United States
Department of
Agriculture

Natural
Resources
Conservation
Service

**Grazing
Lands
Technology
Institute**

National Forage Quality and Animal Well-Being

Contents

Role of the Natural Resources Conservation Service

The NRCS knowledge base concerning forage quality, impact of environmental conditions as they impact animal health has increased significantly. NRCS employees are assisting landowners and managers in the analysis of complex natural processes as they affect diet quality and animal well being. The objective of this project is to implement sound decisions that meet desired future conditions and improve natural resource management of both the environment and the animals. High quality conservation planning assures a balance of natural resource issues with social and economic needs. The planning process also involves an inventory and evaluation of the existing resource conditions to help the conservationist convey knowledge and education to the client. The Grazing Land Technology Institute is providing several animal science and nutrition workshops in an effort to improve professionalism of our employees and increase our knowledge of the relationship between forage quality and animal well-being.

New technology

In 1994 the Grazingland Animal Nutrition Lab (GANLAB) began offering the ranching industry a new set of monitoring techniques.

The near infrared reflectance spectroscopy (NIRS) involves exposing a dry ground fecal sample to light energy, allowing predictions of dietary crude protein (%DCP) and digestible organic matter (%DOM) on a dry matter basis. The NIRS fecal scans look at a large number of chemical bonds in the sample. The intensity of reflectance is measured across several hundred wavelengths in the near infrared band. Reflectance is influenced by the number and type of chemical bonds. Primary wave-length prediction equations appear to be associated with the fiber, alkane, and microbial fractions in the feces. It measures the monochromic light from dried feces and is almost as accurate as the results obtained from wet chemistry on samples analyzed which come from esophageal and fistulated animals. NIRS has shown to be a rapid methodology, less costly than the wet chemistry sampling and accessible to all producers.

Predicting diet quality

Diet samples obtained from esophageal-fistulated animals were matched with feces of intact cows grazing a wide array of forages under changing conditions. These data were used to build the prediction or calibration equations. Fecal equation diet quality predictions were then validated against animals with known diet qualities. The equations developed to date appear to be highly reliable across a broad spectrum of forage types. Currently, the lab can predict dietary crude protein, digestible organic matter, fecal nitrogen, and fecal phosphorous. Dietary content of dicots can be estimated for regions with contrasting C_3 dicot species (browse and forbs) and C_4 warm-season grasses.

1997 to 1999 project

NRCS received funding for the collection and analyzation of 13,000 fecal samples nationally through the GANLAB at Texas A&M University (fig. 2). NRCS employees then provide technical assistance to livestock producers based on the results of the analyses using a nutritional balancing software program called Nutritional Balance Analyzer (NUTBAL). This program allows the user to characterize the animals' genetics, physiological stage body condition, environmental conditions, feeding regime, and dietary values of crude protein and digestible organic matter to evaluate the nutritional status of the animal. The program produces a nutritional report for dietary crude protein and net energy. If a deficiency exists, NUTBAL can determine the amount of least cost feedstuff needed to correct the problem.

Expected results

There were 44 states that participated in the 1997-99 program nationwide. Each state will be developing a strategic plan to gain information about:

- dietary value of specific plants and plant communities
- value of plants to different kinds and classes of grazing animals
- seasonal and physiological variation of forages
- relationships of the forage values and animal well-being and management implications

Project Coordinators

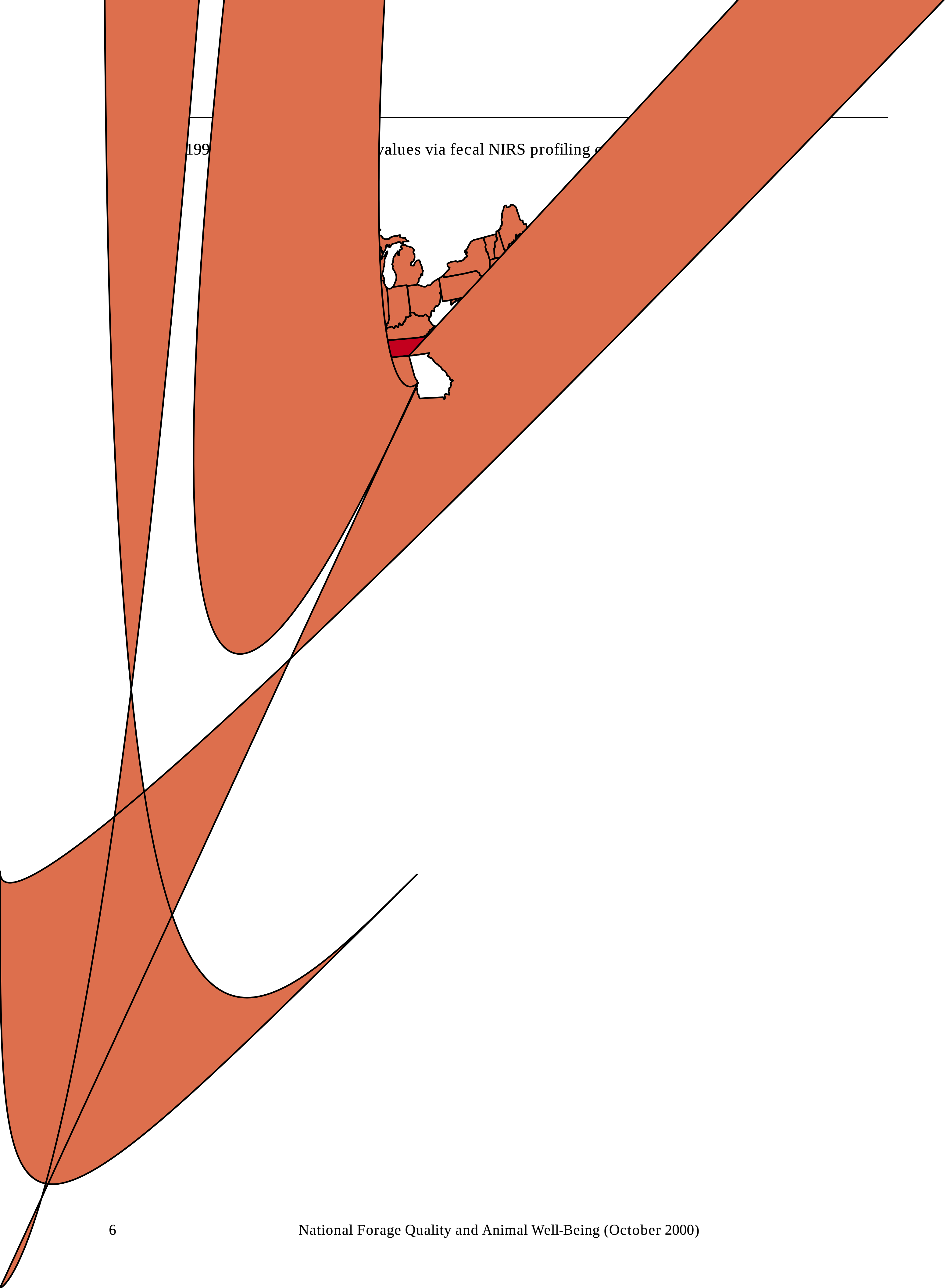
National coordinator:

Arnold Norman	Grazing Lands Technology Institute

Regional coordinators:

Noel Soto	East
Richard Hungerford	Midwest
Dave Schmidt	Northern Plains
Dan Caudle	South Central
Gerald Rouse	West
Sid Brantly	Southeast (S)
Sam Linkenhoker	Southeast (N)

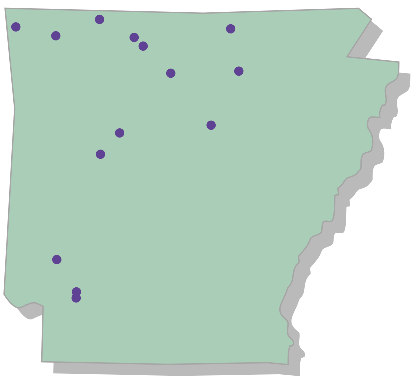
199 values via fecal NIRS profiling o



The Arkansas Diet Quality Sampling Project 1997–1998

Project Overview

Figure 3 Sampling locations of Arkansas



Today's livestock producers must constantly consider the economics of their operations and reduce as many input costs as feasible to stay in business. Figure 3 shows the sampling locations in Arkansas. Feed can be the largest variable cost of an operation. Feeding livestock more efficiently enables farmers to sustain their animals and their livelihood. Knowledge of the true nutrient value of the forages available can assist producers in making decisions about when feeding is actually necessary. By analyzing manure samples with the new technology of near infrared reflectance spectroscopy (NIRS), questions about diet quality from roughage can be answered accurately and promptly. The dietary crude protein and digestible organic matter NIRS results are then entered into NUTBAL where they are compared to the animal's nutrient requirements at a particular stage of development and under specific environmental conditions. This program provides information about whether management changes, such as rotational grazing adjustments or supplemental feeding, are warranted. If necessary, mediation through NUTBAL can also recommend the lowest cost feed that would meet animal requirements. The goal of the Arkansas project was to introduce technical staff and producers to this new monitoring technique and demonstrate the benefits of tracking forage quality to determine if it is meeting the needs of the livestock.

Livestock Operations

Three Arkansas NRCS grassland specialists worked with nine cattle producers that represented common types of livestock in the state. Seven of the landowners ran cow-calf operations. Fall calving herds were sampled on three of the farms, spring calving herds on two farms, and fall and spring calving herds and year-round calving were sampled on one farm each. Only two herds of growing animals were included in the project: a herd of beef steers and one herd of dairy replacement heifers.

Management varied from farm to farm, only one producer did not rotate his livestock. Half of the herds were on a fast rotation with grazing periods of 1 to 7 days. Most of the producers did not supplement concentrates, but one farmer fed cottonseed meal in the winter and two farmers offered the cows either cottonseed meal or the meal mixed with corn and salt year-round. Hay was fed to all the livestock except for one cow-calf herd and the steers where virtually no hay or supplements were fed.

Major Land Resource Areas

The sampled farms were located in four of the six MLRA's in the state that are important in livestock pro-duction. The areas are described as they occur from northern to southern Arkansas.

- ***Ozark highlands*****—**Many spring-fed creeks have cut steep, narrow valleys through the limestone that underlies this plateau. Pasture soils are generally shallow and rocky and primarily support tall-fescue. Bermudagrass is established on some of the deeper soils. Five herds located in this MLRA were tested.
- ***Arkansas valley and ridges***—The broad, flat Arkansas River Valley generally has deep, productive soils on sandstone bedrock. Shallower, rockier soils are on the sideslopes and ridges. Mixed bermudagrass and fescue pastures are common. Two herds were tested in this area.
- ***Western coastal plain***—Deep alluvial soils overlay sand-stone bedrock on this generally flat terrain. Bermudagrass is the prevalent pasture forage. One herd from this MLRA was tested.
- ***Blackland prairie***—Very acid and easily eroded soils based on limestone characterize this region. Native grass prairies have largely been converted to bermudagrass, dallisgrass, and some fescue. Two herds were tested in this area.

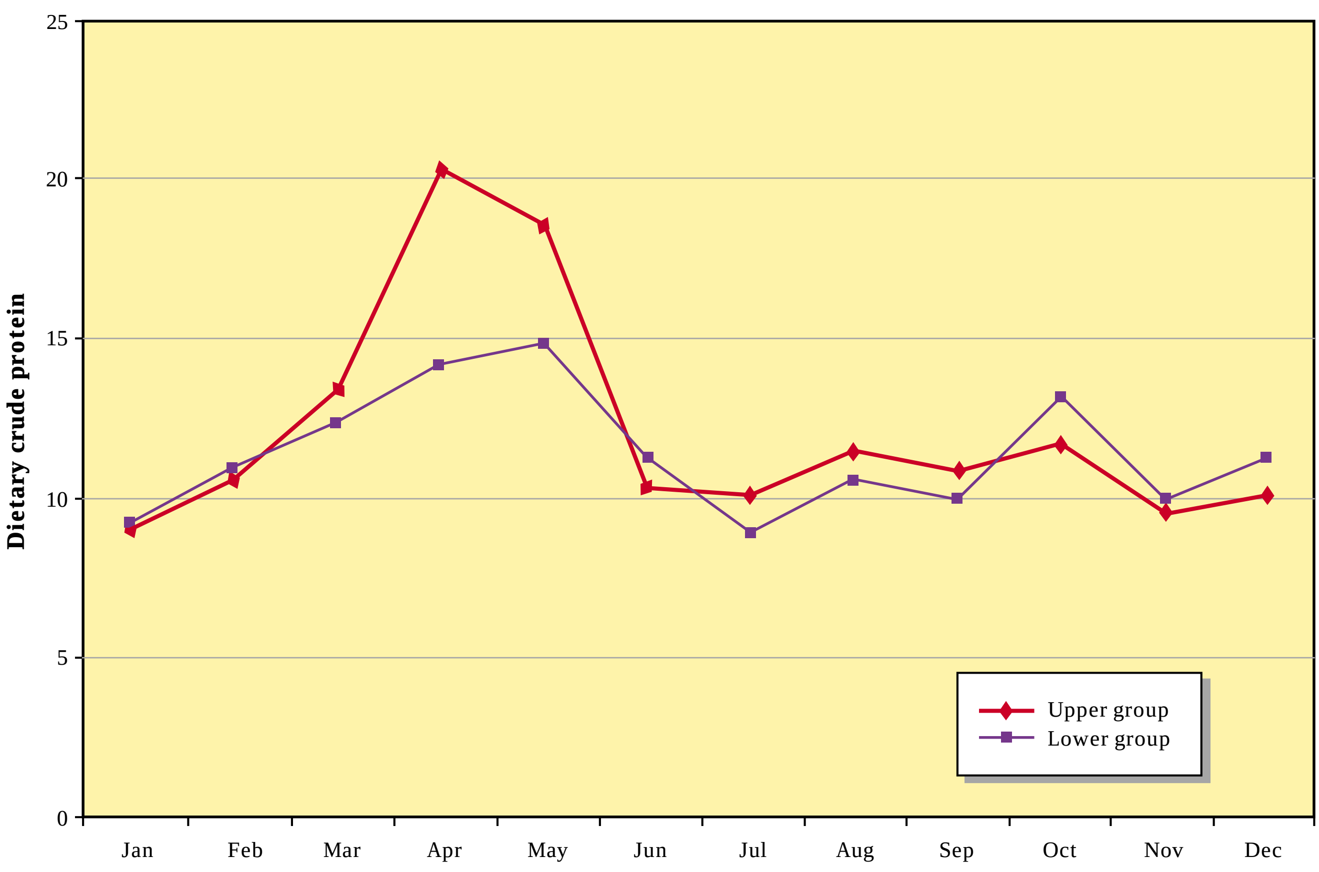
Conclusion

The NIRS fecal testing combined with the NUTBAL computer program seemed to accurately show the trends in diet quality and livestock performance. The crude protein and digestible organic matter of the forages and hay were predicted to meet the livestock needs in most cases. The condition of the cattle reflected this assessment. Rye and ryegrass were the highest quality forages, and fescue with clover ranked a close second. Because of these cool-season forages, the diet quality of all herds except one peaked between March and May. One herd on a bermudagrass-crabgrass pasture had a high test in June.

To further examine this spring period, the test results were separated into either a higher spring peak group or a lower spring peak group and averaged (fig. 4 and 5). The variation between the groups in the spring most likely resulted from a combination of several factors. Animals selecting from adequately fertilized ryegrass or fescue had higher diet quality than those without cool-season forages or where the cool-season growth emerged through an old, stockpiled fescue stand. The forages with high crude protein levels consisted largely of rumen degradable protein; however, that possibly did not contribute to the animal's performance. The ratio of digestible organic matter to crude protein fell below 4 in all but one of the herds in the higher group during this time, indicating high rumen degradable protein levels.

NIRS results pinpointed significant drops in forage quality and when management changes occurred. Some dallisgrass and bermudagrass hay, and over-mature fescue pasture in mid-summer and mid-winter, had the lowest nutrient values measured. The average year-long diet quality for each herd was fairly similar, ranging from 10.9 to 14.5 percent crude protein and 61.5 to 66.1 percent digestible organic matter. Comparing average results among the major land resource areas showed no major differences in diet quality. Herds from the same MLRA were represented in both the higher and lower diet quality groups.

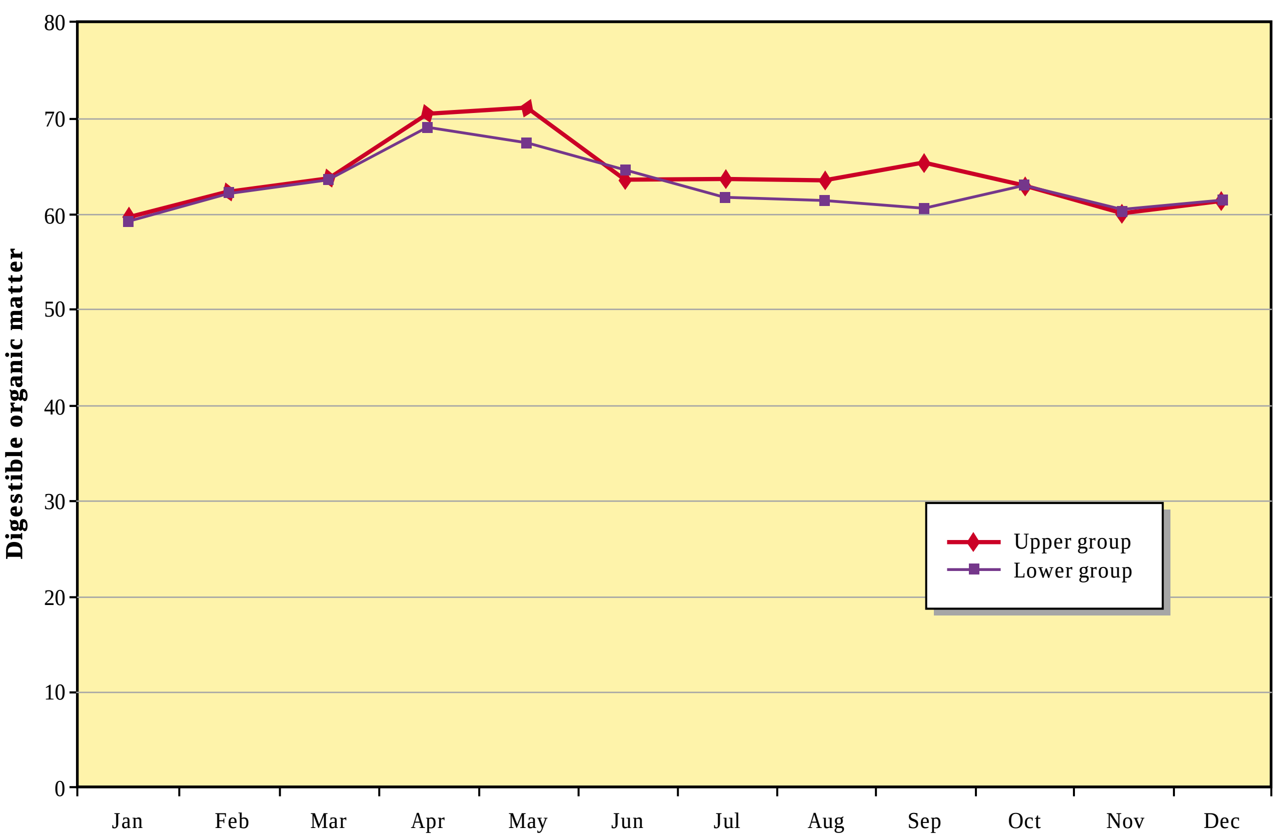
Figure 4 Arkansas diet quality of crude protein



Differences in mature cow nutrient demand were noticeable among certain breed types. The fall-calving Hereford cows were the easiest keepers that thrived almost entirely on fescue with a negligible amount of hay. The Simmental herd had the highest nutrient requirements, but their needs were not met on mature fescue and free-choice hay in January, a month before calving. Nutrient profiling illustrated the importance of matching the protein and energy needs of particular breeds with forage quality and availability. Timing of the calving period, and the peak lactation that follows within 45 to 60 days, are especially critical because of a required higher plane of nutrition.

