Nutrients Produced by Forage Plants Are the Primary Unit of Production in Beef Operations

Llewellyn L. Manske PhD, Range Scientist
Amy M. Kraus, Composition Assistant
Rich Mattern, Agriculture Communication Editor
North Dakota State University
Dickinson Research Extension Center

Beef producers who manage land resources to achieve efficient capture of plant nutrients and their efficient conversion into a saleable commodity from modern livestock can increase the wealth generated from pastures and haylands, says a North Dakota State University range scientist.

"The improved genetic potential of the modern, high-performance beef cow has increased the nutrient demands of the animal, but the industry continues to use traditional pasture-forage management technology developed for the old-style, low-performance cow," says Lee Manske, range scientist at NDSU's Dickinson Research Extension Center. "These traditional systems inhibit the modern beef animal from performing at its genetic capability, and the result is profit margins below potential. To address this situation, the beef industry could implement biologically effective twelve-month pasture-forage management systems designed to efficiently meet the nutritional needs of the improved animal."

Modern, high-performance cattle are larger and heavier, gain weight more rapidly, produce more milk and deposit less fat on their bodies than old-style cattle. The greater size of modern animals increases their nutrient demand, and their higher production levels increase the demand further so that the additional quantities of required nutrients are not simply proportionate to the animals' greater size.

A high-performance cow that has medium milk production and is 20 percent larger than an old-style animal requires 24 percent more energy and 34 percent more crude protein per year than the old-style animal. A high-performance cow requires 20 percent more energy and 24 percent more crude protein during the period from mid November to late April. She also requires 27 percent more energy and 41 percent more crude protein per day during the lactation period from early May to mid November. A high-performance cow that has high milk production requires 44 percent more energy and 74 percent more crude protein per day during the lactation period than the old-style cow.

High-performance livestock do not have the fat reserves that old-style animals produced and could draw on when forage quality was insufficient, so modern cattle perform at greater efficiency when their nutritional demands are met in each production period. Periods with nutrient deficiency limit modern beef animals' production.

The greater nutrient demands of the modern cow, along with the increasing value of land, make efficient production and capture of nutrients, mainly crude protein and energy (TDN), critical to the economic well-being of the modern beef operation. The potential amount of new wealth generated from the land resource is limited by the biological capacity of the plants to produce herbage and nutrients from soil, sunlight, water and carbon dioxide, and by the effectiveness of management treatments in efficiently capturing the plant nutrients produced on the land and efficiently converting them into a saleable commodity like calf weight.

Because traditional management systems focus on capturing the greatest herbage dry-matter weight rather than the greatest nutrient weight, they are inefficient at nutrient capture. As a result, traditional systems lead to unnecessarily high pasture-forage costs while still failing to meet the nutritional demands of the modern animal during 30 to 75 percent of the days in a year. Animal performance falls below potential and profit margins decline.

Biologically effective pasture-forage management systems with improved efficiency can increase production on the land, capture greater economic value from the land resource, and convert captured nutrients into a saleable commodity at lower costs per pound of

accumulated calf weight than traditional systems do. Biologically effective pasture-forage management systems have three characteristics that improve the efficiency of feeding modern beef cows.

First, effective management systems increase forage nutrient production per acre by coordinating defoliation periods with plant growth stages so that the biological requirements of the plants are met. This timed defoliation promotes vegetative reproduction by tiller development from axillary buds, stimulates beneficial activity of rhizosphere organisms and facilitates the functioning of ecosystem processes at higher levels. For native rangeland this stimulation period occurs between the third new leaf stage and the flowering stage (June 1 to July 15).

Second, effective management systems improve nutrient capture efficiency by using various forage types so that each can be harvested during the periods when the amount of nutrient weight captured per acre is a high proportion of the nutrients produced. The optimum plant growth stage for harvest by grazing or haying is the plant stage when the herbage production curve and the nutrient quality curve for a specific forage type cross. For perennial grasses, this period occurs at the flowering stage.

Third, effective management systems increase nutrient conversion efficiency by providing adequate nutrients throughout the cows' 12-month production cycle. Producers can match forage nutrient supply to livestock nutrient demand by selecting appropriate combinations of pasture and harvested-forage types and by timing livestock use of those forages so that herbage production curves and nutrient quality curves of plants match the dietary quality and quantity requirement curves of cow production periods.

A biologically effective pasture-forage management strategy for beef cows with calves born before mid April is to graze fertilized crested wheatgrass (50 lbs. N per acre on the first week of April) from early May to early June; graze native rangeland managed by a 3- or 4-pasture twice-over rotation system from early June to mid October; graze Altai wildrye from mid October to mid November; graze spring-seeded winter cereal, like winter rye, from mid November to mid December and feed early harvested annual cereal hay, like forage barley cut at the milk stage, from mid December to late April. This pasture-forage management system efficiently produces and captures forage nutrients and efficiently converts them into calf weight by meeting beef cow nutritional requirements economically during each production period.

Ranch operations that implement such biologically effective management practices to produce calf weight from the modern beef animal will see reduced pasture-forage costs, stronger cow-calf performance, and increased profit margins.