Beef Species and Ruminant Nutrition Joint Symposium: Cow Size, Genetics, Management and The Beef Industry

25 Management and genetic factors affecting efficiency of cattle in a grazing environment. A. J. Roberts*, J. T. Mulliniks, R. C. Waterman, T. W. Geary, L. J. Alexander, M. K. Petersen, and M. D. MacNeil, *USDA-ARS, Fort Keogh Livestock and Range Research Laboratory, Miles City, MT.*

Much of current efforts to improve efficiency in cattle use measures of individual feed intake in combination with weight gain as an indication of efficiency. This approach provides pertinent information concerning efficiency during the growing phase, but the relationship to cow efficiency remains to be determined. Efficiency in grazing cows is much more complex, especially when considering input and output traits associated with efficiency as functions of genetics and environmental factors, and interactions of these factors. The most critical output influencing efficiency of beef cattle production is reproductive rate, which is a cumulative process requiring years to establish. Nutrition and management components of environment are more complex in range settings and subject to greater seasonal and annual variation than in confined settings relying solely on harvested feed with greater homogeneity. Methodology to measure feed intake while grazing under range conditions are lacking. Seasonal and annual variations in quantity and quality of forage can result in greater distinctions between biological and economic efficiency in the cow-calf phase compared with other segments. For example, cows that consume more calories during the growing season and gain sufficient weight to exist on less harvested feed inputs during winter may require less total economic input than cows with greater biological efficiency that consumes less during the growing season, but require more calories from harvested feed later. Efficiency of beef cattle production requires a balance between nutritional inputs and prolonged optimal output. A provocative question to consider is whether traditional approaches of providing sufficient feed to a herd of cows to achieve a relative high rate of reproduction results in improved efficiency or not? Is this analogous to selecting a type of cattle and managing the environment to sustain the type? What happens when cattle are managed corresponding to restriction imposed by a limited environment and provided relatively minimal inputs rather than feed for a desired level of production associated with a resource rich environment?

Key words: genetics, management, efficiency

26 Genetics of postweaning performance of beef cattle on forage. M. A. Brown*[1], J. W. Holloway[2], D. L. Lalman[3], C. Dobbs[3], and S. M. Clifton[4], [1]*USDA-ARS, Grazinglands Research Laboratory, El Reno, OK,* [2]*Texas AgriLife Research, San Angelo,* [3]*Oklahoma State University, Stillwater,* [4]*Redlands Community College, El Reno, OK.*

Increases in the costs of feed grains have revived interest in increasing use of forages to either market as forage-finished beef or to produce heavy calves that will finish on less grain. However, little is known about the interactions of animal genetics and grazing environment that allows the most efficient use of resources and has the best potential to be economically efficient. Determination of the optimal combination of animal genetics and production environment requires that the target end-points of production are well-defined and it requires knowledge about available animal genetics and the intended production environment. Animal genetics is loosely defined by rate of maturing, milk production potential, and level of tropical adaptation. In addition, knowledge of breed combination, gender, and genetic merit is helpful. Environmental effects that must be considered include nutritional value of the forage, climate, geography, time, and management. With this information, robust systems can be developed considering the interactions of environmental effects, interactions of genetic effects, and the interactions of genetic and environmental effects. Not only do these systems need to appropriately match genetics and environment, they need to be low-capital systems that are simple to implement . Attributes of animal genetics that might be desirable include efficiency of forage utilization, adaptation not only heat and cold conditions but also adaptable to rapid changes in climate. To fit within the current commodity beef system, it is desirable that cattle in these systems marble early with respect to their mature weight, and that they have sufficient growth to produce acceptable carcass weights by 18 to 24 mo of age. It seems reasonable that selection of appropriate genetics will match frame size to forage quality with lower quality forages requiring more moderate frame size. The use of crossbreeding in these systems will require a closer evaluation of genetic effects. The incorporation of tropical adaptation into efficient forage-based beef production systems will be dependent on forage quality, climate, and pressure from external parasites.

Key words: beef cattle, forage, genotype x environment

27 A historical perspective on the influence of the beef industry on mature cow size. B. McMurry*, *Cargill Animal Nutrition, Minneapolis, MN.*

Between 1975 and 2005 efficiency as measured by pounds of beef produced per beef cow increased dramatically. Driven by technological advancements in nutrition, health, reproduction, growth physiology, breeding and genetics, weight gain increases were realized in every industry segment, Calves weaned heavier, stocker and background cattle gained more rapidly, average daily gain and feed conversion in feedlots improved than previous to 1975. During the 30-year period carcass weights of steers and heifers increased 144 and 194 pounds, respectively. The average steer and heifer carcass weights in 1975 were 673 and 556 pounds, by 2005 they had reached 817 and 750 pounds, respectively. Calculated live weights increased for steers and heifers, respectively from 1068 and 869 pounds in 1975 to 1297 and 1172 pounds in 2005. Genetics of European breeds and the advent of EPDs underpinned growth and carcass weight increases. The introduction of faster-growing, later maturing breeds and heavy selection pressure toward growth also had an impact on the US beef cow herd. Selection criteria favored higher growth rates and EPDs for yearling weight, which are highly correlated with mature weight. Consequently, from 1975 to 2005 carcass weights of bulls and cows increased 223 and 146 pounds, respectively. Average bull and cow carcass weights in 1975 were 682 and 475 pounds, by 2005 they had reached 905 and 621 pounds, respectively. Calculated live weights at harvest increased for bulls and cows respectively from 1047 and 1340 pounds in 1975 to 1350 and 1769 pounds in 2005. Additionally during this period, to improve weaning weights, cow/calf producers selected for increased milk production, and, along with increased mature weight, raised the average beef cow's forage dry matter requirements by approximately 25%. During this same 3year period the producing beef cow population declined 13.4 million head or 28.6%, however total DM required to support the US cowherd only declined 6% (from 186 million to 174

million tons); the impact of increasing mature size and milk production. Consequently, limited forage resources constitute a significant barrier for increasing beef cow inventories and domestic beef supplies.

Key words: mature size, beef cattle, efficiency

28 Conclusion: Cow size and keeping perspective. R. H. Pritchard*, *South Dakota State University, Brookings.*

There are enumerable considerations to be accounted when idealizing mature cow weight (MW). Some inputs such as bulls, vaccines, labor are fixed per cow, regardless of MW and cannot be overlooked. Oftentimes we evaluate cow size by creating 2 component production ratios that are considered efficiencies. We express WW per cow or WW per cow BW and get different rankings. Divide these ratios by calving interval and rankings change again, depending on a production environment. Rankings created by using efficiency ratios to identify optimum MW will vary with the nutritional environment, management inputs, and climatic stressors. Alternatively we could work backward from a desirable carcass weight to determine an appropriate cow size. If 385 kg is an appropriate carcass weight, then the cow MW weight may be 580 kg. This average may not be ideal or justifiable in all production situations and includes many assumptions. It is subject to correction (lower) for the use of anabolics; higher for high growth genetics used in an accelerated production system; or lower for progeny reared in a deferred production system. Declining cow numbers have led to lighter and especially younger feeder cattle placements in feedlots. This has created pressures that ultimately increase cow MW. How the feedlot industry responds to greater competition for corn may elicit new influences on the direction of cow size.

Key words: beef, cow, size