Fecal monitoring also showed the occurrence of unnecessary supplementation in several of the herds. On operations with year-round feeding of concentrates, the cows reduced their own consumption of feed in the spring as the quality of forage increased. The livestock operators were informed that they could reduce the cost of production by reducing, or at times eliminating, feed when pasture forages alone meet the animals' needs.

Figure 5 Arkansas digestible organic matter



The current NUTBAL program seems to over-predict gains in growing animals both in the spring with abundant, high-quality forages and in the hot, humid summer in Arkansas. Planned NIRS and NUTBAL improvements are underway to improve predictions under these conditions. Considering the effects of humidity, and high temperatures on animal intake, the improvements should also enable more accurate animal performance predictions. Overall, the combination of testing and using the computer program provided producers useful information. The first year of the fecal sampling project succeeded in educating NRCS personnel and producers about the many benefits of monitoring diet quality during the year as environmental conditions and animal needs change.

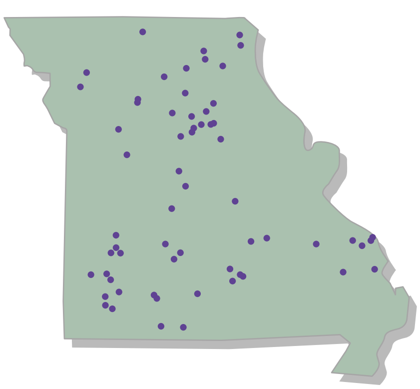
Monitoring Diet Quality and Quantity to Develop an Efficient Wintering Program for Cow/Calf Systems in Missouri

Missouri, the state where east meets west and north meets south, is the second leading state in the Nation in beef cattle production (1998 Missouri Farm Facts). Because of its location, climate, and soils, Missouri can produce a wide variety of forages: native warm-season grasses, introduced warm-season grasses, warm-season annuals, cool-season perennials, cool-season annuals, and legumes. Forage production accounts for over half of Missouri's farm revenues. Figure 6 shows Missouri sampling locations.

During two critical periods in the year, however, forage quantity and/or quality are below what is needed to sustain a productive cowherd. This report addresses only the winter period as it is the longest and most costly for most beef producers. The typical producer in Missouri feeds their livestock hay and supplements for 90 to 120 days during the nongrowing period. Management of forage during this period can have more economic impact to the cow/calf producer than any other single management strategy.

Missouri has more than 18 million acres of grassland. About two-thirds of this is tall fescue. Tall fescue has two attributes that make it a most desirable grass for stockpiling. First, in response to cool nights and short days in the fall, fescue accumulates a high concentration of soluble carbohydrates in the leaves and lower stems (Gerrish, 1997). Second, tall fescue has a waxy layer on the leaf surface that makes it more resistant to frost damage than most other plants.

Figure 6 Missouri sampling locations



Stockpiling, or the managed accumulation of new growth has been practiced for years, but became somewhat unpopular in the 1980's because of all the negative publicity on the quality of tall fescue. While not disputing the data, the management of the fescue during the stockpile period used to obtain these results can be questioned. Considerable amounts of fescue was stockpiled behind the combine during this same period. Even though tall fescue can have quality problems at certain times of the year, it can produce high quality forage in the fall and maintain it well into late winter.

Fecal sampling and the GANLAB analyses on more than 20 farms for the last 4 years, coupled with 2 years of vegetative sampling, show and reasonably predict what the quality of tall fescue can be if managed properly (tables 1 and 2). Many producers were doing a good job of producing and managing stockpiled fescue. However, because of misconceptions about quality, they were supplementing with protein and/or energy supplements from about January 1, until new grass was sufficient to sustain the herd. Tables 3 and 4 depict the nutrient requirements (energy and crude protein) for a 1,100-pound Angus X Continental cross calving in September in southern Missouri using typical weather conditions. Using the NUTBAL program to predict requirements and intake, we can see that under normal conditions stockpiled fescue can meet the requirements for the entire period without supplementation.

When working with a client, the results of the fecal analysis are run through the NUTBAL program for the herd showing current or typical weather for the period. A worst case scenario is used to predict what effect changing weather conditions could have on the need for supplemental feeding. If needed, the mediation process is to get a least-cost supplement for only those periods.

Table 1 Stockpiled tall fescue crude protein

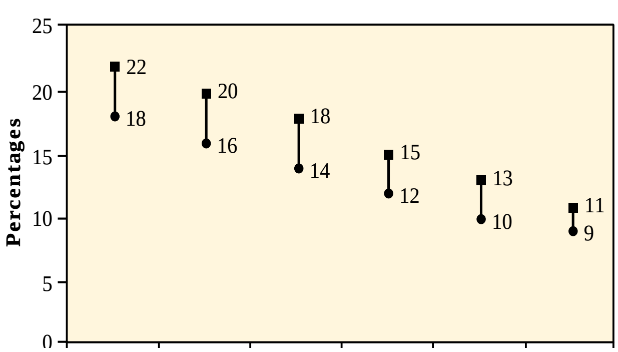
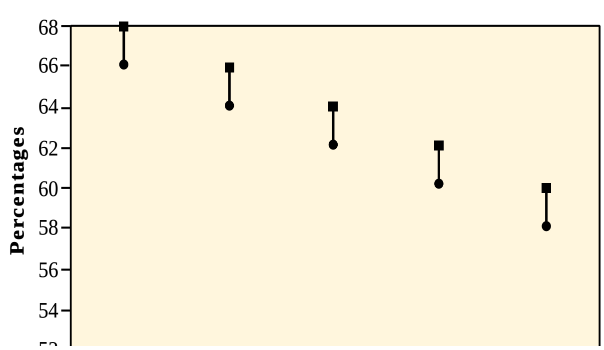


Table 2 Stockpiled tall fescue DOM



This nutritional information coupled with fertilization and fall production research from the Missouri University Forage Systems Research Center (table 5), a low-cost winter feeding program for dry and fall calving cow herds can be developed. In most years, 3,000 pounds per acre tall fescue is grown from late in August to mid-November with about 50 pounds of nitrogen fertilizer applied at the beginning of this period. If allocated properly, 1 acre of stockpiled tall fescue can meet the nutrient requirements of a 1,000-pound beef cow for 75 to 100 days.

Table 3 Energy intake versus requirement

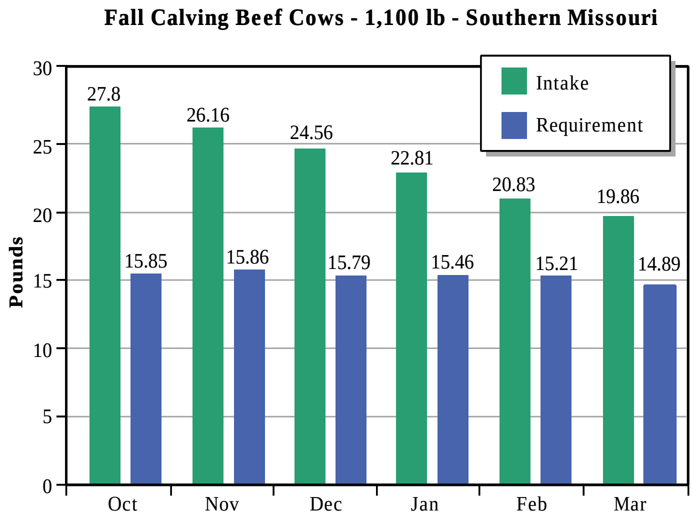
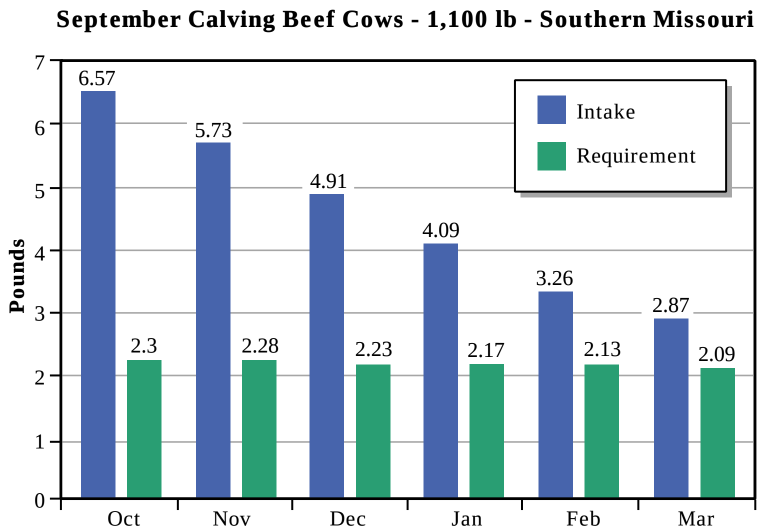


Table 4 Protein intake versus requirement



The recipe for successful stockpiling is:

- Apply 40 to 60 pounds N August 15 to 30
- Start with 3 to 6 inches of leaf growth
- Stockpile 1 acre per animal unit
- Defer grazing until mid-December, if possible
- Stripgraze in 1- to 3-day strips to get greatest utilization
- Feed hay only when grass is covered in deep snow or ice
- Provide protein/energy supplements only when conditions dictate

If producers follow this simple recipe, they can produce an adequate quantity and quality of winter feed at a low cost. This makes fall calving economically attractive in the area.

Use the following assumptions to compare the economics of this system to conventional hay feeding:

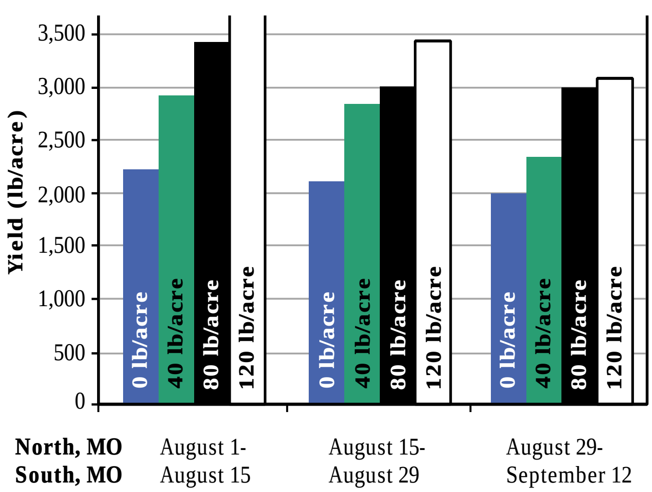
- Cows are consuming 26 pounds per day of either hay or stockpiled feed.
- Medium quality grass hay costs $40 per ton.
- N costs $0.30 per pound.
- 60 pounds N applied x $0.30 = $18 per acre cost.
- 3,000-pound stockpile produced.
- 70 percent utilization using stripgrazing.

Using these figures, wintering cattle on hay would cost $0.52 per cow per day.

$$\frac{\$40}{2{,}000} = \$0.02 / \text{lb}$$

$$\$0.02 \times 26 = \$0.52 / \text{cow} / \text{day}$$

Table 5 Impact of rate and timing of nitrogen fertilization on dry matter yield of stockpiled tall fescue



With stockpiled tall fescue, stripgrazed, the cost would be $0.23 per cow per day.

$$3{,}000 \text{ lb prod. @ } 70\% \text{ utilization} = 2{,}100 \text{ lb consumed}$$

$$\frac{\$18 / \text{ac}}{2{,}100} = \$0.009 / \text{lb}$$

$$\$0.009 \times 26 = \$0.23 / \text{cow} / \text{day}$$

You can also see that this produced 80 AUD per acre.

$$\frac{2{,}100 \text{ lb consumed}}{26 \text{ lb} / \text{cow} / \text{day}} = 80\text{AUD} / \text{ac}$$

The cost comparison for a 90-day feeding period would be $46.80 per cow for hay or $20.70 per cow for stockpiled fescue, which is less than half the cost. If just a 10 percent hay feeding loss is calculated, then the costs change to $0.57 per cow per day for hay or $52 per cow for the 90-day period. This is a significant cost savings to the producer at no expense to the animal or performance.

Summary

In summary, stockpiled tall fescue can be a high quality winter feed source if managed properly. By knowing how to produce needed quantity and monitoring quality, producers in Missouri can have an economical and efficient winter feeding program.

Eastern Montana Grazing Lands Nutritional Value Project Update

Introduction

The NRCS has the responsibility for providing technical assistance to conserve the soil, water, animal, plant, and air resources on America's private lands. Helping operators learn about and meet the needs of grazing animals, specifically domestic livestock, is an effective way to achieve this conservation and is a recognized obligation of the NRCS. Figure 7 shows eastern Montana sampling locations. Until recently, the tools available to evaluate if the nutritional needs of the livestock were being met, were cumbersome and expensive.

The lack of known values for crude protein (DCP) and digestible organic matter (DOM) in livestock diets in eastern Montana can cause considerable loss of income to land managers. Nutritive values of forages vary greatly throughout the year and throughout the eastern portion of Montana, and can fall below the needs of livestock for maintenance and production objectives. When needs are not met, conception rates, birth rates, and growth rates are adversely affected. Supplemental feed is used to fill the void. It is, however, the greatest expense incurred by most livestock producers. Although costly, decisions on type and amount of supplemental feed are often based on availability, tradition, and feed salesmen persuasion rather than on reliable data.

Because nutritional problems can result in reduced income to the producer, indirect conservation problems can be created. Without adequate income, needed range and pasture improvements may not be implemented. Degradation of water quality and plant and soil resources, as well as other problems can result. Improving supplemental feeding practices is an important factor in making livestock enterprises more profitable, resulting in the ability to implement more conservation on the ground.

Figure 7 Eastern Montana sampling locations

Procedure

The eastern most 16 counties of Montana, from the Canadian to Wyoming borders, represent all or a portion of 4 major land resource areas. Some of these areas are further divided into precipitation zones. NRCS personnel in 12 of the 16 counties identified producers willing to assist in the collection of fecal samples. Fecal samples were collected on a monthly basis for 30 months and continued until March 1999. The samples were shipped to the Grazingland Animal Nutritional Lab (GANLAB) at Texas A&M University for analysis of DCP and DOM. The results were returned to the local NRCS office in 5 to 7 days. NRCS personnel, along with each producer, used the NUTBAL software to determine if forage quality was sufficient to meet producer objectives based on that herd description. If producer goals were not met with forage available, least-cost alternatives were provided using NUTBAL to evaluate the feedstuffs available to the producer. In addition to collecting fecal samples, data were gathered as to the type and amount of vegetation being grazed, weather conditions, and precipitation events. The samples collected represent 44 separate herds in 2 major land resource areas (MLRA), sedimentary and glaciated plains, and an additional precipitation zone (15-19 in.) within the sedimentary plains .

Discussion

One of the initial objectives of this project was to gather information on the nutritive values (DCP, DOM) of native grasses throughout the year in each of the MLRA's and precipitation zones. In addition, the information could be used to predict the quality of the forage at a point in time on a range site and perhaps on range sites in different conditions classes. It became readily apparent that what the animals were eating 1 to 2 days before taking the sample could not, with any confidence, be determined. This was especially true on the large pastures sampled. Fortunately, the analysis used by the GANLAB evolved without needing specie-specific information. To further complicate matters, grazing livestock were frequently supplemented at a variety of times throughout the year. Although samples were taken each month, the number of herds limited to grazing without forage supplementation varied throughout the year and from year to year. Because of these factors, the values and charts described in this report deal only with those for native grasses and dryland tame pasture with no additional forage supplement (table 6 and figs. 8–9).

Figure 8 Averages for dietary crude protein 1996-1998

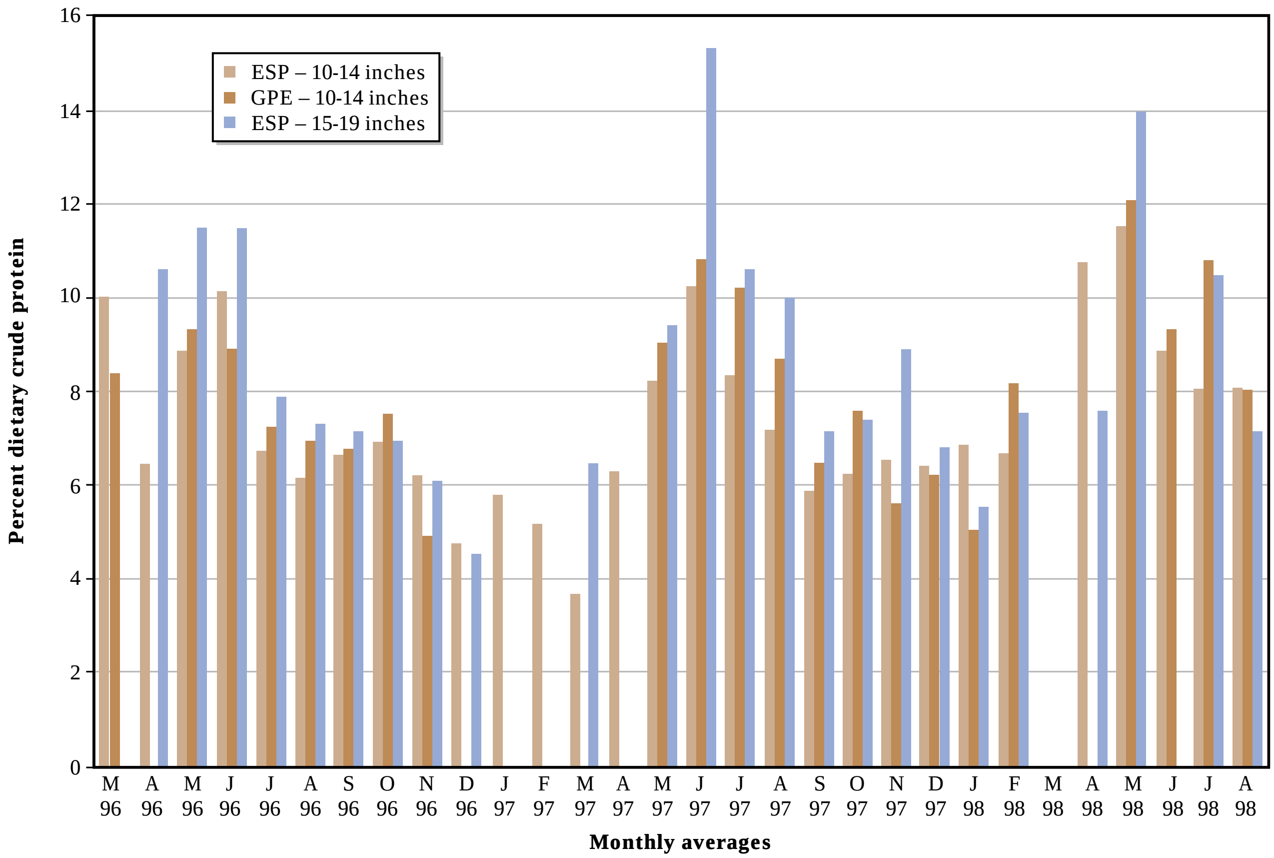


Table 6 Average values for grazed forages with high and low value for the sample period

Year *	DCP High	DCP Low	DCP Avg.	DOM High	DOM Low	DOM Avg.
East 10-14 inches, Sedimentary Plains						
96	14.33	4.06	7.28	65.72	52.55	57.48
97	13.85	2.97	6.65	67.05	54.37	59.27
98	15.65	5.33	8.71	66.99	55.95	60.03
East 15-19 inches, Sedimentary Plains						
96	16.73	3.94	8.16	63.07	55.16	58.35
97	15.99	5.30	9.12	65.71	55.00	60.20
98	15.97	5.54	8.72	65.92	55.00	59.12
East 10-14 inches, Glaciated Plains						
96	13.67	3.75	7.49	66.91	42.33	58.08
97	14.14	3.92	8.07	67.22	54.89	60.16
98	14.12	5.02	8.91	65.53	57.21	60.36

