NUTRITION, REPRODUCTION AND EFFICIENCY IN COW/CALF MANAGEMENT

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INTRODUCTION

What does the future hold for the cow-calf industry? A recent NCA Task Force, commissioned to look at the total cattle industry, made two distinct points that need to be considered by the cow-calf producer in future planning. Consumer demand for beef is excellent, but that demand is very much price related. Thus, when other meat products are sold at a considerably cheaper price, the consumption of beef falls. Second, the cow-calf industry needs to become more cost conscience if it intends to compete for its fair share of the consumer food dollar in the future. The cow-calf producer that plans on a profitable future needs to be focused on being a low cost producer that optimizes production within that economic environment. To be a low cost producer, cow-calf producers need to keep in mind the four key factors that influence profitability.

a. Weaning weight of calves
b. Percent of cows weaning calves
c. Selling price of calves
d. Annual cost of maintaining the cow

It's interesting to note that in the states that have developed programs to monitor the costs of maintaining commercial cows, producers in the most profitable group have higher levels of productivity, but they do this at a lower cost. In work compiled in North Dakota, the herds that were in the most profitable 20% sold 76 more pounds of calf/cow, had 1.3% less death loss and had 3.6% more calves weaned per 100 cows in the herd, but accomplish this with an annual feed cost that was $79 less per cow in the herd.

STEPS TO A LOW COST NUTRITION PROGRAM THAT OPTIMIZES WEANING WEIGHTS AND REPRODUCTIVE EFFICIENCY.

1. Evaluate your forage base and fit your production system to efficient use of this most important resource.

In any area of the United States, and Florida is certainly no exception, the key to a profitable nutrition program is making the most efficient use of the forage base on your operation. To accomplish that, you need to understand the nutritional content of the forages at various times of the year and how that fits the nutritional requirements of the cow.

You need to understand how complimentary forages or introduced forages might fit into the total operation, creating a grazing program where high quality forages are available to cows during as much of the year as environmental condition allows. When harvested forages are used, what is the nutritional content of these feeds? Is a forage test utilized as a basis for formulating diets?

The final step in matching cattle to forages is to take a look at the type of cow you are raising and ask yourself, is this the cow type that best fits the forage resource I have available?

Do you calve at a time that considers matching peak quality in the forage with peak nutritional requirements of the cow?

Are supplements purchased based on complementing the needs of cattle? Unfortunately, in the cattle industry, tradition becomes more of a basis for how supplementing is done rather than current nutritional needs.

2. Understand the nutrition/reproduction linkage.

In the cattle industry, percent weaned calf crop is one of the most integral components of creating a profitable atmosphere. Table 1, compiled by Cattle-Fax, illustrates how a ten percent change in key factors can impact break-even prices. Specifically, percent calf crop weaned is one of the most important economic factors in a cow/calf operation. As I reviewed data from many Florida operations, it appears that 70, 75 and 80 percent calf crops are extremely common. Obviously, many of these are under fairly extensive production systems. However, are there ways that those could be improved and are there ways that nutrition could improve percent calf crop?

As one evaluates the reproductive problems in the cow/calf industry, there are three key problems that are present in virtually every state. One is that cows don't cycle soon enough after calving, and thus long postpartum anestrus periods have a negative impact on percent of cows weaning calves. We need to realize that nutrition, both precalving and postcalving, has a tremendous influence on the length of the postpartum anestrus period. Are there things we can do from a supplementation standpoint 20 or 50 days prior to the start of the calving season that might have a dramatic impact on the percent of cows cycling? We need to take a look at what we might do during the postpartum period nutritionally that could impact the length of the anestrus period. Is part of a long anestrus period not only related to energy and protein levels, but possibly to a lack of understanding and appreciation of the impact of trace minerals and phosphorus on reproductive function?

