The Use of Microcomputers for Consultation

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The computer in the livestock consulting business is a tool to help accomplish goals that potentiate profitable production. The reason I have developed the software I have and developed the production parameters I have is because of some premises that I feel are generally true of the agricultural enterprises that I see. These premesis are generally applicable to most livestock enterprises but especially applicable to cow-calf operations, in my experience. Few operate at 60% of maximum theoreticle efficiency. Producing meat for people to eat at maximum efficiency is not often the primary goal. Very few people develop a mathematical model to test management schemes and control factors in the operation, and cost effective rational schemes are not developed to fully exploit environmental opportunity.

A consulting program is primarily a plan, an economic analysis, problem solving, efficiency study and hands on system. The producer often has the physical resources and the animals that will form the basis of his enterprise, however it is not unusual that he will be marginal or failing due to many reasons. Often the reason he is marginal or failing is because he doesn't have the background to allow him to compete successfully in the market place. He is constantly bombarded with ideas and schemes that in theory will improve production and allow him to sell more product at a better advantage. The problem for the producer is that the people who are offering ideas and products to him all have a specific thing to sell him and therefore have a specific self interest in him and his operation. It isn't their job or interest to integrate their procedure or product into the operation. The specific effect of the product can be a benefit or a liability depending on how it is used and how it integrates with the rest of the operation and the goals of the operation. I am sure we all have experienced the situation of a product or procedure of value that completely failed because of the way it was integrated into the operation. The economic outcome of the operation, which is the efficiency, is the measurement that in the final analysis is the important one.

Integration of factors in an operation is the expertise that is needed. These factors are fertility, resource management, nutrition, genetics, bull management, obstetrics and calf survivability. Unless I have forgotten something these are about all the factors that there are. Computer software lends itself very readily to some of these areas and allows easy and rapid comparisons to base management decisions.

The economic health of a cow-calf operation is first and foremost tied to cow fertility. Cow fertility isn't just the ability to get a cow pregnant but is more related to the calving to conception interval. A restricted breeding season makes possible many efficiencies and manipulations which are not possible otherwise. These potential factors are fertility selection, environmental adaption, resource utilization, improved weaning weights, cheaper and better nutrition, better labor utilization, and more efficient genetic selection. The most obvious advantage of restricting breeding seasons is the ability to control costs, such as purchased nutrition, and plan calf crops so that utilization of resources will be at its maximum. Length of nursing period also can be manipulated to the advantage of the producer. A calf on the cow that is a heavy milker should gain between 2 and 2.2 lbs. per day. It becomes apparent that each day later a calf is born penalizes the producer 2 to 2.2 lbs. A 30 day delay is of course a 60 to 66 lb. penalty. Add to this a longer period of feed supplement to achieve breeding and you have the situation of increased costs and decreased yields. Add to the above factors the increased labor required to tend calving animals and new born calves over longer than necessary time periods, and the adverse effect this has on a program of selection for fertility and it becomes obvious that fertility is the number one priority.

The costs and returns of nutrition are tied to resource management and fertility. Nutrition must be supplied at adequate levels for the level of performance needed to achieve efficiency. The factors that affect cost and yield are cow size, pounds of calf weaned versus cow fed, length of time feeding occurred, and manipulation of resources that are a fixed cost versus purchased feeds. There is about a 20% increase of cost to feed cows to achieve acceptable reproduction for every 30 days increase in length of the calving season. The efficiency of meeting nutritional needs is important to control costs and maintain efficiency. This project in my program is viewed from the basic standpoint of evaluation and uses of ranch resources to best and most economically meet the needs of the cow during the different stages of her reproductive year and also best benefit the calf. Based on ranch resource utilization, feeding programs are worked out on the computer to best meet the needs of the cow. This soft ware is programmed to deal with cows ranging in size from 800 lbs. to 1600 lbs. and will categorize them into groups of middle third of pregnancy, last third of pregnancy, average milker and superior milker. The requirements for these size and production groups are based on N.R.C. values. The nutrient values used in the requirements are, Dry Matter, Digestible Energy, Total Digestible Nutrients, Crude Protein, Calcium, Phosphorous, Vit A, and Crude Fiber. There is a text that files the feeds desired to be used, using the above nutrient

catagories, plus the cost per unit. These feeds are given to the cow on the computer at the rate estimated to represent proposed feeding regimes, which will register the nutrients available cummulatively as the feeds are added. This process will balance a ration for the above factors as well as give a cost per day fed, which will allow comparison of different programs. This gives the capability of very efficient, cost effective feeding programs, due to the ability to use home raised feeds and balance the ration for best performance. The cost and time interval involved will allow different options to be evaluated as to what the most economical calving season should be. This calving season is related to the resource availability, cost and calf utilization to weaning so that the best balance can be reached for efficient production through weaning.