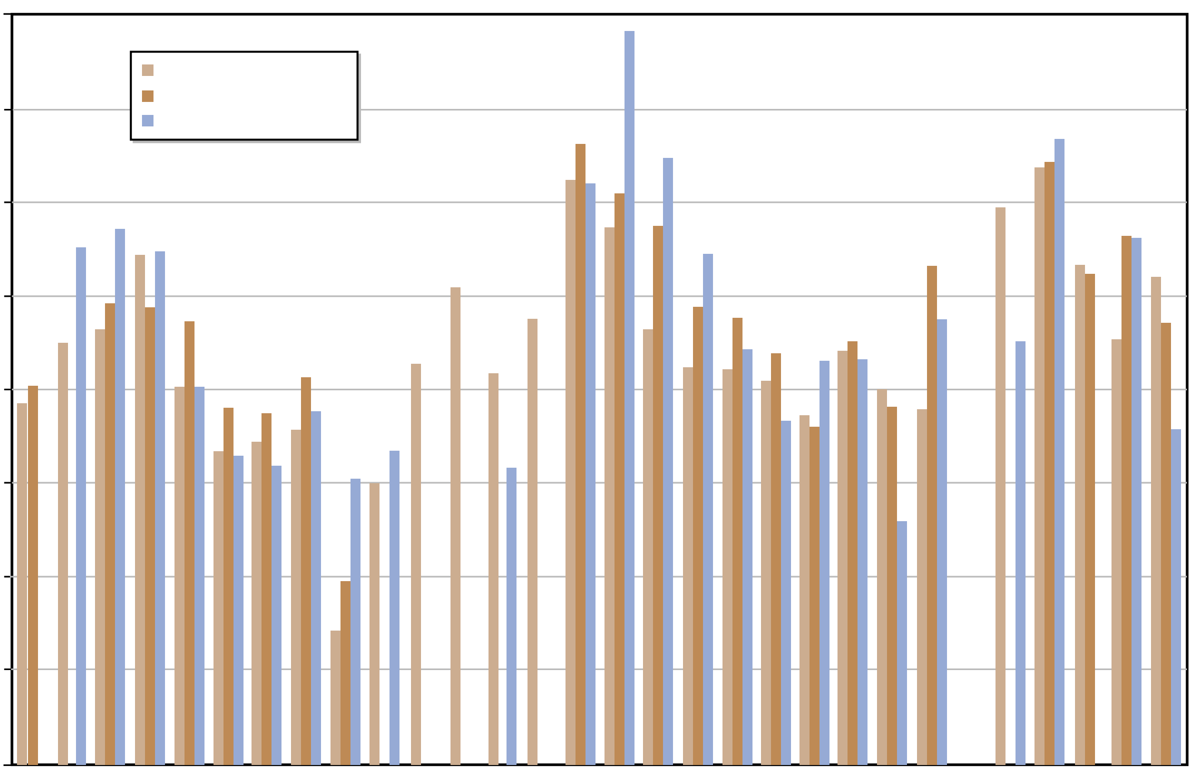
* 1996 Mar. - Dec. ESP 10-14 inches had a total of 140 samples, ESP 15-19 inches had 45, and EGP 10-14 inches had 87.
* 1997 all 12 months. ESP 10-14 inches had a total of 126 samples, ESP 15-19 inches had 30, and EGP 10-14 inches had 70.
* 1998 Jan. - Aug. ESP 10-14 inches had a total of 57 samples, ESP 15-19 inches had 13, and EGP 10-14 inches had 27.

The nutritional values of grazed forages are variable throughout MLRA, by month and from year to year. The presence of cool-season tame pastures (dryland) scattered throughout the rangeland increased the values early in the season as well as late. Warm-season grasses in several of the areas increased values during the hot months on occasion and held their values into fall in several locations. Brush species, typically big and silver sage, as well as greasewood, were being consumed at times and may have affected some of the values. Values for dietary crude protein fell below 7 in the majority of the samples from late July to March in all years, but body condition scores of the animals, as identified by producers, held above 5 well into October in the vast majority of herds.

Conclusion

Livestock producers in this study area have used this new technology and have become confident with the results. Body condition scores in excess of 5 with good calf weights have been consistent during the trial period even with crude protein levels of 4 to 6 for several months prior to weaning. The data bases must to be modified for this technology and the corresponding evaluating tools to be accepted on a larger scale.

Figure 9 Averages for digestible organic matter 1996-1998



Grazing Lands Nutrition Project Foothills and Sedimentary Plains of South Central and Central Montana

This project centered on fecal analysis assessment to

Results

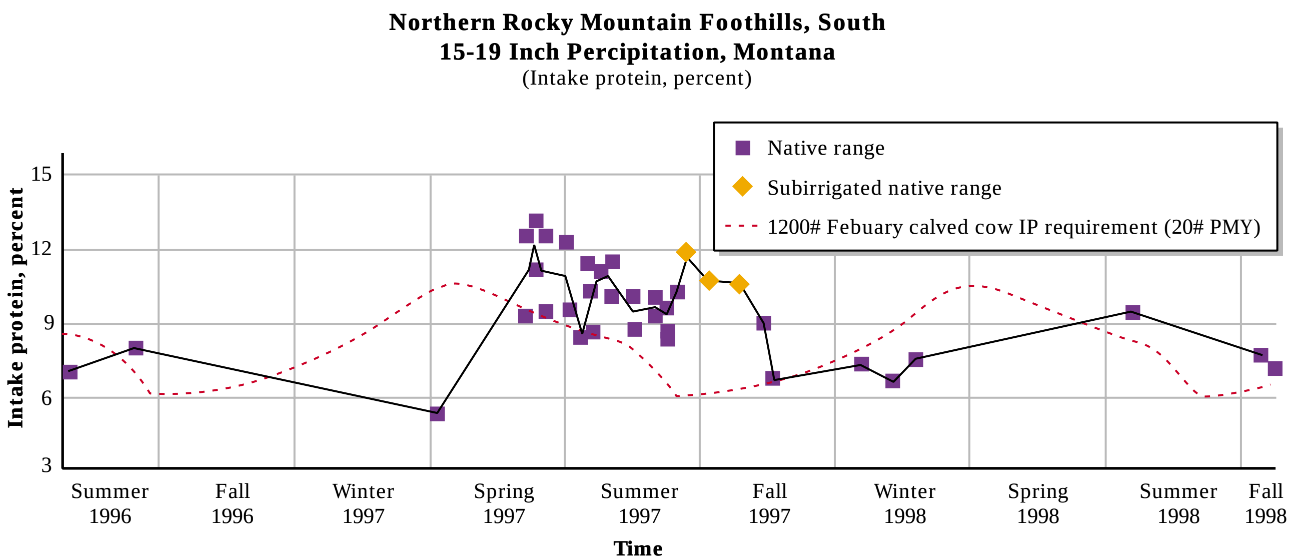
Results varied with precipitation, temperature, grazing intensities, and plant community vigor and health. Within the four grazing seasons of this study, deficiencies for intake protein (IP) occurred for the Sedimentary Plains geographic region in early spring of 1995, late summer of 1996, early spring of 1997, November of 1997, late summer of 1998, and fall of 1998. A cool spring and slow growth and little green may explain the lack of IP seen in the early spring of 1995 and 1997 (both very wet years in Montana). The short fall in protein during the late summer of 1996 and 1998 coincides with summers that turned dry July through September. In 1996, protein deficit was much more severe than in 1998, and it began about a month earlier (late July).

In 1996, only one rancher involved in this project supplemented for protein as directed by his consultation. Everyone in this region weaned steer calves 25 to 100 pounds lighter than their averages except for the individual who supplemented. His steer calf weights met his long-term average.

Dry matter intake (DMI) followed a similar pattern for the Sedimentary Plains.

In the Northern Rocky Mountain Foothills, the average precipitation was greater than that in the Sedimentary Plains, so deficits in DCP and DOM were much less apparent. Protein was insufficient early in the spring of 1995 and 1997. Slightly deficient energy was seen in the early spring of 1995 (probably partly because the pasture had little carryover grass) (fig. 10).

Figure 10 Intake protein percent



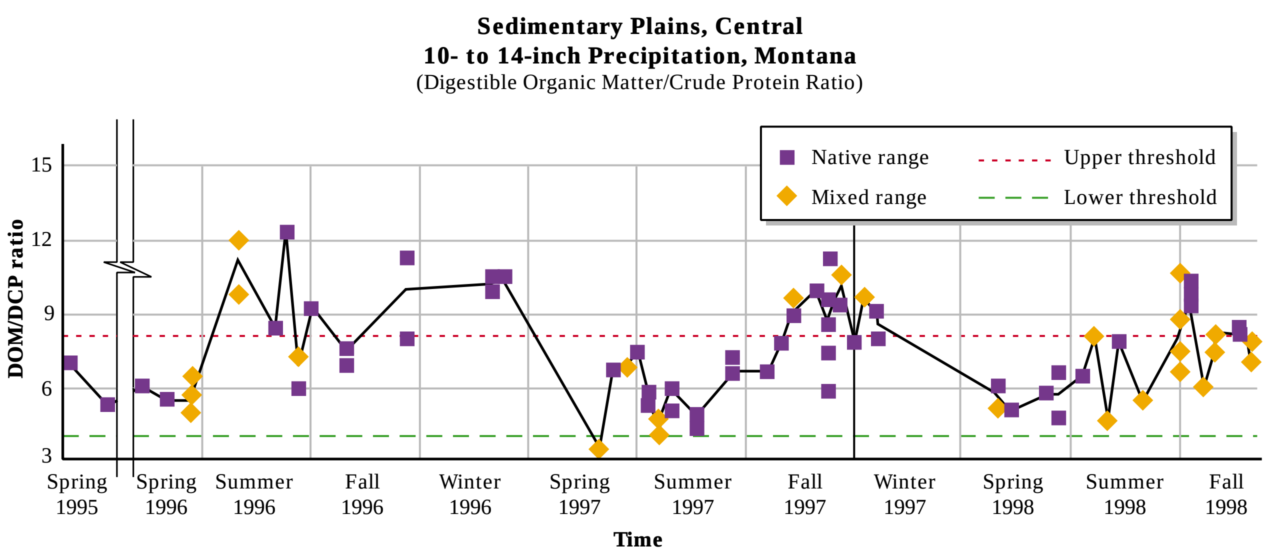
In addition, most of the DOM/CP ratios in the Foothills Region remained within the preferred range of 4 to 8. The Sedimentary Plains, however, repeatedly had ratios rising above 8. This was associated with either dry or heavily grazed conditions.

The fact that the DOM/CP ratio never fell below 4 in either region may help explain that Montana grass is a grass that really puts weight on animals (not excessive amounts of rumen degradable protein) (fig. 11).

Two ranches (one in each region) were sampled extensively. Their nutrient deficiencies tended to follow the patterns found for their regions as a whole.

On one ranch, samples were taken every 2 weeks in cooperation with Montana State University on a “satellite imagery” study. The rancher was using a 5-pasture rest-rotation grazing system. Twenty cow/calf pairs were placed into the rest pasture grazing season May 20 through October 1, 1997. The main herd of 210 followed their normal rotation. At the end of the grazing season, the two sets of weaned calves were weighed separately. The cattle who grazed in the rested pastures weighed about 35 pounds more.

Figure 11 Digestible organic matter/crude protein ratio



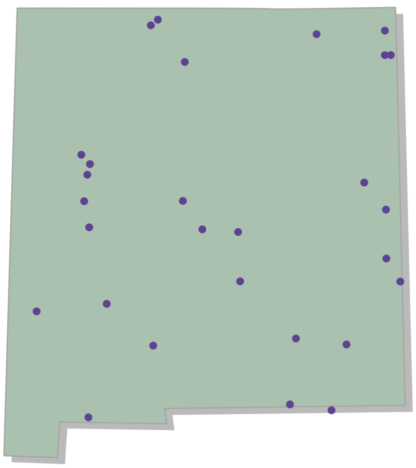
A comparison was attempted of the weaned calves that were steers and from mothers who had demonstrated similar productivity in the past. The differences in weaning weights would have been greater in a normal or below normal precipitation year (1997 was an extremely wet year).

Bi-weekly fecal analyses showed consistently higher protein and energy in the rest pasture (moderately grazed) than in the grazed pasture (heavily grazed). The differences were about 2 percent for both protein and energy. This was consistent with the 35 pounds greater average weaning weight of the rested pasture calves.

Another reason that we felt these differences would have been greater is that for the last 45 days of grazing prior to weaning, the two herds were combined and grazed on a lush, subirrigated bottom. This flushed the main herd calves and probably helped close the weight difference.

New Mexico (Diet Quality Data Collection) June 1, 1997, through September 30, 1999

Figure 12 New Mexico sampling locations



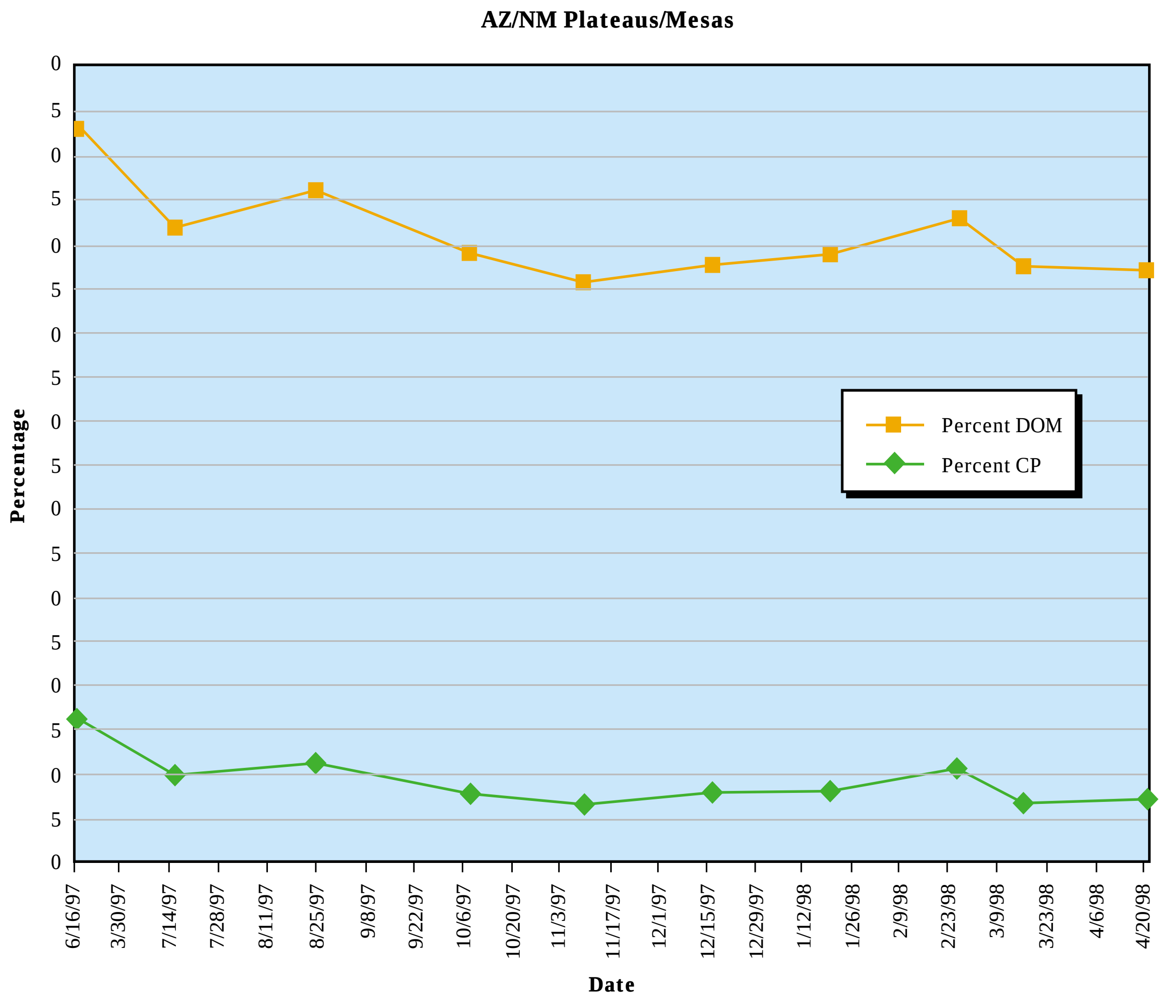
During FY 1998 New Mexico conducted phases I and II of the Diet Quality Data Collection. This involved collecting data on 11 cow/calf operations, 3 yearling operations, and 1 sheep operation. Locations throughout the state were selected to sample a cross section of the Major Land Resource Areas. The study involved monthly nutrition sampling, submitting the samples for analysis, running computer nutritional analysis (NUTBAL), and providing consultation to the client. Figure 12 shows the sampling locations.

Training for resource team NUTBAL contacts is essential. Past experience indicated two training sessions are needed for a person to be able to feel confident enough to provide consultation to a client. New Mexico provided the introductory course to all team contacts during FY 1997. An advanced training session was provided in FY 1998. Training for NRCS contacts participating in the study was set up to provide introductory training first, followed by field experience, then finalized with an advanced training session. This training scheme allowed those being trained to have some field experience before taking the advanced training. In addition, clients participating in the study were invited to take part in the training.

Clients who use NUTBAL software technology provided by NRCS, will be able to better balance livestock nutritional needs with available feed and forage. This in turn will have many positive benefits on grazing land resources in the state. New Mexico's participation in the national Diet Quality Data Collection Study will also help evaluate the difference between poor livestock management and good management in relation to nutrition and its effects on animal needs.

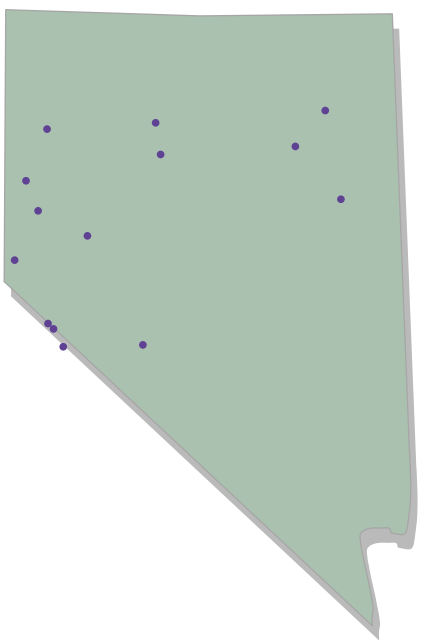
Figure 13 depicts DCP and DOM data collected in New Mexico. Data such as these help clients to balance the nutritional needs and reproductive stages of their livestock. This in turn optimizes production and increases economic return for the client.

Figure 13 DCP and DOM collection in New Mexico



Forage Quality/Livestock Nutrition Monitoring in Nevada

Figure 14 Nevada sampling locations



To date, the main objective of involvement in this study has been to develop forage quality profiles for the major vegetative types that occur in Nevada. Ranchers who manage livestock that graze these common vegetative types have been solicited to collect fecal samples from their grazing animals. Fecal samples are mailed by the cooperating ranchers to the Grazingland Animal Nutrition Laboratory (GANLAB) at Texas A&M University to be analyzed for dietary crude protein and digestible organic matter. The Nevada smapling locations are shown in figure 14.

