

Protocol for Establishing a Monitoring System to Support the NIRS/NUTBAL Nutritional Management System

The NIRS fecal profiling system serviced through the Grazingland Animal Nutrition Laboratory (GAN Lab) in the Department of Rangeland Ecology and Management at Texas A&M University provides ranchers with rapid assessment of the nutritional value of diets of free-ranging livestock and tools to determine the animal's demand on the forage resource as well as the animal's nutritional well-being. The tool is a decision support system referred to as NUTBAL 1.13 - Nutritional Balance Analyzer. Critical to the success of the program is to collect the fresh feces at the appropriate intervals to establish a baseline of information on forage quality and allow the manager to initiate, end, or adjust supplemental feeding programs. Approximately one heaping tablespoon of fresh feces from 5-10 dung pats should be composited for each target herd. The composited fecal sample should be placed in the styrofoam mailer with a freeze pack and mailed via 2-day express mail to the GAN Lab. Analyses will be provided 48-72 hours after arrival at the lab via fax, phone, or mail, or approximately 4 to 5 days after picking up the sample. A detailed description is provided on how to collect and process the sample.

One of the most frequently asked questions is how often should the samples be taken and when would be the best time to take the samples. The recommendation currently being implemented is a regime where one sample is collected per herd in the middle of each month plus or minus seven days during the first year. During that year, four additional samples are used to detect unexpected events or known transitional periods. This is referred to as the "12+4" program. The key is to understand what constitutes a transition period and "events". Transitions occur with seasonal drying, cooling or warming trends. Events are readily identifiable conditions that occur unexpectedly such as an early freeze, mid-summer rainfall, ice storms, exceptionally high mast drop (acorns, beans) etc. Traditionally, the transitions are the fall-to-winter, winter-to-spring, and summer slump.

The fall-to-winter transition is marked by declining temperatures, shorter day lengths and increasing probability of freezing temperatures. This is the period where most producers initiate feeding programs but have difficulty judging when to start feeding and with what kind of feedstuff. Generally, digestibility and crude protein values decline in a linear fashion relative to the decline in soil moisture and day length. Abrupt changes occur when a storm occurs and increases soil moisture and proportionally increases crude protein more than digestibility. A freeze will manifest itself in the animal's diet the next day. Depending on the amount of rainfall after a freeze, forage quality will decline from each rainfall period throughout the winter. Greater rainfall increases nutrient leaching. Excessively warm temperature events can create "green flushing" that will elevate the diet quality, if adequate soil moisture is available.

The winter period is marked by a general decline in quality from the base level set after dormancy occurs. This can be offset by growth of cool-season grasses and forbs. Therefore, sampling should be sensitive to major shifts in availability of the cool-season forage component during winter due to dryness or excessive cold temperatures. Remember that dormant material lose nutrients every time that it rains. If excess periods of rainfall occur early in the winter season, monitoring should try to capture the new adjusted levels after the rainfall period ceases.

The winter-to-spring transition marks a very difficult period due to the intermingling of young, succulent leaves with old, weathered stems and leaves. This can be a very sensitive period for management of cows due to the correlation with peak lactation. Livestock will typically enter into a behavioral pattern referred to as "chasing green." Dry matter intake will be depressed in preference to ingestion of green material. The net effect is high diet quality but low fecal output resulting in reduced nutrient intake.

Therefore, a critical monitoring issue is availability of green standing crop during this period and associated rate of growth. This is where a blend of the NIRS monitoring system and the NUTBAL decision support system is needed to ascertain the well-being of an animal.

Typically, ranchers have ignored the dry, summer periods or the "summer slump" when it comes to feeding supplements. A few ranchers will leave out liquid protein supplements during this period. However, prevention of major weight loss during this period can lead to less feeding in the subsequent winter. Therefore, it is strongly recommended that the livestock manager set performance goals for the summer and attempt to meet those goals through a monitoring program and strategic feeding. This means that monitoring must occur in the period where senescence begins to exceed the amount of green leaves produced trending into a period where the heat and limited soil moisture leads to plant dormancy with mostly dead leaves. Generally, one sample between July 15 and August 15 is sufficient to set the trend and allow for feeding adjustment as necessary. Once fall rains occur, the normal monthly sampling scheme will suffice.

Typically, forage quality will track forage growth. When soils begin to dry and temperatures rise, the trend can be projected by taking two samples 10-14 days apart. The response will be linear until a major weather event occurs to change conditions. For instance, if you are in October and collect two samples 14 days apart, you can project a line of declining quality where feeding should begin. If a frost occurs before that point is reached, then re-establish your trend line by monitoring the new conditions and 14 days later setting the direction of the decline.

