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## **THE LATEST METHODS TO DETERMINE WHEN TO SUPPLEMENT**

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### **INTRODUCTION**

Because feed accounts for a significant portion of operating costs, cattlemen are always interested in getting the most out of the supplemental feed dollar. Two unwanted costs are the costs of overfeeding and the lost opportunities resulting from underfeeding.

Three keys to more efficient supplementation are (1) identifying the most appropriate supplement, (2) determining the proper amount of feed, and (3) identifying the window of opportunity for achieving the desired changes with the minimal feed input. In order to adjust a feeding program, one needs to have an estimate of the nutrient value for the forage being consumed, current cattle condition (or performance), and a performance objective for the cattle. So in order to determine when to supplement, we need to evaluate the cattle and the forage. Forage evaluation costs money and time, but the expense may be necessary to develop a better system of management. In the long run, this should improve feeding practices and hopefully optimize cattle performance.

### **Forage evaluation**

Forage evaluation is becoming more common in the ranching industry. A comprehensive program can provide a valuable database for adjusting management strategies such as the time to supplement and the type of supplement. Additionally, testing different grazing units on a ranch can point to the relative nutritional strengths and weaknesses of various grazing units. These differences might lead to a change in supplementation or grazing management to take advantage of differences in forage value on different units. Historical records will improve long-range planning while current analyses provide the basis for short-term adjustments in the nutritional program.

Ultimately, a forage evaluation program would indicate what nutrients the cattle are actually consuming each day. Although some recent innovations are approaching this point, our current evaluation techniques are not quite this sophisticated.

**Forage testing** Analyzing clipped forage samples is one approach used by some ranchers and nutritionists. If forage testing is to be successful, one must understand the shortcomings or problems with this method. Of primary concern is that cattle graze selectively and therefore the forage that is collected for analysis may not be representative of the forage grazed by the cattle. Research has shown that forage randomly clipped from an area usually

contains less protein and is less digestible (less available energy) than forage grazed by cattle. So, forage values from clipped samples will need to be adjusted to account for selectivity. As a rule-of-thumb, cattle diets will generally contain about 2% more crude protein and be about 3-5% more digestible than hand-clipped forage.

If a person takes the time to observe cattle and note which plants have been grazed, it may be possible to collect forage samples that more closely resemble the diet of the cattle. However, this can be time-consuming and may eventually cause the person collecting the samples to lose enthusiasm.

Using a consistent sampling procedure will insure that values from different collections can be compared. Any changes in the collection procedure should be noted for future reference.

Another possible concern is the analytical methods used by the testing laboratory. In times past, all laboratory analyses were conducted with "wet chemistry". However, a technique referred to as NIR (Near Infrared Reflectance Spectroscopy) is becoming more common. NIR is very precise and accurate when the analytical instrument is properly calibrated for a forage. If the lab does not have the proper calibration for a forage, the results can be misleading. So, check to determine if the laboratory uses NIR or wet chemistry. If NIR is used, be certain that the instrument is calibrated for your forage.

**Forage moisture** In many instances, the protein content of a forage is a primary concern in our decision-making process. The moisture and protein content of a plant decrease as the plant matures. Considering this, the moisture content of the plants can serve as an index of forage protein. It is necessary to collect forage samples and have them analyzed by a lab for moisture and crude protein. Over time the relationship between forage dry matter (100 - percentage moisture) and forage protein can be developed using a spreadsheet or other analysis. The moisture/protein relationship varies among short, mid- and tall grasses so a separate analysis is needed for each forage type. Once a suitable relationship has been developed, forage samples can be dried at home (in a microwave or kitchen oven at low heat) to estimate forage protein and make short-term management decisions.

### **Fecal analyses**

Compared to forage samples, feces is easy to collect and is more representative of what cattle graze. For this reason, producers and researchers have "looked at" and analyzed feces as a means of estimating the plane of nutrition of grazing cattle. Over the years a number of approaches have been used and tested. The primary problem with fecal analysis is in developing a relationship that provides a satisfactory estimate of forage value or provides the information needed to change a supplementation program.

**Fecal consistency** A "method" that has been around for years is based on the consistency or moisture content of fecal material. As the plane of nutrition increases, feces become wetter and looser; as plane of nutrition decreases, feces become drier and stiffer. So, supplemental feed inputs can be adjusted based on changes in fecal consistency. This approach can be a very useful

for making week-to-week adjustments in feeding levels.

A refinement of this approach is to combine monthly estimates of forage value with frequent field observations of feces. Supplemental feeding is initiated based on the forage values. During the time interval between forage tests, the producer observes fecal consistency (moisture, fiber) and increases or decreases supplemental feeding to maintain the desired consistency. When another estimate of forage value is available, the feeding level is adjusted and the producer begins observing feces until the next forage sample is collected.

**Fecal nitrogen** As forage protein and digestibility increases, the concentration of nitrogen in the feces increases. Considering this, researchers have attempted to use fecal nitrogen to estimate forage protein. A problem with this method is that the relationship varies across different forages and range types. This limits the use of fecal nitrogen to areas where prediction equations are available from research. Producers can develop their own equation by analyzing feces and forages simultaneously and incorporating the data into a spreadsheet or similar type analysis.

Although most research has shown that fecal nitrogen can be a useful approach to determine when cattle need supplemental protein, the relationship between fecal nitrogen and diet protein is not perfect. But, this is true for any of the estimation methods that are available.

