Forage News

MISSISSIPPI STATE UNIVERSITY EXTENSION

Impact of Forage Quality on Livestock Production

Volume 11, Issue 11

Rocky Lemus,
Extension Forage Specialist

November 2018

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Forage quality is determined by the amount of crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF) and energy (total digestible nutrients, TDN) present in a specific forage type and species. Forage quality moves in a simultaneous direction with maturity and fertilization. As maturity increases, overall forage quality declines. At the same time as fertilization declines, crude protein levels decrease. Usually, cool-season forages tend to be higher forage quality than warm-season grasses, but cool-season forages tend to be lower in energy to match livestock's requirements. Many producers do not do a good job and balancing yield and forage quality and they might need to depend on supplementation of commodity feeds for animal growth, fetal growth, and milk production.

Protein – Protein supplementation is the most expensive ingredient in a livestock feeding program. The level of protein content in forages vary with forage species, nitrogen fertility, and forage maturity. Legumes forage species tend to have much higher protein levels than grasses, and cool-season grasses tend to have higher CP than warm-season grasses. Protein requirements in the animal increases with lactation and reconditioning after calving. Protein supplementation is only needed when the forage cannot provide the required levels to a cow for maintaining a desired level of production. Cows that are nursing calves require the highest levels of protein and energy.

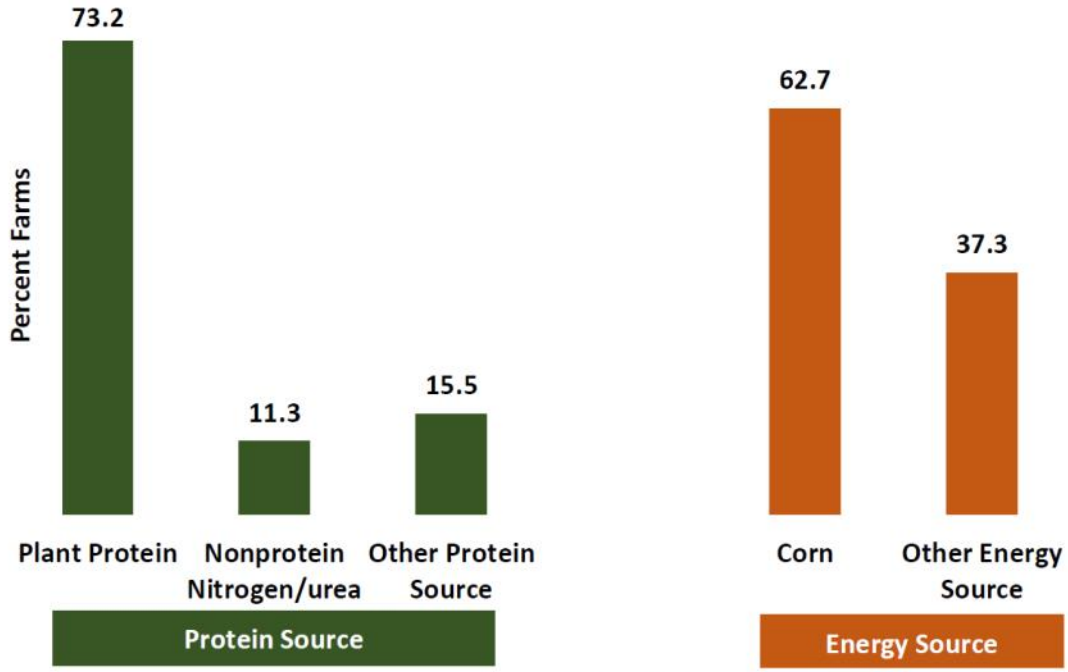

Figure 1. Farm operations in the southern USA (AL, AR, FL, GA, KY, LA, MS. OK, TN, TX, and VA) that fed protein (TP, NPP, other) and energy (corn and other) supplements to beef cows during the previous 12 months of the feeding cycle (Source: APHIS, Veterinary Services, 2010).

Livestock CP requirements vary with the livestock stage of production, animal size, and expected level of performance. The first step in determining if protein and energy levels are adequate for a specific livestock class to maintain a desired level of production or to prepare a CP supplementation program is through the analysis of a representative forage sample. Once this information has been collected, CP requirements can be obtained from the National Research Council (NRC) tables to determine if CP and energy levels are being met or a supplementation program is necessary to meet the expected level of livestock performance. For more detailed information on nutrient requirements for a specific livestock class and size refer to MSU Extension Publication 2528, Beef Cattle Nutrient Requirements (http://extension.msstate.edu/sites/default/files/publications/publications/p2528_0.pdf).

