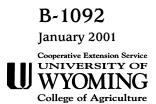


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Editor: Hattie Penny, College of Agriculture, Office of Communications and Technology Graphic Designer: Tana Stith, College of Agriculture, Office of Communications and Technology

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, Director, Cooperative Extension Service, University of Wyoming, Laramie, Wyoming 82071.

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Background

Bison have inseparable cultural and historical links with North America. Native Americans hunted bison for millennia before Europeans arrived. Plains Indians used virtually every part of the bison. Bison meat ensured the survival of many settlers as they pushed west. The bison is a symbol not only of westward expansion, but also of a lost way of nomadic life on the plains.

At the beginning of the eighteenth century, there were estimated to be between 40 to 60 million bison in North America. Unregulated hunting reduced the numbers to only about 1,500 animals by the late nineteenth century. The last century has been devoted to protecting the species from extinction and to developing viable herds.

Herds grew sufficiently in size by the 1980s that bison meat started to be available for sale to the general public. The leanness of bison meat, combined with society's increased health awareness, helped to create the bison industry we see today.

There were approximately 107,000 head of bison in the United States in 1997 (NBA-UW, 1997). Presently, the industry is in a formative phase. Production and



marketing infrastructure are still being established. Bison meat is marketed as an "upscale" product, commanding premium prices. Bison breeding stock are also commanding premium prices since many bison producers are still building their herds. Currently, very few bison heifer calves are slaughtered.

The budget

This budget estimates the costs and returns for a bison cow-calf enterprise. A note of caution is in order, however: the market for bison and bison products is not fully developed, so the prices that producers pay for breeding stock and receive for bison sold may vary markedly from the values used in this study. Potential producers are encouraged to thoroughly study their markets before starting a bison enterprise. The budget is intended as a guide only; it is not representative of any particular ranch. The major assumptions are presented below.

Stock characteristics

As their long history of survival demonstrates, bison are particularly well adapted to the harsh conditions of the open plains. The bison's digestive system allows it to eat some of the less desirable plant varieties found on the plains. However, bison prefer and perform better in areas that have significantly more grass cover (SAF, 1999). It is estimated that a mature bison cow, being a more effective feeder than a beef cow, represents 0.80AU (Animal Units) versus the 1.0AU of a beef cow (AAFRD, 1999). One AU equals the amount of feed one cow consumes in one year (NRPH, 1997). Yet it is also recommended that the stocking rate for the beginning bison breeder be the same as for cattle until the producer understands how bison use the available

range (NBA, 1990). For that reason, this study uses the same stocking rate for bison as for beef cattle.

Herd size is a difficult parameter to quantify. Since the industry is in a developmental phase, there does not appear to be a typical herd size. The National Bison Survey (NBA-UW, 1997) revealed there are extremes at both ends of the spectrum, though there appears to be a level at which the capital expenditure for necessary equipment seems justified. This level, approximately 100 head of breeding cows, is used in the budget.

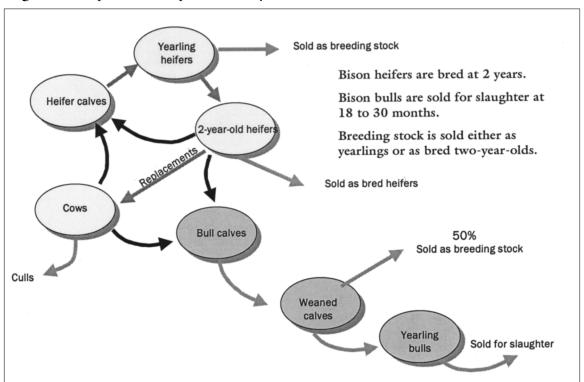
The budget assumes an established bison herd where most replacements are ranch raised. A linear livestock flow chart was created in a spreadsheet to determine production numbers. The spreadsheet represents three years' worth of bison production (three years represents the time it takes for a bison heifer to produce a calf), starting with 100 head of bred bison cows. Weaning rate is set at 85 percent and death loss at 2 percent. The portion of the chart that represents year two of the cycle includes the purchase of two yearling bulls and three yearling heifers, which were purchased to enhance genetic diversity. Herd size is maintained by selling 75 percent of the open cows (both classes) in the fall.



