FEEDSTORIS: A Micro-computer Program for Ranch Planning

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Ranch planning requires the analysis of numerous management alternatives, including how these alternatives will affect management, feed balance, livestock husbandry, and ranch economics. A change in one factor may require recomputation of the entire system. This paper describes a micro-computer program designed to do these computations and to organize information for ranch planning and appraisal.

Ranch planning seeks to select the "best" combination of management practices to achieve a predetermined set of goals. With the large number of management alternatives available, selecting the best combination has often been the result of trial-and-error methods instead of actual planning. These trial-and-error methods have resulted in highly efficient ranches—and those no longer in business.

With the current situation of relatively low cattle prices and high input costs, numerical analysis of the total ranch becomes much more imperative for economic survival. Micro-computers quickly handle repetitive mathematical calculations giving managers more time to formulate a coherent ranch plan that integrates biological, social, political, and economic aspects of ranch management.

The micro-computer program FEEDSTORIS incorporates the algebraic approach for estimating ranch carrying capacity (Workman and MacPherson 1973) and the ranch income statement (Workman 1981a). The program is written on the VisiCalc® electronic spreadsheet for use on the Apple®II Plus and IIe micro-computers and on Lotus 1-2-3® for use on IBM and IBM compatible micro-computers. The program is

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Table 1. Livestock and pasture production parameters.

Operation type = Utah 300 head cow-calf ranch example

Note-% and AU values are entered as decimals

Livestock Parameters			Operation Parameters			Feed Sources		
Calf Crop %	=	.8	Cows - January 1	=	300	Private Lease	=	0
Replacement	=	.15	YRL STR (% Kept)	=	0	Federal Lease	=	1000
Bull:Cow	=	.05	YRL HFR (% Kept)	=	0	Native Pvt Range	=	645
Bull AU	=	1.2				Seeded Pvt Range	=	250
Cow AU	=	1	Purchased Steers	=	0	Aftermath	=	575
2 Yr Rept AU	=	0	Purch Str Weight	=	0	Pvt Pasture Four	=	0
Yrl Rept AU	=	.6				Pvt Pasture Five	=	0
Yrl Str AU	=	0	Own Grain Sales	=	0	Irrigated Pasture	=	0
Yrl Hfr AU	=	0	Own Hay Sales %	=	1	Meadow Hay	=	2150
Str Calf AU	=	.35	AUMS/Irrig Acre	=	2.73	Purchased Hay	=	0
Hfr Calf AU	=	.35	Pounds/AUM	=	800	Barley	=	180
Purch Str AU	=	0	Tons of Hay/Acre	=	4			

Table 2. Feed Sources Chart

	Feed Available (AUMS)								
Season	Private Lease	Federal Lease	Private Native Range	Private Seeded Range	After-Math	Meadow Hay	Purch. Hay	Barley	Total AUMs Avail
May	0		95	250					345
June	0	250	95	0					345
July	0	250	95						345
August	0	250	180						430
September	0	250	180						430
October	0				410			30	440
Nov - Apr	0				165	1755	0	150	2070
AUMS Used	0	1000	645	250	575	1755	0	180	
Remaining	0	0	0	0	0	395	0	0	

adaptable to any micro-computer electronic spreadsheet (e.g. SuperCalc®, Perfect-Calc®, Multi-Plan®, Lotus 1-2-3®). Both the Apple and IBM versions of the program are available at cost from the Range Science Department at Utah State University. A listing of spreadsheet commands is also available for users of other brands of spreadsheets or micro-computers.

The program combines a feed sources chart, a stock count chart, a forage balance chart, and a ranch income statement into an integrated spreadsheet program. This paper will focus on how to use the FEED sources—STOck count—Ranch Income Statement (FEEDSTORIS) program for ranch planning and ranch appraisal. The general form of the FEEDSTORIS program can easily be customized for specific ranch operations. The program should be useful to ranch owners, range and ranch managers and consultants, federal and state land resource managers, ranch appraisers, agricultural loan officers, and educators.

