	2529	3571	3603	2890
	2.0	2649	3763	3890	3067
92	1.2	2519	3538	3495	2845
	1.5	2634	3719	3752	3009
	2.0	2759	3919	4051	3194

* Preliminary: based on one year's data, 1977.

Beef cow enterprise budgets

The cost of establishing and maintaining the pasture systems are only part of the annual costs of the beef cow enterprise.

Costs of production for the beef cow enterprise in the study were affected by the change in tame hay yields but not by increased calf crop percentages. (It was assumed that added calves did not change carrying capacity of the pastures; and since calves are sold in the fall, the non-grazing costs were not changed by the additional calves either.)

However, increases in tame hay yield allowed for more cow units per 100 acres. The additional cow units reduced grazing costs per cow but increased the non-grazing or wintering costs. The variation in different pasture system costs per 100 acres as related to tame hay yield increases is shown in Figure 2. The native pasture system had the lowest enterprise costs followed in order by

Table 5. Forage production costs per acre.

	Pasture system							
					Full-season			
	Native	Inter-seeded	Short-season	Crested wheat	BIA****	Switch-grass	Russian wildrye	Brome-alfalfa hayland
	($ per acre)							
1. **Establishment costs**								
Machine ownership		4.86***	8.46	8.46	8.46	2.95	4.47	2.46
Machine operations		3.38	6.25	6.25	6.25	2.47	3.84	1.98
Custom machine hire			3.20	3.20	3.20	3.20	3.20	3.20
Grass seed		2.40	16.10	5.46	16.10	7.50	7.00	16.50
Companion crop seed			5.00	5.00	5.00			5.00
Chemicals						3.00		
Fertilizer			4.20	4.20	4.20	4.20	4.20	4.20
Total		10.64	43.21	32.57	43.21	23.32	22.71	33.34
2. **Establishment income**								
Value of companion crop +			15.00	15.00	15.00			15.00
Gov't cost share payment		5.70	8.00	8.00	8.00	8.00	8.00	8.00
Total		5.70	23.00	23.00	23.00	8.00	8.00	23.00
3. **Net establishment cost**		4.94	20.21	9.57	20.21	15.32	14.71	10.34
4. **Annual costs**								
Machine cost	.60*	.50*	1.25	1.25	1.25	1.92		
Establishment cost per year of life		.25	1.35	.48	1.35	2.55	.74	.70
Chemicals						2.60		
Fertilizer				12.70		7.80	12.70	
Hay harvest cost			.80		2.04			$20.39**
Total	.60	.75	3.40	14.43	4.64	14.87	13.44	21.09

+ Some farmers establish grasses either with a companion crop or by seeding directly into a grain stubble. Most grasses in this table were established with a companion crop of wheat or oats which was harvested as hay. Russian wildrye was seeded into stubble, and switchgrass was grown without a companion crop.

* General maintenance costs.

** Hay harvest cost increases to $22.22 when tame hay yields 1.5 T/A and to $25.29 when tame hay yields 2 T/A.

*** Assumes the operator does his own seeding.

**** Brome-intermediate wheatgrass-alfalfa.

interseeded, short-season and full-season pasture systems.

The enterprise budget in Table 6 shows the cost differences among the four pasture systems when tame hay yields 1.2 T/A. Operating expenses for the native pasture are lowest at $945 per 100 acres, followed by the interseeded pasture at $1125 per 100 acres. The tame pastures incur substantially higher costs at $1538 and $1891 per 100 acres for short-season and full-season pastures, respectively. Fixed costs also vary widely, ranging from $1355 per 100 acres for native pasture to a high of $1577 for full-season pasture.

The largest components of cost for the pasture systems are forage costs and interest on investments. The forage cost differences occur because the establishment and maintenance costs are higher for the tame pastures than the native and interseeded pastures.

