BEEF SPECIES: **MAKING MORE BUT USING LESS: THE FUTURE OF THE U.S. BEEF INDUSTRY WITH A REDUCED COW HERD AND THE CHALLENGE TO FEED THE UNITED STATES AND WORLD.** ***SESSION 2:*** **THE COW-CALF INDUSTRY**

0121 Where can we support more cows? Overview of the beef cow herd and land use. J. A. Paterson*, *National Cattlemen's Beef Association, Centennial, CO.*

The U.S. cow herd population has declined from 45 million in 1975 to 29 million in 2014. Record-setting drought in the Southern United States caused beef cow herd liquidation, fewer calves on cereal grain pastures, and more cattle in feedlots. All cattle and calves in the United States totaled 90.8 million head (2012) and was the lowest inventory since 1952. The recent drought caused cow numbers to decline by 13% in Texas, 14% in Oklahoma, and 11% in New Mexico. The consequence of low supply has been the closure of packing plants in Texas and California. When there is a return to normal pasture conditions, there will be more of a willingness to increase heifer retention and increase the nation's cow herd inventory. How many beef cows does the beef industry need to remain sustainable? It has been predicted that the cattle industry may not grow beyond 32 million cows because of the availability of growth-promoting technologies, improved cattle genetics, nutritional and health management practices, and new generation antibiotics and anthelmintics. The reasons for future expansion include better pasture conditions in most areas of cow-calf country, higher feeder calf prices, record high beef prices, lower corn prices, and lower debt in mature ranching operations. The reasons for not increasing cow numbers include advancing age of ranchers, EPA regulations in the Eastern United States, Forest Service and BLM regulations on public lands in the West, and continued fear of drought. A significant increase in the beef cow herd is not expected until 2016 or 2017. With expansion likely underway, it will be 2017 or 2018 before a trend of larger fed cattle supplies will be measured. As a percentage of the nation's cow herd population, the Great Plains increased from 27 to 34.2% and the Corn Belt increased slightly from 13.3 to 14%, whereas the Southern Plains (-3% units), West (-1.2% units), Southern Plains (-3% units), and Southeast (−4.4% units) have all decreased. A decrease in cow numbers is predicted to be more pronounced in the states of Illinois, Indiana, Iowa, Minnesota, Missouri, Kentucky, and Tennessee, where competition with crops is greater. As a result, it is projected that an increasing share of the total beef cow herd will be located in the Great Plains, with a smaller increase in the Western Corn Belt.

Key Words: cattle, drought, retention

0122 How can we improve replacement heifers as we rebuild the cow herd? S. L. Lake*, *University of Wyoming, Laramie.*

The beef industry is currently experiencing a climate that few, if any, generations have ever encountered. Beef demand is soaring, both nationally and internationally, cattle prices continue to break all-time highs, and environmental conditions in many regions of the United States have put a premium on calves and replacement females. One of the areas of greatest potential to increase profitability and sustainability in livestock operations is to capitalize on the heifer enterprise. However, to rebuild the national cow herd in the current economic climate, producers and scientists are going to have to increase the use of technology and outside-the-box thinking to remain competitive in the global market. Applicable research is needed to answer relevant production questions that will enable the U.S. cow herd to grow and remain competitive in global markets.

Key Words: heifers

0123 Can we improve cow efficiency or manipulate feeding strategies to reduce inputs? H. C. Freetly*, *USDA-ARS, U.S. Meat Animal Research Center, Clay Center, NE.*

In most temporal environments, nutrient availability does not match the nutrient requirement of the cow; and for part of the year, nutrient availability is less than what is required to keep a cow at maintenance. Intensively managed agriculture production systems use mechanically harvested feed to fill the deficit between nutrient availability and nutrients required to maintain cow weight. These harvested feeds are often expensive. In open and pregnant cows, the energetic efficiency of allowing cows to lose and gain body energy does not differ from holding cows at constant body energy. This common energetic efficiency allows for the development of management strategies that allow cows to decrease BW during periods of low nutrient availability and subsequently gain BW when grazed forages are available. However, these strategies do not decrease the total energy required by a cow in a production cycle. Production efficiency does not differ between cows that lose BW in the second trimester and regain BW in the third trimester, and cows managed to maintain maternal BW throughout pregnancy. The nutrient management strategy chosen for the pregnant cow may influence productivity of the subsequent generation through developmental programing. The timing of nutrient restriction during pregnancy may be a trigger that alters lifetime productivity of heifers that have experienced a restricted nutrient environment in utero. Nutrient restriction in early pregnancy has been associated with reduced fertility in daughters; however, heifers born to cows that receive elevated nutrients in the third trimester breed earlier than heifers born to cows fed to maintain maternal BW. Recent emphasis on the development of tools to select for feed efficiency in the growing animal may impact subsequent performance of the cow. Residual feed intake (RFI) is a popular measure of feed efficiency in growing and lactating cattle, and EPD are being developed to allow for its selection. One of the outcomes of selecting for lower RFI is a decrease in feed intake. The consequence of selecting for low RFI in growing cattle in the cow herd needs to be explored. The USDA is an equal opportunity provider and employer.