Due to the variety of marketing strategies employed by bison producers, it is impossible to reflect the entire industry structure here. This is especially true for bull calves destined for slaughter. Bison bulls are typically slaughtered at 18 to 24 months of age, with some kept as long as 30 months. While virtually all of the heifers are used as breeding stock, there are varying strategies for bull calves. Conversations with individuals close to the industry indicate that there appear to be three "marketing windows" for bulls. The first is at six months of age, right after the calves are weaned. These calves are sold to a feedlot. The second marketing option is to keep the bull calves for another year and sell them as yearlings to be fed out. Finally, some producers choose to feed their own bulls until they reach slaughter weight. In order to reflect this variety in marketing behavior, the budget sells one half of the bull calves at six months and the other half as yearlings the following year. This means there will be less stock to feed during the winter and that less pasture will be required in the summer. The trade-off is that the producer must accept less revenue for the calves than he or she would for the finished animal.

Older (trophy) bulls do not bring as much in the market, but bison producers have been particularly innovative at marketing their products. Online offerings of steaks, jerky, sausage, robes, and skulls were encountered in the course of research for this report. Hunting also is done on some operations to generate additional revenue. However, this enterprise budget is only concerned with costs and returns from a cow-calf enterprise. Other alternatives would require separate budgets outlining

Figure 1. Simplified bison production cycle.



the set of costs and returns associated with that enterprise.

Since bison mature more slowly than cattle and since there are no steers, some different classes of livestock had to be added for the budget (e.g. two-year-old heifers, cows three to nine years, cows older than 10 years, two-year-old bulls, and bulls older than two years). The classes used in this study are the same as used in the 1997 National Bison Survey. The weights and prices for these classes are from the same source. Figure 1 shows a simplified production cycle for bison. The significant difference from beef cattle is that bison heifers are bred at two years of age, whereas beef cattle are bred after one year.

Land

The variety of bison operations varies as much as the methods used to market bison. That is, no dominant form of bison production has yet emerged. In developing this enterprise budget, it was necessary to make a number of assumptions regarding the size of the operation, as well as the type and amount of land used. It is assumed that the ranch is located on the eastern plains of Wyoming and has an average productive capacity of 0.32 AUM/acre (Animal Unit Months per acre). One AUM is one twelfth of an AU or the amount of feed that one mature cow will consume in one month. The above AUM/ acre figure is considered typical for the region (Bastian and Hewlett, 1996). In addition, it is assumed that bison will be fed

for four months out of the year. The implied acreage and associated land capacity is calculated at 6,541 acres or 2,077 AUMs of range forage and 1,038 AUMs fed for a total of 3,116 AUMs of feed requirement (Table 4). The budget assumes all hay is purchased, since there would be no difference in hay production for cattle or bison. The authors chose to focus the budget on the livestock aspect, given that bison production represents a departure from traditional stock-raising practices. Many producers may have a hay enterprise included in their operations, which would need to be evaluated separately.

Labor

Bison, being considered non-domestic animals, typically do not benefit from much human contact. Some producers report working their animals only once per year (NBA-UW, 1997). Most sources report that it is best to handle bison as little as possible. When working bison only once per year, vaccination, testing, sorting, culling, and shipping take place all at once. These activities normally occur in the fall. However, the amount of time spent on maintenance and repair of facilities is higher for bison due to the increased fenc-



ing and handling equipment required. It was assumed that the enterprise requires one full-time employee and that the owner is employed one-half time in the enterprise with management duties. Both the owner and the employee are paid at the rate of \$7 per hour (including benefits).

