

Capturing Greater Wealth from the Land Natural Resources

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Animal agriculture of the Northern Plains has been hampered by high production costs and low profit margins. Efforts of the beef production industry to correct these problems has been to improve animal performance. The genetic make-up of the North American beef herd has been transformed over the past forty to fifty years, and we now have high-performance, fast-growing meat animals. However, the anticipated improved profit margins from this new-style of livestock have not materialized.

Forage management systems were not improved simultaneously with beef animal performance. Traditional livestock production paradigms assume the source of income to be from the sale of animal weight and traditional pasture and harvested forage management practices are extremely inefficient at capturing the forage plant nutrients produced on the land. A problematic mismatch of forage nutrients required and forage nutrients available exists between modern, high-performance cattle and traditional low-performance forage management practices. Modern cattle on traditional forage management practices developed for old-style cattle have reduced production efficiencies that depress cow and calf weight performance below genetic potentials causing reduced value received at market and reduced profits.

The basic components of the traditional pasture and harvested forage management concepts have not changed since they developed during the early stages of the beef industry. Forage resources continue to be managed from the perspective of their use as dry matter livestock feed. Forage dry matter quantities are still used as the measure when producers make major pasture and harvested forage management decisions. Pasture stocking rates are determined from estimates of herbage dry matter production. Harvested forages are cut at the time when the greatest dry matter weight can be captured, and hay is traded on the dry matter weight basis per bale or ton.

Forage dry matter does not have a real economic value because it is not incorporated into the

beef weight produced. The dry matter is simply the carrier of the nutrients it contains. All of the dry matter ingested by livestock is deposited back on the land. The nutrients, mainly crude protein and energy (TDN), are the valuable products produced by forage plants on the land. The renewable forage nutrients are the primary unit of production in a beef operation, and forage nutrients are the authentic source of new wealth from agricultural use of grazingland and hayland resources of the Northern Plains.

Management of renewable land natural resources should not be directed towards the use of the land but be focused on meeting the requirements of all living and nonliving components of the ecosystem for the purpose of improving ecosystem processes and maintaining resource production at sustainable levels. The quantity of new wealth generated from renewable land natural resources is proportional to the biological effectiveness of the pasture and harvested forage management strategies. Biologically effective pasture and harvested forage management strategies perform three essential functions that increase forage nutrient production, improve nutrient capture efficiency, and enhance nutrient conversion effectiveness.

Biologically effective forage management strategies increase forage nutrient production per acre by coordinating defoliation periods with plant growth stages so that the biological requirements of the plants and soil organisms are met. Coordination of partial defoliation promotes vegetative reproduction by secondary tiller development, stimulates beneficial activity of rhizosphere organisms, and facilitates ecosystem biogeochemical processes.

Biologically effective forage management strategies improve nutrient capture efficiency by using various forage types during the periods in which the amount of nutrient weight captured per acre is a high proportion of the nutrients produced. The plant growth stage for harvest by grazing or haying is that at which the herbage production curve and the nutrient quality curve for a specific forage type cross. This period occurs at the flower (anthesis) stage for perennial and annual grasses.

Biologically effective forage management strategies enhance nutrient conversion effectiveness by providing adequate nutrients throughout the 12 month beef cow production cycle. High-performance livestock convert nutrients to animal weight at greater efficiency when their nutritional demands are met each day of each production period. Periods with nutrient deficiency limit livestock production. The forage nutrient supply can match the 12-month livestock nutrient demand by selection of appropriate combinations of pasture and harvested forage types and timing livestock use of the selected forages so that the herbage production curves and nutrient quality curves of plants match the dietary quality and quantity requirement curves of livestock during each beef cow production period.

Effectively meeting the biological requirements of plants and soil organisms occurs when the defoliation resistance mechanisms of grass plants and the biogeochemical processes of ecosystems are activated by partial defoliation during phenological growth between the three and a half new leaf stage and the flower (anthesis) stage. These mechanisms help grass tillers withstand and recover from grazing by triggering compensatory physiological processes that increase growth rates, increase photosynthetic capacity, and increase allocation of carbon and nitrogen; by stimulating vegetative reproduction of secondary tillers from axillary buds; and by stimulating rhizosphere organism activity and increasing conversion of inorganic nitrogen from soil organic nitrogen. Activation of these mechanisms results in increased herbage biomass production, increased plant density, increased available forage nutrients, increased soil aggregation, improved soil quality, increased soil water holding capacity, increased resistance to drought conditions, improved wildlife habitat, and improved grassland ecosystem health status.

Improvement in performance of forage management systems requires paradigm shifts that consider the land natural resources to be the source of new wealth generated from livestock agriculture with the renewable forage nutrients as the primary unit of production and the produced animal weight as the commodity sold at market. Biologically effective 12-month pasture and harvested forage management strategies efficiently meet the biological requirements of plants and soil organisms, improve the characteristics of soil, increase forage nutrient production, efficiently capture forage produced nutrients, and efficiently convert nutrients into animal weight commodities. These improvements permit renewable natural resource ecosystems to perform at

biologically sustainable levels and modern high-performance beef cattle to perform at genetic potentials. Results of these improvements reduce costs per pound of crude protein, reduce costs per pound of calf weight gain, reduce costs per day of forage feed, and increase returns after feed costs per acre. These changes in costs and returns effectively increase profit margins for land and cattle enterprises and improve the regional livestock agricultural economy.

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