WSASAS Symposium: Growing Beef Cattle: The future of stocker/ backgrounding systems in beef production

598 Improving the production, environmental, and economic efficiency of the stocker cattle industry in the Southeastern United States. P. Beck*[1], M. Anders[2], B. Watkins[2], S. Gunter[3], D. Hubbell[4], and S. Gadberry[5], *[1]University of Arkansas, Southwest Research & Extension Center, Hope, [2]University of Arkansas Rice Research & Extension Center, Stuttgart, [3]USDA-ARS Southern Plains Range Research Station, Woodward, OK, [4]University of Arkansas Livestock & Forestry Research Station, Batesville, [5]University of Arkansas Cooperative Extension Service, Little Rock.*

Grazing small-grain forage can be a profitable "2nd crop" for grain producers and an opportunity for retained ownership for cow-calf producers. The costs of conventional tillage and movement of soil nutrients into streams and water ways creates a need for sustainable production practices. Systems research at the Livestock and Forestry Research Station near Batesville, AR and the Southwest Research and Extension Center near Hope, AR has been conducted over a 9-yr span to characterize the effects of pasture systems on forage production, animal performance, soil quality, water runoff, and economics of stocker cattle enterprises. Compared with both bermudagrass or toxic endophyte-infected tall fescue, gains of growing cattle are increased by 80% with non-toxic endophyte-infected tall fescue and 150% with small-grain forages. Producers with spring-calving cowherds can utilize these improved forages to accelerate stocker programs with retained calves. Economic analysis indicates a 99% improvement in net returns for producers retaining ownership of calves with these production systems. Rainfall simulation indicates that runoff volume and nutrient load does not differ between conventionally tilled fields and no-till fields in the spring before tillage when surface cover is similar. In the fall following tillage operations conventionally tilled fields had 4-times greater runoff, 1.9-times greater N, and 3.2-times greater P leaving the field in runoff compared with no-till. Total natural rainfall runoff from conventionally tilled wheat fields were 2-times greater than that from no-till fields with 2.5 cm rainfall events yet were 4-times greater with 6.25 cm rainfall events. Soil analysis shows that soil aggregate content was greater in no-till compared with conventional till, indicating greater soil porosity, improved water infiltration rate, and reduced erositivity of soil. Carbon content of no-till soils was 50% greater than conventional tillage indicating increased C sequestration. Together these studies show that production systems can be designed that provide improved production economics, increase soil quality and C sequestration, and reduced nutrient loads of streams and water ways that also do not decrease productivity of pastures.

599 Growth, development, and the expression of genes in marketable tissues. P. A. Lancaster*[1], E. D. Sharman[1], M. A. Vaughn[2], C. R. Krehbiel[1], G. W. Horn[1], J. D. Starkey[2], and U. DeSilva[1], *[1]Oklahoma State University, Stillwater, [2]Texas Tech University, Lubbock.*

Increasing adipose tissue development during the stocker phase of production could increase value and efficiency of beef cattle production. Our objective was to evaluate rate of gain on growth and development of adipose tissue, and skeletal muscle characteristics in growing cattle. Two experiments were conducted where Angus cross-bred steers were grown on winter wheat pasture or dormant native range to achieve divergent rates of gain. A subset of steers was harvested at similar age (Exp. 1) or BW (Exp. 2) at the end of the stocker phase. During the stocker phase, ADG ranged from 0.19 to 1.37 kg/d in Exp. 1 and 0.49 to 1.41 kg/d in Exp. 2. At the end of the stocker phase, steers were fed a common finishing diet to a rib fat thickness of 1.27 cm. In Exp. 1, marbling score at intermediate harvest increased linearly with ADG, whereas rib fat thickness increased at an increasing rate. In Exp. 2, there was not a strong relationship between ADG and marbling score or rib fat thickness. In Exp. 1, there was no treatment × adipose tissue interaction for lipogenic gene expression indicating that each adipose tissue responded similarly to the treatments. Lipogenic gene expression increased with increasing ADG. There was a significant ($P < 0.05$) treatment × adipose tissue interaction for adipogenic gene expression, with no difference in subcutaneous adipose tissue (SC), but in intramuscular adipose tissue (IM) PPARy mRNA expression increased and DLK1 mRNA expression decreased with increasing ADG. In contrast to Exp. 1, there was a treatment x adipose tissue interaction for both lipogenic and adipogenic gene expression in Exp. 2, where expression of FASN and PPARy mRNA expression increased with increasing ADG in SC, but not IM. In Exp. 2, low rates of gain tended to increase satellite cell differentiation, Type 1 (oxidative) muscle fibers, and capillary density, as well as final marbling scores. These data indicate that rate of gain to similar BW affects metabolic pathways in SC and IM differently than rate of gain to similar age, and that low rates of gain result in skeletal muscle characteristics that are more favorable for marbling deposition.

