Controlling Yellow Starthistle: Economic Considerations

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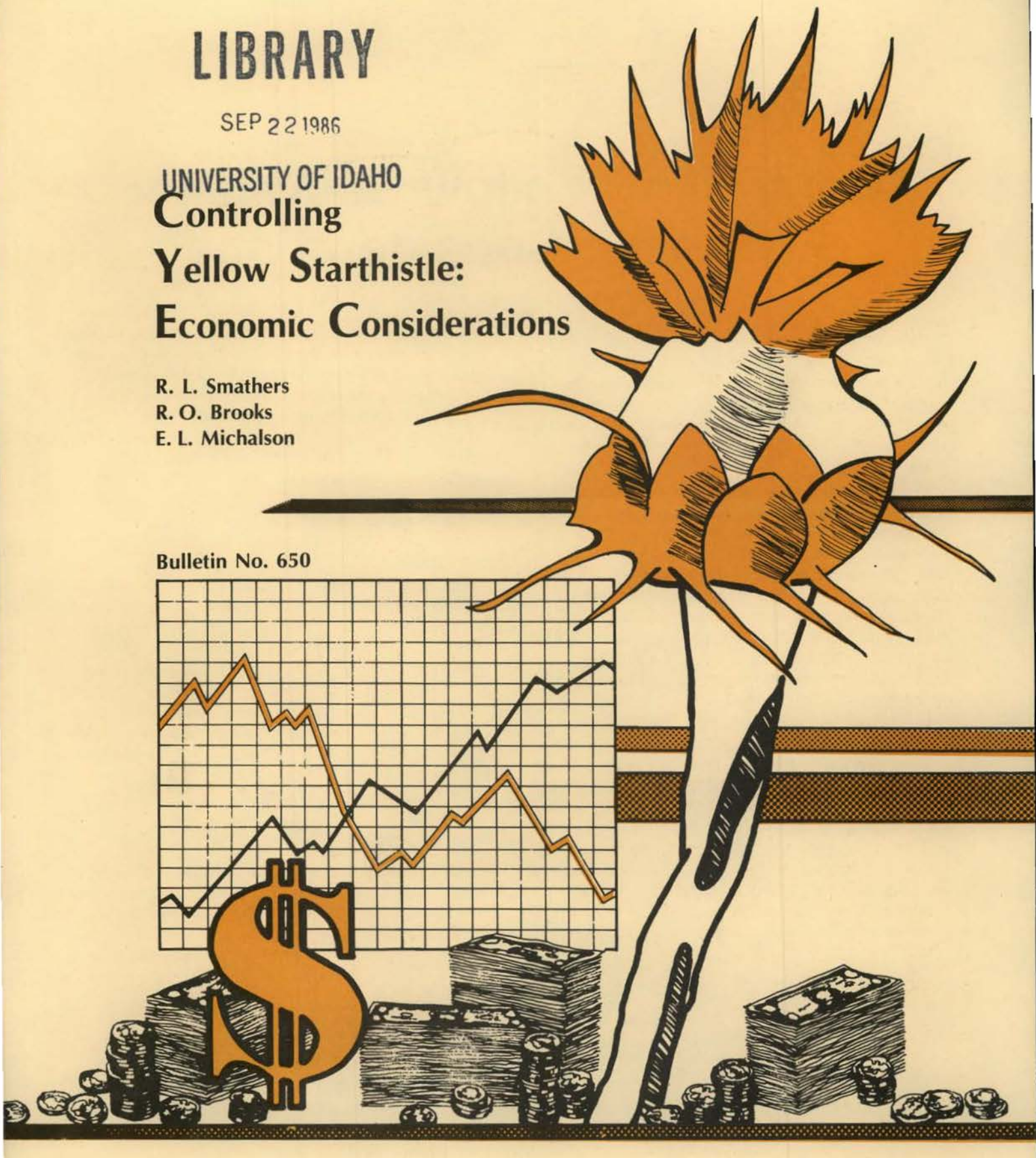

Agricultural Experiment Station
University of Idaho
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Conclusion

The encroachment of yellow starthistle on northern Idaho rangelands poses a major threat to farmers and ranchers. The major problem is a dramatic reduction in productivity in severely infested areas. The weed is also a nuisance and in some cases a poison to grazing animals.