Capital

Table 5 shows the investment summary for the budget. This is where the economic costs of the enterprise are outlined. An economic budget differs from a cash budget in that all costs are included. In other words, an economic budget includes all cash cost information but goes further to include all non-cash costs as well.

One of the largest non-cash costs in an economic budget, after depreciation, is opportunity cost. The term opportunity cost is used by economists to describe the cost of investing capital in a particular enterprise rather than an alternative investment. Short-term U.S. Treasury bills are often used as an example investment because they carry no risk and a current interest rate (about 6 percent as of December 2000). Another method, the one used in this budget, is to use a long-term real (inflation adjusted) interest rate plus a risk premium to value the cost of capital investment. Whatever method is used, the economic budget tries to capture the true enterprise costs.

The budget assumes that 100 percent of the operating capital is borrowed. The authors realize that this is not always the equity ratio that producers face. But regardless of the source, there is a cost to using capital, even one's own. By assuming that 100 percent of the operating capital is bor-

Table 1. Rangeland ownership information.	
Grazed forage (AUMs)	

Grazed forage (AUMs)	2,0//.2
Dollars per Animal Unit	\$2,718.00
Estimated dollars/AU/year	\$163.08
Total rangeland cost	\$470,485.80
Real estate taxes (65.7 mills)	\$1,934.80
Opportunity cost interest rate	6 percent
Annualized opportunity cost	\$28,299.15

rowed, opportunity costs for this asset are fully accounted for. A nominal interest rate of 9 percent was used for operating capital, while an 8.75 percent interest rate was applied to livestock, machinery, and buildings.

The costs associated with rangeland ownership are shown in Table 1. The opportunity cost of owning land was estimated by using the implied acreage previously calculated for forage base and multiplying it by the average price per acre for rangeland sold in eastern Wyoming from 1993-95 (NBA-UW, 1996). This total land cost, \$470,485.80, was multiplied by a real long-term interest rate (3 percent) plus a risk capital rate (3 percent) to come up with a surrogate for opportunity cost of capital (AAEA, 1998). The resultant \$28,229.15 is the estimated annual opportunity cost for land. This number was divided by the number of AUs of forage provided by the land to give a commonly-used value on a per AU basis.

Land costs represented a special challenge in developing the budget. The authors developed the land base from feed requirements and productivity data as outlined in the land section above. Economists consider land a capital input since it is a resource that is not used up in a single production cycle, but provides as string of inputs (feed) over time without losing its intrinsic value (given proper stewardship). Even if the land is owned and paid for, there is an opportunity cost associated with its ownership and use. That is, the money tied up in land could be used for other purposes, such as operating capital. Land costs are shown in Table 1 and in the budget in Tables 2 and 5.

2.077.2

Breeding stock

Interest on retained livestock is a significant ownership cost. The value of replacement heifers includes an interest charge relating to the cost of raising the animal. This opportunity cost tries to capture the value of what it actually costs to raise a calf as opposed to buying yearling heifers and breeding them.

Bison add a new dimension to the retained livestock issue. Since bison mature more slowly than cattle, often not breeding until their second year, the costs of raising an animal are carried for a second year (until the heifer enters the herd as breeding stock). More research is needed to uncover and value these costs for bison. In this study, all bison not sold in the fall are considered retained. Consequently, interest on

retained livestock in Tables 2 and 5 may be higher than expected.

The budget assumes an established herd in which most of the breeding stock is ranch raised. Some heifers and most bulls are purchased to enhance genetic diversity. Costs for these animals are listed in Table 5.

Machinery and equipment

The machinery and equipment compliment for this enterprise was assumed to be optimal for the number of bison produced. That is, all equipment is fully utilized by the enterprise. New machinery costs were used in the budget, as this provides a conservative estimate of ownership and capital costs. Most producers already own at least some equipment, and many do not purchase new equipment. However, this method allows a more complete look at the full costs of ownership. Table 4 shows a list of the equipment used in the budget. Of particular concern is the cost of fencing and handling equipment, which must be suited for bison. A wide array of fencing and handling equipment is available for bison. A discussion of these can be found in a variety of sources, both in print and on



various Web sites (SAF, 1999). Fencing estimates run from \$3,500 to \$6,000 per mile. A value of \$4,500 per mile for 16 miles was used to represent the fencing investment in this study.