Crude protein is the measure of the nitrogen content in the forage. It is comprised two types of proteins: true proteins or natural proteins (TP) and non-protein nitrogen (NNP). Products such as corn gluten feed, distillers grains, cotton seed meal, and soybean meal are consider true proteins. On the other hand, urea is consider a non-protein nitrogen. Other alternative products that may include TP or NNP such as liquid supplements and protein blocks are also available for supplementation and it is important to make sure that will meet the nutrient requirement of the specific livestock class. Available report indicates that in the southern USA, farms fed 73.2% TP, 11.3% NNP, and 15.5% other proteins as primary ingredients to beef cows during the previous 12 months of the feeding cycle (Fig. 1)

Energy – The main sources of energy for cattle come from carbohydrate fermentation in the rumen. One of the most common ways to determine concentration of available energy in the forage is by determining total digestible nutrients (TDN). This calculated forage parameter is easily understood and still a common measure of energy. Total digestible nutrients is usually the sum of digestible protein, digestible crude fiber, digestible nitrogen free extract, and digestible fat. These digestible nutrients vary with plant maturity and the older the older the forage, the lower the TDN concentration and vice versa. Values of TDN also varies with plant species, Alfalfa > Cool-season Grasses or Clover >Warm-season grasses. Total digestible nutrients information is useful for beef cow rations that are primarily forage and its values tend to under predict the feeding value of concentrate relative to forage.

There are energy supplements that can be fed to beef cows when forages do not satisfy the required amount of energy. Keep in mind that the energy requirement of a cow vary over the production cycle. Lactation is the stage in which cows have a higher demand for both protein and energy. Available report indicates that in the southern USA, farms fed 62.7% corn and 37.3 % other energy supplement as primary ingredients to beef cows during the previous 12 months of the feeding cycle (Fig. 1). For more information related to commodity feed please refer to MSU Extension Publication 2834, Feedstuffs for Beed Cattle (http://extension.msstate.edu/sites/default/files/publications/publications/P2834.pdf).

Fiber content - The nutritional quality of a forage is primarily assessed by its NDF and ADF content. Fiber is composed primarily of three main components: cellulose, hemicellulose, and lignin. Neutral detergent fiber is a measure of all three fiber components and it is correlated with forage intake (how much forage the animal will consume). The general agreement is that cattle will consume 1.2% of the body weight as the NDF fraction of the forage. Therefore the cattle's forage dry matter intake (% of the body weight) can be predicted by 120 by the percent NDF in dry matter basis. On other hand, ADF measures only cellulose and lignin and it is correlated with forage digestibility.

How will fiber content impact growth stage?

Calves [(1 month to age until 7 months (weaning)] – Most calves do not develop a functional rumen until they are approximately 60 day of age or older. At this point they start to depend more on nutrients provided by forages. At five months of age, the cow might provide less than a fourth of the nutrients required for growth and development of the calf. Weaning calves weighing 500 lbs might require forages with NDF and ADF levels of 43 and 35%, respectively, to sustain daily gains of 2 lbs. These fiber levels needs to be also maintained as well in a heifer development program that want to achieve 65% mature weight at breeding. This type of nutritive value could exist in cool-season grasses such as annual ryegrass that are kept vegetative in the late winter and early spring. This type of nutritional quality might not be observed with warm-season perennial grasses (bermudagrass and bahiagrass) and might not support those targeted gain rates. However, inter-seeding legumes into warm-season perennial pastures or using annual warm-season grasses can help to increase rates of gain. Young, growing calves ranging from 300 to 7000 lbs with an average daily gain of 2.0 lb/day will need relatively high levels of TDN (69%) and CP (13%) in their diets to support growth.

Pregnant Cows – There is an additional increase in nutritional demands in pregnant animals during the last two to three months to maintain weight gain and fetal growth. To maintain acceptable gain in a pregnant heifer, a forage should maintain maximum NDF of 58% and 22% NDF in dry matter basis. It is also required that energy density in the forage will have an increase of 1.5 fold to match the requirements of the heifer and avoid issues with calf vigor and timely breed back. Keep in mind that once conception occurs, that cow will devote nutrient to maintain the pregnancy and mismatching the nutritional requirements during the pregnancy can lead to poor score condition of the animal at calving. Depending on body size, lactating cows might require 7% CP and 47% TDN.

Lactating Cows – Not having good quality forage will affect peak milk production and the duration of the lactation cycle. It is important to remember that calves will not have a functional rumen for at least 60 days after birth, but the greatest demand of nutrients for the calves from the cow occurs in the first three months after calving. To support a cow at peak milk productions (20 lbs), the forage will need to have fiber not higher than 34% ADF and 50% NDF in a dry matter basis. Higher fiber values could impact the cow body score condition. Depending on body size, lactating cows might require 11% CP and 60% TDN.

Summary – Forage quality can be defined in many ways since it is associated with nutrients, energy, protein, digestibility, fiber, mineral, and vitamins. A lot of producers do not associate forage quality with animal production and spend more time in supplementation. Remember that feed is a major proportion of the total cost of beef cattle production. Producers should focus more on forage systems that matches forage quality with the nutritional requirements of the cattle operations and different livestock classes throughout the year. With the exception of mineral supplementation, producers should focus on strategic supplementation more than being a common and frequent management practice to improve a cow/calf producer's profitability. Appropriate supplements for beef cattle should be selected based on the quality of the forage and livestock's stage of production to optimize efficiency of feed rations and choice of supplements with greater economic return. Don't guess, hay test!

Upcoming Events

For upcoming forage related events visit: ***http://forages.pss.msstate.edu/events.html***

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