Yellow starthistle infestations that are not controlled in the early stages of development can spread quickly and leave large areas of land virtually unproductive. Farmers and ranchers, therefore, who delay treatment face the risk of major infestations and consequently major control costs. This consequence can be avoided if landowners react quickly and keep small isolated infestations contained. Periodic spraying and seeding of yellow starthistle infested land in the early stages can benefit the landowner by keeping control costs low and by keeping infestations small and manageable.

Most ranch managers in north-central Idaho recognize the threat of yellow starthistle to their operation. However, the willingness of these ranchers to invest in control programs will depend on their current economic situation. Those who can afford the control program should examine the feasibility of such an investment. In other words, will the long term annual net benefits outweigh the costs? By developing and analyzing their budgets and applying a decision criterion such as IRR, ranchers will be better able to make sound judgments with regard to investments in range improvement.

If the rancher perceives that the IRR is too low, then some alternative options should be considered. The consideration of other options would be appropriate if (1) the IRR is too low relative to other investments which implies that control is not economically feasible for the farmer, and (2) there are social benefits of controlling yellow starthistle that justify cost-sharing and/or tax relief. Federal and state subsidies for controlling yellow starthistle would only be justified if farmers refuse to adopt control practices without financial help, and net social benefits are positive after financial help is provided.

The quantification of social benefits would be difficult. However, an example of social benefits would be lower beef prices and/or a steady supply of beef to society. At the other extreme are social costs. If rangelands become unproductive as a result of noxious weeds, with no economical way to bring back productivity, then ranchers may abandon these lands. This would mean fewer tax revenues and the added burden to society of administering these lands. Therefore, the maintenance of these rangelands by either the private or public sector would be a benefit to society.

Introduction

The encroachment of yellow starthistle *(Centaurea solstitialis* L.), on Pacific Northwest rangelands poses a serious threat to farmers and ranchers. Yellow starthistle infestations are spreading in several areas, but the full extent of the problem has not been determined.

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In Idaho, the more serious outbreaks of yellow starthistle have occurred in the north-central area of the state. The river breaks of the Clearwater, Salmon and Lower Snake in Clearwater, Idaho, Latah, Lewis and Nez Perce counties contain major infestations. Small, isolated infestations have also been found in Ada, Adams, Canyon, Gem, Jerome, Kootenai, Owyhee, Payette and Washington counties.

The major resources affected by yellow starthistle are dry range and pasture lands. The weed favors well-drained soils where it invades and competes with existing vegetation. It grows particularly well where overgrazing or limited moisture have left perennial grasses weakened and vulnerable to infestation.

Once yellow starthistle is established in an area, it crowds out annual forage grasses and lowers dramatically the productivity of the land both in terms of grazing and recreational potential. The toxicity of the weed has been known to cause chewing disease in horses, and sharp spines on the weed can damage the eyes of grazing cattle. Because of its severe impact on the land resource, existing infestations should be treated to confine the weed to presently infested areas. Eradication of new and accessible old infestations will help prevent future loss of grazing and recreational land uses (Higgins and Kambitsch 1978).

Eradication and Control

Yellow starthistle infestations that are not controlled in the early stages of development can spread quickly and leave large areas of land virtually unproductive. Farmers and ranchers who delay management of yellow starthistle when initially discovered face the risk of major infestation and consequently major control costs. This can be avoided, however, if landowners control yellow starthistle when first discovered. Periodic spraying and seeding of yellow starthistle infested land in the early stages of infestation can benefit the farmer or rancher by keeping control costs low and affordable and by keeping infestations small and manageable.

Since yellow starthistle is present on federal, state and private lands, constant reinfestation after control efforts is probable. It is unlikely that yellow starthistle could be totally eradicated. At best, ranchers and farmers can protect their land by containing small, isolated infestations that might develop.

