Economic Evaluation of Tobosagrass Prescribed Burning with a Microcomputer Model

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Tobosagrass builds up large quantities of litter under normal range conditions. As litter accumulates, tobosagrass becomes less palatable to cattle and decreases both plant and animal production. Grass palatability and yield can be increased for several years by prescribed burning. Burning of tobosagrass constitutes a capital investment because the major expense occurs at one time and effects extend into the future. Because the effects are expected to last several years, there are two risks in prescribed burning: (1) biological variation, of which the impact of weather is an example, and (2) economic uncertainty, arising mostly from variations in product (livestock) prices.

An economic model for evaluation of prescribed burning of tobosagrass has been reported by Ethridge, Sudderth, and Wright (1985) for the Texas Rolling Plains region. They developed a herbage yield response function relating the increased grass production resulting from a prescribed burn to time since the burn occurred, rainfall during the growing season, rainfall during the period preceding the growing season, slope of the terrain, and site where the burn was conducted. Their model indicates that the useful life of a prescribed burn is five years. Because some of the economic and technical parameters may vary over time and among producers, there is a need for tools to assist with economic evaluations of production practices and investments which can adjust as conditions change.

Microcomputer programs can be useful aids in reinforcing abstract principles and concepts being taught in classrooms and extension settings. Computer packages are generally effective for teaching, having been used to teach risk management, enterprise mix optimization, financial analysis, and other applications. It is estimated that by 1990, 75 percent of all managers of mid-sized agricultural firms will use computers in making management decisions (Kramer 1982). There is still much software yet to be developed. The purpose of this article is to describe a microcomputer software package which can be used by cow-calf operators as a production decision tool to evaluate the economic feasibility of prescribed burning on rangeland.

Program Overview

The program assumes a cow-calf operation and marketing of calves in the fall. All data prompts are described, and results presented in producer terminology. The user is led throughout the presentation with easily understood prompts until finished. The program uses a grass yield response function (Ethridge, Sudderth, and Wright 1985) which measures changes in forage production due to varying levels of precipitation after burning has occurred. The user is allowed to input precipitation representing areas other than the Texas Rolling Plains region. Additional grass production associated with prescribed burning is represented as a function of treatment variables, environmental variables, and time. Time allows the investment aspects of the response relationship to be economically evaluated.

Considering the useful burn life, the program calculates the resulting annual increase in grass production, the annual discounted returns, and the total discounted returns over the burn life. These results are calculated at the producer's expected calf price and at estimated high and low calf prices established by the producer. Thus, the producer is able to consider risk because the estimated range of returns provided over the burn life are tied to cattle prices. The program also allows the user to supply alternative values for treatment and environmental variables which may better represent individual circumstances.

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Table 1. Result screen from the microcomputer model employing the expected calf price for evaluating the economic feasibility of prescribed burning.

Economic evaluation of controlled burning of tobosagrass in the Texas Rolling Plains

Calf prices are $ .65 per cwt

Year	Added grass production (lb/acre)	Discounted value per acre ($)
1	821.5041	1.212356
2	477.4647	.5446402
3	276.2144	.2465802
4	133.4253	9.415826E-02
5	22.66914	1.275171E-02

If the total discounted value of additional returns per acre is greater than the cost of burning per acre, then the burning activity is economically feasible.

The total discounted value per acre under the following conditions is $2.11

1.	Interest rate (as a decimal)	.15
2.	Calving rate (as a decimal)	.8
3.	Selling weight of calves (lbs.)	400
4.	Cow death loss (as a decimal)	.02
5.	Calf death loss (as a decimal)	.05
6.	Price of calves ($/lb)	.65
7.	Variable cost per cow-calf unit ($/yr.)	178
8.	Rainfall during March-June (inches)	6.85

Retrieval of documentation for the program requires printing capabilities. The user is given the choice of printing the documentation early in the program. Those without a printer are not restricted in the program's analysis.