Key Words: adipose tissue, growth rate, stocker cattle

600 Opportunities for grazing cattle systems. J. C. MacDonald*[1,2] and F. T. McCollum[3], *[1]Texas AgriLife Research, Amarillo, [2]West Texas A&M University, Canyon, [3]Texas AgriLife Extension, Amarillo.*

Yearling production systems serve several purposes in the beef cattle industry. Utilizing grazed forage resources to grow stocker cattle spreads the feeder calf supply across the calendar year from a national calf crop that is largely fall-weaned. Grazed forage resources have historically reduced the cost of gain over the lifetime of a feeder calf. Yearling production systems allow producers to fully utilize forage resources while providing flexibility to stock and manage grazed forages. Finally, yearling systems have increased beef supply by increasing carcass weights relative to feeder cattle entering the feedlot at lighter BW. Dynamics of agricultural enterprises have changed over the past decade and present new challenges and opportunities for yearling production systems. The size of the national cow herd has declined which increases competition for feeder calves. Volatility of commodity prices has increased which exposes producers to greater risk and often narrower margins. Increasing societal awareness of agricultural production practices will cause more scrutiny of the industry. However, the functional role of yearling operations in the US beef industry has not changed. The supply of byproduct and alternative feeds provides opportunities to increase production while cattle are grazing. The reduction in cow inventory may result in increased forage resources available for yearling systems, as well as the need for feeding entities to capture future supplies of feeder calves. Increased cooperation between the stocker and finishing segments may be the result. New information will be required to ensure the future success of these production systems. The upper BW limit of stocker cattle entering the feedlot has been discussed, but not clearly defined. Residual effects of stocker management on feedlot performance and beef quality will increase in importance. The age old issue of compensatory gain and body composition at feedlot entry will need to be clearly defined.

Despite reduced inventories relative to feeding capacity, higher feed commodity costs, relatively lower costs for grazing, and the continued need to spread the harvest of finished cattle across the year will ensure the role of stocker production in the future.

Key Words: grazing cattle, yearlings, beef production systems

601 Opportunities for drylot backgrounding systems in the beef industry. B. P. Holland,* *Department of Animal Science, South Dakota State University, Brookings.*

Traditional feedstuff prices, with roughages costing a premium to grains on an energy basis, resulted in the proliferation of cattle feeding and reduced the placement weight of cattle in feedlots. However, recent increases in the cost, and price volatility, of feedstuffs, inputs, and feeder cattle have put a strain on commercial feeders. Although roughage-based backgrounding and grazing programs often result in decreased G:F in subsequent finishing, increasing the weight of feeder cattle through backgrounding results in decreased days on feed and a potentially more economical system. In some scenarios, cattle can be grown on higher-roughage, lower-energy diets at a cost-competitive advantage to high-concentrate feeding. This is especially true in situations where a significant portion of feed is produced on-site and does not require outside purchase. Improvements in plant varieties allow the production of higher yield and quality forages for lower costs, and some available by-product feeds seem to have positive associative effects with roughages. These factors, combined with cattle that have superior growth potential, allow for high rates of gain on relatively low quality feeds. Traditional wisdom may have suggested purchasing feeder cattle with less condition, hoping to achieve compensatory growth in the feedlot. Because of this, there is a perceived upper gain limit for backgrounding cattle. However, in recent studies, fatter steers entering feedlots have been more efficient during finishing. This may be be indicative of backgrounding diet and intake having more impact on feedlot performance than empty body fat. As a result, the acceptable ADG range for backgrounding programs is increased. Viability of feedlots will depend on a steady supply of feeder cattle, and a greater flexibility by backgrounders to produce feeder cattle will reduce inefficiencies and risk associated with keeping lots full. This paper will highlight potential scenarios in which drylot-based backgrounding programs can fit into the beef industry.

Key Words: backgrounding, cattle, feedlot