Currently, research is being done on biological and chemical control of yellow starthistle. At present, the most effective means of control includes use of herbicides. In addition, weed scientists at the University of Idaho indicate that the effective control of yellow starthistle not only involves the chemical eradication of the weed but also rangeland renovation to achieve the establishment of a healthy stand of grass. This range renovation program means additional costs plus an associated risk of not getting a grassland seeding established. With the high costs of chemical application and seeding plus the risk of not achieving control of yellow starthistle, farmers and ranchers may be reluctant to invest in such a program.

Willingness to Pay For a Control Program

In a survey conducted in five north-central Idaho counties in 1982, ranchers and farmers were asked how much they would be willing to spend for a control program if one were developed in the future (Carlson, Konn and Michalson 1985). The respondents were asked to respond to a hypothetical situation that would require 2 or 3 years non-use of land after treatments with herbicides, burning, fencing and seeding or some combination of control measures. The program would result in a three- to five-fold increase in the forage production on infested acres and higher quality forage.

When ranchers were asked how much they would be willing to pay for treatments associated with this type of program, 16 percent would not be willing to spend anything, 33 percent said $1.00 to $9.00 per acre and 27 percent would be willing to spend up to $19.00 per acre. Twenty four percent of the 110 farmers who responded to the question said they would be willing to spend more than $20.00 per acre to control yellow starthistle under the program.[1]

When respondents were asked how receptive they thought other ranchers would be to adopt the program, 51 percent felt other ranchers would be anywhere from slightly to highly receptive. Only 8 percent felt that ranchers would not be receptive. Forty-one percent said they did not know.

This information indicates that the majority of ranchers and farmers in north-central Idaho do perceive yellow starthistle as being a threat to their operation and would be slightly to moderately receptive to implementing a control program involving range improvement. In doing so, ranch managers must address two major problems: (1) is such a control program economically viable based on their current financial situation and (2) if it is viable, does the investment yield a satisfactory capital return?

With the high cost of chemicals and the risk of getting a stand established, operators must exercise caution when investing scarce resources into a control program. Careful evaluation of their financial status will help ranchers determine whether they can afford to invest in such a range improvement program. If money is available for such an investment, ranchers must examine closely the benefits and costs associated with a control program and make comparisons with alternative uses of their capital. Farmers/ranchers who fol-

[1] Investment in range improvement on poor range may be prohibitive because of low market values. The market value for rangeland in the survey area ranges from $75 per acre for poor range (1 AUM/5 acres) to $250 per acre for good range (10 AUM/5 acres).

low these guidelines will be in a better position to make wise decisions with regard to capital investment in range improvement programs to control yellow starthistle.

Economic Considerations Of a Control Program

In evaluating the ability of operators to invest in range improvement, it becomes necessary to look at the financial strength of their operation. If a ranch operator has the necessary funds for a range improvement program, he must then determine whether such an investment is the most efficient use of his capital. Making this decision requires that the analysis be formulated with the appropriate decision criteria. The criterion examined here is the internal rate of return (IRR). The IRR can be used by the ranch operator to determine the feasibility of a range improvement program.[2] IRR is that rate of discounting future money flows that equates the sum of future discounted net benefits to zero. In other words, IRR is the discount (interest) rate that equates present value of project costs to present value of project benefits.

Since ranchers investing in range improvements incur initial costs with few or no returns until a future date, it becomes necessary to discount that "flow of future returns" to the present. The internal rate of return is the rate that equates the discounted income stream to the project costs. If the IRR exceeds the market rate of interest for obtaining additional capital and exceeds the IRR of other investments, then the range improvement should be undertaken.

If, however, the rancher perceives that the IRR is too low, then some alternative options will have to be examined. The consideration of other options would be appropriate if (1) the IRR is too low relative to other investment opportunities that implies that control is not economically feasible for the farmer and (2) there are social benefits of controlling yellow starthistle which justify cost-sharing and/or tax relief. In other words, federal or state subsidies for controlling yellow starthistle would only be justified if farmers would not adopt control practices without subsidies, and net social benefits are positive after subsidies are provided.

