The symposium was held at the Joint Annual Meeting of the American Dairy Science Association, the American Society of Animal Science, and the Canadian Society of Animal Science in Kansas City, MO, July 20 to 24, 2014.

The purpose of the symposium was to explore how the efficiency of beef and dairy production on marginal lands and using marginal-quality harvested feeds can be improved. In the future, grazing and forage production will be relegated to more marginal land and confinement feeding systems will be increasingly based on fibrous byproducts. Four invited presentations were planned to explore 1) strategies to improve the efficiency of production systems using grazing beef and dairy cattle, 2) application of improved grazing management to improve long-term productivity through improved soil health and associated ecosystem services, 3) advances in the use of fibrous byproducts with a focus on the use of corn crop residues, and 4) selection of new forage species for improved productivity on marginal lands.

The symposium began with a presentation by J.T. Mulliniks (University of Tennessee, Crossville) and co-authors that considered strategies to improve the efficiency of production in beef and dairy grazing systems (Mulliniks et al., 2015). The paper considered grazing management strategies as well as the importance of animal nutritional strategies and environment × genetic interactions on system productivity. The authors discussed how emphasis in grazing-based production systems is shifting from the primary focus of high product output toward enhanced system efficiency where both output and input are considered. Recent emphasis on decreasing the level of harvested and stored feed inputs, improved use of grazed forages, and reduced level of energy and protein supplementation were stressed. Research presented showed that small changes in animal management, including the reduction of feed inputs, can lead to significant improvement in lifetime productivity of beef cows. Improved grazing management through more frequent pasture rotation has been proposed as a mechanism to improve the output of pastures and rangelands, but the authors point out that many research studies refute the importance of grazing management to long-term system health, with many studies showing that achieving a conservative stocking rate may be more important than the grazing management system. Authors suggest this may be due to artificial rigidity of research designs that do not allow for reactive and adaptive management that is necessary in the management of complex dynamic systems. The authors finished the paper with a discussion of how level of “genetic merit” of animals impacts the productivity of the system. A contrast of beef cows from New Mexico and Tennessee illustrated that despite much higher genetic merit of cows in Tennessee, necessitating a high feed input system to match their nutritional needs, system productivity and efficiency for Tennessee cows did not differ considerably from cows in New Mexico. The ability to enhance production efficiency through improved forage resource management is important for improving beef and dairy production.

The second presentation, by J.R. Russell (Iowa State University, Ames), covered the use of managed
grazing to improve soil health and grassland system productivity (Russell and Bisinger, 2015). There has been a net loss of grazing lands across the United States in recent decades, especially related to recent conversion of grasslands to row crops across the midwestern United States. Loss of highly productive grasslands makes management of marginal land critical to future ruminant production. Management of grazing lands also needs to consider additional ecological services provided by grassland in addition to livestock grazing including carbon sequestration, soil and nutrient retention, and wildlife habitat. Grassland systems generally result in greater carbon sequestration compared with ungrazed or cropping systems, but these changes occur slowly, making long-term studies critical to determine sequestration rates. Species diversity may or may not benefit yield or carbon sequestration, but rotational grazing to improve species richness will generally make systems more resilient to environmental stresses and will have benefits to wildlife. Systems with the greatest benefit to wildlife may require long rest periods resulting in overmaturity in desirable forages, reducing productivity of the grazing animals. Grazing will generally increase soil bulk density and reduce water infiltration, but grazing to maintain a high level of OM groundcover will help overcome reductions in infiltration rate. Although long term, integrated studies are needed to understand the complex relationships between grazing livestock; systems that use short grazing episodes combined with long rest periods overcome many of the negative impacts of grazing animals in the grassland environment.

The third presentation, by J. C. MacDonald (University of Nebraska), considered implications of recent shifts from perennial forage crops to row crops across the midwestern United States on beef and dairy production systems (Watson et al., 2015). The loss of traditional perennial forages has been concurrent with an increased availability of cereal crop residues, especially corn residue. Grazing by beef cattle is considered by the authors to be the first and best use of corn residues. When appropriate stocking rates are applied, beef cattle, cows, and growing calves will consume the more digestible plant parts (leaf and husk) and leave the less digestible parts (stem and cob), thereby providing the benefits of organic residue to the soil system. In situations where corn residues cannot be grazed, they can be harvested and treated with CaO to improve digestibility. Recent use of CaO for treatment of fibrous residues has proven to be effective at improving digestibility while overcoming some of the logistical and safety problems with the use of other chemical treatments, such as anhydrous ammonia and sodium hydroxide. Economic benefits of treatment of corn residues with CaO will depend on the price of corn, but the material can be effectively incorporated into diets for beef cows, growing and finishing cattle, and lactating dairy cattle.

The organizing committee regrets that the fourth paper was not presented due to health of the presenter at the time of the symposium. The abstract submitted (Casler, 2014) summarizes considerations for breeding forage plants to be productive on marginal landscapes. There is substantial genetic variability within any population of plants that can impact their survival and productivity under stressful environments. Use of sufficiently harsh conditions and enough numbers of plants can help identify strains that are more resistant to these conditions. Continuous selection and release of more widely adapted cultivars will lead to better forage productivity in marginal environments. This topic deserves attention in future discussions on improving agricultural productivity on marginal lands.

Loss of prime grassland to row crops and other land uses is shifting attention to the management of marginal landscapes for grazing and the use of fibrous crop residues for mixed diets. Meeting future food needs while maintaining ecological balance on grassland and grazed cropland will require additional long-term studies with integrated approaches that consider both productivity and economics of the grazing animal and the impact on ecological services provided by grasslands. Improved understanding of how managers can adaptively interact with these highly dynamic systems will be critical in maintaining overall system efficiency.

LITERATURE CITED