Major vegetative types evaluated include winter-fed forage crops (grass hay and grass+alfalfa hay), meadow hay aftermath, crested wheatgrass pastures, mountain browse communities, and native meadows. Forage quality information for each of these vegetative types is presented in table 7. The forage quality values presented represent monthly averages for all samples collected within a vegetative type.

As forage quality information is returned from the GANLAB for each sample, it is linked with the NUTBAL model. The NUTBAL software allows users to enter the kind, class, and breed of animals to be monitored, characterize body condition and environmental conditions, and establish weight performance goals, in addition to entering diet quality information. The NUTBAL program then is used to produce a report for the amount of dietary crude protein and net energy provided by the forage consumed and relates this forage quality to the targeted animal's nutritional needs.

Nevada NRCS personnel assisted client ranchers in the collection of baseline forage resource and herd information. The data were entered in the NUTBAL model. Dietary information was also entered for each target group of animals as GANLAB analyses were received. Using the NUTBAL software, each client rancher was provided with interpretations to predict animal performance.

Once information on forage quality for the various vegetative types sampled was obtained, we then wanted to determine how well these forage types might satisfy the nutritional needs of ruminant animals grazing them.

In addition to generating diet quality/animal performance reports for client ranchers, the NUTBAL program was used to estimate the nutritional needs for a representative beef cow over the course of a year. The representative beef cow selected for this evaluation is a mature (5 to 10 year old) Hereford cow with a frame score of 4 and weighing 1,100 pounds with a body condition score of 5.

The first step in this process was to account for the different physiological stages of this representative beef cow and the changing nutritional requirements at these periods. A cow's production cycle can be divided into four stages:

- calving to breeding (70 to 80 days)
- breeding to weaning (±120 days)
- mid-gestation (±100 days)
- late gestation (60 to 70 days)

Table 8 describes these stages in a cow's production cycle

Table 7 Results of forage quality study May 1997 through October 1998

Month	Grass hay		Alfalfa/ grass hay		meadow hay aftermath		crested wheatgrass		mountain browse		native meadow	
	DCP (%)	DOM (%)	DCP (%)	DOM (%)	DCP (%)	DOM (%)	DCP (%)	DOM (%)	DCP (%)	DOM (%)	DCP (%)	DOM (%)
February	9	59										
March	10	59	11	63								
April			11	61					14	65		
May				13	62		17	67				
June			16	67		7	57	13	63	16	67	
July	12	63	12	66		7	59	12	61	15	65	
August						10	59	12				
September			11	61			11	60	12			
October	9	59	5	56	9	58	11					
November	6	57	6	59								
December	6	57	6	58								
January	8	58			6	59						

Dietary crude protein (%DCP) and digestibility (%DOM) of forage types and roughages fed

Table 8 Stages in a cow's production cycle[1]

Calving to breeding: Most critical period in terms of a cow's nutritional requirements.

- From calving until the cow's uterus is in condition for a new pregnancy is about 40 days.
- Weight loss during this period results in lower first-service conception rates than cows that gain some weight.
- Given a 282+ day gestation period, if a cow is to calve every 365 days, she must be bred within 83 days of calving.
- Weight loss at this stage decreases milk production and weaning weight of the calf

Breeding to weaning: Milk production declines during this period as the calf matures.

- Consequence of poor nutrition during this period is lowered weaning weights.
- Nutritional plane of cow rarely affects developing fetus at this stage.

Mid-gestation: Cow requires only sufficient feed quality to maintain her weight.

- Cows entering this stage in good condition can lose 10 to 15 percent of their body weight to just after calving and still reproduce satisfactorily if they get ample feed in the spring to initiate estrus early in the breeding season.

Late gestation: At this stage, the fetus gains at a rate of about 1 pound per day, fetus will make 70 percent of its growth in the last trimester.

- Cows losing weight during this period take longer to start cycling after calving and may have lowered conception rates.
- Because the unborn calf is largely protein, the need for protein increases as calving time approaches.
- Cow requires 15 to 20 percent more protein at this stage than during mid-gestation.

Rasby, R., and I. Rush. 1996. Feeding the beef cow herd—Part I; factors affecting the cow nutrition program. NebGuide G80-489-A, Cooperative Extension, University of Nebraska-Lincoln.

Table 9 lists the nutrient needs for different periods in the "representative" beef cow's annual production cycle given a spring calving cycle. Figures 15 and 16 relate how forage quality information collected for the various vegetative types sampled can meet these dietary needs. As can be seen in these tables, the nutrient quality of the more prevalent vegetative types (in northern Nevada) is sufficient to meet the dietary needs of cattle if grazed at the appropriate time.

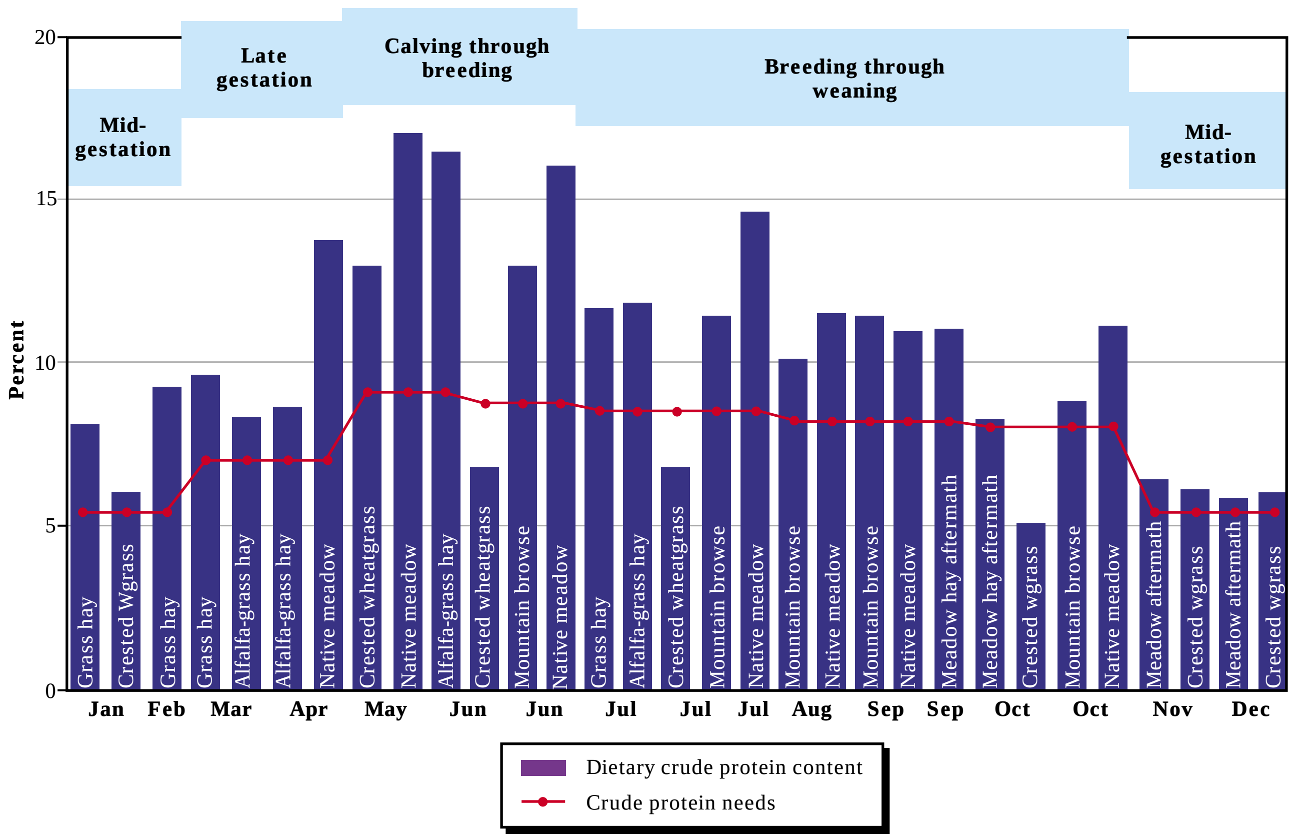
Table 9 Nutrient requirements

Mature Hereford cow frame score 4.0
1,100 pounds live weight at BCS 5
Nutrient needs to meet performance goals listed
Approximate nutrient needs, Crude Protein (CP) and Energy (DOM),
at different stages of cow's production cycle.
Feed intake is not considered to be restricted.

Nov. Dec. Jan. Feb.	Mar. Apr.	May June July	Aug. Sept. Oct.
Mid-gestation with calf weaned	**Late gestation**	**Calving to breeding**	**Breeding to weaning**
Dry cow; 1,100 lb live-weight CP 5.50%, DOM 52.50% Maintain mother cow at BCS 5 No weight gain 0 °F high temperature	8th month Increase BCS from 5.0 to 5.3 ADG=1 lb; 7.00% CP 59.50% DOM 15 °F high temperature	Lactating cow w/10-day-old calf; to 5.8; ADG=0.8 lb/d CP 9.00% DOM 60.00%	Lactating cow w/ 90-day-old calf; BCS to 6.9; ADG=0.5 lb/d CP 8.50% DOM 59.00%
	9th month Increase BCS from 5.3 to BCS 5.7 ADG=1 lb; 7.50% CP 60.00% DOM 25° F high temperature	Lactating cow w/40-day-old calf; to 6.3; ADG=0.5 lb/d CP 9.00% DOM 60.00%	Lactating cow w/ 120 day-old calf; BCS to 6.9; ADG=0.5 lb/d CP 8.25% DOM 68.25%
		Lactating cow w/70-day-old calf; BCS to 6.6; ADG=1.0 lb/d CP 8.76% DOM 59.00%	Lactating cow w/180-day-old calf; BCS to 7.2; ADG=0.5 lb/d CP 8.26% DOM 57.50%
			Lactating cow w/205-day-old calf; BCS 7.2; ADG=0.5 lb/d CP 8.00% DOM 54.50%

This information is valuable in the sense that not only do we have a measure of the potential forage quality of major vegetative types in Nevada, we also have a measure of how well these vegetative types can satisfy the nutritional needs of livestock that utilize them. Additionally, this information offers a locally relevant, livestock performance basis (economic basis) for recommending grazing management and associated improvement practices to Nevada livestock producers. The forage quality/livestock nutrition data reinforce the need for grazing management decisions based on knowledge of both the forage resource and the changing nutritional demands of grazing animals.

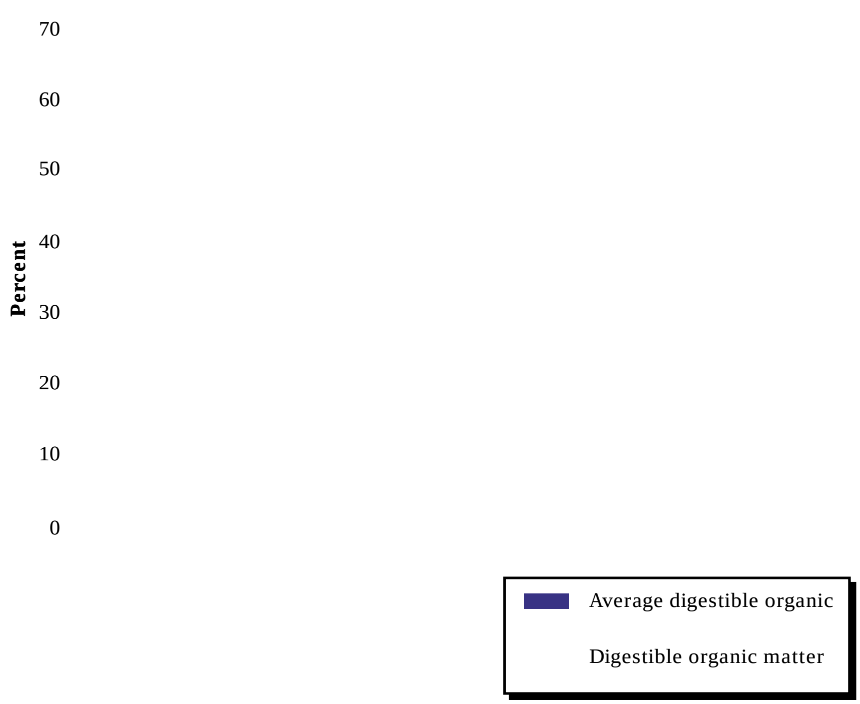
Figure 15 Percent dietary crude protein



For a variety of reasons, many ranching operations in the West are faced with reductions of livestock grazing on public lands. With a reduction in public land grazing, increased grazing pressure will be brought to privately owned grazing lands. It is important that data on the productivity and quality of these privately owned lands is available to provide livestock producers management alternatives that will ensure the sustainability of their grazing land resources.

Improved native meadows represent one of the more important forage resources throughout the West. More than 2 million acres of privately owned lands are classified as native meadows in the Western United States. Improved native meadows can be generally characterized as a diverse mix of introduced cool-season pasture plants, such as timothy, orchardgrass, and clovers, in association with native perennial grasses, grass-like plants, and forbs.

Figure 16 Percent digestible organic matter



In the spring of 1998, forage quality evaluations were initiated on registered Gelvieh cattle that are maintained year-around on improved native meadow pastures irrigated by water from the West Fork of the Walker River. See figure 17 for plant species composition typical for these pastures.

Fecal samples were collected from cattle grazing pastures during the 1998 growing season. Average forage quality values (percent crude protein and percent digestible organic matter) collected for all pastures are presented in table 10.

Using the NUTBAL program, forage quality of the meadow pastures was related to the nutritional demands of the Gelvieh cattle grazing these pastures. Table 10 displays the net energy and crude protein intake needs of Gelvieh cows to gain weight at a rate of least one-half pound per day during the pasture grazing season.

Figure 17 Native meadow pasture species composition

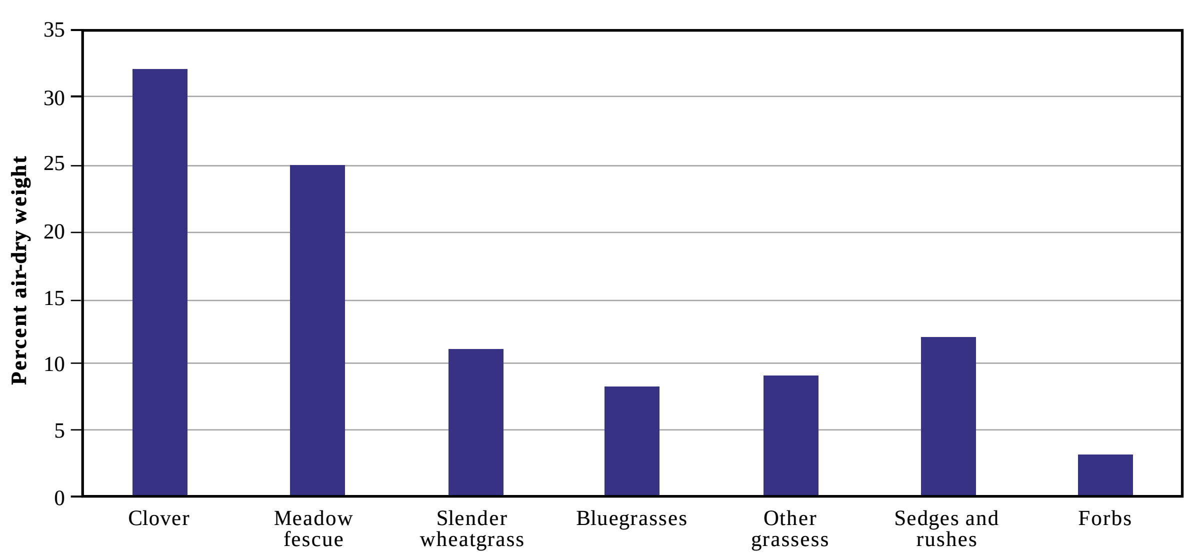


Table 10 shows that throughout the growing season improved native meadows offer high quality forage that can satisfy the changing nutritional demands of cattle. Although forage quality of improved native meadows is typically high, forage productivity of the cool-season plants that comprise these plant communities is restricted early in the growing season and again during the hot temperatures of mid- to late summer.

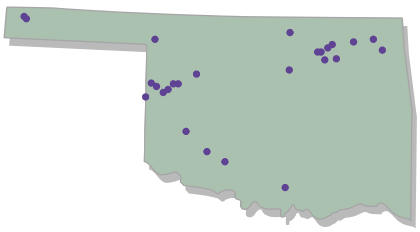
Two distinct meadow plant communities were recognized during the course of the Nevada forage quality/livestock nutrition study of improved native meadows. These plant communities are intermingled in meadow landscapes and occur in varying amounts within any given pasture. The first plant community type is comprised primarily of cool-season perennial grasses, clovers, and native forbs with about 10 percent rushes and/or sedges. The second community is dominated by sedges and rushes with about 10 percent grass species, such as tufted hairgrass (*Deschampsia caespitosa)* and bentgrasses (*Agrostis* spp.).

Table 10 Nutrient needs versus intake spring calving Gelvieh cows (gain at one-half pound per day through growing season)

Production period	Date	Calf age	Crude protein req. lb/d	Crude protein in diet lb/d	Net energy maint. needs Mcal/d	Net energy maint. in diet Mcal/d	Net energy gain needs Mcal/d	Net energy gain in diet Mcal/d
Calving to breeding	April 5	37 days	3.06	4.36	23.71	26.47	1.18	1.67
	May 10	71 days	2.96	5.48	21.75	25.16	1.11	2.15
	June 10	101 days	2.93	5.70	20.87	25.99	1.53	3.28
Breeding to weaning	July 7	128 days	2.76	5.70	20.86	25.99	0.90	3.28
	August 8	166 days	2.63	4.44	19.68	22.96	0.91	2.07
	Sept 8	195 days	2.55	3.54	18.89	20.70	0.93	1.22
Mid-gestation	Oct. 14	NA	1.61	3.03	12.45	16.93	0.96	2.69

Oklahoma's Diet Quality and Animal Nutrition Project

Figure 18 Oklahoma sampling locations



Understanding diet quality and the impacts on animal nutrition and performance is an impor-tant part of grazing management in Oklahoma. Livestock producers rely on a high quality diet of forages to provide needed nutrients (primarily crude protein and energy) for livestock to meet performance and economic goals. When the diet does not provide the nutrients to meet the needs of the livestock, the producer must then provide supplemental nutrients in the form of roughages and concentrates. Being able to identify if the animals diet is sufficient to meet demands and when and/or if supplemental nutrients are needed is the key to meeting livestock performance and economic goals.

Fecal sampling is a tool that can be used by producers to monitor livestock diet and determine if it is sufficient to meet the animal's needs. Fecal samples are collected from the animals and analyzed at the Grazing Animal Nutrition Lab (GANLab) at Texas A&M University using Near Infrared Reflectance Spectroscopy (NIRS). The analysis provides data concerning dietary crude protein (DCP) and energy, Digestible Organic Matter (DOM). This information is then used with the Nutritional Balance Analyzer (NUTBAL) decision support system to help producers better understand diet quality and meet the needs of their livestock through improved grazing and herd management and supplemental feeding strategies. Figure 18 shows the Oklahoma sampling locations.

Oklahoma Ruminant Livestock Efficiency Project

To introduce livestock producers to this technology, as part of a national project, the NRCS in Oklahoma has been assisting producers in collecting fecal samples and making decisions concerning animal nutrition. Our goal in Oklahoma with this project is to help producers better understand diet quality and animal nutrition and implement management practices to improve forage quality and quantity, meet animal performance goals, and conserve our grazing land resources.

As part of this project, 160 samples were collected across Oklahoma through October 1999. The samples were collected at different locations across the state based on Major Land Resource Area (MLRA), forage and livestock types, and producer demand. Sampling includes:

- Cattle grazing on native rangeland and tame pastures to compare similar range sites across various MLRA's and compare tame pastures with native. Data will show how management, fertility, and burning affects quality and performance.
- Cattle grazing CRP fields to provide information on diet quality of released fields ready for grazing.
- Goats grazing native range.
- Bison and cattle grazing on same site to compare the diet selection and quality.