Data Requirements

The program requires the following estimates: (a) interest rate expected to be charged for the capital used to finance the burn; (b) expected calving rate; (c) expected sale weight for calves; (d) expected cow and calf death losses; (e) expected price of calves to be marketed; (f) calf price variability to be considered; (g) expected variable costs associated with adding an additional cow-calf unit; and (h) expected average rainfall from March through June in inches.

Prescribed Burn Example

Following is an example program session illustrating a user's response to each prompt. Upon loading the program, the user is given the option of reading a narrative description of how to use the program. An affirmative answer produces a printed description, while a negative response brings a prompt to enter items of data. The user is asked to enter: (a) interest rate charged for capital used to finance the burn (15%); (b) expected calving rate (80%); (c) weight at which the calves will be sold (400 lbs.); (d) expected cow death loss (2%); (e) expected calf death loss (5%); (f) expected market price for calves when they are marketed (0.65/lb.); (g) calf price variability to be considered (15%); (h) expected variable cost associated with adding an additional cow-calf unit ($178); and (i) expected average rainfall in inches during the months of March through June (producers may enter any value, but assuming that the user wants average rainfall during this period for the Texas Rolling Plains region; the user responds by pressing the enter key. The program then uses the region's average rainfall for the time period, 6.85 inches. Thus, the user may employ the Texas Rolling Plains average in lieu of individual ranch data).

The program lists the data established in the current session and queries whether changes are needed. A negative response prompts the program to begin the analysis. Once the analysis is complete tables are produced for three different product (calf) prices (i.e., expected calf price, and estimated high and low prices). Each table presents the annual increase in grass production and the annual discounted value per acre. The three resulting screens for the example session are presented in Tables 1 through 3[1]. Table 1 provides the total discounted value per acre representing the results when market calf prices are as expected. Table 2 provides the total discounted value per acre representing the results of the circumstances described at the upper limit of the expected market price for calves established in the example, and Table 3 provides the same information for the circumstances described at the lower limit of the expected market price for calves. Negative values represented in Table 3 indicate that the discounted value of added grass production with calf prices at this level is less than the variable cost per cow-calf unit. Thus, the cost of prescribing burning would not be recovered. The tables are followed by a state-

[1]Each table contains discounted value(s) with E-02 or E-03 attached to the right end of the value. This term indicates that the value is represented in scientific notation and is multiplied by ten raised to the power indicated to the right of the "E". Therefore, the discounted value 9.415826E-02 of Table 1 is .09415826 when converted to standard format.

Table 2. Result screen from the microcomputer model employing the highest expected calf price for evaluating the economic feasibility of prescribed burning.

Economic evaluation of controlled burning of tobosagrass in the Texas Rolling Plains

Calf prices are $ .7475 per cwt

Year	Added grass production (lb/acre)	Discounted value per acre ($)
1	821.5041	2.660101
2	477.4647	1.195027
3	276.2144	.5410363
4	133.4253	.2065982
5	22.66914	2.797928E-02

If the total discounted value of additional returns per acre is greater than the cost of burning per acre, then the burning activity is economically feasible.

The total discounted value per acre under the following conditions is $4.63

1.	Interest rate (as a decimal)	.15
2.	Calving rate (as a decimal)	.8
3.	Selling weight of calves (lbs.)	400
4.	Cow death loss (as a decimal)	.02
5.	Calf death loss (as a decimal)	.05
6.	Price of calves ($/lb.)	.7475
7.	Variable cost per cow-calf unit ($/yr)	178
8.	Rainfall during March-June (inches)	6.85

Table 3. Result screen from the microcomputer model employing the lowest expected calf price for evaluating the economic feasibility of prescribed burning.

Economic evaluation of controlled burning of tobosagrass in the Texas Rolling Plains

Calf prices are $ .5525 per cwt

Year	Added grass production (lb/acre)	Discounted value per acre ($)
1	821.5041	–.2353902
2	477.4647	–.105747
3	276.2144	–4.787586E-02
4	133.4253	–1.828171E-02
5	22.66914	–2.475863E-03

If the total discounted value of additional returns per acre is greater than the cost of burning per acre, then the burning activity is economically feasible.