FEEDSTORIS is composed of five interrelated tables. Table 1 defines the ranch operation (e.g., livestock and range production parameters). Table 2, the feed sources chart, is used to allocate each feed source to its correct season of use. Table 3, the stock count chart, is used to display the numbers of each animal class, by season, and to compute total AUMs required for a given herd size. Table 4, the forage balance chart, is used to compare AUMs available with AUMs required, by season, for the specified herd size. Table 4 allows rapid identification of seasonal forage balance or imbalance. Table 5, the ranch income statement, calculates net return over variable costs (Workman 1981a).

The input required and format changes necessary to model a particular ranch will be described for each table. The example Utah ranch operation shown in Tables 1-5 includes all input and output values. The tables are partially customized for this example ranch but still contain unused portions in order to show all parts of the model.

Table 1—Livestock and Pasture Production Parameters

Table 1 defines the type of livestock operation (cow/calf, cow/calf/yearling) and expected production levels. The program can incorporate a stocker operation and can allow for the sale of any unused portion of raised hay and/or grain.

The first column specifies livestock parameters of percent calf crop, cow herd replacement rate, bull to cow ratio, and animal unit (AU) factors. The second column defines the type of livestock operation and specifies production parameters. The entries "Cows-January 1" and "Purchased Steers" specify herd size. The cow herd size is used to calculate numbers of all other livestock classes (except purchased steers) based on percentages from column one. If calves are held over winter for sale as yearlings, the percent of steers and heifers kept is entered. The percentage of heifers kept as sale yearlings is based on the total number of heifer calves less those kept as replacements.

The program assumes that ranch-raised hay and grain is used first for feeding owned livestock. Any percentage of excess hay or grain produced may be specified for sale. Four additional parameters are specified in column two: purchased steer weight, number of AUMs produced per irrigated acre, pounds of forage per AUM, and tons of hay produced per acre.

The third column requires an estimate of total AUMs produced from each feed source. Feed sources with common features (e.g., ownership, season of use) can be grouped together. Headings in columns two and three should be changed to reflect the operation being modeled.

Table 2—Feed Sources Chart

Any feed source heading change made in Table 1 must also be made in Table 2. The analyst must then define the grazing seasons. The example program (with six seasons corresponding to one month each and one season of six months) can easily be changed to accommodate any number and length of seasons. Once the chart headings are established, the analyst must specify when each feed source is available for livestock use so that total AUMs from each feed source can be divided among available seasons. The season of use is shown by blanking-out (or placing zeros in) each season that feed sources are unavailable due to physical, biological, and policy limitations. Numbers entered in the body of the chart will be reflected in the "Total AUMs Avail(able)" column and in the "AUMs Used" row. The latter value is then compared to the total AUMs specified in Column 3 of Table 1 and the difference shown in the "Remaining" row.

Table 3—Stock Count Chart

Seasons must correspond to those shown in Table 2. Since required AUMs are calculated within the chart (as opposed to being input into Table 2), it is necessary to change the formulas in the last column if the season length is not one

Table 3. Stock Count Chart

	Stock Count Chart - Livestock Numbers									
Season	Bulls 1.2	Cows 1	Two-Year Replace 0	Replace-ments .6	Yearling Steers 0	Yearling Heifers 0	Steer Calves .35	Heifer Calves .35	Purch. Steers 0	Total AUMS Required
May	15	300		45	0	0			0	345
June	15	300		45	0	0			0	345
July	15	300		45	0	0			0	345
August	15	300		45	0	0	120	120	0	429
September	15	300		45	0	0	120	120	0	429
October	15	300		45	0	0	120	120	0	429
Nov - Apr	15	300		45	0	0			0	2070

month. For example, since the last season is six months long, it was necessary to multiply the entire formula in the last column by six. This change will automatically be reflected in both Tables 3 and 4. The calculations follow formulas outlined by Workman and MacPherson (1973).