Handling facilities represent a significant cost associated with a bison enterprise. Recommendations for bison handling facilities typically call for chutes $6\frac{1}{2}$ to $7\frac{1}{2}$ feet high and strong enough to withstand the abuse of a bull bison weighing upwards of 2,000 pounds. Producers reporting on operations of this size provided cost estimates from \$10,000 to \$40,000 for these facilities. An estimated value of \$23,000 was used in this budget. This value represents the average reported for this size of operation. It is slightly higher than the \$C22,000 reported for a facility in Canada (SAF, 1999).

Taxes, insurance, and overhead

Property taxes and insurance costs were valued at 60 cents per hundred dollars of assets. Real estate taxes were valued using the productivity assumptions and the Wyoming Department of Revenue's *Mapping and Agricultural Manual* to classify typical eastern Wyoming rangeland. An average mill levy of four eastern Wyoming counties of 65.7 mills was calculated to generate taxes of \$1,934 on rangeland.

A flat rate of \$20,000 per year was chosen for the overhead costs. This value represents professional services such as accounting, tax preparation, subscriptions, and minimal legal fees.

Summary

Recognizing there are a wide variety of options available to bison producers in both structure and herd size, this budget estimates the costs and returns for a bison operation of 100 breeding cows on the eastern plains of Wyoming. The budget presented shows gross receipts of \$191,248.02 or \$1,912.48 per head. Operating costs are \$67,415.03 or \$674.15 per head. Ownership costs are \$110,594.55 or \$1,105.95 per head. Total costs are \$178,009.59 or \$1,780.10 per head. This leaves returns to risk and management, or net profit, of \$13,238.43 or \$132.38 per head.

It should be noted that a large part of the profitability of the bison enterprise shown here is due to the prices currently being received for breeding stock. Should there be a dramatic decrease in prices, the enterprise would suffer significantly. To illustrate this point, the budget was re-evaluated with the price for two-year-old heifers reduced by 50 percent (from \$366 per hundred weight to \$183 per hundred weight). With that change in place, the returns to risk and management (net profit or loss) were -\$40,146.57 or -\$401.48 per head. This represents a decrease of \$53,384.76 or \$533.85 per head from current prices and illustrates the sensitivity of the enterprise to fluctuations in market prices.



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Be aware that due to the dynamic nature of the World Wide Web, Internet sources may be difficult to find. Addresses change and pages can disappear over time. If you find problems with any of the listed Web sites in this publication, please contact Tom Foulke, P.O. Box 3354, Laramie, WY 82071; (307) 766-6205; foulke@uwyo.edu.

Table 2. Enterprise budget, bison cow-calf.

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Housing and improvements \$ 2,005.90 1 2,005.90 20.06	
Filled (abo) / 1/,4/2.00 1/4./2	
Owner labor hour 1,248.00 7 8,736.00 87.36	
Interest on operating capital \$ 42,668.92 0.09 3,840.20 38.40	
Total operating costs \$67,415.03 \$674.15	
3. Income above operating costs \$123,832.98 \$1,238.33	
4. Ownership costs	
Buildings, improvements, and equipment	
Capital recovery \$ 16,159.09 161.59	
Annual taxes and insurance \$ 894.20 8.94	
Purchased livestock	
Capital recovery \$ 1,465.72 14.66	
Annual taxes and insurance \$	
Retained livestock	
Long-term interest \$ 27,423.29 274.23_	
Machinery and vehicles	
Capital recovery \$ 13,613.66 136.14	
Annual taxes and insurance \$ 875.44 8.75	
Land resources	
Annual taxes \$ 1,934.00 19.34_	
Long-term interest \$ 28,229.15 282.29_	
Overhead \$ 20,000.00 200.00 Total ownership costs \$110,594.55 \$1,105.95	
φ110,374.33 φ1,103.73_	
5. Total costs \$178,009.59 \$1,780.10	
6. Returns to capital, risk and management \$13,238.43 \$132.38	

	Table 3: Monthly summary of returns and expenses.
733	ry of returns and
I.m E.k	expenses.