The presence of economic disincentives and the foresight of net social benefits would justify cost-sharing and/or tax relief programs to farmers who attempt to control yellow starthistle. These programs would most likely be run on a county basis under noxious weed programs with supervision by the county's weed supervisor. Such programs may have merit in that yellow starthistle does not respect individual property lines, and a coordinated control program involving areas that are infested would be a more effective way to approach the control of this weed.

[2]For a more comprehensive view of range improvement analysis, see "Economics of Range Improvements" by Darwin B. Nielsen.

A Model for Evaluating the Economics of Range Improvement

A microcomputer worksheet utilizing the IRR decision criterion was developed to help ranch and farm managers make decisions regarding the feasibility of range improvements?[3] (see Appendix 1). In doing so, the worksheet allows ranchers to summarize the costs and benefits of a proposed range improvement program. Whether it be to control yellow starthistle and reseed or to control other noxious weeds, there are costs and benefits that must be accounted for. The initial costs of such a program would be entered into the worksheet. Costs would include purchasing seed, herbicides, fertilizer and fencing. Additional costs might include machine application of seed, herbicides and fertilizer and the annual cost of fence maintenance. Labor is also a significant cost. During the range recovery period, there are often costs due to non-use. These costs are incurred if a rancher finds it necessary to lease alternative rangelands while his improved range is recovering. The non-use period could extend from 1 to 3 years depending on soil quality, climate, percentage of seed establishment, etc.

After entering each cost item associated with a range improvement program, total initial cost is computed. This figure will be used to determine the IRR of the proposed investment.

Annual operating costs are another consideration. With a proposed increase in forage production and quality, the rancher may decide to increase his herd size as well as anticipate an increase in cattle weights. Herd expansion would mean an increase in annual operating costs. Increased hay and grain requirements, marketing and trucking costs and interest on additional cattle purchases are just a few of the annual costs likely to increase.

The worksheet also allows the ranch manager to summarize the changes likely to occur in the ranching operation following range improvement. Information is inserted on increase in herd size and expected weight gains by the various classes of cattle. This information is then used to determine the additional revenue associated with the control program. If a weed control program is successful, in that it eliminates a noxious weed from a piece of ground and increases forage production, the rancher is in a position to either increase his herd size or experience weight gains in his current herd or both. The added revenue associated with either or both of these benefits would be accounted for in the worksheet.

The worksheet was designed to use information from livestock enterprise budgets for the state of Idaho. With the aid of livestock budgets for similar sized operations,

[3]The microcomputer worksheet on range improvement analysis is available on Lotus and Visicalc from the University of Idaho, Department of Agricultural Economics. The worksheet also includes a user's manual.

a ranch operator may be better able to determine his fixed and variable operating costs. Livestock enterprise budgets are constructed by the University of Idaho for selected areas in the state. In addition, a number of computer programs have been developed to help ranchers and farmers determine fixed and variable operating costs. These programs can be obtained from Cooperative Extension Service offices in each county.

The primary objective of this worksheet is to provide an easy to follow outline for determining the IRR of a proposed investment. The IRR is computed in the final section of the worksheet based on the summaries of costs and returns examined earlier.[4] If this number is greater than the IRR of alternative investments and the rate of borrowing additional capital, then the investment in range improvement should be undertaken.

[4]The results of the example worksheet in Appendix 1 are based on cost and return information for a typical cow/calf operation of 150 cows in Cassia County, Idaho.

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Appendix 1 — Range Improvement Analysis

Yellow Starthistle Worksheet
Department of Agricultural Economics
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This worksheet is designed to help analyze your ranch operation's costs and returns when considering improvement of your range resources.

Section 1. Range forage requirement: (Enter the number of cattle in each classification for your operation. Range forage requirements will be calculated for you).