The computer nutrition programs are very cost effective when it is necessary to select winter roughages. Putting the nutrient content and cost on the hay and then adding a supplement to balance the ration for the category of cow you are dealing with, will give you a read out that will feed the cows properly and the most economically. I feel this is a must do procedure to get high performance and keep the cost of production at reasonable limits. When possible, an analysis should be done on a roughage so that you have an idea of the levels of calcium, phosphorous, magnesium, potassium, manganese, copper, cobalt, zinc, iron, and molybdenum so that these minerals are not dangerously deficient in the ration.

Another aspect of a ranch's nutritional problem is the growing of replacement heifers for the herd. A heifer should reach 65% of her mature body weight at breeding (1) which should occur at 13 to 15 months of age. We have a yearling nutrition program that will assist in feeding and growing these animals efficiently and we also have a heifer growing analysis program that will give the economics of the project. The idea is to grow the heifers at a profit so that when the open heifers are sold they will reduce the cost of the pregnant heifers. Another effect of this procedure is that if a heifer is grown and fed properly to calving there will be a remarkable reduction in calving problems as well as an increase in milk production and mothering by the heifer (2).

Nutrition to the cow 30 to 45 days prior to calving, post calving and through breeding not only affects fertility but it also affects calf survival. There is a difference of up to 20% in survival rate of calves from well fed cows versus inadequately fed cows (3). This factor should be considered when choosing a calving season because control of the source and quality of nutrients can affect all of the above factors. I have seen cows breeding on spring and summer pastures experience very bad performance, apparently due to the quality, or possibly the dry matter content of the pastures they were on. Tested feeds of a known quality are a basis to build a ration on, compared to a pasture that isn't coming close to what a rancher thinks is the nutrient value of the pasture. The choice of calving season will also affect what forages and pastures are available as the calf matures and becomes able to utilize these forages. This is extremely important from the standpoint of resource utilization and cost of production. Whether a calf can use forages that represent a fixed cost of production efficiently or not can make as much as a 15¢ per pound difference in the per pound cost of production (4).

Genetic selection plays a big role in the whole operation from the standpoint of goals to consistently produce calves at the least cost and highest quality. This goal is not automatically presumed to be the object of producing bigger and bigger calves. The genetic selection problem means to wean as many calves as possible from a given number of cows. I am referring to what I call a genetic balance that results in a phenotype that is consistent with an efficient animal unit. The word "balance" could conceivably be interpreted as compromise for the purposes of this problem. Each ranch has different environments, forages, financial resources, and weather factors. To produce efficiently, different goals have to be defined and met, which are definable as cost of production. The compromise reflects the factors of fertility, size, calving ease, calf survival, weaning weight, supplement requirements, ranch resource utilization and environmental adaption. The key element from the genetic standpoint is environmental adaption. Genetically, I think we are trying to get as consistent and as high a production as possible without spending anymore than is necessary to make a profit. The cost versus yield equation depends on the cow's ability to consistently wean a good calf under the conditions she is living. The expenditure required to alter environmental conditions that can be adverse to some cow's production will result in increasing the cost of the herd until environmental adaption is selected for.

The problem of proper obstetrical procedures and calf survivability have an effect on the cost of production and are integrated into the system for the producers benefit. The effect on cost of production on a 400 lb. calf costing $325.00 to produce is as follows.

% of calf crop	Cost of production per pound
100%	.8125 ¢
95%	.8552
90%	.9027
85%	.9558

The effect of calf loss on higher production groups is similar. The cost of production is higher in the higher production groups because nutritional requirements are higher.

Effect of death loss on cost per pound in high and medium production groups are as follows.

10% death loss of 600 lb. calves = .722¢ per pound
15% death loss of 600 lb. calves = .764¢ per pound
10% death loss of 500 lb. calves = .794¢ per pound
15% death loss of 500 lb. calves = .841¢ per pound

Microcomputer software has the ability to store information and make mathematical computations in a specific manner very rapidly. Prior to use of the computer, I

used to do all these things by hand on paper. My son saw me doing this and in as much as he has an interest in programming computers, he alerted me to the labor saving advantages of programmed software.

