FORAGES AND PASTURES SYMPOSIUM: USE OF MARGINAL LANDS AND FIBROUS BYPRODUCTS IN EFFICIENT BEEF AND DAIRY PRODUCTION SYSTEMS

0313 Improving efficiency of production in pasture/range based beef and dairy systems.
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Despite overall advances in technology and livestock production systems in the last century, it is still critical for research to be focused on efficient nutrient and forage utilization to improve efficiency of grazing beef and dairy production systems. Beef and dairy cattle have the advantage to capitalize on the ruminant's ability to utilize these feed resources that are not usable for other production industries. However, poor forage and subsequent energy utilization are often the primary limiting factors associated with decreased efficiency in range- and pasture-based beef and dairy systems. Although forage remains the least expensive nutrient source to maintain productivity of the cow herd, energy utilization of converting forage to a marketable output can be relatively inefficient. Thus, improving energy efficiency of pasture- and range-based grazing systems is essential to maintain long-term profitability and sustainability of livestock industry. Increasing profitability by optimizing grazing management and reproduction requires a rapid adoption of grazing management practices and genetic selection criteria for animals that fit diverse environment. The task of developing efficient production systems is biologically and economically complex and not easily achieved. Forage production and utilization on pasture- and range-based grazing systems varies tremendously across regions in the United States. This variation in forage production and utilization is due to differences in environmental conditions (e.g., temperature, precipitation, humidity, topography) and genetic makeup of the cow, which creates challenges in recommendations for specific genotype and grazing management schemes. However, matching cow type or genetic potential to the production environment and grazing management scheme may provide opportunities to increase energy utilization efficiency. In addition, pasture nutritive value and production varies within forage species across regions (e.g., cool-season vs. warm-season grass), and recommendations for grazing strategies leading to greater pasture utilization should factor differences in pasture composition. Therefore, increasing ruminants' efficiency of forage utilization through selection of energy efficient animals and/or grazing management decisions (i.e., supplementation, grazing management) would result in an increased profitability and sustainability.

Key Words: pasture, range, energy efficiency

0314 Forage breeding programs aimed at increasing productivity of marginal lands.
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The definition of "marginal lands" is highly contentious, subject to a wide range of opinions and contexts. For the purposes of this paper, I define marginal land simply as land with one or more problems that reduce crop productivity or economic sustainability. Numerous production and sustainability problems may be caused by land, soil, or atmospheric issues, including drought, nutrient imbalance, toxicity, pH imbalance, air pollutants, and temperature extremes. Forage crops, particularly perennials, are often relegated to these lands, particularly when crop productivity or sustainability falls below an economic viability threshold. As such, forage breeders have been faced with numerous challenges to breed both grasses and legumes that will tolerate these stresses, providing the basis for profitable and sustainable livestock production on lands that are "marginal" for crop production. The foundation of plant breeding is genetic variation, which has been observed for nearly all of the major stresses that have presented themselves as challenges for forage breeders. Genetic variation often must be coaxed out of a species by designing the proper challenge and screening method for the plants, such as an acid soil that is sufficiently acidic to cause measurable or observable stress, but not so much as to kill all the plants. For many stresses, it is quite common to find very low frequencies of tolerant or resistant plants, sometimes as low as < 1 in 10,000. For this reason, forage breeding is often a "numbers game" in which genetic improvements are directly proportional to the population sizes and efforts expended. Numerous cultivars have been developed and released to the public, often expanding the geographic range and broadening the environmental circumstances under which a forage species can be used for livestock production.