A second major reproductive problem in the cattle industry is cows that don't conceive. Excellent research data has clearly shown that energy levels during the postpartum period have a dramatic influence on conception rates. If we are going to achieve a high percentage of cows weaning calves and a high percentage of the cows breeding in a short period of time, a sound nutrition program will become a key.

A final reproductive factor that is extremely important is percent calf death loss at or near calving. Part of this death loss often may be health related, but part of this death loss can relate to inadequate nutrition. Clearly, research has shown that a sound nutrition program 30 to 50 days before calving has a dramatic impact on calf vigor and calf survival. There are some little things that we can do in formulating rations that will insure that we start out with a calf that is alive and a calf that has the ability to take advantage of its genetic potential to gain weight.

All of these reproductive losses contribute to the ultimate reproductive evaluation that needs to be accomplished on the ranch, and that is what percent of your cows are weaning a calf, and can this be changed?

3. One of the keys to formulating a sound nutrition program is understanding what influences the cow's nutritional needs.

There are many factors that need to be considered in evaluating the cow's nutritional requirement. One of the most important is the stage of production, another is level of lactation

and yet another is cow size. Let's evaluate each of these a little closer.

Stage of production Table 2 illustrates a cow herd nutrition calendar that starts with calving and ends with the production of the next calf 365 days later. Although this nutritional calendar appears to be based on an individual cow, it fits an operation for the whole cow herd. Period 1 begins on the date when the first calf is born. To ensure that a large percentage of the cows are in the same period and, therefore, can be fed similarly, a short breeding season and subsequent calving season must be utilized.

Period 1: To maintain a yearly calving interval, the cow has approximately 80 days from the time of calving until rebreeding. In the case where it is desirable to move late calving cows to an earlier calving date, the cow may have less than 50 days. Because mature cows typically take from 40 to 80 days to recycle and first calf heifers take from 60 to 100 days, proper nutrition during this period is important. Thus, period 1 becomes the most critical period, because the cow is maintaining a peak level of lactation, and the onset of cyclicity and rebreeding must occur. As pointed out earlier, nutrition during this period will have a major influence on conception rates.

Period 2: Once the cow is pregnant, the major nutritional needs are to maintain lactation. Also, in most production systems, it's advantageous that the cow gain weight during this period, putting on adequate "flesh" for harsh environmental conditions that may await.

Period 3: This period has the lowest nutritional requirements. In some environments, this is an ideal time to utilize crop residues, lower quality feed, or the poorest roughage that is available. However, it's important that the cow not lose excessive weight during this period unless she enters it in fairly good body condition. If the cow enters in moderate to slightly below average condition, she should maintain weight and possibly even gain weight.

Period 4: This is the period often overlooked in many cattle operations. It should be kept in mind that during this short period (approximately 50 days), approximately 65 to 80 percent of the fetal growth will occur. In cases where typical birth weights are 80 to 85 pounds, this means that from 50 to 60 pounds of fetal growth may occur during this time. Research has shown clearly that improper nutrition during this period will influence calf birth weight, calf vigor, and calf survival. There is no advantage to reducing the cow's plane of nutrition to reduce calf size as a means of alleviating calving difficulty. Poor nutrition during this period will cause a longer postpartum interval, reduce level of milk production, and reduce calf weaning weights. Table 3 shows the requirements for an 1100 lb cow with average milk production demonstrating the highest requirements in period 1 and the lowest requirements in period 3.

Effect of Milk Production and Cow Size on Nutritional Needs

To develop a more productive cow, many cow/calf producers have emphasized growth and milk production in their selection process. This has tended to increase cow size and level of milk production. Table 4 shows that a five pound increase in milk production per cow per day increased the TDN (net energy) requirements by 10 percent and the crude protein requirement by 13-15 percent.

Changes in cow size do not have the same impact on energy requirements that significant changes in milk production do. Each change of 100 lbs. in cow size changes the maintenance net energy requirements by 6-8%.