The uses I make of the computer at present is to balance rations and compare ration costs for beef cows, yearling calves and dairy cows. The beef cow ration program has four categories for the cow's requirements, which are, middle third of gestation, last third of gestation, lactation average milker, and lactation superior milker. The other variables are cow size, which ranges from 800 lb. to 1600 lbs. The cow size and situation are indicated to the computer (example 1000 lb. cow – superior milker) and the computer will select the appropriate requirements. There is a text file that will hold 20 feeds per file that can be used to feed to cows. The feeds as well as the requirements have the following measurements in them, Dry Matter, Digestable Energy, TDN, Crude Protein, Calcium, Phosphorous, Vit A., Fiber, and Cost per Unit. These feeds are entered on an as is basis, rather than a dry matter basis, so that a client can see what the actual feeding rates are on the feed he has on his farm. As the feeds are added to the cow, the computer will show and print out the cow's requirement and what is available from the feed added. The what available is a cumulative value as you add feeds, as well as the cost is cumulative, thereby giving a running and, at the end, a total cost. Feeds can also be subtracted with this program if you wish.

The yearling program and dairy program are set up the same way as the cow program. The yearling program has weight categories from 300 lbs. to 600 lbs. and daily weight gains from 0 to 1.8 lbs. per day. The dairy program has body weights from 800 lbs. to 1600 lbs. and any milk production and butter fat you wish to put in.

What we have is an easy and rapid way to compare cost versus nutritive value. I put grasses in the text file based on time of year, growth characteristics, nutritive values from analysis or standard values, along with the cost based on cost of leasing the resource. I base other forages and concentrates on analysis or NRC values. This gives me a very fast and accurate ways to compare feeding schemes. I can do in one hour what used to take two days to do, plus I have a printout of everything I have done as a permanent record. The procedure is so fast that I encourage the client to be there during the last stages of this to contribute to the process.

My son has also programmed a replacement heifer economic analysis program. This program uses the costs in the heifer at weaning, the cost of growing the heifer to breeding, the breeding costs, the cost to pregnancy test, and the interest. Then the percent heifers open, the weight of the heifers, and the price per pound are put in and the program will tell you how many dollars you have in the pregnant heifers. I use this program to plan the replacement program, to see how much money and growth we want to get into them.

We also do a considerable amount of yearling work at Limon Veterinary Clinic. The computer programs we have to support our yearling programs are the yearling nutrition program, already above mentioned, a yearling treatment program, and a yearling economic analysis program. The yearling treatment program is designed to measure parameters related to shipping fever in yearling cattle received and treated by us. We have a receiving program for these calves whereby we set up a vaccination schedule, identify all the animals with tags, record sex and breed, list the days treated, the drugs used to treat with, and the death loss. The information is put into a text file that identifies the group in question and is integrated with the treatment program. On received cattle it usually takes 3 to 4 weeks to get them straightened out. A running tabulation of numbers treated etc, is kept and a printout is sent to the owner on a weekly basis. The client will get a printout that is in the following form.

I.D. NO. **The day of treatment program**

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
300	temperature				107		103		101							
					0		0		0							
301																
302					105		101		101		101					
					0		0		0		0					
303																
304																
305										106		103		101		101
										0		0		0		0

Total number of cattle	_____
Heifers	_____
Steers	_____
Bulls	_____
Cost of Treatment	_____
Heifers	_____
Steers	_____
Bulls	_____

List of Drugs

O = oxytet	A = serum
C = chloramphenicol	T = tylan
P = penicillin	N = neomycin
S = sulfa	D = spectinomycin
M = micronutrients	

Breeds of Cattle — 8 categories

Her	Ang X	Brahma X
Ang	Exotic	Shorthorn X
Her X	Charlaise	

Costs of treatment are analyzed as to sex and breed, total costs, and average cost for the herd.

The yearling economic analysis program is made on visicalc and is in the following form.

Name of Client	A.A.B.P.	
Date	11-28-83	
Purchase date (day of year)	200	Totals of information
Purchase cost per pound	.60¢	
Interest Rate	15%	
Number of cattle purchased	140 head	
Average Weight	400 lbs.	
Rate of gain per day	1.25 lbs.	
Feed cost per head per day	.35¢	
Transportation cost per head		
To ranch	$4.50	
To grass	0.00	
To market	7.50	
Labor cost per head per day	8.50	
Drug costs (total)	$490.00	
Veterinary costs (total)	630.00	
Death loss %	0.3%	
Sale date (day of year)	350	
Sale price per pound	.60¢	

Net profit or loss _____
Cost of production .58¢ lb.