The interest and all other cost differences can be directly associated with the carrying capacity of the alternative pasture systems. For example, the grain and veterinary costs vary directly with the number of cows carried. Also, interest on operating capital varies with the amount of capital investment in beef cows. Therefore, as carrying capacity increases enterprise costs increase.[6]

Return to labor and management

From a productivity or revenue standpoint the full-season and short-season pasture systems are the best pasture management alternatives. However, these two pasture systems also incur the highest costs of production for the beef cow enterprise. The difference between revenue and costs (or return to labor and management) is shown in Table 7. With a low calf crop (85%) and low tame hay yields, the short-season and interseeded pasture systems are the best management alternatives.

The native pasture system also yields a positive return to the operator, but the full-season pasture system has a return to labor and management of a negative $176 per 100 acres.

As tame hay yields and calving percentages increase, the short-season pasture system becomes the best pasture management alternative, followed by interseeded pasture.

[6] The appendix contains cow-calf enterprise budgets derived using tame hay yields of 1.5 and 2.0 T/A and calf crops of 88 and 92%.

Table 6. Beef cow enterprise budgets: 100 acres of land, 85% calf crop, and tame hay yield of 1.2 T/A.

	Pasture system			
	Native	Inter-seeded	Short-season	Full-season
Cow units supported (head)	11.31	12.77	15.69	15.88
		($/100 A)		
Receipts[a]				
42.5% of 405 lb steer	1129.03	1275.03	1566.09	1585.56
24.5% of 385 lb heifer	576.04	650.53	799.03	808.97
2.0% of cull heifer	62.20	70.24	86.28	87.35
15.0% of cull cow	576.77	651.36	800.05	809.99
Total	2344.05	2647.16	3251.45	3291.88
Operating costs[b]				
Forage cost	504.84	627.08	926.82	1272.51
Grain (corn & oats)	95.00	107.28	131.77	133.41
Supplement	142.50	160.92	197.66	200.12
Mineral & salt	33.93	38.32	47.06	47.65
Veterinary & drugs	67.86	76.63	94.12	95.29
Transportation (marketing costs)	56.55	63.86	78.44	79.41
Equipment repair	3.39	3.83	4.71	4.76
Building repair	7.46	8.43	10.35	10.48
General overhead	33.93	38.32	47.06	47.65
Total operating costs	945.46	1124.67	1538.00	1891.28
Income over direct costs	1398.59	1522.59	1713.45	1400.60
Fixed costs				
Property tax, insurance, depreciation	89.57	101.15	124.24	125.79
Real estate tax	150.00	150.00	150.00	150.00
Interest on operating[c] capital @ 7%	490.28	545.54	663.14	675.96
Interest on land @ 5%	625.00	625.00	625.00	625.00
Total fixed costs	1354.85	1421.69	1562.38	1576.75
Total costs	2300.31	2546.36	3100.38	3468.03
Return to labor & management	43.74	100.80	151.07	-176.15

[a] Assumes a 1% death loss.
[b] Obtained from Allen and Jibben.
[c] Includes interest on the cow-calf unit.

Table 7. Returns to labor and management from beef production on 100 acres of land with various pasture systems, percentage calf crops, and tame hay yields per acre.

		Pasture system			
Calf crop	Hay yield	Native	Full-season	Short-season	Interseeded*
(%)	(T/A)			($/100 A)	
85	1.2	44	-176	151	101
	1.5	148	- 71	322	232
	2.0	254	70	520	380
88	1.2	119	- 74	255	186
	1.5	223	37	434	322
	2.0	336	185	640	475
92	1.2	219	38	394	292
	1.5	328	155	583	442
	2.0	446	311	801	602

*Preliminary: based on one year's data, 1977.

When productivity is high the native pasture system yields a return to labor and management of up to $446 per 100 acres compared to $801, $602, and $311 per 100 acres for short-season, interseeded, and full-season pasture systems, respectively.

With good management, the full-season pasture system does yield a positive return to labor and management; but with low alfalfa yields and low calving rates its return is negative.