A common question asked by today's beef

producer is: "Can we maintain reproductive efficiency in higher producing cows?" Actually, the question is: "Will a commercial cattle producer adjust his management program and nutritional philosophies to accommodate the added nutrient demands of a higher producing cow?" Ample research indicates that normal reproductive performance can be maintained in more productive cows if the additional nutrient needs are met. The real dilemma facing the commercial cow/calf producer is that the nutritional needs will be increased and, thus, some change in managerial philosophy must occur to accommodate the more productive cow. In making the decision to have a more productive cow, the producer needs to consider the resources available. If there is an ample supply of high quality feed, a heavier, larger milking cow can often be maintained. If the feed supply is limited or if environmental conditions such as drought, which reduces reproductive rates, frequently occur, then maintaining slightly smaller, somewhat lower producing cows may be the best choice.

4. Know how to monitor the nutrition program - use body condition.

Cow body condition score has long been established as an effective management tool due to the impact it has on both cow reproductive performance and the amount and type of winter feed supplements that will be needed. Because live weight does not accurately reflect changes in nutritional status, body condition is a more reliable guide for evaluating the nutritional status of a cow. Body condition scores are simply numbers used to suggest the relative fatness or body condition of the beef cow. A cow with a body condition score of five or six should be in average to good flesh and represent a target that many cattlemen strive for. Body condition scores allow producers to sort cattle according to their nutritional needs (thin, moderate and fleshy), thus improving the efficiency of their nutritional programs. Most research has indicated that a cow will gain or lose 60 to 80 pounds of body weight to change by one body condition score.

Some excellent research data has been collected by University of Florida staff members that evaluated the relationship of body condition score and pregnancy rates. Table 5 clearly illustrates the impact of condition score at the time of pregnancy testing and how it related to reproductive efficiency.

Condition scoring is an excellent way of evaluating the status of your cattle and whether changes in nutrition programs need to be made.

Another excellent way of monitoring the effectiveness of your nutrition program is to look at the reproductive rate in your young cattle. If you are calving at two years of age, what percent of your two-year-olds are rebreeding back? If your two-year-olds have a considerably lower pregnancy rate than the rest of your cows, that is a pretty good indication that your nutrition program is extremely borderline or that you may be calving your heifers later than you should be, not giving them adequate time to rebreed.

5. Don't cut corners - that may be a false economy.

Understand the relationship between feed costs and maintaining reproductive efficiency.

Invariably when feed costs go up, it's tempting to cut corners. To illustrate this, wintering pregnant 1050-1100 lb cows typically need 9 to 10 pounds of TDN (9-10.5 Mcal NE/day), depending on cow size and potential productivity. If for example, a producer felt it would be advantageous to cut corners just a little and save money on the most expensive ingredient (TDN or energy) they might reduce the amount

of TDN fed/day by a pound. Unfortunately, that thought process can be costly. Supplying a pound of TDN today costs about 6-8¢ a day. Utilizing the higher figure, over 150 day wintering period, that equates to $12/cow. The daily reduction of a pound of TDN can easily reduce the weaning weights of next spring's calf by 15 to 25 pounds and delay the rebreeding of the cowherd by as much as 8 to 10 days. Relating this to 100 cows, the producers would save $1,200 in feed costs, but a loss of 20 pounds per calf equates into 2,000 pounds of calf weaning weight loss, which at 90¢/pound means a $1,800 loss in calf value. This is this year's loss and does not include the delayed breeding which will impact next year's calf crop.

Cutting corners on the cow nutrition program can have a quick impact on the reproductive efficiency of the cowherd. What the industry needs to strive for is a high percentage of our cows calving the first 20 days--with a goal of at least 50 percent of the cows calving the first 20 days very achievable. Ideally, we want 70 to 75 percent of the cows calving the first 40 days. Why is that so important? A recent Kansas research study looked at the impact of calving sequence (when the cow calved) on the productivity of that cow. For each 20 days later the cow calves, we lose 26 pounds of calf. Let's utilize two illustrations--one characteristic of the cattle industry and the other when an ideal level of the reproductive efficiency is being achieved. As one can note in the Table 6, reducing the reproductive efficiency of the herd can have an economic impact of $1,422 (15.8 lbs of reduced weaning weight x 100 cows x 90¢ calf price) based on 100 cowherd.