Lable 3: Monthly summary of feturns and expenses.	furns and	expense	. ·) 	,	r t	1			j)	•	-
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Value
I. Production:													
Heifer calves													0
Yearling heifers													0
2 yr old heifers												106,770	106,770
Cows 3-9												15,852	15,852
Cows > 10												13,349	13,349
Bull calves												22,752	22,752
Yearling bulls												32,526	32,526
2 yr old bulls													0
Bulls >2													0
Total receipts												\$191,249	\$191,249
2. Operating inputs:													
Native hay	4,306	4,306	4,306	4,306									17,224
Protein cake 14%	416	416	416	416							134		1,798
Corn (whole-bulk)						495	495						990
Mineral	110	110	110	110	110					110	110	110	880
Salt	16	16	16	16	16	16	16	16	16	16	16	16	192
Freight/trucking												2,989	2,989
Advertising	50	50	50	50	50	50	50	50	50	50	50	100	650
Electricity	40	40	40	40	30	20	20	20	20	20	30	30	350
Veterinary medicine												301	301
Machinery (fuel, lube, repair)	422	420	420	420	420	420	420	420	420	420	420	420	5,042
Vehicles (fuel and repair)	332	331	331	331	331	331	331	331	331	331	331	331	3,973
Equipment (repair)	82	81	81	81	81	81	81	81	81	81	81	81	973
Housing, improvements (repair)	168	167	167	167	167	167	167	167	167	167	167	167	2,005
Taxes and insurance*		2,137					1567						3704
Hired labor	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	17,472
Total costs	\$7,398	\$9,530	\$7,393	\$7,393	\$2,661	\$3,036	\$4603	\$2	\$2,541	\$2,651	\$2,795	\$6,001	\$58,543
	¢7 208	ξ0 λ3π	¢7 202	¢7 202	. \$3 661	¢2 026	\$7 200 \$0 60E \$7 202 \$7 202 \$3 661 \$2 026 \$4 204 \$5	e2 7.41	e3 n41	5.41 e3 5.41 e3 651	e3 70n	8182 248	\$1 37 706
- 10t - 0terano	4.9000	47 30-0	4. 7-7-	4. 3	4-3	4-7	+ - y = y = -	7 - y	7-7	7-9	7-7	+ j	+ = - j

^{*}Includes property and real estate taxes

Table 4: Monthly feed requirements.

Feed	Units	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Rangeland	AUM	0	0	0	0	260	260	260	260	260	260	260	50 260 260 260
Native hay	ton	55	55	55	55	0	0	0	0	0	0	0	0
Protein cake 14%	ton	သ	3	သ	3	0	0	0	0	0	0	_	0
Corn (whole-bulk)	cwt	0	0	0	0	0	90	90	0	0	0	0	0
Mineral	lь	500	500	500	500	500	0	0	0	0	500	500	500
Salt	lb.	265	265	265	265	265	265	265	265	265	265	265	265

Table 5: Investment summary.