**Fecal profiling with NIR** The most recent approach to estimating diet nutritional value was developed by the Ranching Systems Group in the Rangeland Ecology and Management Department at Texas A&M University. This approach analyzes fecal material using Near Infrared Reflectance Spectroscopy. The NIR instrument estimates forage protein and digestibility based on characteristics of the fecal material. Theoretically, this method should provide better estimates than a single measure, such as fecal nitrogen, because the instrument uses multiple, rather than a single, characteristics of the feces.

Initial research was conducted in central and south Texas. Although the relationship between the instrument estimates and actual forage values was not perfect, the procedure accounted for a significant amount of the variation in test diet values. Based on this initial work, the application of the procedure was expanded and is currently being utilized by a number of producers across the country. However, there is some concern about this broader application because the calibration equations are based on a relatively narrow forage base. Currently, universities and some companies are participating in field validation trials. This research will determine what, if any, adjustments are necessary to improve the calibration equations and the estimates of nutrient value for different forages and range types. The lack of widespread field validation should not discourage producers from utilizing this tool. Instead, anyone using the service should understand that there is some potential for error and cattle performance should be monitored to insure that the supplementation decisions were correct.

The NIR analysis is relatively rapid and can provide information for making tactical changes in a supplementation program. Usually a producer can have diet estimates in hand within 5 days of collecting the samples. Hence this technique can provide valuable information

for building historical datasets but also can provide support for immediate short-term management decisions.

The NIR fecal profiling is part of a nutritional management package developed by the Texas A&M group. A computer software package named NUTBAL includes a module for projecting livestock performance and supplemental feed requirements and a module for least-cost supplement formulation. The software package can be purchased for use on the ranch. The model requires forage values generated by the fecal analysis or by other means such as forage testing. For more information, contact Dr. Jerry Stuth in the Rangeland Ecology and Management Department, Texas A&M University, College Station.

### **Protocol**

A producer needs to outline a sampling protocol. The protocol will include the frequency of sample collection. For forage testing, the protocol should also describe the method of forage collection (random clipping, grazed plants only, etc.), key forage species and key sampling areas on the ranch. Fecal sampling protocols should define the number of animals to be sampled and when the samples are to be collected. The fecal profiling with NIR requires that the samples be collected at least 48 hours after feeding a supplement or supplement residues in the feces will bias the results. Whatever approach is utilized, it is important that samples be collected and analyzed in a consistent manner in order for the data to be useful.

Sampling should occur monthly during transition periods for the forage. For instance in the winter when forage is dormant, the frequency of sampling may not be as critical as in the spring, summer, and fall when forage quality is changing continuously. Other periods of specific interest are a green-up period following late summer rainfall, or changes following snow and ice cover. Knowledge of the changes that occur with these events will add to the experience base for making decisions in the future.

### **Tissue Analysis**

Tissue analysis is another tool that can be used to diagnose problems and lead to a change in a supplementation program. In herds with chronic problems that cannot be corrected with protein or energy supplements, parasite control, and other health programs, tissue analysis may be necessary to identify a problem. These analyses are generally used when diagnosing problems associated with mineral nutrition. Blood samples are commonly analyzed for various minerals, but other tissues such as liver may be of more value. Improved techniques such as needle biopsy have increased the utility of sampling tissues like the liver.

### **Monitoring livestock**

An estimate of forage value alone is relatively meaningless unless we have some idea of the requirements of the cattle grazing the forage. Weight gain objectives can easily be set for growing cattle. Performance can then either be monitored by weighing subsets of cattle or by estimating performance from forage values. For the cowherd, body condition scores may be used

as performance objectives.

**Body condition scoring** Body condition scoring is a valuable tool for determining the current status of the cowherd and then determining what nutritional adjustments may be required to hit condition targets at future dates. Current BCS, the changes needed to hit the future target, and an estimate of forage value, provide the basis for determining if supplemental feeding is required to meet the production goal. BCS alone may indicate the cows need help, but without a forage value, we do not know how much help is needed.

Most cattle producers are noting (at least subconsciously) the condition of their cows throughout the year but special attention at certain times will aid with management decisions. Using spring-calving cows as an example, condition should be noted at least five times during the year. Late summer and early fall is the easiest time to put condition on cows. Therefore, producers should evaluate body condition in the midsummer to determine if cow management should change in order to improve condition prior to winter. Two management changes might include low level supplementation to boost forage utilization and/or weaning a month or two early to remove nutritional stress on the cow. At weaning, producers should note condition to determine if supplemental feeding should begin earlier than normal to improve cow condition during the period when nutrient requirements of the cow are the lowest and forage quality is still relatively good. Condition should be noted again about 60 days prior to the calving season. Body condition at calving and at the start of the breeding season will indicate whether more supplemental feed will be required. Scoring at this time will also give early indication of potential rebreeding problems and set into motion the decision process for managing around these potential problems.

Once again, body condition only tells us if cows need additional nutrients to move them toward some target. In order to determine what and how much to feed, an estimate of forage value and intake is needed to support our decisions.

### **Summary**

Several approaches are available for producers that wish to monitor cattle nutrition and refine their nutritional programs. No one approach will provide completely accurate results. It is important to realize that these are simply guidelines and it will be necessary to observe the cattle to insure the performance is meeting the objectives. If the supplemental feeding program based on forage testing or fecal testing is not producing the desired results, then the producer must adjust. It is important to record these adjustments in order to improve the knowledge base so, in the future, these adjustments can be incorporated into the decision process. Combined use of several approaches will provide a better base for both long-term planning and short-term management decisions.