This program has several practical uses. When going through the program it becomes quite apparent which factors affect cost of production the most. As each factor is punched in, the rest of the factors change in an integrated way and change the cost of production appropriately. It soon becomes obvious that the most important factor as it affects cost is the rate and cost of gain. The interest rate doesn't have an effect any greater than death loss. In other words, a two percent increase in death loss is about equivalent to a 1% rise in interest. By running this program for a client we can put his production plan to a mathematical test, get a printout he can present to the lender as his plan, and have a basis to hedge his cattle. The biggest advantage to the client is that we can show him where specifically he can gain the most efficiency. We have also shown some clients that their situation is such that they shouldn't be in the yearling business at all.

In the dairy business we have several programs. The dairy nutrition program has been previously alluded to and we also have a dairy fertility program. This program is designed to identify and measure cows that are abnormal by listing cows with uterine infections, cystic cows, anestrus, abnormal C.M.T. values, and so forth. The program will list these by identification number and as a percent of the herd. The cows that haven't come in heat at a point in time post calving are listed by identification number and the number of days since calving. The same is true for breeding dates and pregnancy dates. The computer will also give you the average time from calving to first heat, calving to first breeding and calving to pregnancy. You can get information such as a list of animals that are over 100 days since calving and haven't been bred, whatever days since calving and haven't been diagnosed as pregnant and heat data on the same parameters. The beginning of the program lists all the cows by identification number and calving date.

Microcomputer programs are real great tools for storing, tabulation, and analysing information. The proper use of this tool requires a well developed rational philosophy of livestock production to benefit the producer, which I hope I have given a good idea of in my explanation of the cow-calf program. The other problem with the computer is the inadequacy of available software. There is a lot of junk software available that just isn't worth the powder to blow it up. To make your own software is a very time consuming project that most people will not be able to accomplish to their satisfaction. High school age kids are a good source of programming because they often have an interest in these things and have a lot of time. We were particularly lucky to have a son who was familiar with the livestock business and had a great interest in programming computers.

Cow Weight : 300 lbs.
Average Daily Gain: 1.25 lbs.

Changes with the addition of 7 lbs of Winter Grass.

	Requirements	Available	
Dry Matter	7.92 lbs.	6.3 lbs.	Deficient
DE (MCAL)	10.65 lbs.	5.67	Deficient
TDN	5.31 lbs.	3.15 lbs.	Deficient
Crude Protein	.97 lbs.	.31 lbs.	Deficient
Calcium	.03 lbs.	.03 lbs.	Deficient
Phosphorous	.02 lbs.	0 lbs.	Deficient
Vitamin A (I.U.)	5800	10500	
Crude Fiber	900	245	Deficient

Cost/Day : $.06

Changes with the addition of 1.25 lbs of Cotton Seed 41%

	Requirements	Available	
Dry Matter	7.92 lbs.	7.46 lbs.	Deficient
DE (MCAL)	10.65 lbs.	7.59	Deficient
TDN	5.31 lbs.	4.02 lbs.	Deficient
Crude Protein	.97 lbs.	.84 lbs.	Deficient
Calcium	.03 lbs.	.03 lbs.	Deficient
Phosphorous	.02 lbs.	.02 lbs.	
Vitamin A (I.U.)	5800	10500	
Crude Fiber	900	260	Deficient

Cost/Day : $.18

Changes with the addition of 1.75 lbs. of H R W Wheat.

	Requirements	Available	
Dry Matter	7.92 lbs.	9.02 lbs.	
DE (MCAL)	10.65	10.67	
TDN	5.31 lbs.	5.39 lbs.	
Crude Protein	.97 lbs.	1.06 lbs.	
Calcium	.03 lbs.	.03 lbs.	Deficient
Phosphorous	.02 lbs.	.03 lbs.	
Vitamin A (I.U.)	5800	10500	
Crude Fiber	900 lbs.	264.72	Deficient

Cost/Day : $.28

Changes with the subtraction of .2 lbs. of Cotton Seed 41%

	Requirements	Available	
Dry Matter	7.92 lbs.	8.83 lbs.	
DE (MCAL)	10.65	10.36	Deficient
TDN	5.31 lbs.	5.25 lbs.	Deficient
Crude Protein	.97 lbs.	.97 lbs.	
Calcium	.03 lbs.	.03 lbs.	Deficient
Phosphorous	.02 lbs.	.02 lbs.	
Vitamin A (I.U.)	5800	10500	
Crude Fiber	900	262.32	Deficient
Cost/Day : $.26			

Balanced Ration for 300 lbs:
7 lbs. of Winter Grass.
1.05 lbs. of Cotton Seed 41%
1.75 lbs. of H R W Wheat.