	Purchase	Salvage/cull	Livestock	Useful	Capital ¹	Annual taxes	Long -term	Total
	price	value	share	life	recovery	and insurance	interest	ownership
Buildings, improvements a			7.00	• •	41.000.05	011440		¢2.002.75
Shop (40x60)	\$20,000.00	\$2,000.00	100	30	\$1,888.35	\$114.40		\$2,002.75
Fencing	\$72,000.00	\$7,200.00	100	25	\$7,093.89	\$411.84		\$7,505.73
Corral/handling (7ft)	\$23,000.00	\$2,300.00	100	30	\$2,171.60	\$131.56		\$2,303.16
Water developments	\$15,000.00	\$1,500.00	100	30	\$1,416.26	\$85.80		\$1,502.06
Gooseneck trailer	\$5,000.00	\$1,000.00	100	10	\$703.94	\$31.20		\$735.14
Squeeze chute	\$1,950.00	\$390.00	100	10	\$274.54	\$12.17		\$286.71
Vet equipment	\$650.00	\$65.00	100	10	\$95.84	\$3.72		\$99.56
Mobil feeders	\$5,000.00	\$500.00	100	15	\$593.80	\$28.60		\$622.40
Post hole auger	\$750.00	\$75.00	100	10	\$110.59	\$4.29		\$114.88
Rear blade	\$1,100.00	\$110.00	100	10	\$162.19	\$6.29		\$168.48
Shop equipment	\$2,500.00	\$250.00	100	10	\$368.62	\$14.30		\$382.92
Granary (300bu)	\$500.00	\$100.00	100	10	\$70.39	\$3.12		\$73.51
6-feed bunks	\$1,400.00	\$140.00	100	10	\$206.43	\$8.01		\$214.44
Grain grinder	\$6,800.00	\$680.00	100	10	\$1,002.65	\$38.90		\$1,041.55
Total	\$155,650.00	\$16,310.00			\$16,159.09	\$894.20		\$17,053.29
Purchased livestock								
Yearling bull	\$2,714.00	\$272.00	100	6	\$564.12			\$564.12
Yearling heifer	\$6,786.00	\$678.00	100	12	\$901.60			\$901.60
Total	\$9,500.00	\$950.00			\$1,465.72			\$1,465.72
Retained livestock								
Heifer calves	\$113,940.00	\$11,394.00	100				\$5,483.36	\$5,483.36
Yearling heifers	\$119,886.00	\$11,978.00	100				\$5,769.05	\$5,769.05
2-yr-old heifers	\$30,085.00	\$3,014.00	100				\$1,448.08	\$1,448.08
Cows 3 to 9	\$195,504.30	\$19,536.00	100				\$9,408.01	\$9,408.01
Cows > 10	\$55,620.00	\$5,550.00	100				\$2,676.19	\$2,676.19
Bull calves	\$26,544.00	\$2,660.00	100				\$1,277.68	\$1,277.68
Yearling bulls	\$2,710.50	\$272.00	100				\$130.48	\$130.48
2-year-old bulls	\$0.00	\$0.00	100				\$0.00	\$0.00
Bulls > 2	\$25,568.40	\$2,556.00	100				\$1,230.44	\$1,230.44
Total	\$569,858.20	\$56,960.00					\$27,423.29	\$27,423.29
Machinery and vehicles			3.00	2.0	#2 224 OF	#222 O 1		#2 FF (AC
Tractor loader	\$35,600.00	\$7,100.00	100	30	\$3,334.05	\$222.04		\$3,556.09
Tractor - 80hp	\$30,000.00	\$6,000.00	100	30	\$2,809.46	\$187.20		\$2,996.66
Pickup 4x4 3/4 ton	\$27,000.00	\$5,400.00	100	6	\$5,251.73	\$340.20		\$5,591.93
4 wheeler nrl	\$5,000.00	\$1,000.00	100	5	\$1,109.21	\$63.00		\$1,172.21
4 wheeler nr2	\$5,000.00	\$1,000.00	100	5	\$1,109.21	\$63.00		\$1,172.21
Total	\$102,600.00	\$20,500.00			\$13,613.66	\$875.44		\$14,489.10
Land resources								
Rangeland	\$470,486.00		100	4		\$1,934.00	\$28,229.15	\$30,163.15
Total	\$470,486.00					\$1,934.00	\$28,229.15	\$30,163.15

¹ Annual capital recovery is the method of calculating depreciation and interest recommended by the National Task Force on Commodity Costs and Returns.
² Interest on average investment.