Thus, don't cut corners on nutrition, because reproductive efficiency is one of the first components that will be affected--feed balanced diets, but don't overfeed.

6. When buying supplements, know what you want and price it per unit of nutrient that you are buying.

In the cow/calf industry we too often make purchases based on perceived needs and tradition rather than what is the best buy to supply the nutrients needed.

To illustrate this, let's consider an example: referring to Table 7, let's assume we have a situation where alfalfa hay is costing $100/ton, a 20% protein cube is costing $170/ton and soybean meal is costing $279 a ton. What's the best buy? If one determines what a ton of each of these feeds supply in the way of crude protein and then divide the cost/ton by the pounds of crude protein, we are able to achieve a price per unit of crude protein.

The same illustration occurs when we compare energy sources for the cows. If we're extremely short of feed we typically buy hay. Let's compare a situation where grass hay costs $80/ton and grain (milo) costs $4.30/cwt. Which is the best buy to supply energy for the cows? Table 8 illustrates how we would calculate this and which is the best buy.

There are many times that cow-calf producers can save money by doing their own formulating rather than simply buying completely prepared feeds.

A good example of this is on mineral mixes. Typically in a cow herd we feed mineral mixes that contain from 9 to 12% phosphorus. An excellent mineral mix can be made by mixing 50% trace mineralized salt with 50% dicalcium phosphate. If one is so inclined, you can add vitamin A and other trace elements as needed. Typically, today this combination can be formulated in most areas at a cost of $200 to $250/ton, yet many comparable prepared mineral mixes will cost $50 to $80/ton more. This seems like a relatively simple savings, but over 200 days

this equates into $1/cow or $100 savings for 100 cows.

Often there are some excellent buys on unusual sources of protein that may work very well. It may be possible to buy protein sources like distiller grains, or dehydrated alfalfa or some other related protein feedstuffs fairly cheaply. The key is to "shop around" and don't be "traditional."

7. When environmental adversity hits - don't panic!

In the cattle industry, one of the things that cow/calf producers have learned to live with is the tremendous environmental variation that exists in every part of the United States, and obviously, Florida is no exception. It's either too wet or too dry, too hot or too cold, but no two years ever seem to be the same.

The net result is that some years you are going to have excess feed, some years you are going to be short of feed, but the key is to take a look at the situation and say, "O.K., if I have to liquidate some cattle, what are the most logical ones to liquidate? If I have to buy feed, what's going to be the cheapest way of supplying energy and protein to the cows?"

The ingenuity of successful cattlemen and their ability to handle adverse environmental conditions never cease to be amazing.

8. Always look at ways of enhancing the feed value or locating a cheaper source of energy.

Again, successful cow/calf producers have a unique way of finding cheaper sources of energy, particularly in periods of time when their forage base is inadequate. In many parts of the United States, crop aftermath or byproducts of some industries yield some excellent buys in the way of both protein sources and energy sources. Cows have been maintained on byproducts of the citrus industry or the baking industry. In cow/calf operations located near large cities, grass clippings have become a disposal problem at city dumps and have become an excellent feedstuffs for cows. Many of these feedstuff sources are not convenient, but they can be economically worked into a ration.

Another little tip is to not overlook ways that feedstuffs can be enhanced. Excellent research at the University of Florida has looked at the value of ammoniation and what it does to the quality of feedstuffs.

To improve the nutritional value of crop aftermath, the economic potential of ammoniation should not be overlooked. It's a relatively simple procedure to cover the straw or aftermath with plastic and then pump ammonia, at the rate of 60 lbs/ton, into the covered stack. The resulting feed has a significantly improved nutritional value. The protein value is virtually doubled, the TDN value is increased by 10 to 15 percent, and the cows find ammoniated residue considerably more palatable. This procedure gives ammoniated wheat straw the nutritional value of grass hay.