The relative returns to labor and management from alternative pasture systems as tame hay yields change and the calf crop is 85% are shown in Figure 3. Between 1.0 and 1.5 T/A, interseeded and short-season pastures produce the best return. Over 1.5 T/A, the short-season pasture is clearly the best pasture management alternative. If tame hay yields are below 1.0 T/A, all four pasture systems would probably incur negative returns to labor and management.

Comparing figures 4 and 5 with 3 shows how increases in the calf crop shift the returns to labor and management upward. At higher calf crops, the short-season pasture system clearly produces the highest return to labor and management with all three hay yields. However, if tame hay yields are less than 1.0 T/A, the native pasture system may very well be the best pasture management alternative in the research area.

The pasture systems with legumes, short-season and interseeded, consistently produced the best rate of return to the operator's labor and management.

Limitations

As pointed out earlier, numerous economic and physical variables were held constant in this analysis. Probably the most important constant economic variable was the price of beef. As beef prices decline, the total revenue from each pasture

system will decrease; the relative net income positions of these alternative pasture systems will remain unchanged until beef prices decline to the mid 40's. If beef prices drop below the mid 40's, all pasture systems produce a loss, but native pastures yield the smallest losses.

Another limitation was the availability of only one year's productivity data from the interseeded pasture system.

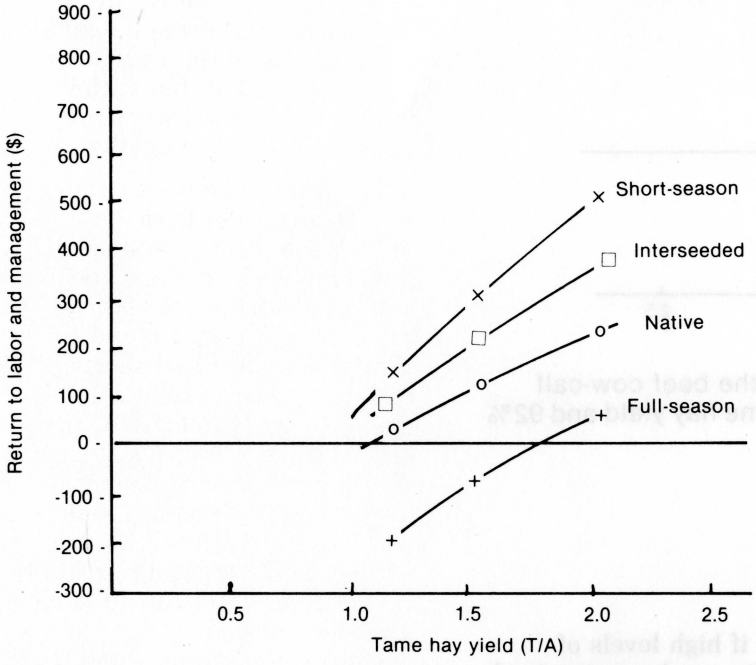

Fig 3. Return to labor and management from the beef cow-calf enterprise on 100 acres of land with varying tame hay yield and 85 % calf crop.