Key Words: beef, cow, nutrition

0124 Can we build the cow herd by increasing longevity of females? A. Roberts*[1], M. Petersen[1], and R. N. Funston[2], [1]*USDA-ARS Fort Keogh Livestock and Range Research Laboratory, Miles City, MT,* [2]*University of Nebraska, West Central Research and Extension Center, North Platte.*

Increasing longevity of beef cows by decreasing proportion culled due to reproductive failure reduces the number of replacements needed to sustain a constant herd size. Rate of reproductive failure varies with cow age, where failure in cows younger than 4 yr of age can be twofold greater than in cows 4 yr and older. In addition, BW of cow and calf at weaning also increase as cows advance from 2 to 5 yr of age. Cumulative effect of improving retention in young cows is greater production efficiency through decreased replacement rate and a consequent change in age structure of the herd toward a greater proportion of cows at their maximal production potential for calf BW at weaning and cow BW at time of culling. Calculations from cow age-specific culling and BW data from commercial and research herds indicate that reducing replacement rate from 20 to 15% can result in annual increases of 20% of total calf crop weight and 10% in cull cow BW. Although improving longevity can foster increases in efficiency, genetic advancement in longevity is challenging, as it is the sequential culmination of the annual repetition of numerous discrete physiological processes, each ending in a qualitative response, including puberty, ovulation, transport of male and female gametes, fertilization, implantation, pregnancy maintenance, parturition, and calf survival. Successful completion of 1 process is the prerequisite to evaluate subsequent processes. Comparisons among different biological types of cattle maintained under varying levels of nutritional inputs provide evidence for genetic variation in prioritization of nutritional partitioning among production traits (i.e., milk, growth, and reproduction) and the apparent nutritional threshold required for initiation of reproductive processes indicating genetic-by-nutrition interactions. This is in contrast to traits for which EPD exist, where genetic-by-environmental interactions are not substantial. The impact of nutrition on reproduction has been extensively studied. Results for this research led to recommendations that heifers and cows be fed to a threshold BW or BCS to ensure reproductive success. This is a process that basically overrides nutritional interactions, resulting in reproductive failure, thereby minimizing selection of animals better suited for sustained reproductive function under limited nutrition. Rearing and managing cows under nutritionally limited environments can result in adaptation leading to relatively high levels of reproduction with lower levels of input. These management strategies may result in fetal programing that improve chances for longer retention in their offspring.

Key Words: beef cow, efficiency, longevity

0125 Can we develop a cowless cow herd? Beef production without mature cows. G. E. Seidel*, *Colorado State University, Fort Collins.*

A beef production system is being studied that eliminates the mature cow herd. Nulliparous heifers are bred with sexed semen enriched to > 90% X-sperm, so most heifers replace themselves with a heifer calf. Weaning will occur at about 100 d of age, after which the dam is fattened for ~2 mo and slaughtered at 28 to 30 mo of age. Research objectives are: 1) determine profitability by evaluating capital requirements, expenses, and income; 2) evaluate ways of initiating such a program, e.g., starting with weaned heifer calves, open heifers, or bred heifers; and 3) determine if carcasses produced are of a quality that avoids market discounts. There is no cow herd to feed year round and all cattle are growing. In traditional cow-calf systems, ~50% of consumed feed energy goes to metabolic maintenance of mature cows with no accretion in meat. The other ~50% is for calf replacement-heifer maintenance, growth, and fattening, and for cow pregnancy and lactation. In the new system, all cattle are growing, so a high percentage of feed energy goes to growth. The net result is a significant decrease in feed required per pound of beef produced, manure, greenhouse gas production, and excretion of nitrogen and phosphorus. Fringe benefits include: eliminating low pregnancy rates in first-calf heifers that are lactating and still growing; minimizing health problems, such as cancer eye, foot and leg ailments, mastitis, etc., which are more prevalent in older cows; almost eliminating bull calves needing castration; and decreased generation interval. Fringe costs include: increase in dystocia if all calvings are from heifers, which is expected to be minor, because heifer calves average 2 kg lighter than bull calves at birth, and calving ease AI sires will be used. Early weaning requires increased management and heifers gain weight less efficiently than steers, which can be compensated by using anabolic implants. This system is not entirely self-sustaining because of: imperfect gender-selected semen, inevitable deaths, and non-pregnancy or late pregnancy of some heifers. Thus, to maintain herd numbers, 25 to 30% of heifers need to be replaced annually from outside of the system. Fringe benefits appear to outweigh fringe costs, but the main advantage is that more beef can be produced with given feed resources.

Key Words: efficiency, heifer beef, sexed semen