

Efficient 12-Month Pasture-Forage Management Systems Reduce Beef Production Costs

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

Implementing efficient 12-month livestock feed management systems based on biological and ecological sciences will increase value capture from land resources, improve the profit margin for beef production, and enhance the regional agricultural economy, says a North Dakota State University range scientist.

“The potential amount of new wealth generated from agricultural use of land resources is limited by the biological capacity of the plants to produce herbage and nutrients from soil, sunlight, water, and carbon dioxide. It is also limited by the effectiveness of management practices in capturing value from plant production,” states Lee Manske, range scientist at NDSU’s Dickinson Research Extension Center.

“Traditional grazing and haying management practices place priorities on animal husbandry practices and focus on harvesting greater amounts of forage weight. Such practices lead to diminished herbage and nutrient production and capture only a small portion of the value potentially available from the land resource,” Manske says. “The result is high livestock feed costs and low profit margins. Increasing value capture from the land requires management strategies with improved biological effectiveness, nutrient capture efficiency, and nutrient conversion efficiency.”

The solar energy that plants capture during photosynthesis is both the primary force driving all ecosystem functions and the foundation for all uses of grasslands, Manske explains. The performance level of the plant component of grassland ecosystems determines the performance levels of all other ecosystem components; therefore, sustaining high levels of herbage and nutrient productivity from pastures and haylands requires using management strategies that place priority on plant health and growth.

“Traditional practices, which place management priorities on the various uses of the grassland ecosystems or on promoting grass sexual reproduction and seed production, are not biologically effective,” he says. “Biologically effective management strategies meet the requirements of the plants and promote vegetative reproduction by tillering from axillary buds—the primary method of grass reproduction in the prairies. They also stimulate beneficial activity of rhizosphere organisms and facilitate the functioning of ecological processes at higher levels. Such biological conditions result in the enhanced production of herbage and nutrients on pastures and haylands.”

Efficient capture of nutrients is also a major consideration of an effective management system. The valuable agricultural products from pastures and haylands are the nutrients, and various types of forages used for livestock feed should be evaluated by the cost per unit of weight of nutrients rather than by the cost per unit of weight of dry matter, Manske notes. Feeding forages to meet livestock nutrient requirements and supplementing dry matter is more cost efficient than feeding forages to meet dry matter weight requirements and supplementing nutrients.

The proportion of produced nutrient weight captured by grazing or haying is the efficiency of a harvest method. Traditional management practices that focus on harvest of forage dry matter weight capture nutrients inefficiently, and the loss of forage nutrients produced but not captured raises livestock feed costs, he says. Efficient management strategies time harvest to coincide with the plant growth stages that yield the greatest nutrient weight per acre.

Nutrient weight is related to the percent nutrient content of forage and to the weight of forage dry matter at the time of grazing or haying. The optimum plant growth stage for harvest is when the herbage production curve and the nutrient quality curve cross for a specific forage type. Grazing or haying a forage at this time yields a high proportion of captured nutrients and results in lower costs per unit of nutrient and lower pasture-forage costs per day.

“Efficient conversion of nutrients into a saleable commodity is another major consideration of an effective management system,” Manske says. “The traditional pasture-forage management practices used in the Northern Plains were developed during the era of low-performance livestock. Over the past several decades, the type of livestock in the region has shifted to a fast-growing, high-performance animal, but pasture-forage management strategies have not been adjusted to take full advantage of the livestock’s genetic potential.”

Modern high-performance cattle have a reduced level of production efficiency when their immediate nutritional needs are not met. Nutrient deficiency in the cattle diet for two weeks results in calf weaning weights below potential and in high annual expenses for cow maintenance. The effects become more severe as the period of deficiency increases. With traditional management practices, cattle diets lack adequate nutrients 40 to 60 percent of the days in a year, he says.

Traditional practices do not systematically change forage types in response to varying livestock nutrient demands but change forage feed selections in response to the depletion of a forage source. In traditional practices, timing of cow production periods is not coordinated with pasture and harvested forage quality but is determined by selection of calf weaning dates that match changing market patterns. Effective management strategies for modern high-performance livestock provide nutrients at the times and in the amounts required during each production period to maintain efficient conversion of the nutrients into saleable commodities.

“The efficiency of pasture-forage management strategies can be improved through the coordination of grazing and haying periods with plant growth stages and through the selection of appropriate combinations of forage sources to be fed or grazed in a 12-month sequence so that the dietary quantity and quality requirements of cow production periods coordinate with the herbage production curves and nutritional quality curves,” Manske says. “Systems with these characteristics meet livestock biological and nutritional requirements during each production period. The resulting efficient capture and conversion of nutrients are reflected in lower costs per unit of weight of nutrients, land area per animal unit, feed costs per day, and cost per pound of calf weight gain.”

“The livestock forage feed costs from pasture and haylands are largely determined by the biological effectiveness and nutrient capture and conversion efficiency of the management strategy. Efficient 12-month pasture-forage management systems enhance plant growth, capture a high proportion of the produced nutrients, and efficiently convert those nutrients into saleable commodities such as calf weight,” says Manske. “These strategies improve livestock weight performance, reduce livestock production costs, and increase profit margins.”