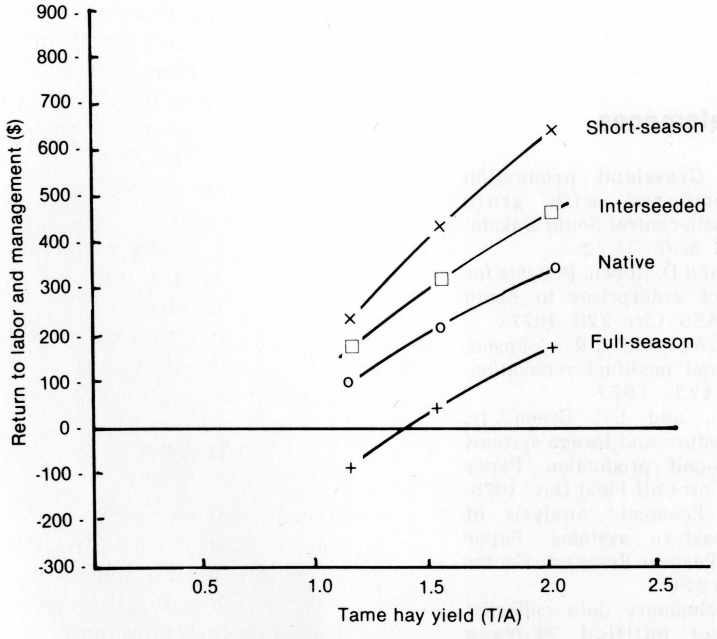

Fig 4. Return to labor and management from the beef cow-calf enterprise on 100 acres of land with varying tame hay yield and 88% calf crop.

Summary

Based on purely physical production rates the full-season pasture had the highest carrying capacity with low tame hay yields. Short-season pastures followed close behind. When tame hay yields were increased, the short-season pasture had the highest carrying capacity, followed closely by full-season pastures. With high tame hay yields the short-season pasture capacity increased more than the full-season pasture because hay was fed 215 days with short-season pasture and only 170 days with full-season pasture. Interseeded pastures carried 10-15% more beef cow units than the native pasture.

Inspection of the pasture alternatives from a cost as well as a revenue standpoint revealed that the short-season pasture was the best beef production alternative. The high costs of establishing and maintaining a full-season pasture were offset by increased returns from its large carrying capacity, but this system did not yield net returns that were as high as the net returns from the other pasture systems. Pasture systems containing a legume (eliminating the need for nitrogen fertilizer) yielded the highest returns to the operator's labor and management. Further research is needed to identify methods of reducing costs in full-season pasture systems.

At low calf crop rates and tame hay yields, short-season and interseeded ranges produced the greatest economic return to operator labor and management. And as the tame hay yield and calf crop rate increased, the short-season pasture clearly became the best forage production alternative. Increased management skills greatly enhance returns to operator labor and management.[7]

[7] Most individuals will also have to compare cultivated pasture returns with crop production returns.

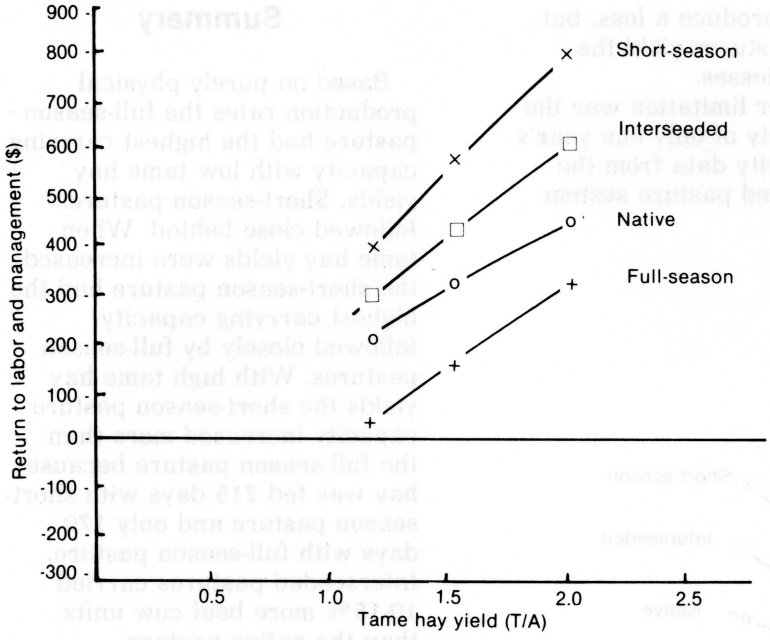

Fig 5. Return to labor and management from the beef cow-calf enterprise on 100 acres of land with varying tame hay yield and 92% calf crop.

Conclusions

In areas where interseeding and short-season pasture production are feasible, alternatives to native pasture can enhance returns to the operator's labor and management without acreage expansion. Interseeded and short-season pasture systems yield higher returns to labor and management than native pastures when tame hay yields exceed 1.0 T/A. However, when tame hay yields less than 1.0 T/A the native pasture system may be the best management alternative.