There are many ways to structure the stock count chart. However, it must be possible to follow an animal from birth through different livestock classes without either double counting or failing to count the animal in some season. It is also important that the AU factors accurately reflect the average size of the animal in a particular class. Blank-out entries in those seasons when the animal class is not present on the ranch or when calves are too young to consume forage.

Table 4. Forage Balance Chart

	Forage Balance		
Season	Total AUMS Avail	Total AUMS Req	Forage Balance
May	345	345	0
June	345	345	0
July	345	345	0
August	430	429	1
September	430	429	1
October	440	429	11
Nov - Apr	2070	2070	0

Table 4—Forage Balance Chart

Table 4 displays the last columns from Tables 2 and 3. The seasons must be consistent, as in the other tables. The forage balance column shows either balanced, excess, or deficit feed for each season, which can then be used to identify any required management changes.

Table 5—Cash Portion of the Ranch Income Statement

The analyst must specify prices for all potentially salable livestock and crops, sale weight of each animal class, and all feed and non-feed variable costs on a per unit basis. Non-feed variable costs are calculated by entering costs on a per animal basis. Any variable costs considered to be "lumpy" (e.g., hired labor may only increase when herd size increases by a given amount) are relatively easy to incorporate as fixed amounts; simply specify total costs in the first sub-total column for that item and leave the per animal cost as zero. All other values in this table are automatically calculated by the program.

FEEDSTORIS for Ranch Planning and Appraisal

Depending on specific needs, there are two ways to set up the baseline operation using FEEDSTORIS for ranch planning and appraisal: (1) begin with the maximum herd size for a "typical" or average production year, or (2) begin with the existing herd size and production levels. The Utah ranch example (Tables 1-5) could be used to set up either baseline operation. The difference is in how the numbers are derived.

Contemplated management changes are compared to the baseline operation. One particularly useful question for ranch appraisal answered by this program is what herd size can be maintained with a specific set of forage resources. To obtain this estimate, first enter the number of brood cows and an initial forage allocation among seasons. Herd size is then increased in Table 1 until a limiting forage season is found. Forage allocation in Table 2 is then adjusted within season of use constraints. If the adjustment results in excess available forage in every season, the herd size is increased to again balance with available AUMs. This process is repeated until herd size can no longer be increased. The maximum herd size will usually not be the "optimum" (profit maximizing) herd size and adjusting herd size downward from the maximum will usually increase net return over variable costs (Workman and Fowler 1984).

Ranch Example

The hypothetical Utah ranch example runs 300 brood cows, has a 15 percent cow herd replacement rate, and has a bull to cow ratio of 1:20. Bulls are kept an average of three years. The AU factors are based on the rule-of-thumb of 0.1 AU per 100 pounds live body weight.

The ranch sells all calves after retaining herd replacements. All excess meadow hay is sold. From May to September the herd grazes on a combination of federal allotments, private native ranges, and private seeded ranges. In October, the cattle graze aftermath. From November to April cattle are fed home-grown hay and grain (barley).

Calves are born about April 1 and counted as grazing animals (independent of their mothers) in August. Calves (except replacement heifers) are weaned and sold November 1. Heifer calves enter the replacement class in April and the cow class in November when culling occurs. An unused column has been included for two-year old replacements (Table 3) to illustrate that this may be a viable option in herd management.

The forage balance chart (Table 4) indicates an almost balanced feed situation for the 300 cow herd size. If excess feed were available in each month, more cows could be added to the herd. If the herd requires more forage than is produced in a given season, adjustments must be made in seasonal allocation and use of existing feed, amounts of feed produced or purchased, and/or herd size.

The ranch income statement (Table 5) indicates that total annual receipts would average $87,373 from sale of livestock and surplus hay. Variable costs (costs which vary with herd size) total $84,775.

In addition to these variable costs, there are fixed costs that must be paid regardless of cow herd size. The example ranch has $2,598 in net return over variable costs with which to pay fixed costs (e.g. depreciation, loan service, return to operator labor and mangement, and return to owned capital). The net return over variable costs is also a baseline value to which alternative management schemes are compared.