Key Words: forage breeding, genetic variation, stress tolerance, adaptation

0315 Improving soil health and productivity on marginal lands using managed grazing livestock.
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Beyond grazing, managed grasslands can provide ecological services with indirect and direct economic benefits that offer an incentive for multi-functional uses that provide the opportunity to increase available grazing lands. Increasing biodiversity of the plant community may maximize primary production by optimizing utilization of available light, water, and nutrient resources, enhance forage nutritive value for grazing livestock, improve nutrient retention while reducing nutrient leaching or loading in surface run off, enhance stability of

production in response to disturbance, increase soil organic matter, reduce invasion of exotic species, and provide wildlife feed and habitat. Strategically managed grazing may increase biodiversity of cool season pastures by creating disturbance in the established plant community through diet selection and treading as well as increased nutrient cycling and dispersal of plant seeds. Soil organic matter will increase carbon and nutrient sequestration and water-holding capacity of soils and is greater in grazed pastures than land utilized for row crop or hay production. Studies evaluating the effects of grazing management on soil organic matter in the eastern and central United States are limited. However, greater soil organic matter has been observed in cool season pastures grazed by management intensive than continuous grazing or grazed by mob or strip grazing than ungrazed grasslands. In addition to organic residues, pasture forages provide roots that produce macropores mitigating compactive forces on soils. The reduced soil compaction and increased surface structure provided by plant shoots and residues increase water infiltration. Therefore, water infiltration in cool season pastures managed to maintain 10 cm residual height did not differ from ungrazed pastures, which limits nonpoint-source pollution of surface water resources and provides resilience to floods and droughts. Through increased diversity of the plant community, productivity of selected species, and nutritive quality of the forage with alterations of habitat structure, grazing systems can be developed that enhance habitat for wildlife and insect pollinators. Although grazing management may enhance the ecological services provided by grasslands, environmental responses are controlled by variations in climate, soil, landscape position, and plant community, resulting in considerable temporal and spatial variation in the responses. Furthermore, a single grazing management system may not maximize both forage quality for grazing livestock and each of the potential ecological services provided by grasslands. Therefore, production and ecological goals must be integrated to identify the optimal grazing management for an individual site.

Key Words: grazing, biodiversity, ecological services

0316 Optimizing the use of fibrous residues in beef and dairy diets. J. C. MacDonald*, G. E. Erickson, P. J. Kononoff, and T. J. Klopfenstein, *University of Nebraska, Lincoln.*

Increased corn prices over the past decade have altered land use away from traditional forage in favor of corn. Accordingly, beef and dairy producers have had to adopt non-traditional forage resources into their production systems, many of which have become available as a result of increased corn production. Byproducts of the wet and dry milling industries have been used to replace both corn and forage in beef and dairy diets. Byproducts containing corn bran have large amounts of readily digestible hemicellulose. The use of byproducts may increase milk production, ADG, and G:F in dairy, beef growing, and beef finishing diets, respectively. In beef finishing diets, byproducts allow for use of low quality forages or partial replacement of traditional forages with minimal losses in ADG or G:F by formulating for equal NDF concentrations. Corn residues have become more available due to increases in corn acres and yield. The individual plant components (i.e., husk, leaf, stem) vary in fiber digestibility (NDF digestibility estimates = 40.5%, 31.4%, and 0.6% ± 0.8 for husk, leaf, and stalk, respectively). Selectivity for husks and leaves by grazing cattle likely improves their performance. New technologies that allow for selective harvesting of husk and leaf may result in a higher value feed product. Alkaline treatment is another technology that may improve the feeding value of residues. Concentrations of up to 20% harvested corn residue treated with calcium oxide may be included in finishing diets with an average of 2.3% reduction in G:F when diets contain 40% wet or modified distillers grains. Conversely, when untreated corn residues are included in similar finishing diets, G:F may be reduced by 20%. Calcium oxide treated residues included in beef growing diets increases DMI and ADG without significant improvements in G:F. Calcium oxide treatment of corn residues has been evaluated in dairy diets by replacing corn or corn silage with variable results. Harvesting corn silage rather than separate harvest of corn grain and residue may allow for greater total net energy per acre to be captured. The use of wet and modified corn milling byproducts enhances the use of corn silage in finishing diets. While G:F may be reduced, feeding greater concentrations of corn silage may be economical. Efficient use of non-traditional fiber sources, like corn milling by products and corn residue, are critical to the future viability of ruminant animal production.

Key Words: alternative fiber sources, corn milling byproducts, corn residue