Cow Weight : 1050 lbs.
Cow Situation : 1st Half Lactation (Great Milker)

Changes with the addition of 25 lbs. of C. S. I. WH Hay.

	Requirements	Available	
Dry Matter	27.03 lbs.	22.87 lbs.	Deficient
DE (MCAL)	31.68	26.24	Deficient
TDN	15.84 lbs.	13.95 lbs.	Deficient
Crude Protein	2.86 lbs.	1.75 lbs.	Deficient
Calcium	.1 lbs.	.03 lbs.	Deficient
Phosphorous	.1 lbs.	.04 lbs.	Deficient
Vitamin A (I.U.)	48667.0	0	
Cost/Day : $.43			

Changes with the addition of 1.75 lbs. of Cotton Seed 41%

	Requirements	Available	
Dry Matter	27.03 lbs.	24.5 lbs.	Deficient
DE (MCAL)	31.68	28.94	Deficient
TDN	15.84 lbs.	15.17 lbs.	Deficient
Crude Protein	2.86 lbs.	2.49 lbs.	Deficient
Calcium	.1 lbs.	.03 lbs.	Deficient
Phosphorous	.1 lbs.	.06 lbs.	Deficient
Vitamin A (I.U.)	48667.5	0	
Cost/Day : $.59			

Changes with the addition of .25 lbs. of Cotton Seed 41%

	Requirements	Available	
Dry Matter	27.03 lbs.	24.73 lbs.	Deficient
DE (MCAL)	31.68	29.32	Deficient
TDN	15.84 lbs.	15.35 lbs.	Deficient
Crude Protein	2.86 lbs.	2.59 lbs.	Deficient
Calcium	.1 lbs.	.03 lbs.	Deficient
Phosphorous	.1 lbs.	.06 lbs.	Deficient
Vitamin A (I.U.)	48667.5	0	
Cost/Day : $.61			

Changes with the addition of .75 lbs. of Cotton Seed 41%

	Requirements	Available	
Dry Matter	27.03 lbs.	25.43 lbs.	Deficient
DE (MCAL)	31.68	30.48	Deficient
TDN	15.84 lbs.	15.87 lbs.	
Crude Protein	2.86 lbs.	2.91 lbs.	
Calcium	.1 lbs.	.03 lbs.	Deficient
Phosphorous	.1 lbs.	.07 lbs.	Deficient
Vitamin A (I.U.)	48667.5	0	
Cost/Day : $.68			

Changes with the addition of .2 lbs. of Dical.

	Requirements	Available	
Dry Matter	27.03 lbs.	25.62 lbs.	Deficient
DE (MCAL)	31.68	30.48	Deficient
TDN	15.84 lbs.	15.87 lbs.	
Crude Protein	2.86 lbs.	2.91 lbs.	
Calcium	.1 lbs.	.08 lbs.	Deficient
Phosphorous	.1 lbs.	.11 lbs.	
Vitamin A (I.U.)	48667.5	0	
Cost/Day : $.69			

Balanced Ration for 1050 lbs. :
.2 lbs. of Dical.
2.75 lbs. of Cotton Seed 41%
25 lbs. of C. S. I. WH Hay.

Cost Pro		300.00		
Cost Gro		45.00		
Cost Br		10.00	Tot Cost	79990.10
Cost Pr		15.00	Inc Hfr	18831.75
Int Rt	13			
Total		379.10	Diff	61158.35
Cst Prod		0.45		
Yield/Lb		0.70		
Lbs Sold		850	# Pr Hfr	179.35
Income		595.00	$ Pr Hfr	341.00
% Hfr Open		15		
# Hfr Tot		211		
# Hfr Open		31.65		

References

1. Lawrence Rice – Reproductive Health Management in Beef cow, Current Therpay in Theriogenology – Morrow, page 540. 2. Gene Leverett – Unpublished data. 3. Tom Dunn – The Relationship of Nutrition to Reproductive Performance and Economics of Beef Production. Annual Meeting Society for Theriogenology, September 25, 26, 1975. Cheyenne, Wyo. 4. Gene Leverett – Unpublished data.