The data will provide a data base that can be used as a planning tool to compare forage types and quality throughout the year and to compare and plan management strategies that help producers meet animal performance goals.

One example of how the data are currently used is in the northeastern part of Oklahoma. Sampling in this area is being done with cattle in the Cross Timbers (84A) and Cherokee Prairies (112) MLRA's grazing on native range and bermudagrass / fescue pastures. Figures 19, 20, and 21 shows analyzed data.

Figure 19 Dietary Crude protein comparisons of cattle grazing on native range vs. bermudagrass/fescue pastures

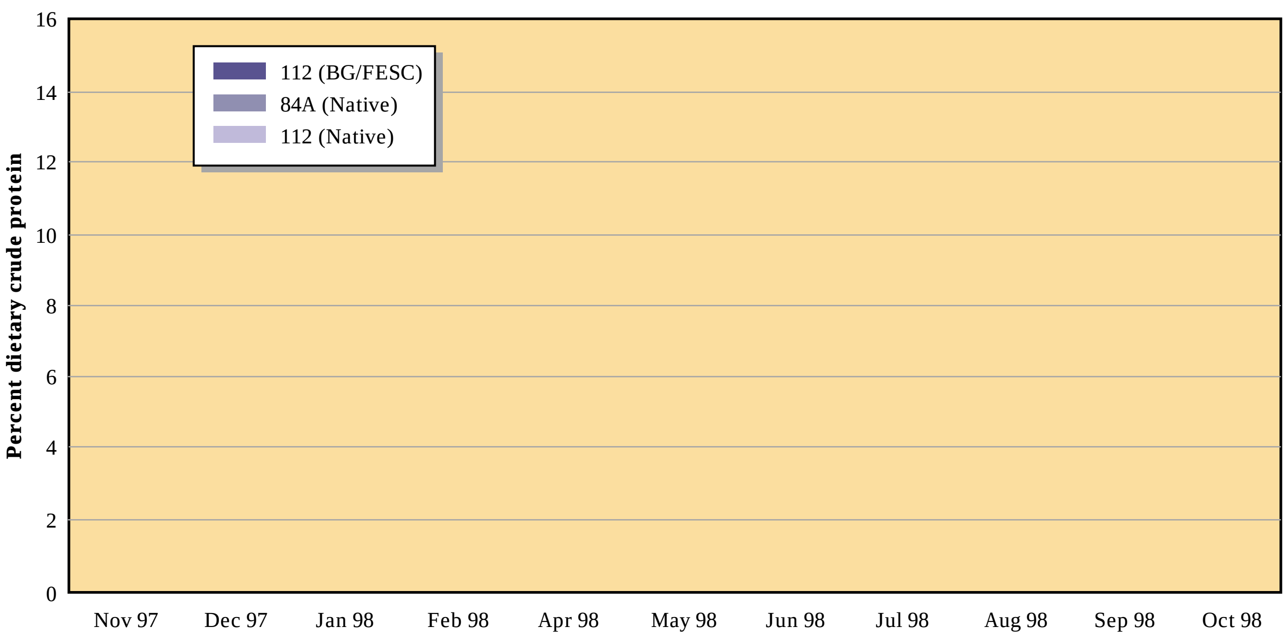


Figure 20 Digestible organic matter comparisons of cattle grazing on native range vs. bermudagrass/fescue pastures

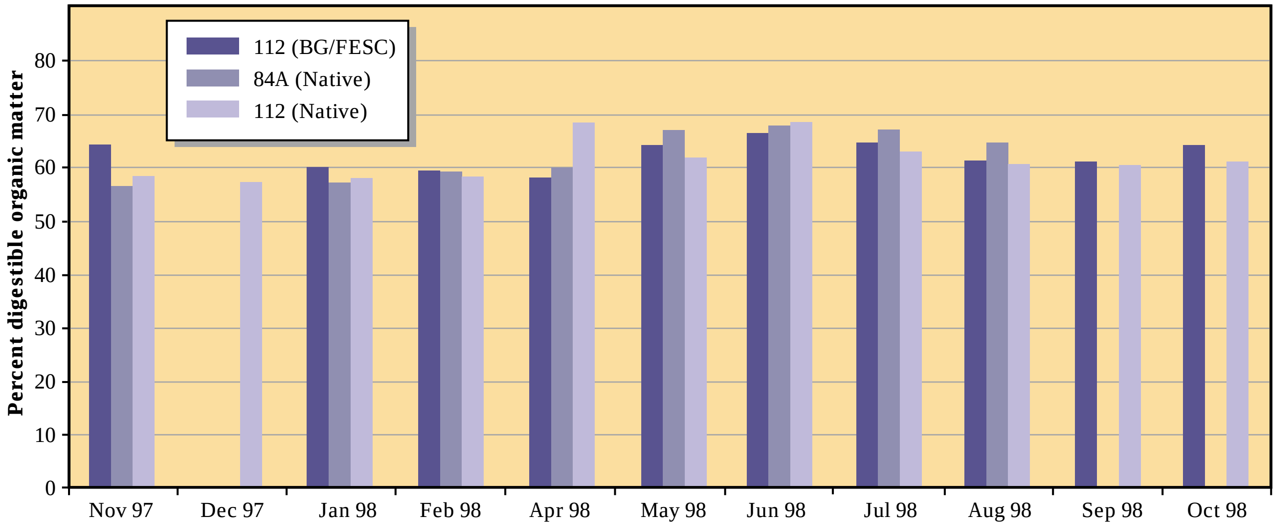
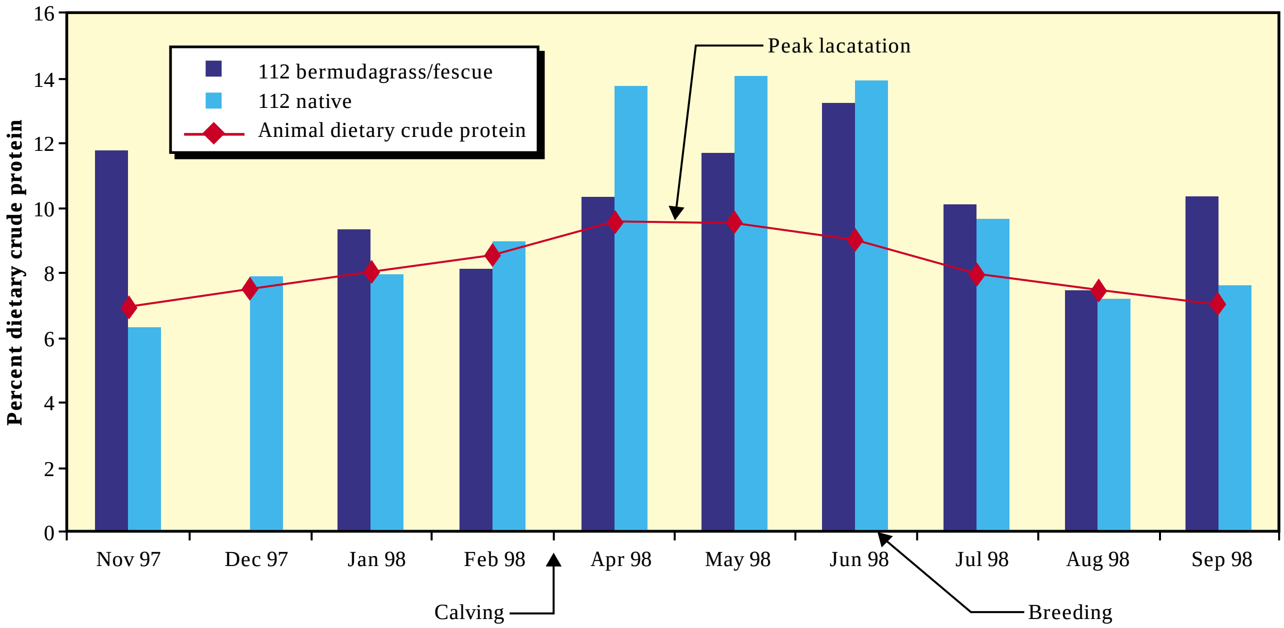


Figure 21 Meeting CP demands of cattle grazing native range vs. bermudagrass/fescue pastures



Comparing loamy prairie range sites in MLRA's 84A and 112

Samples on the native range were collected from cattle grazing on predominately loamy prairie range sites in both MLRA's in order to compare range sites across multiple MLRA's.

Dietary crude protein (DCP) and DOM values consistently changed (increase/decrease) on both sites for the sampling period. The actual values for DCP and DOM were different though and varied throughout the period. These differences were due to several factors:

- **Plant composition**—Both sites contained cool-season annuals, but the amounts and types on each site were different. The 84A site was primarily annual bromes, whereas on the 112 site, cool-season species included annual bromes, some native rye, and also scattered invading fescue. Scattered sericea lespedeza was beneficial in the 112 site after the burn which increased consumption. The increase in CP from the lespedeza only lasted for about 45 days at which time the consumption of lespedeza dropped significantly, probably due to increase in tannin content and maturity of the plant.
- **Weather**—Temperatures through the winter months were above normal resulting in increased cool-season species growth. Less than normal precipitation resulted in lower quality in June, July, and August in 112. Values in 84A declined, but not as much as in 112 because of more precipitation. Quality was lower in August and September of 1998 than in 1997 because of lower than normal precipitation in both MLRA's.
- **Management**—In March, the site in MLRA 112 was burned, and from that point until May, values on the 112 site were higher than the 84A site. This not only provided the expected response from warm-season grasses, but also increased availability of cool-season species and the release of young sericea lespedeza plants.

Comparing native range to tame pastures

Tame pastures play an important role in northeast Oklahoma. They provide a complementary forage to native range, and with the cool-season component, provide the ability to feed cattle longer throughout the year and cut feeding costs. To show these benefits as well as a comparison to native range, samples were collected from cattle grazing on bermudagrass and fescue pastures within the MLRA 112.

The first five samples were collected from fescue that had been fertilized with 80 pounds actual nitrogen the first of September and stockpiled through November 10, when grazing began. This practice is being promoted to extend the grazing season and cut winter feeding costs. The remaining samples were from a bermudagrass and fescue mixed pasture.

The data show the benefits of stockpiled fescue in bermudagrass for November through February, at which time the fescue quality begins to decline. As growth begins again in late February and March, quality begins to increase once again. The native range begins to catch up to the bermuda/fescue in February and exceeds it by April. Once again, both range samples contained cool-season species at this time and the site in 112 was burned. By mid-April the cattle were beginning to consume young bermudagrass and diet quality was increasing, but did not exceed that of native until the end of June when 112 locations were experiencing below normal precipitation. The samples indicate that through this time, diet quality from the bermudagrass/fescue pastures was not affected as much as the native range diet quality. Once again the 84A site had received rainfall and diet quality was higher than both the 112 locations. The September samples show diet quality improving due to rainfall, and the bermuda/fescue quality increasing above the native due to the actively growing fescue component. In normal years, diet quality on native range in September usually peaks again because of some fall rains and desirable temperatures, but because of the below normal rainfall during the late summer, this peak did not occur until late September and early October.

Meeting animal nutritional needs

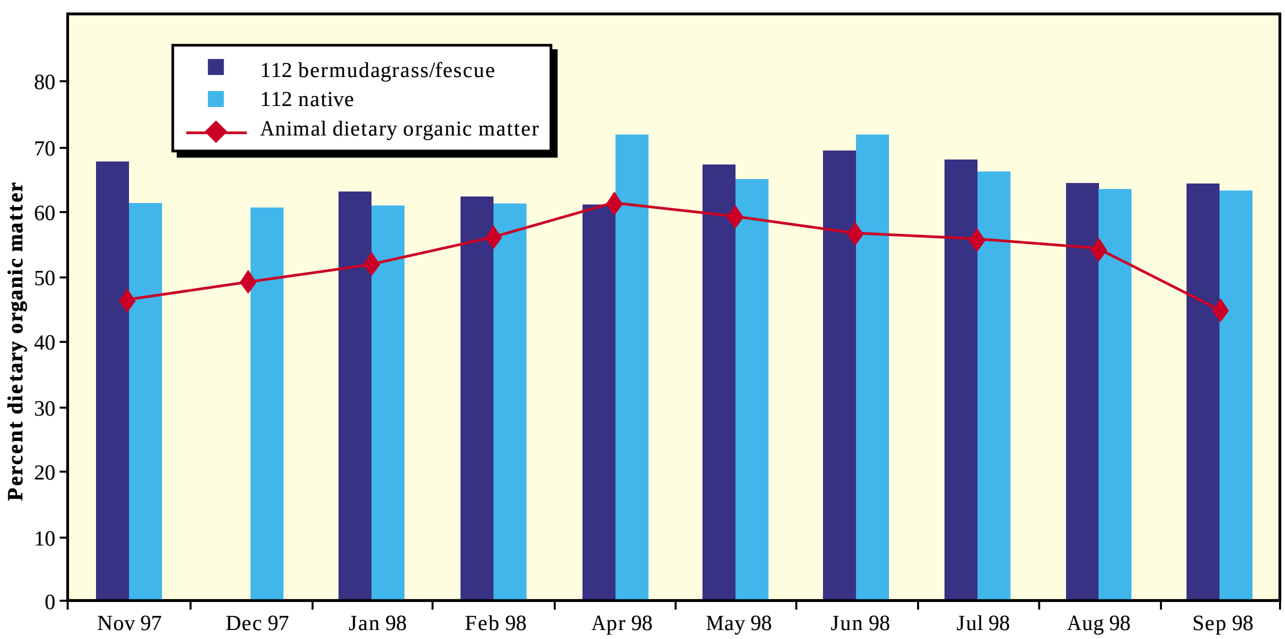
These results show the benefits of diversity in plant composition (cool-season species, lespedeza), the impacts of management (prescribed burning, stockpiling) on diet quality, and the effects of weather on forage quality. But the most important benefit is how these factors and their effects on forage quality impact animal nutrition and meeting performance goals.

To show this, the bermudagrass/fescue pastures were compared to the native range in MLRA 112. The comparison is based on a cow/calf operation, and samples were collected from two herds and the same producer, all in MLRA 112 (fig. 22).

Nutrient needs for cows vary throughout the year, and nutrients from forage often do not meet animal needs (table 13). During the last couple of months of pregnancy through peak lactation at about 45 to 60 days, a cow's nutrient needs are the highest. Cow/calf operations need to be able to plan calving seasons to meet these higher needs at the optimum time from available forages. If a herd's peak needs are within a certain period, management for meeting animal needs can be more efficient. Whereas having a herd with peak needs over a 6- or 7-month period is more difficult to manage for and can be costly. For example, if a herd is calving over a 6-month period and peak needs for lactation occur at 45 to 50 days, diet quality needs to meet animal requirements for over 7 months. The animal needs can be compared to the sampling data to determine when and if these needs can be met. Based on the samples collected, the native range would meet peak lactation needs for 4 months while the tame pasture will meet them for 6 months.

Based on sampling data for these two forage types in table 11, the producer in 112 would benefit most from a calving season beginning in late February (figs. 21 and 22). This would provide sufficient nutrients during critical times, such as peak lactation, and to improve BCS before breeding. The data also show that forage types have the potential to provide sufficient nutrients to meet animal needs with little or no supplemental feeding (excluding hay if availability to standing forage is limited because of snow cover or ice). This will vary from place to place as the quantity of cool-season species and management practices vary. For operations that have a wider window for calving, the bermuda/fescue pastures have more opportunity of meeting livestock demands.

Figure 22 Meeting DOM demands of cattle grazing native range vs. bermudagrass/fescue



Summary

This project provided NRCS the opportunity to get in the field, working one-on-one with livestock producers. Eight Oklahoma producers received assistance through this project and availability of this technology has spread to many other producers. Producers have a better understanding of diet quality and what the nutrient requirements are for their animals. They understand how diet quality changes by maturity, plant composition, management, and weather. They also understand the importance of monitoring diet quality and animal condition to meet performance goals and plan supplemental feeding programs, which also impact the economic goals for the operation. Producers have implemented changes in grazing management, feeding programs, and herd management.

The understanding of diet quality and animal nutrition and the availability of this technology will provide NRCS another tool to assist livestock producers to implement grazing land management strategies that have both economic and environmental benefits.

Table 11 Typical animal requirements for 1,100-pound mature cow, 15 to 20-pound peak milk yield (1996 NRC)

Animal	Months since calving											
requirements	1	2	3	4	5	6	7	8	9	10	11	12
DCP	9	9.5	9.5	9	8	7.5	7	7	7	7.5	8	.5
DOM	57	58	56	54	52	51	43	44	45	47	50	53
Calving			Breeding				Mid gestation					
	Peak lactation											

NUTBAL Summary 1998 Sample Season Pennsylvania

Figure 23 Sampling locations of Pennsylvania

Seven farms were sampled in south central Pennsylvania. Figure 23 shows the sampling locations of Pennsylvania. Two farms were chosen to share some things that were observed.

The first farm is a Holstein dairy heifer project. The grazing project consists of 55 acres of class II and III land. An extensive watering system was installed in the fall of 1997. This watering system collects a spring in the mountain upslope of the pasture area and, by gravity empties it into a reservoir. Then a solar submersible pump carries the water to a large holding tank on top of an adjoining hill. From there the water gravity flows to 80 percent of the grazing system is buried 18 inches deep. This was done to try to keep cost down because of the depth of topsoil. The heifers graze the fields in 1. 5- to 2.5-acre paddocks. The pastures are subdivided by 1 or 2 strands of Hi-Tensile® electric fence.

Hay has been made available to the livestock free choice since early May. This was done after the April sample was taken and the DOM/CP ratio was close to 4. The heifers seemed to be not doing as well as expected, plus the manure was extremely loose. After the hay was added to the diet, the heifers gained better and their appetites seemed to increase. The heifers were getting a high-level protein supplement when the project began, but after 2 months of sampling, the protein supplement was withdrawn. The performance of the heifers continued the same. Table 12 shows the NUTBAL report for this project.

The second farm was purchased by the a trust and setup as a vital demonstration project. The operator incurred all expenses just as a normal farm would. This farm is a seasonal dairy operation. The cows calved within a 30- to 45-day timeframe. They choose to calf in early March to mid-April. This is done to maximize the productivity of the grass production and the peak production of the cows. Grass production will peak on this farm around the middle to end of June, and the cows lactation will peak in around 45 to 60 days.

This farm consists of 200 acres of pasture and hayland. The milking herd consists of 82 Holstein Jersey and Jersey X Holstein cows. The farm has many monitoring devices that are all situated so as not to interfere with the day-to-day operations of the farm. Grass is the main forage on the farm. Legumes are not overabundant. In previous years hay was the only crop harvested on the farm, and no pastures were grazed. Various species of grasses are available on the farm. They vary from Kentucky bluegrass to tall fescue. The legumes consist of white clover and birdsfoot trefoil.

The watering system on the farm is similar to that of the heifer project. The main difference is that most of the waterlines lay on top of the ground. The farm has some permanent subdivision fences, but this leaves some large paddocks. To make them more efficient and manageable, the operator uses poly wire and temporary fenceposts.

The results of milk production are not exact. Differences occur when you compare the projected milk yields. These differences can be caused by a couple of things. At the end of May, cows are wormed and vaccinated to prepare the cows for the breeding season. This was coupled with extremely high temperatures and is accounted for in NUTBAL program. At the end of June, the operator said the predicted milk was still off 5 pounds. Probably because the cows still had not bounced back from the vaccinating and the extreme heat. From then on, the milk production is pretty close to the predicted yield.

Some of the variations in yield could be caused by the mix of types of cows sampled and in the herd. Also, there was more production off this farm, and the cows were not dried off until January 23, 1999. The figures in this report (table 13) are good baseline figures to use for any farm operation if they add their own miscellaneous expenses. Table 14 shows the 1998 financial project for the Cove Mountain farm.