The full-season pasture system did not compete economically with the other pasture systems at any productivity level because of high annual nitrogen costs.

The results indicate that full-season pasture systems which use legumes to replace nitrogen fertilizer would yield a very good return to operator labor and management. However, more research is necessary to determine if high levels of productivity can be maintained with the substitution of legumes for nitrogen.

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APPENDIX

Table 1. List of constant economic input variables used for pasture cost and returns analysis.

Item	Amount
No. of cows per bull	25
Age at first calving	2 yrs
Steer calf price per lb	$ .58
Heifer calf price per lb	$ .54
Cull cow price per lb	$ .34
Average herd cow value	$500.00
Dollars per hd., 600 lb open hfr.	$275.00
Average value of bulls	$600.00
Tax rate on land per acre	$ 1.50
Land value per acre	$125.00
Interest charge on operating capital	.07
Interest charge on land capital	.05
Cattle supplement per cwt	$ 8.40
Mineralized salt per cwt	$ 5.00
2, 4-D, per gallon	$ 6.55
Nitrogen, per lb of N	$ .195
Phosphorus, per lb of P_2O_5	$ .16
Potash, per lb of K	$ .08
Pasture life;*	
Native Grass	Infinite
Crested Wheat	20 yrs
Brome-Intermediate-Alfalfa	15 yrs
Switchgrass	6 yrs
Russian Wildrye	20 yrs
Interseeded	20 yrs
Seed cost per 100 lbs:	
Crested Wheatgrass	$ 78.00
Intermediate Wheatgrass	$145.00
Teton Alfalfa	$210.00
Switchgrass	$125.00
Russian Wildrye	$100.00
Diesel fuel/gal	$ .43

*Estimated average, with proper grazing and fertility management pasture life can be extended.

Table 2. Machinery complement for hay production and pasture establishment.

Item	Investment
85 H.P. tractor	$15,470
60 H.P. tractor	10,640
20.5-ft tandem disk	4,410
28-ft spike harrow	434
Fertilizer spreader	2,723
7-ft mower	1,188
8.5-ft side delivery rake	1,080
Stack frame	450
Loader and buckrake	5,500
Total investment	$41,895

*All drilling is custom hired.

Table 3. Beef cow enterprise budgets - 100 acres of land, 88% calf crop and tame hay yield of 1.5 T/A.

	Pasture system			
Item	Native	Inter-seeded	Short-season	Full-season
Cow units supported (head)	11.82	13.51	16.84	16.69
		($/100A)		
Receipts[a]				
44.0% of 405-lb steer	1221.93	1396.29	1740.84	1725.44
26.0% of 385-lb heifer	639.05	730.24	910.44	902.39
2.0% of cull heifer	65.02	74.30	92.64	91.82
15.0% of cull cow	602.95	688.98	859.00	851.40
Total	2528.95	2889.82	3602.92	3571.04
Operating costs[b]				
Forage cost	465.11	583.75	893.66	1266.99
Grain (corn & oats)	99.13	113.48	141.48	140.23
Supplement	148.96	170.22	212.22	210.35
Mineral & salt	35.47	40.53	50.53	50.08
Veterinary & drugs	70.94	81.06	101.06	100.16
Transportation (marketing costs)	59.11	67.55	84.22	83.47
Equipment repair	3.55	4.05	5.05	5.01
Building repair	7.80	8.92	11.12	11.02
General overhead	35.47	40.53	50.53	50.08
Total operating costs	925.54	1110.09	1549.87	1917.40
Income over direct costs	1603.41	1779.73	2053.05	1653.64
Fixed costs				
Property tax, insurance, depreciation	93.63	107.00	133.40	132.22
Real estate tax	150.00	150.00	150.00	150.00
Interest on operating[c] capital @ 7%	511.43	575.56	711.05	709.68
Interest on land @ 5%	625.00	625.00	625.00	625.00
Total fixed costs	1380.06	1457.56	1619.45	1616.89
Total costs	2305.60	2567.65	3169.32	3534.29
Return to labor & management	223.35	322.17	433.60	36.74

[a] Assumes a 1% death loss.
[b] Obtained from Allen and Jibben.
[c] Includes interest on the cow-calf unit.