The total discounted value per acre under the follow conditions is –$0.41

1.	Interest rate (as a decimal)	.15
2.	Calving rate (as a decimal)	.8
3.	Selling weigt of calves (lbs.)	400
4.	Cow death loss (as a decimal)	.02
5.	Calf death loss (as a decimal)	.05
6.	Price of calves ($/lb.)	.5525
7.	Variable cost per cow-calf unit ($/yr.)	178
8.	Rainfall during March-June (inches)	6.85

ment asking the user to compare the range of total discounted values of additional returns to the cost of the burn. The user is advised that if the total discounted value of additional returns (considering its range) per acre is greater than the cost of the burn per acre, the burn is economically feasible. At this point changes may be made in any of the user inputed data for an additional session.

Availability

The software package "Economic Evaluation of Controlled Burning of Tobosagrass in the Texas Rolling Plains," comes on a 5 1/4 inch diskette and contains its own documentation, which can be printed by the user. The program is written in BASIC for an IBM personal computer (PC, XT, or AT) or compatible with at least 64K of memory.

The Department of Agricultural Economics of Texas Tech University is in charge of distribution of the program, and will provide it free of charge to interested parties who send to the authors a 5 1/4 inch diskette along with a stamped self-addressed container suitable for returning the formatted diskette. Agencies in other states may choose to distribute and support the program locally or direct their clientele to this office for acquisition.

References

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Intensive Grazing—Precautions

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Many ranchers facing financial difficulties are closely following developments in new grazing management techniques designed to increase livestock production and improve overall ranch management efficiency. There are many new intensive grazing methods commonly referred to by various names such as Short Duration Grazing, The Savory Grazing Method, Cell Grazing Method, Time Controlled Grazing, and even Mob Stocking. Most of these intensive grazing methods employ some form of time control of livestock rotation among pastures.

Current literature contains a lot of controversial and misleading information on these grazing methods. This contributes to the difficulties in understanding what application these grazing methods have in solving the problems facing today's livestock producers. The following is a summary of precautions that should be considered before implementing any intensive grazing method.

Increased Planning and Management Are Required

One of the most important steps before implementing a new grazing method is to review **all available** options to improve the ranch. An operator should know the financial health of the existing operation and go through a step-by-step, in-depth planning process before deciding if a new grazing method will improve the ranch operation. Appropriate goals must first be developed to guide the actions. **Warning: Today's ranchers have no business building new water developments or fences until they push a pencil or do a computer analysis to determine if these new improvements will pay for themselves.** Wasting dollars and time are not in the cards for most livestock operators today.

Ranchers should apply a cash flow analysis to their operation and determine the weakest link. Possible weak links are poor animal nutrition, a poor breeding program, or an inadequate livestock-marketing system. For example, genetics, affecting milking ability, calving difficulties, fertility, or resistance to disease may need more attention than the operator's current grazing method. Another common weak link is human resource management. If a rancher decides that a more intensive grazing plan is going to improve ranch profitability, he must be prepared to spend much more time operating, monitoring, controlling, and replanning than before.

Without this preliminary planning, unwanted problems may result, such as depressed animal gains, inadequate feed in the rotation, overgrazing, inadequate nutrition or spending too many dollars on construction projects to be cost effective.

Ranchers must have a thorough understanding of what time-controlled grazing means and its relationship to overgrazing. It needs to be emphasized that time control is determined by plants and not calendar dates. With intensive grazing (more livestock in smaller pastures), you can now graze the corners of the pasture. Mismanagement cannot be afforded here either. Also, if any early spring pasture should only be grazed for 2 to 3 days, the manager cannot go off and leave the animals on this pasture for 4 to 8 days. This could lead to depressed animal performance and overgrazing. An operator will need to closely monitor each pasture for overgrazed plants, the optimum deferment, litter on the soil, and then move livestock accordingly. Time control is very important to insure that all plants receive adequate deferment before they are regrazed to insure their health and vigor. Drought may change the entire pattern of grazing followed the year before, including number of animals grazed.

Motivation and attitude are very important. Ranchers should have the will, desire, and time to properly plan their change in management. **Caution: Do not overlook the proper training and background information necessary to successfully run an intensive grazing plan.**

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