160 Effects of cow-calf management strategies on environmental footprints of beef cattle production in the United States. Jessica Baber[1], Tryon Wickersham[1], Sara Place[2], Al Rotz[3], [1]*Texas A&M University,* [2]*Elanco,* [3]*USDA-ARS*

As baseline environmental footprints of beef cattle production are established, mitigation strategies through cow-calf dietary and production management can be evaluated. Our objective was to quantify environmental benefits obtained by beef cattle production through implementation of cow-calf management strategies. Ten cow-calf management strategies were identified related to animal performance, feed management, or pasture management. Each strategy was incorporated into 20 representative beef cattle production systems and simulated with the Integrated Farm System Model (IFSM) using local soil and climate data. A combined strategy was identified based upon the results of individual strategies, which was also simulated with IFSM. Farm-gate life cycle assessment was used to estimate carbon (C) footprint, fossil energy use, blue water use, and total reactive nitrogen (N) loss for all production systems and strategy combinations. Averages of each environmental metric for the cow-calf sector were based on weighted averages of regional cow inventory data. National estimates of environmental impacts were based upon number of cattle represented by each production system. Feed efficiency, terminal cross sires, and reduced cow body size strategies had greatest effect on C footprint (reductions of 1.31, 1.15, and 0.71 kg CO_2e/kg CW, respectively from a baseline of 16.34 kg CO_2e/kg CW). Calving season, reduced cow body size, and improved fiber digestion increased fossil energy use (7.8%), while improved feed efficiency and calf implant use reduced fossil energy use (7.4%). Blue water use was reduced by a greater extent from improved feed efficiency (4.6%) and reduced cow body size (5.3%) compared to other strategies (0.6%). Total reactive N loss was reduced by 7.0 and 6.9% through improved feed efficiency and reduced cow body size, respectively. Combining strategies reduced C footprint (18.2%), fossil energy use (18.6%), blue water use (18.9%), and reactive N loss (16.2%).

Keywords: environmental footprints; mitigation; sustainability

161 Effects of management strategies on environmental footprints of cow-calf production in the United States. Jessica Baber[1], Tryon Wickersham[1], Sara Place[2], Al Rotz[3], [1]*Texas A&M University,* [2]*Elanco,* [3]*USDA-ARS*

Estimates of beef cattle production's national and regional cradle to farm grate environmental impacts have been quantified. As baseline footprints are now established, cow-calf dietary and production management strategies can be evaluated for their capacity to reduce environmental impacts. Accordingly, our objective was to quantify environmental changes from implementing management strategies in cow-calf production. Ten management strategies were identified, with each related to animal performance, feed management, or pasture management. Each strategy was incorporated into a representative cow-calf operation for each of 6 major regions of beef production in the United States and simulated with the Integrated Farm System Model (IFSM) using local soil and climate data. A combined strategy was also identified based on results of the individual strategies, which was simulated with IFSM. Farm-gate life cycle assessment was used to estimate carbon (C) footprint, fossil energy use, blue water use, and total reactive nitrogen (N) loss for all production systems and strategy combinations. Averages of each environmental metric for the cow-calf sector were based on weighted averages of regional cow inventory data. Averaged across all strategies, the reduction in C footprint was 4.1% and fossil energy use was reduced 3.5% for the cow-calf sector. Improved feed efficiency (8.0%) and terminal cross (7.1%) strategies reduced C footprint to a greater extent than other strategies simulated (2.0%). Fossil energy use was reduced by 8.3, and 6.5% from improved feed efficiency and terminal cross strategies, respectively. Early weaning increased C footprint, fossil energy use, blue water use, and reactive N loss by 13.8, 17.8, 20.2, and 12.7%, respectively. The combined strategy, including improved feed efficiency, improved fiber digestion, calf implant use, increased weaning rate, reduced cow body weight, and terminal cross strategies, reduced C footprint (18%), fossil fuel use (18%), blue water use (23%), and reactive N loss (15%).

Keywords: cow-calf management; environmental footprint; sustainability