For the purposes of ranch appraisal, the analysis using FEEDSTORIS is complete. The program estimate of average annual net income over variable costs can easily be adjusted to net ranch income (see Workman 1981a) to estimate ranch value by the appraisal income approach.

Once the baseline situation has been established and verified, it is easy to analyze alternative management options and to answer various "what if" questions (e.g., what if cost of growing hay increases ten percent?). Potential ranch management alternatives for consideration by FEEDSTORIS are

Table 5. Cash Portion of the Ranch Income Statement

				Sub-Total	Sub-Total	Total
Production Receipts						
I. Gross Livestock Sales						
Head	Class	Lb/Head	$/CWT			
45	Cull Cows	1000	40.00	18000		
5	Cull Bulls	1200	48.00	2880		
120	Str Calves	440	68.00	35904		
75	Hfr Calves	420	63.00	19845		
0	Yrlg Steers	0	0.00	0		
0	Yrlg Heifers	0	0.00	0		
0	Purch Steers	0	0.00	0		
Subtotal - Livestock Sales					76629	
II. Gross Feed Sales			$/Ton			
158	Tons of Raised Hay		68.00	10744		
0	Tons of Barley		0			
Subtotal - Feed Sales					10744	
Total Receipts						87373
Production Costs						
I. Feed Costs			$/Unit			
0	AUMS Private Lease		0.00	0		
1000	AUMS Federal Lease		2.02	2020		
0	Acres Irriga Pasture		0.00	0		
215	Acres Raised Hay		173.00	37195		
0	Tons Purchased Hay		65.00	0		
72	Tons Barley		80.00	5760		
Subtotal - Feed Costs					44975	
II. Non-Feed Costs			$/Cow			
300 Head of Cows						
	Labor Hired		0.00	7500		
	Repairs, Maintenance		20.00	6000		
	Interest		15.00	4500		
	Supplies		3.00	900		
	Vet and Medicine		2.00	600		
	Gas, Oil, Fuel		20.00	6000		
	Taxes		14.00	42 00		
	Insurance		5.00	1500		
	Utilities		5.00	1500		
	Freight, Trucking		2.00	600		
	Miscellaneous		5.00	1500		
			$/Bull			
	5 Bull Purchase		1000.00	5000		
			$/Steer			
0	Steers-Purchase					
	($/CWT)		0.00	0		
	Labor/Miscellaneous		0.00	0		
Subtotal -Non-Feed Costs					39800	
Total Variable Costs						84775
Net Return Over Variable Costs						2598

limited only by the imagination of the decision-maker. Following is an example of the use of FEEDSTORIS to estimate the annual net benefit from a range seeding project. At this point, the cost of the seeding (or other project) does not need to be known. FEEDSTORIS can be used to estimate whether the project produces a positive annual net return. If so, the required investment can then be estimated and economic feasibility tested (see Workman 1981b).

Ranch Planning Example

The range seeding and its effects on the ranch will first be discussed in general terms and then in terms of changes made in the program by the analyst. The program response will then be described. Tables are not shown for this example but the reader can verify the results with a few relatively simple calculations based on Tables 1-5.

Suppose the rancher is considering the conversion of 285 AUMs of native range into 450 AUMs of seeded range. With the seeding, forage could be reallocated within various seasons so that herd size could be expanded. The herd could be on the seeding during May and June, on the federal allotment from July to mid-September, on private range in late September, and on aftermath in October. The changes in forage allocation and herd movements are expected to increase both the nutritional level and breeding efficiency. This scenario is based on the combined effects of increasing average weaning weights by 10 pounds/calf and calf crop percentage by 5 percent. Estimating these benefits is sometimes the most difficult aspect of ranch planning but FEEDSTORIS enables rapid analysis of numerous scenarios.

The analyst must change input values in Tables 1, 2, and 5. Calf crop percent and relevant feed sources are changed in Table 1. AUMs are reallocated in Table 2 to reflect the above changes. Forage balance (Table 4) must be maintained. Pounds/head produced by steer and heifer calves are changed in Table 5. FEEDSTORIS then calculates all other changes in program values.