The following illustration shows how much ammoniated forage can save cow-calf producers. Straw can usually be harvested at a cost of $20/ton. The ammoniation costs about $15/ton resulting in a feed ready to use at $35/ton. If you compare this to grass hay at $70/ton, and assume that over 100 day wintering period a cow will need at least 20 pounds of roughage/day, that equates into a savings of $35/cow or for 100 cows, a savings of $3,500.
If feed costs stay high, more cow-calf producers may need to harvest residue, ammoniate it and sell their hay as a cash crop.

9. By all means, avoid fads and gimmicks.

In the cattle industry, like any industry, there is always somebody willing to sell you some new fad or some new gimmick. Base your nutrition program on sound nutritional principles that focus on the cow's need and the forage resource you have available. Stay away from gimmicks, particularly those that aren't backed by sound research data.

10. Take a look at what is new in the way of research data that might enhance the economic efficiency of your operation.

From a nutritional standpoint, one of the exciting new research findings is the work by Dr. Mark Peterson and coworkers at Montana State, in which he has looked at the impact of by-pass proteins on postpartum cyclicity and first service conception rate (See Table 9). This work certainly merits consideration in formulating protein supplements for use with postpartum cows in a cattle operation.

Another area of research work that has shown exciting potential is the inclusion of lipids in the postpartum diet. Lipids of plant origin such as sunflower oil, soya oil or cottonseed oil (Table 10), seem to exert an influence on onset of cyclicity and fertility. Recently, research in the dairy industry illustrated that feeding lipid postpartum improved conception rates. Work done in North Dakota and Texas by Gary Williams has clearly elucidated that a higher percent of the cows were pregnant when lipid was included in the postpartum beef cow diet.

Both of these have some practical ramifications as we formulate supplements for the postpartum cow. Other management practices exert an influence on the onset of cyclicity and should not be ignored. Some excellent research work at Nebraska as well as the Miles City Experiment Station has shown that including a vasectomized or reproductively altered bull will hasten the onset of cycling in the postpartum cow. It appears that this is one management practice we need to take a hard look at in many cattle operations to insure that a high percentage of the cows are cycling at the start of the breeding season. Table 11 illustrates an excellent summary of the Nebraska research. Other management practices that producers have resorted to have been practices such as calf removal and use of progesterone compounds such as Synchromate B to elicit cyclicity. In some operations, these may be a very useful aid.

SUMMARY

As the industry continues to change in years ahead, it will be imperative that producers have a good handle on costs of production. History tells us that it is rare that all segments of the industry are profitable during the same period of time. It's no secret that cow/calf producers are probably in the best position of any segment of the industry going into the next few years. But at some point in the future, financial troubles will again affect the cow/calf industry. Successful producers will be those that can put together a nutrition program that will enhance reproductive efficiency and subsequently, economic efficiency.

Table 1. Effect of a Ten Percent Change on Breakevens

Factor	Change	Decrease in Breakeven Price ($/cwt)	Increase in Return ($/cow)
Weaned Calf Crop	+10%	$9.15	$36.87
Weaning Weight	+10%	7.69	30.75
Calf Price	+10%	0.00	30.75
Total Feed Cost	+10%	5.83	18.60
Interest Cost	+10%	1.64	5.25
Cull Cow Weight	+10%	2.08	6.65
Cull Cow Price	+10%	2.08	6.65
All Combined	+10%	$24.70	$143.41

Table 2. The 365-Day Beef Cow Year by Periods

Period 1	Period 2	Period 3	Period 4
80 days (postcalving)	125 days (pregnant and lactating)	110 days (mid gestation)	50 days (pre-calving)