Table 12 NUTBAL report for Holstein Heifer Project

Month	%DCP	%DOM	%TDN	Projected lb. gain	DOM/CP	
4/27/98	17.2	64.64	67.9	9.96	4.18	
5/25/98	16.7	69.73	73.2	10.83	4.16	
7/02/98	13.2	63.08	66.2	1.3	5.02	
8/24/98	13.0	64.97	68.6	1.4	4.85	
10/09/98	16.6	63.9	67.1	2.3	4.15	orchardgrass hay
10/09/98	16.6	63.9	67.1	1.3	4.34	haylage

Feeds fed

Date	Haylage	Corn silage	Protein supplement	Hay	Grain supplement
	- - - pounds per day - - -				
04/27/98	0	14	2	5	0
05/25/98	0	0	2	7	0
07/02/98	0	0	0	7	0
08/24/98	9	0	2	10	12
10/09/98	16	0	0	16	2.5

Table 13 NUTBAL report and other data for seasonal dairy

Month	%DCP	%DOM	% TDN	Projected lb milk	Actual lb milk	DOM/CP
4/17/98	18.3	69.51	75.2	75.0	68.0	4.06
5/18/98	20.3	66.09	72.8	72.8	63.0	3.49
6/29/98	17.5	61.08	69.5	60.7	55.0	3.80
8/03/98	18.3	64.33	71.3	52.2	50.0	3.75
8/31/98	14.3	65.8	74.7	44.1	45.0	4.76
10/07/98	17.8	63.5	69.6	36.8	36.0	4.17

Feeds fed

Date	Silage	Corn	Soybean meal	Hay
	- - - pounds per day - - -			
04/17/98	15 corn	14	2.5	0
05/18/98	0	14	2.5	0
06/29/98	0	14	2.5	0
08/03/98	0	14	2.5	0
08/31/98	0	14	2.5	0
10/07/98	14 haylage [1/]	14	2.5	8.5

Table 13 NUTBAL report and other data for seasonal dairy—continued

Average market value of feedstuff

Corn	$0.05/lb x 14.0 lb/d	= $0.70
Soybean meal	$0. 10/lb x 2.5 lb/d	= $0.25
Corn silage	$0.012/lb x 15.0 lb/d	= $0.18
Haylage	$0.03 /lb x 14.0 lb/d	= $0.42
Hay	$0.04/lb x 9.5 lb/d	= $0.34

Costs and profit per cow per day

	Costs/d	Milk produced	Milk price/cwt		Profit/cow/day
April	$1.47	68 lb/milk/day	$15.58/cwt sold	=	$10.60–1.47 = 9.13
May	$0.95	63 lb milk/day	15.58/cwt sold	=	$9.82–.95 = 8.87
June	$0.95	55 lb milk/day	15.58/cwt sold	=	$8.57–.95 = 7.62
August	$0.95	45 lb milk/day	15.58/cwt sold	=	$ 7.01–.95 = 6.06
September	$1.71	36 lb milk/day	15.58/cwt sold	=	$5.61–1.71 = 3.90

Average cost/day/cow/herd/month

April	$1.47	x	82 cows	x	30 days	=	$3,616.20 expense
May	$0.95	x	82 cows	x	31 days	=	$2,414,90 expense
June	$0.95	x	82 cows	x	30 days	=	$2,337.00 expense
July	$0.95	x	82 cows	x	30 days	=	$2,414.90 expense
August	$0.95	x	92 cows	x	31 days	=	$2,414-90 expense
September	$1.71	x	82 cows	x	30 days	=	$4,206.60 expense

Income/cow/day/month/herd

April	$10.60/cow	x	30 days	x	82 cows	=	$26,076.00
May	$9.82/cow	x	31 days	x	82 cows	=	$24,962.44
June	$8.57/cow	x	30 days	x	82 cows	=	$21,082.20
July	$7.79/cow	x	31 days	x	82 cows	=	$19,802.18
August	$7.01/cow	x	31 days	x	82 cows	=	$17,819.42
September	$5.61/cow	x	30 days	x	82 cows	=	$13,800.60

Table 13 NUTBAL report and other data for seasonal dairy—continued

Net profit/month above feed costs only [2/]

	Avg. milk revenue		Avg. feed expense		Net profit from milk.
April	$26,076.00	—	$3,616.20	=	$22,459.80
May	$24,962.44	—	$2,414.90	=	$22,547.54
June	$21,802.20	—	$2,337.00	=	$19,465.20
July	$19,802.18	—	$2,414 .90	=	$17,387.28
August	$17,819.42	—	$2,414.90	=	$15,404.52
September	$13,800.60	—	$4,206.60	=	$9,594.00

Total net profit

Total milk production revenue		Total feed expense for 82 cows		Net profit
$121,205.84	—	$17,404.50	=	$103,801.34

1 Both hay and haylage
2 Net profit for 82-cow herd considering feed cost

Table 14 1998 financial projections for Cove Mountain farm

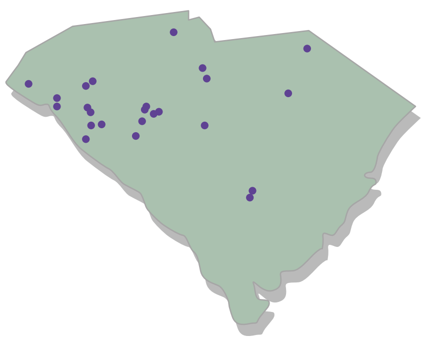
Farm statistics	
Farm workers (total FTE)	1.3
Total milkers and dry cows (avg.)	82
Total number of head	100
Cows culled	18
Avg. lactation length (days)	275
Lb. Milk/cow/lactation	11,059
Weighted avg. milk price	$15.09
Total Crop/pasture acres	200
Crop/pasture acres owned	0
Crop/pasture acres rented	200

Cash income	**Per cow**	**Total**
Total lb. milk sold	11,059	906,802
Total value milk sold	$1,668	$136,795
Cull cow and calf sales	$55	$4,500
Crop sales	$0	$0
Other farm income	$0	$0
Total cash income	$1,723	$141,295
Cash expense		
Marketing and hauling	$146	$11,972
Purchased feed: forage	122	10,004
Purchased feed: grain ($)	324	26,568
Vet/medicine/hoof trimming	25	2,050
Breeding	6	492
Labor (paid)	12	984
Custom machine hire	12	984
Fertilizer/lime/chemical	37	3,034
Seed	12	984
Repairs and maintenance	25	2,050
Fuel	37	3,034
Bedding	4	328
Supplies	68	5,576
Utilities	49	4,018
Rent	220	18,000
Taxes (property)	0	0
Insurance	10	820
Interest	20	1,610
Total cash expenses	$1,128	$92,508
Net cash farm income	**$595**	**$48,787**

Summary — 1998 Projections	
Total milkers	82
Pounds of milk sold/cow/year	11,059
Average milk price	$15.09
Total cash income/cwt. sold	$15.58
Total cash expenses/cwt. sold	$10.20
Net cash margin/cwt. sold	$5.38
Net cash income	$48,787
Net cash income per cow	$595
Net cash income per worker	$37,528
Purchased feed costs per cwt. Milk	$4.03
Pounds of milk sold per worker	697,540

Diet Quality of Deer in South Carolina

Figure 24 Sampling locations of South Carolina



By the late 1800's white-tailed deer had disappeared from the Piedmont region of South Carolina because of changes in habitat and over hunting. After the Depression, many small farms were purchased by the Government and placed in national forests.Other significant changes that took place on land was the conversion of row crops to pasture or woodland. Starting in 1950, the South Carolina Wildlife Resources Department (DNR) began restocking deer from the Coastal Plains into suitable habitat in the Piedmont. Seventy-two deer were stocked in the area now known as the Western Piedmont Hunt Unit. Limited hunting began in 1957 with a total harvest of one deer. The hunt unit reached its largest geographical area in 1978, and since 1992, about 20,000 deer have been harvested.

Since the mid-80's, DNR has recognized that deer in certain areas of the hunt unit are in better condition than those in other areas. Generally, deer in the original stocking area have a lower body weight and smaller antlers than those from areas where the deer population is still expanding. Assumptions were made that this resulted from the number of deer exceeding the carrying capacity of the habitat. Various management techniques were used and combined with the addition of either-sex days or earlier opening dates to reduce deer numbers in the overpopulated areas. These techniques have slowed but not corrected the situation. The Hunt Unit is divided into nine wildlife management areas (WMA) that include private and public lands. In 1997, DNR regional wildlife biologists were told about NIRS technology to determine diet quality. They decided to initiate a pilot study using deer fecal samples from deer killed by hunters. The sampling locations of South Carolina are shown in figure 24.

Techniques

Mandatory checking of deer was not required in 1997, so the only practical way to collect fecal samples was from deer that were brought to commercial deer processing businesses. Four sites were selected for collecting points. DNR personnel were trained to take the sample during the dressing process by bisecting the lower 18 inches of the large intestine and manually extracting the compacted fecal material into a plastic bag.

Collections

Collections were made October 24, 25, and November 27, 1997. Other techniques, such as using long-handled spoons or specially made scrapers to remove the sample from the intestine before dressing, were also tried unsuccessfully. Each sample was labeled with date, sex, age, weight, and a corresponding data card number that had the same biological data plus antler development. Location of the kill was then plotted on a hunt unit map as closely as the hunter could or would identify the actual site. Collected samples were sorted by sex and age. Individual frozen samples were then composited into each sex and age group, and a subsample was shipped to the GANLAB. October samples were divided for 1- and 2-year-old males only. Older deer were sampled to get an indication of how age would affect sample results.

The deer nutrition summary table (table 15) shows percent DCP and DOM for October and November. In this table, the average weights of the 1-year old deer in each WMA was:

Cokesbury	109.47
Parson Mt.	97.27
Ninety-six	105.56
Forks/KB	97.59

While Cokesbury and Ninety-six WMA generally produce deer in better body condition than those in the other WMA's, the nutritional quality studied is not that much better, and for some age and sex groups is actually poorer. A point of interest is that the Cokesbury and Ninety-six October 22 crude protein is less than that for Parson Mt and Fork/KB WMA's for 1.5 year olds

The Forks/KB management areas had essentially the same levels of CP as deer from Cokesbury or Ninety-six WMA which produced heavier deer.

Table 15 Deer nutrition summary, 1997

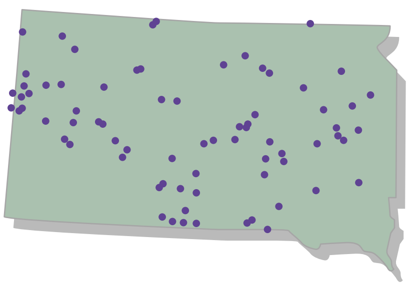
WMA	Sex	Age	Avg. wt.	% dietary crude protein Oct. 22	% dietary crude protein Nov. 24	% DOM Oct. 22	% DOM Nov. 24	Number of Samples Oct. 22	Number of Samples Nov. 24
Cokesbury	Male	1.5	109.47	12.98	14.63	39.4	33.52	10	3
	Female	1.5		12.98		47.84		2	
Ninety Six	Male	1.5	105.56	11.57		43.37		5	
	Female	1.5		11.44		42.5		1	
Fork/KB	Male	1.5	97.59	13.04	11.9	44.35	60.81	8	1
	Female	1.5		13.07	13.54	56.34	50.38	2	1
Parson Mt.	Male	1.5	97.27	13.06	15.67	45.53	47.37	14	4
	Female	1.5		13.09	16.47	48.75	52.84	1	2
	Average			**12.65**	**14.44**				

Conclusions

Reason for the generally higher body weights from the Cokesbury/96 WMA while nutritional indicators are generally the same or lower than those from the parsons Mt or Fork/key Bridge WMA's is unknown. It is suspected that quantity plays a larger role than quality. The Parson Mt./Forks WMS has little to no agriculture and is predominately 15-20 year old pine rotations. This is deemed good deer habitat.

South Dakota Forage Quality/Animal Nutrition Project Report for 1998

Figure 25 Sampling locations of South Dakota



The tools available today help sharpen grazing manage ment on the livestock operation. Fecal sampling provides fast information on the percent deitary crude protein (DCP) and digestible organic matter (DOM) livestock are actually consuming. The data can be input into the Nutritional Balance Analyzer (NUTBAL) computer ratio balancing program along with the herd description. Figure 25 shows the sampling locations of South Dakota.

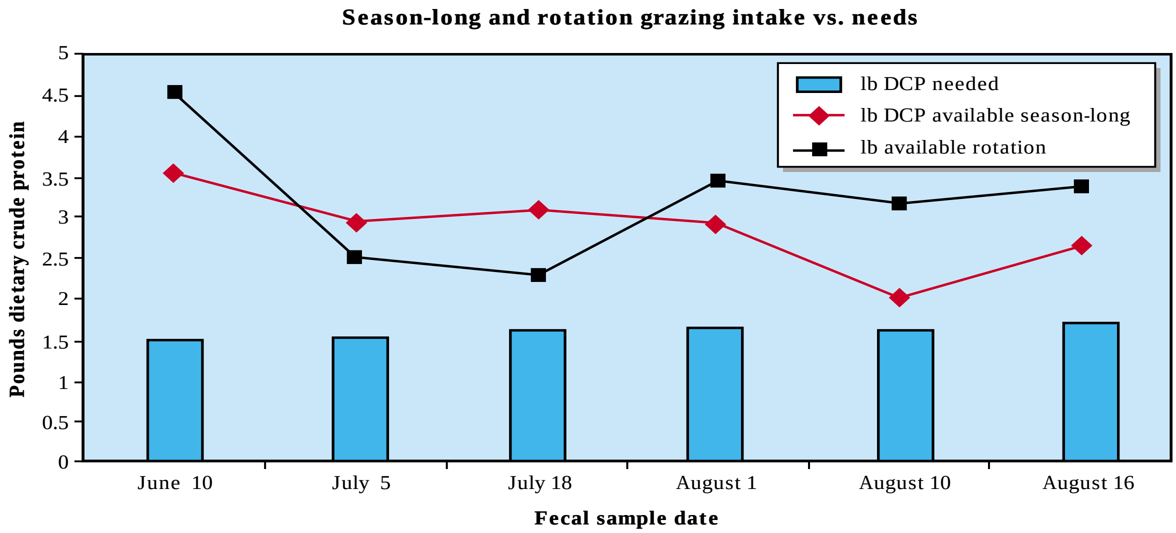
Once livestock goals were established and the information from the fecal samples entered, the NUTBAL program provided predicted animal weight gains. This process was used on two herds of stocker cattle grazing on pasture during the summer of 1998. One herd was grazed season-long on native range consisting of a mixture of warm- and cool-season grasses. Another herd was grazed in a system of 8 pastures and moved every 6 to 14 days depending on grass growth. The pastures in the rotation consisted of old stands of tame grass, native range in high condition, and established native seeded pastures. The rotated pastures are typical of pasture conditions on many of the farming operations in the area.

Results of the data collected from the grazing cattle are input into the NUTBAL program displayed in figure 26 (dietary crude protein) and figure 27 (net energy for gain). Protein intake was adequate to meet the average daily gain goals. However, the energy was inadequate in mid-July for the herd in rotation to meet the established gain goal. This was a result of grazing cool-season grass pasture after the plants had made seed heads and forage quality decreased.

Energy consumed dropped below the desired level for the season-long grazed herd in the latter part of August as predicted by the NUTBAL program, Forage was naturally maturing, and little rain expedited the process of reducing forage quality on the season-long pasture.

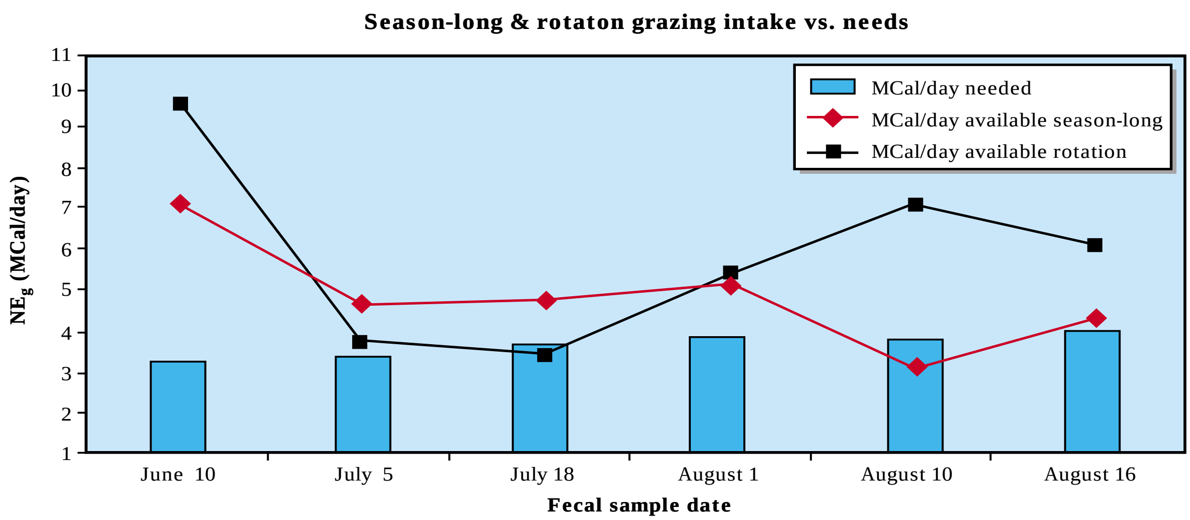
By using this information, the manager was able to effectively increase the level of protein and energy available to the herd in the pasture rotation. The available crude protein and energy for gain was increased significantly for the stocker cattle. Using

Figure 26 Dietary crude protein (CP)



Note: Crude protein needs for 1.8 lb average daily gain
Stocker cattle herds, South Dakota, 1998

Figure 27 Net energy for gain (NEg)

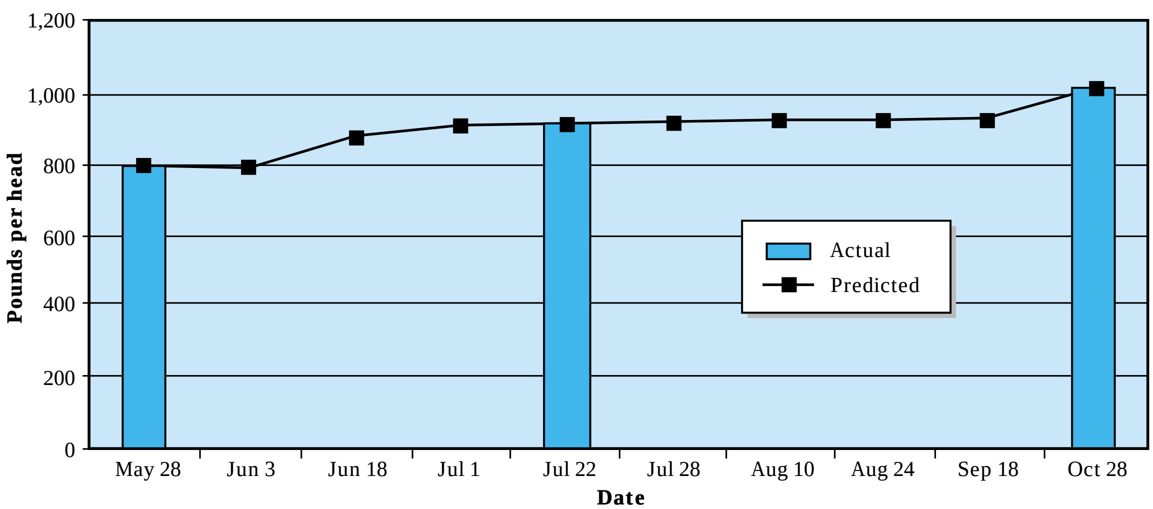


Note: Crude protein needs for 1.8 lb average daily gain
Stocker cattle herds, South Dakota, 1998

fecal sampling and the NUTBAL program allowed the producer to rapidly monitor the diet quality available to the stocker operation. The cow/calf producer who raises replacement heifers can also use these tools to monitor diet quality for their pregnant growing heifers.