Establishment and maintenance practices used in cost analysis

Machine operations

Cultural practices for the establishment of grasses can vary considerably, depending upon individual conditions at the time of seeding. In this analysis machine costs for establishment included spreading, fertilizer, disking, harrowing, and drilling. A custom rate charge of $3.20 per acre was used for drilling. An annual custom rate charge of $1.50 per acre was used for spraying switchgrass.

Hay harvest machine charges included mowing, raking, and stacking in the field. A custom rate charge of $1/T was used for stack moving for distances up to 2 miles. This was based upon $8.00 per stack and an average stack weight of 8-10 tons.

Mowing for weed control during establishment was included in machine costs.

Seeding Rate

Crested Wheatgrass: 7 lbs/A
Mixture: Smooth bromegrass, 4

lbs; Oahe intermediate wheatgrass, 6 lbs; Pasture type alfalfa, 2 lbs.
Switchgrass: 6 lbs/A
Russian wildrye: 7 lbs/A
Bromegrass-alfalfa: Alfalfa, 4 lbs; bromegrass, 7 lbs.

Fertilizer

All seeding establishments were charged with 20 lbs of P_2O_5 and 5 lbs of nitrogen /A. Annual maintenance fertilizer included 65 lbs of nitrogen on crested wheatgrass and Russian wildrye. Switchgrass received 40 lbs of nitrogen. It is recognized that this cannot serve as a recommendation for all individual situations. General fertility level (as determined by a soil test), weed problems, and other factors will influence the level of fertilizer application.

Chemicals

An annual application of 1 lb of 2,4-D amine/A on switchgrass was used in this analysis.

Table 4. Beef cow enterprise budgets - 100 acres of land, 92% calf crop and tame hay yield of 2 T/A.

Item	Pasture system			
	Native	Inter-seeded	Short-season	Full-season
Cow units supported (head)	12.38	14.34	18.18	17.59
		($/100 A)		
Receipts[a]				
46.0% of 405-lb steer	1338.20	1549.25	1964.75	1901.06
28.0% of 385-lb heifer	720.93	834.63	1058.47	1024.16
2.0 % of cull heifer	68.12	78.86	100.01	96.76
15.0% of cull cow	631.61	731.23	927.33	897.27
Total	2758.86	3193.97	4050.56	3919.25
Operating costs[b]				
Forage cost	422.20	535.34	855.69	1261.46
Grain (corn & oats)	104.03	120.44	152.74	147.79
Supplement	156.05	180.66	229.11	221.68
Mineral & salt	37.15	43.01	54.55	52.78
Veterinary & drugs	74.31	86.03	109.10	105.56
Transportation (marketing costs)	61.92	71.69	90.92	87.97
Equipment repair	3.72	4.30	5.45	5.28
Building repair	8.17	9.46	12.00	11.61
General overhead	37.15	43.01	54.55	52.78
Total operating costs	904.70	1093.94	1564.10	1946.92
Income over direct costs	1854.16	2100.03	2486.46	1972.33
Fixed costs				
Property tax, insurance, depreciation	98.09	113.56	144.01	139.34
Real estate tax	150.00	150.00	150.00	150.00
Interest on operating[c] capital @ 7%	535.08	609.36	766.13	747.06
Interest on land @ 5%	625.00	625.00	625.00	625.00
Total fixed costs	1408.59	1497.92	1685.14	1661.40
Total costs	2313.29	2591.86	3249.24	3608.32
Return to labor & management	445.57	602.11	801.32	310.93

[a] Assumes a 1% death loss.
[b] Obtained from Allen and Jibben.
[c] Includes interest on the cow-calf unit.

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