Table 3. NRC[a] Requirement for a 1,100 lb. Beef Cow with Average (15 lbs/day) Milk Production				
Nutrient	**Period**			
	1	**2**	**3**	**4**
TDN (lbs/day)	14.5	11.5	9.5	11.2
NE_m (Mcal/day)	14.9	12.2	9.2	10.3
Protein (lbs/day)	2.3	1.9	1.4	1.6
Calcium (grams/day)	33	27	17	25
Phosphorus (grams/day)	25	22	17	20
Vitamin A (I.U./day)	39,000	36,000	25,000	27,000
[a] 1984 NRC Requirements for Beef Cattle				

Table 4. Relationship of Cow Size and Milk Production to Nutrient Requirements[a]					
Cow Size (lbs)	**Milking Level**	**Milk/Cow (lb/day)**	**TDN (lb/day)**	**NE_m (Mcal/day)**	**CP (lb/day)**
1000	Average	10	11.5	11.0	2.0
	Above Average	15	12.7	12.7	2.2
	Superior	20	13.8	14.4	2.5
1100	Average	10	12.1	11.5	2.0
	Above Average	15	13.3	13.2	2.3
	Superior	20	14.5	14.9	2.6
1200	Average	10	14.0	12.1	2.1
	Above Average	15	12.8	13.8	2.4
	Superior	20	15.2	15.5	2.7
[a] 1984 NRC Requirements for Beef Cattle					

Table 5. Relationship of Body Condition and Pregnancy Rate--Florida Ranch Data		
Body Condition Score at Pregnancy Testing	Number	**Pregnancy Rate, %**
2	39	8
3	187	30
4	630	61
5	1745	88
6	211	92
7	21	100
Kunkle et al., 1991 Florida Rum. Nut. Symposium		

Table 6. Effect of Increasing the Percentage of Cows Calving in the First 21 days on Average Weaning Weight			
Calving Period	**Weaning Weight[a]**	**% of Cows Calving by Period**	
		Typical	**Ideal**
1st 21 Days	496	30	50
2nd 21 Days	470	55	75
3rd 21 Days	447	73	88
4th 21 Days	421	90	100
5th 21 Days	399	100	---
Average Weaning Wt.		458	474
[a] Figures based on 33,200 Kansas weaning weight records--R.C. Perry, KSU.			

Table 7. Calculating the Best Buy in Protein Supplements

Feedstuff	Cost/Ton ($)	Protein (%)	Protein Supplied/Ton (lb)	Cost/lb of Crude Protein (¢)
Alfalfa Hay	100	17	340	29.0
20% Protein Cubes	170	20	400	42.5
Soybean Meal	200	44	880	22.7

Table 8. Calculating the Best Buy in Energy Supplements

Feedstuff	Cost/Ton ($)	TDN (%)	TDN Supplied/Ton (lb)	Cost/Lb Of TDN (¢)
Grass Hay	80	50	1000	8.0
Milo	86	82	1640	5.2

Table 9. Effect of Ruminally Undegraded Protein on Reproductive Parameters

	Bypass Protein	Rumen Degraded Protein
% Estrus[a]	59.3	43.7
% Bred[b]	65.5	43.3
% Pregnancy	78.6	81.6

[a] in estrus pre-breeding
[b] bred first 21 days
[c] Source: Petersen et al., 1991. Int'l. Beef Symposium

Table 10. Effect of Feeding Suckled Beef Cows High-Fat (Whole Cottonseed) Supplements for 30 Days Prior to the Breeding Season		
Treatment	**Number**	**% Cycling at Start of Breeding Season**
Normal Fat	160	56.9
High Fat	162	70.3

Table 11. Effect of Bull Exposure on Postpartum Interval in Beef Cows[a]		
Treatment	**Number of Cows**	**Postpartum Interval, Days**
Control - No Bull Exposure	158	72.6
Cows Exposed To Mature Bulls	154	59.5
Cows Expose To Young Bulls	152	61.8
[a]Nebraska data, 1991--Cupp et al.		