When collecting the samples, it is important to catalog the conditions associated with the sample. The GAN lab provides a data sheet to note the various conditions needed to run a NUTBAL analysis. Be sure to fill out the information at the time of the collection. Also, purchase an inexpensive Polaroid camera or regular 35-mm camera and take a series of pictures which depict the condition of the livestock and the pasture. Typically, a rancher will have a standard key site to photograph which reflects the "average" of the pasture. Also, a side and rear view of a representative animal is useful to index body condition score and calibrate your view with the consulting nutritionist. An assessment of

composition of body condition of a herd can be a quick and revealing piece of information about potential problems in delivering an effective supplementation program. Animals that are very low in body condition should be separated out and put on a different feeding protocol to insure the effectiveness of monitoring system.

Typically, animals are fed only when there is a problem which is suitable if the animal is in good body condition. However, if the animal is in poor condition, one should consider accelerated conditioning of the animal during good forage quality periods. That is, feed supplements when it does not take too much for them to gain weight and then feed only to hold a desired weight when conditions are poor.

There are two major skills that need to be developed in effectively using the NIRS/NUTBAL system. First, the manager should have a comprehensive understanding of body condition scoring and its relationship to re-breeding success of the animal. Second, critical levels of standing crop should be easily judged by the manager. The NUTBAL system is insensitive to standing crops below 2250 lb/ac. Fecal output declines approximately 8% from 2250 to 1000 lb/ac. However, it exponentially declines from 1000 to 500 lb/ac. Therefore, it is recommended that managers be able to judge what 1000 lb/a looks like at their "key site". The Extension Service of Texas has two excellent publications on body condition scoring and establishing forage monitoring guidelines. The NUTBAL user's guide also has guidelines to body condition scoring cattle, sheep, goats and horses. Purchasing of a set of inexpensive spring scales, a pair of clippers and a .5 x .5 m frame is all that is required to train yourself in judging forage standing crop.

Another piece of monitoring information is temperature and windspeed. The local newspaper and TV's weather channel are good sources for this information. However, you can purchase an inexpensive digital maximum and minimum temperature gauge and windspeed gauge from several resource management supply catalogs. The GAN lab can help you locate sources for this equipment.

Once you have received the analyses from the GAN Lab, the crude protein and digestible organic matter values should be written on the back or bottom of the photos of the vegetation in the pasture and the condition of the cows. This helps establish an

historical picture of conditions at different times of the year and helps you develop an "eye" for judging if significant changes in forage conditions have occurred to warrant collect of a sample.

After the first year of monitoring, we recommend that routine sampling be continued but less frequently. Sampling in the second year should focus on transition periods and unexpected events that occur during periods of traditionally high forage quality. Recommended sampling periods would be as follows:

1. Early October.
2. Late October.....project when feeding would have to occur.
3. Three days after the first frost.
4. 14-21 days after the first frost.... project until frequent rains set in during winter.
5. Seven days after major winter rainfall sample or sample in early January.
6. Sample 14 days after major rainfall period to set trends.
7. Sample in mid-February.
8. Sample in the early stages of spring green up ... (grasses approximately 2-3 inches in height) ... project when feeding would have to stop from trend line.
9. Sample in mid-July.
10. Sample in early August ... if problem exists, sample again in mid-August ... set trend line unless rainfall occurs.
11. When fall rains occur, check forage quality 10-14 days after the rains start.
12. Repeat monitoring cycle.

This sampling regime would require approximately 10 samples. After the second year, it is recommended that you only sample when major deviations are noted from the first two years. This is typically a result of abnormally dry springs and falls as well as excessively wet winters after early frosts. The key is to monitor the condition of the animal and the availability of the forage and keep good historical records to recognize

significant deviations. The beauty of the system is that you can use the NUTBAL system to play "what if" games to help assess if the perceived conditions really matter or should you collect a sample because you are too close to the edge of a problem. Maintaining the results in an electronic spreadsheet by year, and day of year, allows you to create charts and quickly glance at the trend lines or make contrast with previous years.

Historical forage quality information will allow you to make rational decisions as to which feeds are most cost effective and whether you should forward contract for feed or hold off purchases for better future prices. The NIRS/NUTBAL nutritional management system allows the manager to assess a problem, formulate a solution, and move on to other pressing issues which occupies a manager's time. The "worry factor" in management is greatly reduced with a system that takes the guesswork out of one of the major items in the variable costs of raising livestock.