FEEDSTORIS will calculate a net return over variable costs for the ranch after the seeding has been implemented ($8,213). This value is then compared to the baseline value to yield an annual net benefit from the seeding of $5,615. Since this value is positive, the analyst should then estimate the economic feasibility of the project by comparing net cash flow to the required investment.

In addition to providing an estimate of the annual net benefit of a management practice, FEEDSTORIS also outlines any necessary changes in herd size, seasonal forage balance, and both feed and non-feed inputs. Any required additional forage or purchased feeds will be apparent in the revised Table 4.

The program is flexible enough to be adapted to most types of western livestock ranches. The program can help evaluate numerous management options and situations including the effects of obtaining additional forage through range improvements or forage acquisitions, alternative livestock management options, and different cost/price, livestock, and crop parameters. Although the program enables rapid evaluation of alternatives, FEEDSTORIS cannot *make* the decision. The rancher must ultimately evaulate each alternative's biological, economic, political, and social feasibility.

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Economic Conditions Influencing Ranch Profitability

John M. Fowler and L. Allen Torell

Editor's Note: This paper should be required reading for anyone who thinks that ranching is a foolproof way to make a lot of money.

The economic performance and well-being of the range livestock industry varies considerably. No single performance indicator can capture the variation that exists between ranches or different ranch managers. Ranches have many physical factors affecting ranch profitability, including topography, climate, vegetation types, soils, and range conditions. They also have various economic and social influences including managerial ability, planning time horizon, and motivation for ranching. The equity position of ranchers varies from complete ownership of land assets to servicing a considerable debt. Size and type of ranching operations also varies. Ranching is dynamic in nature with gross returns, costs, production, and net returns varying greatly through time.

Cost-Price Squeeze

Viewing the economic well-being of the range livestock industry at a single point in time can be very misleading. Livestock prices vary considerably, often within short time periods. Several types of information are necessary before an adequate assessment of ranching profitability can be determined. Both revenue and costs must be considered, including the quantity of livestock products sold, product prices, and quantities and cost of ranch inputs.

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Ranch Revenue

Gross income from ranching is predominantly derived from the sale of livestock, usually calves, steers, sheep, and lambs. Additional revenue may come from selling breeding stock, horses, and cull animals. Total revenue consists of four elements: kind of livestock, number of livestock sold in each class, average market weights of each class, and the price received per unit. A historical perspective of cattle prices received in New Mexico for the period 1940 to 1985 is provided in Figure 1. The most evident trend has been an

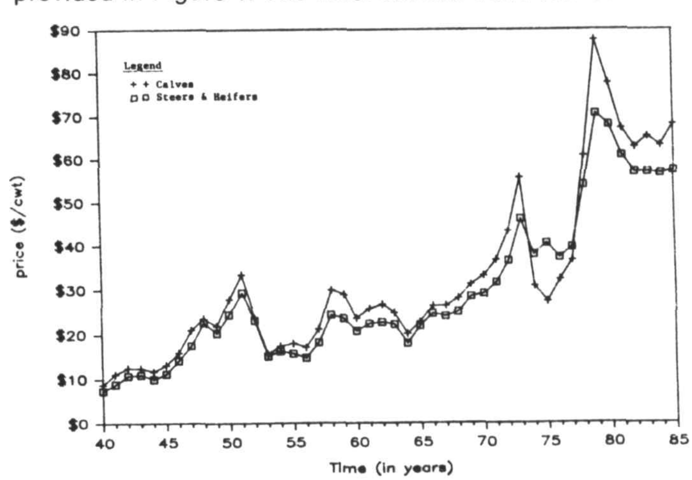

Fig. 1. *Annual average calf and steer and heifer prices in New Mexico, 1940-1985.*
Source: Fowler and Gray (1983) and Agricultural Prices, P & L (10 & 11, 78-85 series) and Cattle & Calves, New Mexico Crop and Livestock Reporting Service, 1985.