Figure 28 represents a different herd of yearling steers in a different location in South Dakota. The steers grazed once in each of 5 pastures, ranging in duration from 9 to 50 days. The diversity and number of desirable species were lower on these pastures in comparison to the forage represented in the previous example. However, the species and production represented in this example is not uncommon in this region of South Dakota. It should be mentioned that a planned rotation on this operation has just begun, and monitoring will be conducted to measure the expected increase in diversity and desirable species. As is shown in figure 26, the actual average total gain of the yearling steers was only slightly higher than that predicted by NUTBAL using the results of the fecal samples. The dietary crude protein peaked on June 18 at about 13 percent, and the digestible organic matter peaked on June 3 at about 69 percent. Both the DCP and DOM then declined relatively uniformly the remainder of the summer.

Figure 28 Weight comparison between actual and predicted



Others are not as convinced that the NUTBAL program can accurately predict animal performance. Chance Davis, a Butte County rancher using the program says, "Currently I have about a 50/50 confidence level in the program, it is another tool to help in monitoring animal performance along with experience." Just like any other computer program available today, the accuracy of all the information loaded into the program predicts the accuracy of the output.

Davis goes on to say, "A potential benefit of NUTBAL is to provide the producer information to target when your pasture quality is no longer providing the animal performance needed to meet economic returns. Knowing this will help me in marketing and/or supplementing strategies."

Is this new idea of measuring livestock diet quality by using fecal samples accurate? Some say clipping the grass available to grazing livestock is more accurate. To find out, NRCS personnel collected grab samples of growing forage like the livestock were selecting in the pasture. Five different herds across the state were sampled at the same time a fecal sample was collected.

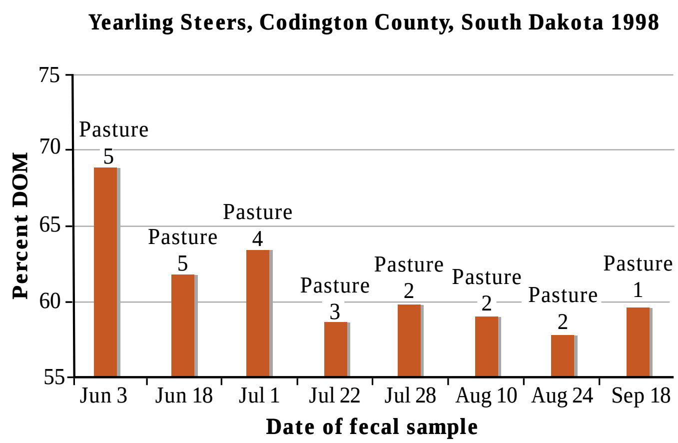
Preliminary results indicate that grab samples can not accurately duplicate the quality of forage selected by livestock. This confirms prior research findings in other areas of the country. It is important to note that the fecal sample collection process gives the producer a "snapshot" of the diet being selected. Sample results will change as the quality of available forage changes in the pasture. That's why the accuracy of fecal sampling and NUTBAL was checked using season-long animal performance. Participating producers were not able to weigh livestock every time a fecal sample was collected.

Butte Co. rancher Jane Kok thought the fecal analysis was good information. "Without the program we probably wouldn't have done mid-weights and that helped our confidence that we were accomplishing our animal performance." Like others in the project, the Kok's used livestock scales throughout the grazing season just to verify animal performance. "This was the first year for the bred heifer program so we liked the added assurance that the heifers were being rotated timely and maintaining an adequate level of nutrition," adds Kok.

Fecal samples identified how energy levels can be maintained at a higher level by carefully rotating livestock through pastures. Such a grazing rotation was demonstrated on a Codington County riparian area demonstration project. Producer Vince Foley implemented a planned grazing system by dividing the grazing land into five different pastures.

Foley stated, “The combination of expertise of the NRCS staff, and the real-world experience of my neighbors generated a project that provides a clear example and data on why rotational grazing will work.”

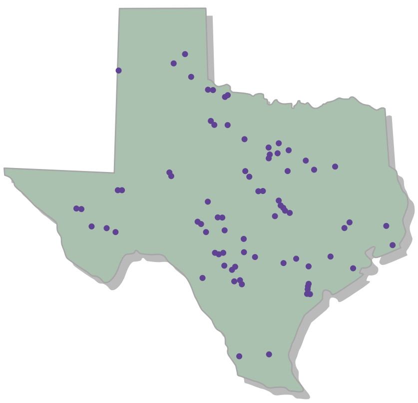
Interest in learning the secrets of quality pastures continues to grow as other producers hear about fecal sampling and NUTBAL. “This work will catch the eye of the producer,” says Mike Davelaar, district sales manager for Quality Liquid Feeds, Inc. Davelaar actively participated in the 1998 project.



This graph shows how digestible organic matter (DOM) increased each time the cattle were moved to a different pasture. The fecal sample for pasture 3 was collected the day cattle were moved after grazing 6 days. Energy had dropped because of a shortage of forage in the small pasture.

Texas Forage Quality and Animal Nutrition Project

Figure 29 Sampling locations of Texas



Sustainable production of livestock using Texas grazing lands requires attention to the needs of the forage and water resource as well as the well-being of the grazing animal. One of the major limitations to ecosystem based planning and planning proper grazing strategies is understanding forage demand of the various kinds and classes of livestock. A second limitation is strategic use of external nutrients to maintain proper body condition for the most economic level of production and limit excess nutrient loading into the ecosystem. New technologies capable of rapidly assessing nutritional quality of livestock diets are making possible the effective application of decision support systems for accessing animal demand and nutritional needs on Texas grazing lands. Figure 29 shows the sampling locations of Texas.

The USDA, Natural Resources Conservation Service (NRCS) is currently focusing on assisting grazing land clients in developing complete, comprehensive conservation plans considering both natural resources (soil, water, air, plants, and animals) and human concerns (economic and social). Those NRCS employees in Texas who have been involved in the national nutritional profiling program have developed an increased awareness and understanding of the need of the animal and its related economic impact. NRCS employees who have recently become advanced users of the nutritional balancer (NUTBAL) and the nutritional management system are now well trained in both animal and economic needs.

The Grazingland Animal Nutritional Lab provides a service to producers, advisers, feedstuff representatives, and researchers which allows rapid analysis of fresh fecal material to predict dietary crude protein and digestible organic matter via near infrared reflectance spectroscopy (NIRS). The lab is in the Ranching Systems Group, Department of Rangeland Ecology and Management at Texas A&M University. The NUTBAL software package uses information provided by the NIRS system. This provides nutritional advisors with information on dry matter intake, protein net energy balance, and liveweight change. In addition, it provides least-cost solutions to mediating nutritional deficiencies. The NUTBAL system allows resource planners to work with producers onsite to meet the individual's goals. When the NIRS fecal profiling system is coupled with the

NUTBAL analyzer, the resource planner can utilize a set of powerful technologies. When animal demand and nutritional status are properly characterized, the planner can better recommend changes in grazing and feeding strategies.

Texas Ruminant Livestock Efficiency Projects

Texas collected 662 fecal sample with the two projects):

- 12 of the 16 Major Land Resource Areas of Texas were represented in these projects.
- 50 of the 235 field offices are represented in these projects.
- These collections involved all grazing land uses, which are rangeland, pastureland, grazed forest, and grazed cropland.
- Projects involved cattle, sheep, goats, and white-tailed deer.
- Fecal sampling on white-tailed deer indicates that deer were eating less palatable, lower quality plant species because of excess animals. However, after proper harvesting of the animals, quality of the diets has improved.

Results of these projects include quantifying both plant and animal data bases and developing NRCS employee expertise.

Forage Quality in the Gulf Coast and Texas Blackland Prairies of Texas

NRCS in Texas introduced this technology to 62 ranches. The following are examples of data collection on three of these ranches.

Example 1—Rangeland Operation, Gulf Coast Prairie Major Land Resource Area (150A)

Herd and resource baseline data:

- Victorian breed (Hereford-Brahman cross) with frame scores of 3 (1,030 pound @ body condition score of 5.0).
- 6-year-old cow, lactating with 30-day-old calf in October.
- Adequately watered pasture less than 15 percent slope.
- Average high temperatures: Oct. 75°, Nov. 73 °F, Dec. 55 °F, Jan. 65 °F, Feb. 65 °F, and Mar. 65 °F.
- Body condition scores: Oct. 5.5, Nov. 5.5, Dec. 5.0, Jan. 5.0, Feb. 5.0, and Mar. 5.5
- Dry body coat.
- 350 head of cattle are rotated through 5 pastures

- Animals were grazed from October through November on indiangrass, little bluestern, panicums, paspalums, and tanglehead, and some high quality forbs. The cattle diet in December and January shifted to Texas winter-grass, native legumes, and numerous forbs. In February and March, the diet shifted to indiangrass, little bluestem, and brownseed paspalurn, and some Texas wintergrass.
- Moisture and growing conditions from October through March have been above normal. A normal killing frost did not occur.
- Cattle were moved to a fresh pasture and allowed to graze from 2 to 15 days before fecal samples were collected.
- Cattle grazing involved pastures that have blackland, loamy prairie, and claypan prairie ecological sites with similarity index ranging from 45 to 60.

Nutritional profiling consultation results:
The crude protein (fig. 30) dropped below the required nutritional level for the cow in late December. Net energy requirements (fig. 31) remained above the animal requirements from October through March.

South Texas had a relatively mild winter in 1998, and forage quality remained high. The tendency, however, is to feed the same amount that is normally fed each winter. This year the

Figure 30 Nutritional profiling—Crude protein

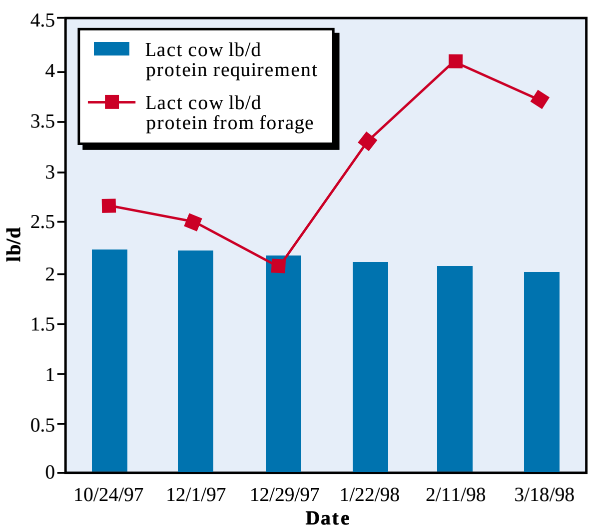
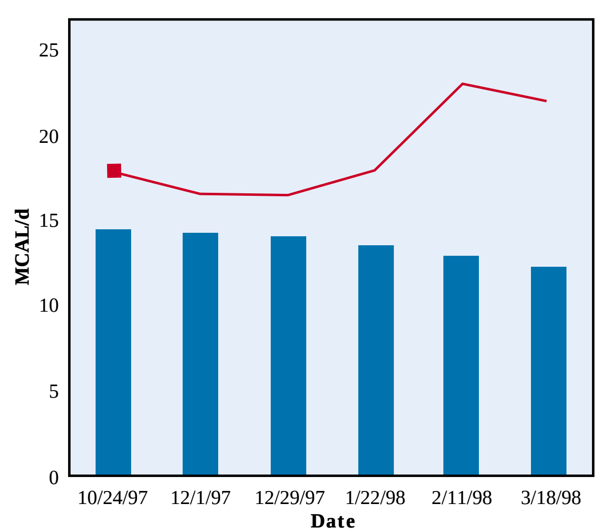


Figure 31 Net energy needs



client fed only what was needed according to the NUTBAL program. This resulted in saving about $3,000 in feeding cost during the winter feeding period. Animal conditions were monitored closely, and the program provided reliable information. This client realizes that good management techniques, such as proper stocking rates, pasture rotation, correct timing of calving, and a 60- to 90-day calving interval, are key attributes in balancing nutritional needs of animals.

Example 2—Management Intensive Pastureland, Blackland Prairie Major Land Resource Area (86)

Herd and resource baseline data:

- Stockers are crossbred with Hereford, Brangus, Shorthorn, and Charolais. They are 8 months old and weighed 550 pounds in October.
- Dairy heifers are Holstein that weighed 800 pounds in October and gained about 3 pounds per day per head.
- 4-year old cows (some lactating and some dry crossbred) are Hereford, Brangus, Shorthorn, and Charolais with frame scores of 4 (1,013 pound at body condition score of 5.0). The lactating cows had 120-day-old calves in October.
- Adequately watered pasture, less than 15 percent slope. Average high temperatures: Oct. 75 °F, Nov. 73 °F, Dec. 72 °F, and Jan. 66 °F.
- Body condition scores for the dairy heifers were: Oct. 5.0, Nov .5.0, Dec. 5.0, and Jan. 5.0. For the dry and lactating cows: Oct. 5.5, Nov. 5.5, Dec. 5.5, and Jan. 5.5.
- Dry body coat.

Nutritional profiling consultation results:

Stockpiling and stripgrazing techniques are used to cut hay feeding and hay handling time. This provides a way to leave hay in pastures and harvest it with cattle a little at a time, throughout the winter. Winter grazing stockpiled warm-season forages successfully replaced feeding hay in the Texas Blackland MLRA. These fertilized tame grass species were either grazed or hayed late summer, then fertilized and stockpiled in the pasture until January. A third of the pasture was grazed each month for 3 days, and fecal sample was collected on the third day. A vegetative sample was collected the same day as the fecal sample. A study was conducted to compare values of coastal Bermudagrass (fig. 32), Tifton 85 bermudagrass (fig. 32).

Neither protein nor energy requirements for lactating beef cows were met for stockpiled coastal bermudagrass in January.

Stockpiled Tifton 85 bermudagrass met the needs of stocker beef steers for both protein and energy in January (figs. 34 and 35). Tifton 85 bermudagrass is relatively high in forage quality and palatability and has performed better than other bermudagrass varieties in the Blackland MLRA.

Figure 32 Value of coastal bermudagrass

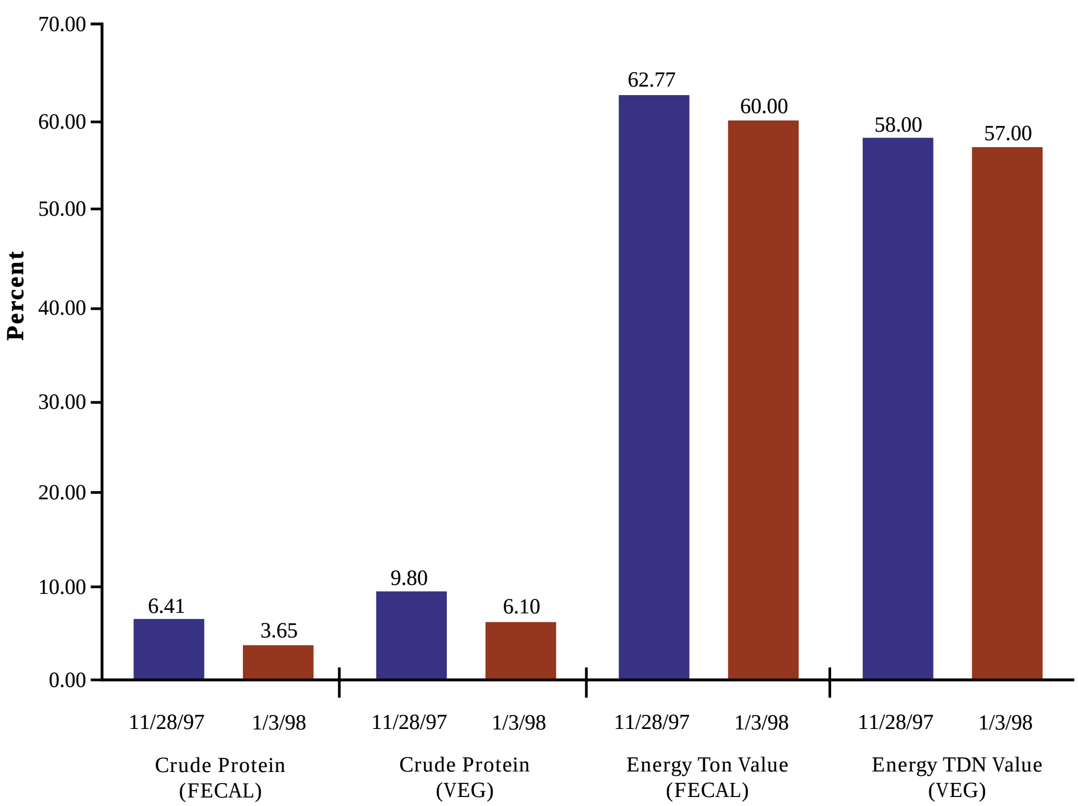


Figure 33 Value of Tifton 85 bermudagrass

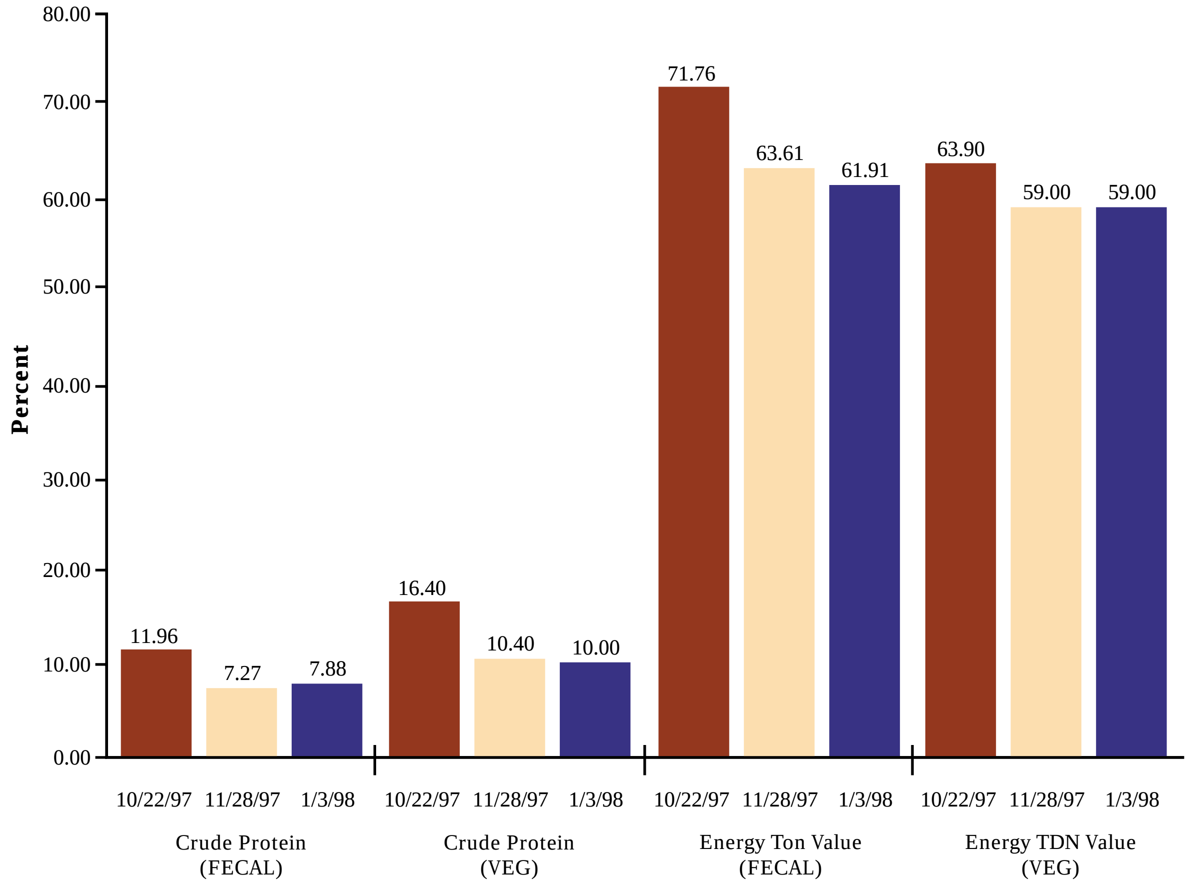
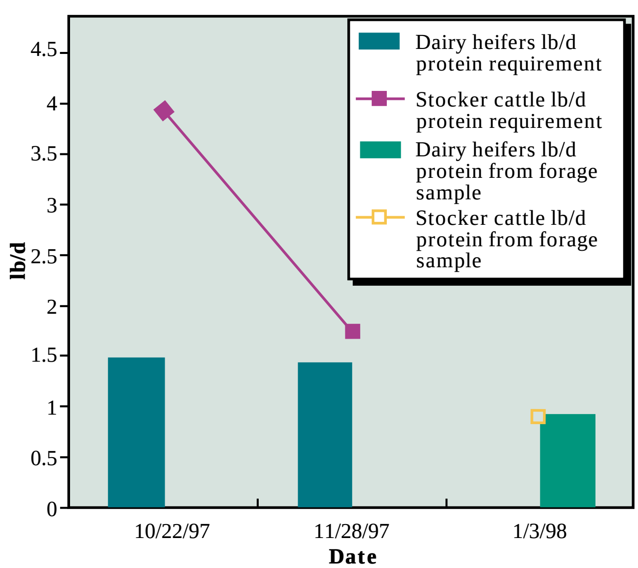