Ranch Name	?	Example Ranch	
Turnout			
Month	?	4	< Enter month cows are turned out
Day	?	5	< Enter day of month of turnout
	=	95	
Feeding			
Month	?	11	< Enter month cows are put on winter feed
Day	?	28	< Enter day of month feeding starts
	=	332	

			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Days of year			31	59	90	120	151	181	212	243	273	304	334	365
Days of use			0	0	0	25	30	31	31	31	30	31	28	0
Class		**No. head**										**Total days of use**		237
Cows	?	150	0	0	0	123	148	153	153	153	148	153	138	0
Calves	?	129	0	0	0	0	0	0	0	27	51	53	48	0
Yrlng	?	125	0	0	0	62	74	76	76	55	18	18	0	0
Rep hf	?	30	0	0	0	20	24	24	24	24	24	24	22	0
Bulls	?	8	0	0	0	8	10	10	10	10	10	10	9	0
Horses	?	5	0	0	0	5	6	6	6	6	6	6	6	0
Total AUMs/month			0	0	0	218	262	270	270	277	256	265	223	0
Total AUMs			0	0	0	218	480	750	1,021	1,297	1,554	1,819	2,042	2,042

Section 2. Range forage availability: (Enter the available forage in AUM's from each source for your operation).

Forage source	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Forest permit ?	0	0	0	0	0	0	0	0	0	0	0	0
BLM permit ?	0	0	0	100	100	100	100	100	100	100	100	0
Pvt lease ?	0	0	0	125	100	100	100	0	0	100	0	0
Deeded range 1 ?	0	0	0	0	0	25	25	50	50	50	0	0
Deeded range 2 ?	0	0	0	0	0	0	0	75	25	25	0	0
State lease ?	0	0	0	0	60	50	25	25	75	0	0	0
Aftermath ?	0	0	0	0	0	0	0	0	0	0	120	0
Other ?	0	0	0	0	0	0	0	0	0	0	0	0
Other ?	0	0	0	0	0	0	0	0	0	0	0	0
Total resource =	0	0	0	225	260	275	250	250	250	275	220	0
Net resource =	0	0	0	7	−2	5	−20	−27	−6	10	−3	0
											Total AUMs available >>	2,005

Section 3. Yellow starthistle control and range improvement costs: (Enter costs that apply to your operation).

Initial costs? Inputs	Unit ?	Units /acre ?	Costs /unit ?	Number of acres to be treated?	Total cost
Grass seed	lb	1.50	$ 0.60	27.00	$ 24.30
Herbicide1	pt	1.00	12.00	27.00	324.00
Herbicide2	pt	0	0	0	0.00
Fertilizer1	lb	40.00	0.23	27.00	248.40
Fertilizer2	lb	0	0	0	0.00
Fencing	mile	1.00	3,000.00	——	3,000.00
Water Development					
Machinery (ground application)					
Disk	acre		2.58		
Seed	acre		1.78		
Spray	acre		1.76	27.00	165.24
Total machinery					
Machinery (air application)					
Burn	acre		0.00		
Spray — helicopter	acre		0.00		
Seed and fertilize *- helicopter	acre		0.00	0.00	0.00
Total machinery					
Nonuse costs (1 year)					
Leased range:					
Private	acre		0.00		
BLM	acre		0.00		
USFS	acre		0.00		
State	acre		0.00	0.00	0.00
Hay purchased:	tons	0.00	0.00		0.00
Total initial costs					3,761.94
Annual costs associated with the control and rehab project ?					
Water device maintenance	acre		2.00	27.00	54.00
Fence maintenance	acre		2.00	27.00	54.00
Total annual costs					$108.00

Section 4. This section summarizes the variable costs that are incurred when operating a cow-calf operation. (Enter the costs that pertain to your operation on a per cow basis. Also enter costs per additional cow in the second column if you plan to increase your herd size.)

Variable ?	Present costs ?	Added costs ?	Variable ?	Present costs ?	Added costs ?
Alfalfa hay	$111.60	$ 60.00	Tractors (fuel, lube, repair)	$ 8.09	$ 0.00
Stubble graze	14.40	0.00	Machinery (fuel, lube, repair)	24.72	0.00
BLM	2.60	0.00	Equipment (fuel, lube, repair)	3.89	0.00
Forest Service	6.94	3.00	Labor, tractor and machinery	17.52	0.00
Trucking and marketing	1.00	0.00	Labor, equipment	3.01	0.00
Sales commission	4.50	4.50	Labor, livestock	49.60	0.00
Vet medicine	24.80	24.80	Interest on operating capital	17.79	14.00
Mixed feed	0.00	0.00	Miscellaneous	0.00	0.00
Salt	1.00	1.00			
Assoc. rider	11.04	0.00	Total Operating cost	$302.50	$107.30

Section 5. Summary of the changes in your ranching operation.