Figure 34 Tifton 85 bermudagrass meets the needs of stocker beef steers for protein

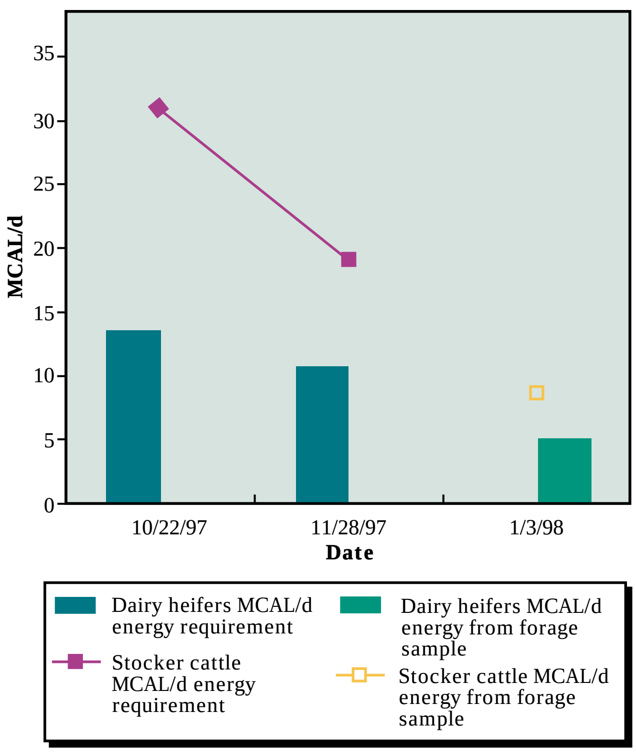


Example 3—Rangeland Operation, Blackland Prairie MLRA (86)

Herd and Resource Baseline Data:

- Black Angus breed with frame scores of 4 (1,103 lb. with body condition scores 5.0).
- 21–month–old heifer, with first one-third pregnancy.
- Adequately watered pasture; less than 15 percent slopes.
- Average high temperatures in July frequently were 105 degrees Fahrenheit.
- 900-pound heifer with body condition score of 5.8 in July.
- Dry body coat, with nighttime cooling.
- The forage values in July for crude protein was 9.79 percent, and digestible organic matter was 59.88 percent.

Figure 35 Tifton 85 bermudagrass meets the needs of stocker beef steers for energy



Nutritional profiling consultation report:
Black Angus heifers could not maintain their .23 average daily gain when maximum daily temperature exceeded 85 degrees Fahrenheit (fig. 35). Even with nighttime cooling and high quality diet, Black Angus cattle lose about 1.5 pounds per day when daily temperatures exceed 95 degrees Fahrenheit. Thus, the dry matter intake was reduced about 30 percent (fig. 37).

Other breeds that have more or less superior basal net energy conversion were compared to these Black Angus heifers. For example, if Black Angus were replaced by Brahman, a Brahman heifer could maintain its body weight when the maximum daily temperature exceeds 95 degrees Fahrenheit (fig. 36). Without nighttime cooling, however, Brahman loose more than 1 pound per day. Nighttime cooling usually occurs in most of Texas however, the few days that it does not occur dramatically affects intake as figures 34 and 35 indicate.

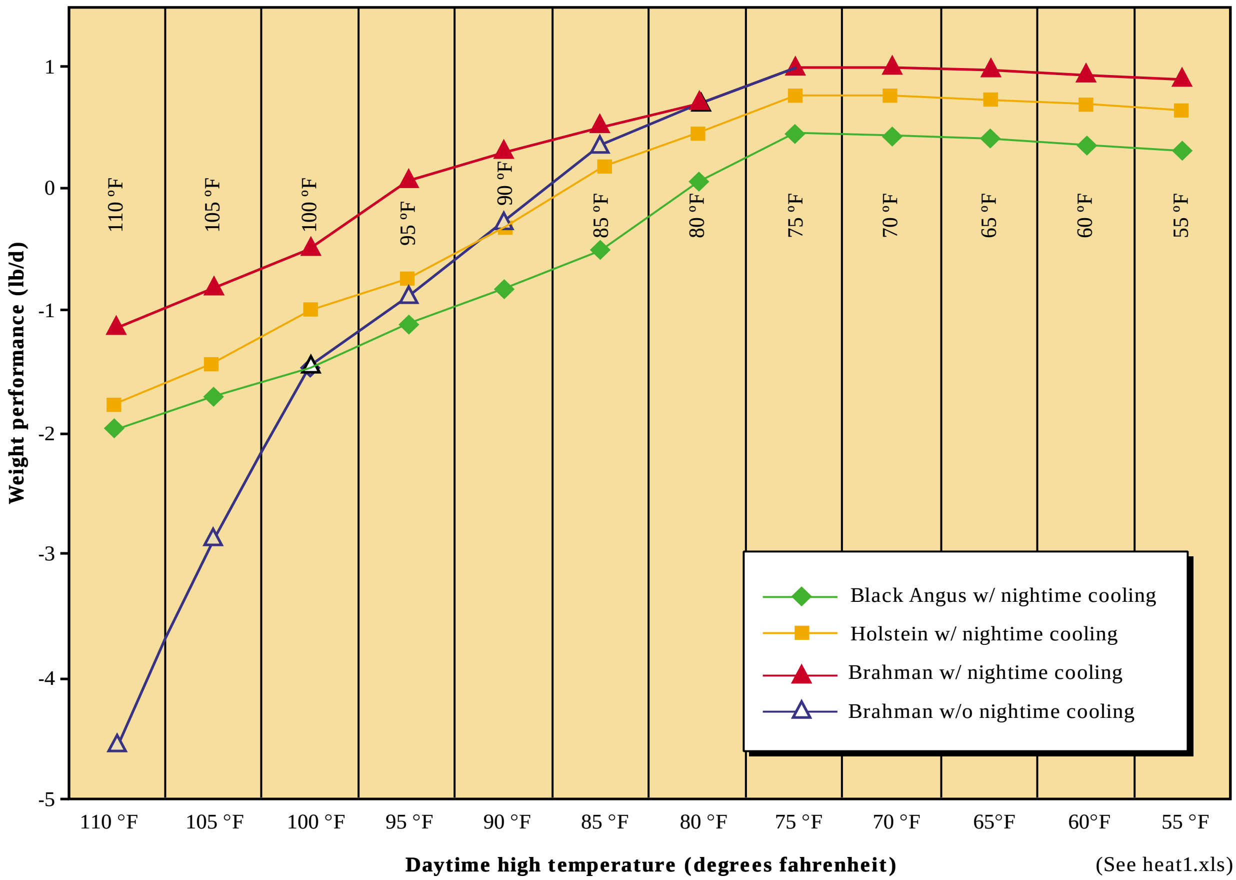
The effect of heat is greater on dairy cattle than on other breeds. A client in this same Blackland WRA noted a significant decrease in intake of forages when temperatures of 95 degrees Fahrenheit and greater occurred. However, feeding cracked corn, whole cottonseed, and hay in shade tree areas during daytime heat caused the animals to gain adequately. These cattle adjusted to grazing forages mostly at night when temperatures were lower.

What can we learn from this?
- Breeding when temperatures are high results in poor conception rates.
- Brahman can dissipate heat more effectively.
- Cattle do not graze from about 9:30 a.m. through 6:30 p.m. in July and August. Black Angus and Holstein make up for this loss at night, however, the intake loss rate is still less for Brahman.

Summary

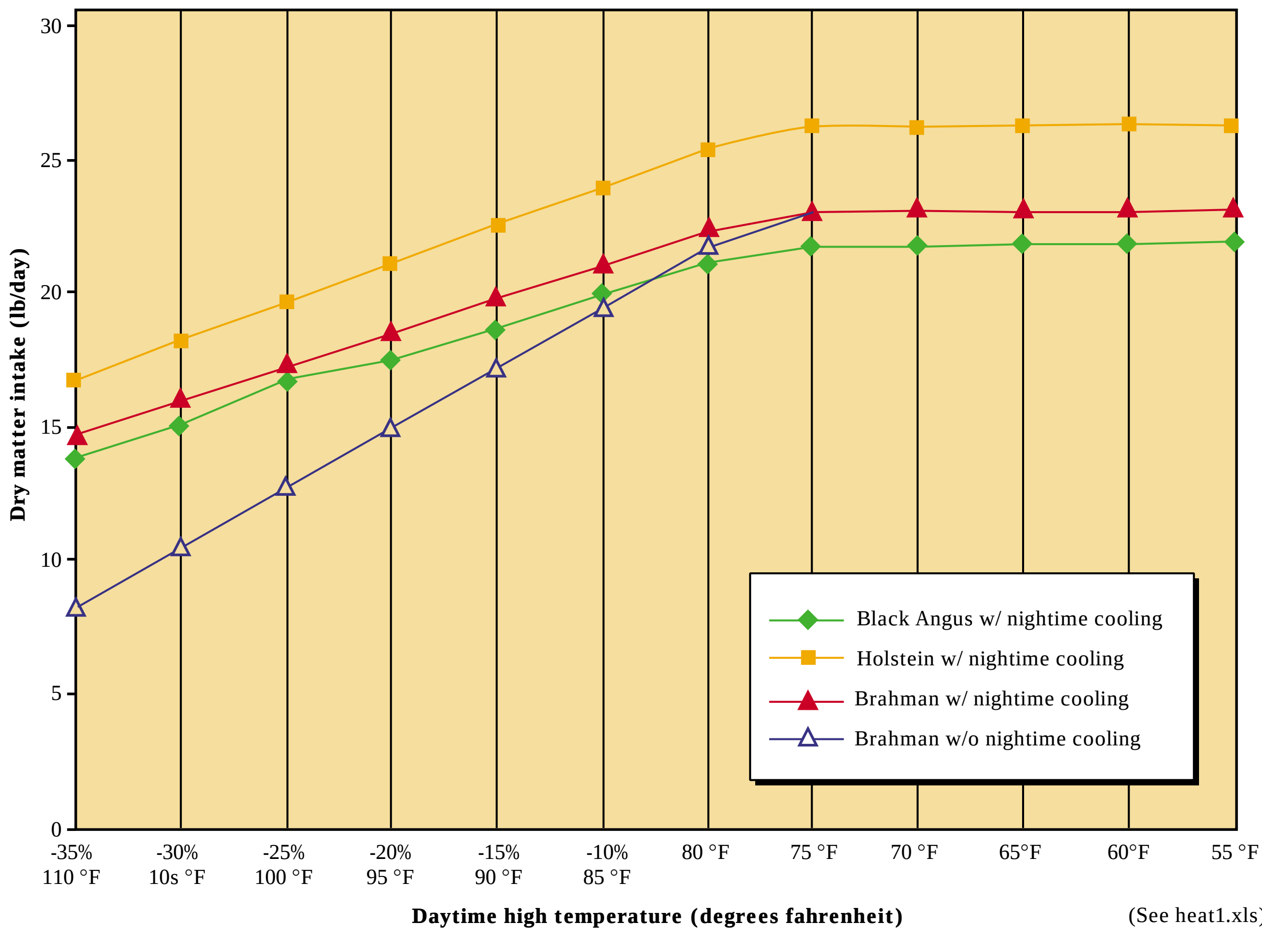
Sixty-two Texas producers received assistance through the forage quality projects. Many other ranches are now sampling and requesting assistance because of the interest these projects from neighboring ranches. The benefits of these projects included quantifying both plant and animal data bases, developing of NRCS employee expertise, and increasing technical assistance. Producers have implemented changes in grazing management, supplemental feeding, and herd management. Producers have gained information on forage quality and animal nutrition, which has allowed them to achieve an improved economic goal for the operation.

Figure 36 Daily gain of Black Angus heifers



(See heat1.xls)

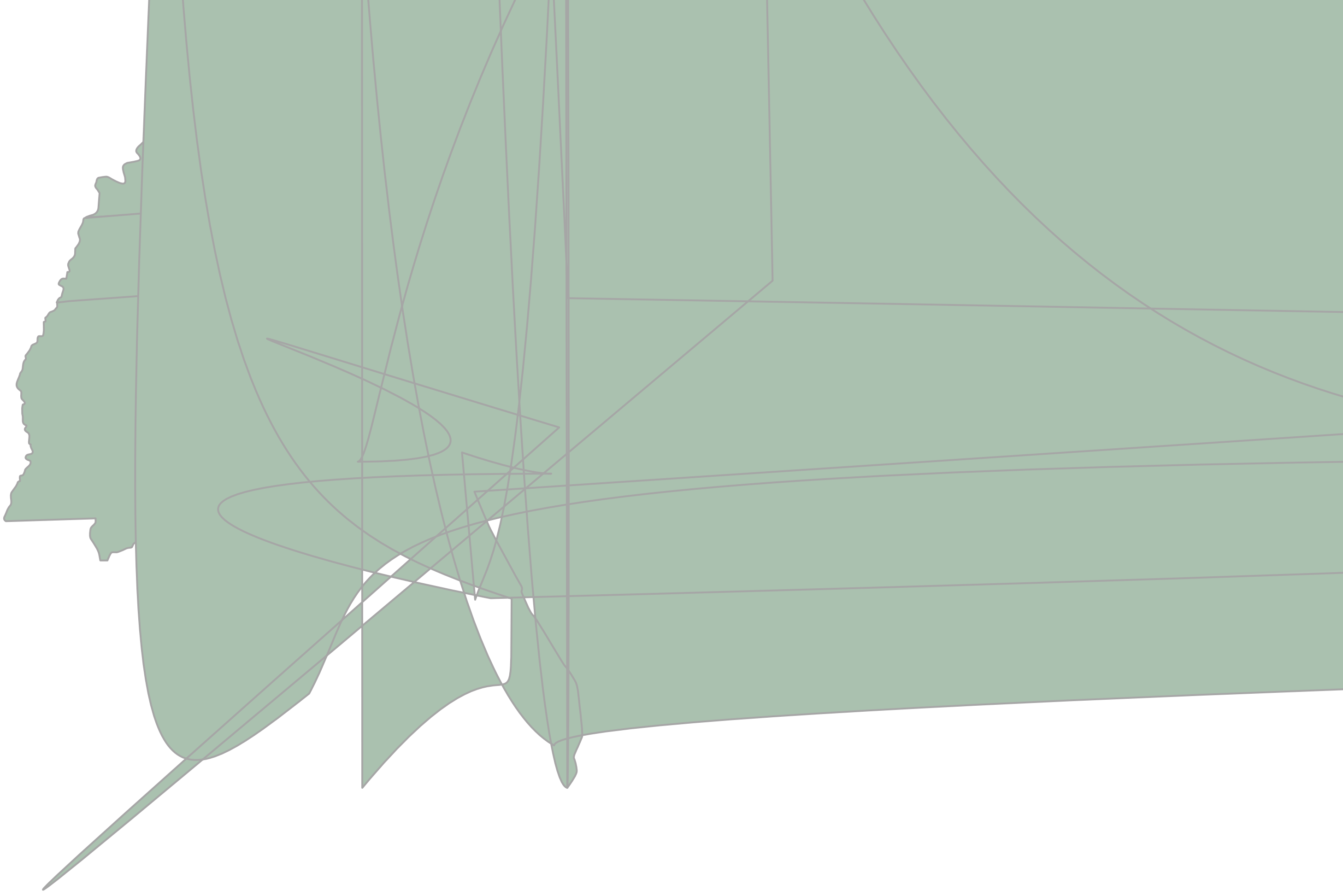
Figure 37 Daily gain of Black Angus heifers



(See heat1.xls)

S
N

Figure 38 S



In some locations the NRCS agent uses the nutritional balance analyzer (NUTBAL) to provide consultation regarding nutrition needs for producers' herds. In others this portion of the task could not be completed. NRCS supports providing technical assistance in conservation and management of soil, water, air, plants, and animals. Toward this end, the Agency is allocating a portion of its resources to enable us to work on addressing this unmet need in the Southeast. The data also create awareness in NRCS conservationists of the role animal nutrition plays in the success or failure of forage management and grazing systems in the region. State grazing land specialists (and grassland specialists, agronomists) are building data bases for forages in their respective state, by forage species, by month.

A summary of these results from 405 specimen is given below. This summary data include all kinds of pastures and forages described above as well as a large geographical and physiographical area. The graph of "Regional Data for all Pastureland" (with correction line for October and November samples from hunting areas in South Carolina) seems to indicate that average forage quality values remain above minimum requirements for mature, dry cows yearlong and for lactating cows excepting protein levels in December and January only. The reality is, of course, that forages are well above these levels in the regions with more palatable, perennial C3 forages (northern areas, piedmont, and upper coastal plains), and generally much less in the southern coastal plains and peninsular Florida.

Results - SE Summary

July 1997
58 samples
11.7 average CP
64.1 average DOM

August 1997
49 samples
11.3 average CP
63.1 average DOM

September 1997
51 Samples
11.1 average CP
61.2 average DOM

October 1997
30 samples*
12.0 average CP
54.1 average DOM

November 1997
28 samples*
11.1 average CP
52.1 average DOM

December 1997
15 samples
8.2 average CP
59.9 average DOM

January 1998
20 samples
9.88 average CP
(lowest 10% - 5.6% CP belonging to Alabama and Florida)
60.17 average DOM

February 1998
22 samples
11.54 average CP
(lowest 10% - 6.3% CP belonging to Alabama and Florida)
63.45 average DOM

March 1998
18 samples
12.7 average CP
63.8 average DOM

April 1998
15 samples
16.9 average CP
66.9 average DOM

May 1998
39 samples
14.6 average CP
66.2 average DOM

June 1998
60 samples
12.3 average CP
64.0 average DOM

* 50 to 60 percent of the samples in October and November is for testing plant materials on the Western Piedmont Hunting Area in South Carolina. These samples reflected digestible organic matter content ranging from a low of 32 percent to a high of 59 percent (the average of which was 45.4 percent in November and 46.5 percnet in October). Without this influence, Southeast Region DOM for October averaged 62.9 percent and November averaged 60.8 percent.