Will you increase your herd size? If so, list the net increase in the number of cows..... 2

How many cows are you currently supporting?..... 150

Do you plan to increase your herd size following range improvement? If so, please indicate the increases in the number of cattle to be marketed in each class. If there are no increases in the number to be marketed or none are to be marketed, then enter zero.

Steer calves 1 Heifer calves 1 Cull cows 0

Bulls 0 Heifer replace 0

How many cattle do you anticipate taking to market following range improvement? Please indicate the total number to be marketed for each class. If not sold, then enter zero.

Steer calves 94 Heifer calves 36 Cull cows 0

Bulls 0 Heifer replace 0

Do you expect weight gains by the different classes of cattle? If not, enter zero.

Steer calves 9.00 Heifer calves 7.50 Cull cows 0.00

Bulls 0.00 Heifer replace 0.00

Section 6. Added revenue associated with an increase in herd size. (Enter expected selling weights and price per unit).

Option A. Estimated returns from additional cattle marketed.

Class	Price or cost/unit ?	Unit	Weight each ?	Value or cost per head	Total value or cost
Steer calves	$70.00	cwt	4.50	$315.00	$315.00
Heifer calves	65.00	cwt	4.00	260.00	260.00
Cull cows	41.00	cwt	9.50	389.50	0.00
Aged bull	47.50	cwt	17.50	822.50	0.00
Repl. heifer	54.00	cwt	8.00	432.00	0.00
Added returns					$575.00

Section 7. Added revenue associated with an increase in cattle weights.

Option B. Estimated returns resulting from an increase in cattle weights.

Class	Price or cost/unit	Unit	Net weight gain	Value or cost per head	Total value or cost
Steer calves	$70.00	cwt	0.09	$6.30	$592.20
Heifer calves	65.00	cwt	0.08	4.88	175.50
Cull cow	41.00	cwt	0.00	0.00	0.00
Aged bull	47.00	cwt	0.00	0.00	0.00
Repl. heifer	54.00	cwt	0.00	0.00	0.00
Added returns					$767.70

Section 8. Summary of costs and returns.

Total initial investment	$ 3,761.94
Additional annual costs associated with the control and rehab project	322.60
Other?	0.00
Additional annual costs	322.60
Total annual costs (with improvement)	45,697.60
Total annual costs (without improvement)	45,375.00
Additional annual returns	1,342.70
Total annual returns (with improvement)	39,737.70
Total annual returns (without improvement)	38,395.00

Section 9. Range improvement analysis

Market discount rate	?	13.00%
Starting discount rate for IRR calc	?	25.00%
Risk factor	?	20.00%
Expected life of project	?	7 years

Year	Benefits	Costs	B-C	Year	Benefits	Costs	B-C
0	$ 0.00	$4,514.33	$ -4,514.33	15	0.00	0.00	0.00
1	1,342.70	322.60	1,020.10	16	0.00	0.00	0.00
2	1,342.70	322.60	1,020.10	17	0.00	0.00	0.00
3	1,342.70	322.60	1,020.10	18	0.00	0.00	0.00
4	1,342.70	322.60	1,020.10	19	0.00	0.00	0.00
5	1,342.70	322.60	1,020.10	20	0.00	0.00	0.00
6	1,342.70	322.60	1,020.10	21	0.00	0.00	0.00
7	1,342.70	322.60	1,020.10	22	0.00	0.00	0.00
8	0.00	0.00	0.00	23	0.00	0.00	0.00
9	0.00	0.00	0.00	24	0.00	0.00	0.00
10	0.00	0.00	0.00	25	0.00	0.00	0.00
11	0.00	0.00	0.00		5,255.08	5,257.58	-2.50 NVP
12	0.00	0.00	0.00				
13	0.00	0.00	0.00		B/C ratio		1.00
14	0.00	0.00	0.00		Approximate IRR		12.98%

About the Authors

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