EXTENSION

Aberdeen Breeds Comparison

January 2023

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Introduction

In a recent study (DeVuyst et al. 2022), we investigated the economic differences in Angus-derived beef cows. Angus, Red Angus and Aberdeen Angus (also called "Low-line Angus) derive from the same original breed but now have significant differences in phenotype and genetics due to selection pressures. We investigated differences in birth weights, calving interval, weaning weights, mature weights and feed expenses across Angus, Red Angus and American Aberdeen-influenced cow herds and how those differences translate into profits.

Bio-economic Model

Producers are assumed to seek to maximize per acre weighted-average expected returns to fixed costs, labor and management from cow-calf production by choosing sire and dam breeds. The model is normalized on acres required per head as pasture acres are fixed for a producer. Even though per head profits might be highest for a large-bodied breed, higher forage requirements and thus lower stocking rates, means fewer heavy-weight cows can be stocked on a given acreage. Total profits can then be higher for lighter-weight cows with lower per head profit but a higher stocking rate.

Regression models were estimated for calf birth weight and calf weaning weights as functions of dam and sire breeds and age and weight of dam. Cow weights were estimated as a function of age and breed. Data from North Dakota State University Dickinson Research Extension Center (DREC) from 2001 to 2018 were used. A cow age distribution model from Bir et al. (2018), was used to weight the distribution of calf weaning weights and revenues based on dam age. Revenues were then averaged across the ten years. Based on the culling model, 19 heifers were retained annually for a 100-head breeding herd. We assumed 85% of the retained heifers bred with the balance culled as feeder heifers .

Feeder calf and cull cow prices from LMIC (2020) and the age distribution model were used to calculate weaned calf, cull feeder heifer and cull cow revenues. Pasture, hay and protein supplementation requirements were calculated using CowCulator (Lalman and Gill 2010). The feed requirement calculations are based on cow weight, stage of gestation/lactation, body condition score and target body condition score . Given the climate in western North Dakota, cows were assumed to graze smooth brome grass pastures for seven months and fed hay for the remaining five months each year. Protein in the form of 20% range cubes was used to supplement protein as required. Rations were computed for each breed by cow age and month of the year, resulting in 360 rations.

Smooth brome grass pasture yields were varied from 1500-2700 pounds per acre (Manske 2018). Using a pasture utilization rate of 25% (Meehan et al. 2020), acres of pasture were computed for each breed and cow age by month under each of the grass yields. Acreage requirements were then multiplied by the age distribution model to generate a weighted-average acreage requirement by dam breed, i.e., acres of pasture per cow. Hay was assumed fed October through March with an 80% utilization rate. Pounds of protein (20% range cubes) fed were computed, assuming a 100%

utilization rate. USDA National Agriculture Statistics data were used for North Dakota pasture lease rates and hay prices (USDA, 2019). Protein (20% range cube) prices were from Stillwater Milling Company (2020).

Biological Modeling Results

While there are several interesting results, we focus only on breed differences here for each of the estimated models. Aberdeen sires had calves born 5.0 pounds lighter relative to Angus sires. Aberdeen dams birthed calves that were 9.4 pounds lighter relative to Angus dams. No difference was observed in calving interval due to breeds. At weaning, Red Angus-sired calves were 15.2 pounds lighter at weaning and Aberdeen-sired calves were 56.8 pounds lighter than Angus-sired calves. Heifer weaning weight was 26.9 pounds lighter than steer weaning weight. Birth weights and weaning weights peaked for 6–7-year-old dams.

Red Angus cows weighed 7.8 pounds more than their Angus cousins at weaning. Aberdeen dams weighed 241 pounds less than Angus dams at weaning. Cow weights peaked at nine years old. Dams with faster growing calves from the previous year had a slightly shorter calving interval.

Economic Modeling Results

As expected, revenue per head has a similar pattern as calf weaning weights. Angus and Red Angus dams earned, on a per head average, more than Aberdeen-influenced dams regardless of sire breed. Both Angus and Red Angus calf revenues and cull revenues were always higher than the American Aberdeen-influenced dams. These results were primarily driven by weights. Heavier Angus and Red Angus-influenced cows weaned heavier calves so both cull cow and calf revenues were higher. The average revenues during the ten-year time period were likely rather high in comparison to other historical returns.

There is one caveat needed. As Aberdeen Angus cows and bulls are smaller framed, there is the possibility of frame score 3 (FS3) calves. Small-framed calves are often discounted in the sale barn. Newport (2013) reported small-framed calves sold for $22 per head less than comparable larger framed calves.

As expected, sire breeds × dam breeds that weaned heavier calves, received higher returns per head. Sire breeds × dam breeds that weighed less required less pasture, hay and protein supplements on average. Regardless of forage yield, Angus-influenced dams brought in the highest returns per head with Red Angus-influenced dams within $20 of Angus dams. Differences in per head returns were driven by simulated calf weaning and cull cow weights. For the DREC herd, Angus sires × Red Angus dams weaned the heaviest calves, weighing a few pounds more than Angus sires × Angus dams and around 60 pounds more than Red Angus sires × Aberdeen dams. These differences in weaning weights account for most differences in per head returns.

However, producers are constrained by grazing acres, so net returns per head is often a misleading measure of profitability. Rather, the ability to generate higher returns per acre is the appropriate metric. Returns per head were divided by the acres required per head to generate returns per acre. When normalized on acres required per head, there are advantages for the Aberdeen-influenced cow bred to Angus or Red Angus sires. The Aberdeen dam bred to a Red Angus sire generated the highest per acre returns with a $3-$4 per acre advantage over an Angus sire. Other Red Angus sire matings were comparable to Angus sire matings. Aberdeen-sired calves had the lowest returns. These matings had the lowest weaning weights, resulting in low per head and per acre returns.

Conclusions and Implications

Using Angus and Red Angus sires, results indicate there are differences in returns per acre across the three cow breeds when measured in the appropriate metric, dollars per acre. Smaller cows bred to Red Angus bulls resulted in the highest returns across all grass yield scenarios, by $1-4 per acre. This mating resulted in the highest weaning weight to cow weight ratios and the lowest feed cost per cow. Although calves weaned from this mating were lighter than calves from Angus-influence and Red Angus-influenced dams, the reduction in feed cost and higher stocking rate offset the lower weaning weight.

A couple of strong caveats are necessary. Feed costs were simulated and not benchmarked to this herd's data. Nutritional requirements for Aberdeen-influenced cows in comparison to other beef breeds have not been established. So, we used standard assumptions for feed intake based on weight and known Angus requirements. However, there is potential that differences in selection pressures have resulted in differences in metabolic efficiency between the three breeds.

Also, a caution is needed regarding sample size: we have one environment. Cows and calves in other environments will perform better or worse in comparison to the environment in western North Dakota. For example, Russell (2014) found that lighter weight cows were economically superior in nutritionally challenging environments. The colder North Dakota environment may favor a larger cow. Data from several locations are necessary to fully weigh the relative economic merits of Angus-derived breeds.

As U.S. beef cow herd weights have steadily increased (Wiseman et al. 2018), there is growing evidence that mature cow size has exceeded the optimal weight for the industry. From cow-calf producer to the consumer, it is reasonable to ask, even speculate, that cow size is heavier than economically optimal. Bir et al. (2018) found lighter weight cows are more profitable than heavier weight cows. Smaller cows require less forage than larger cows, so stocking rates are higher. Aberdeen-influenced herds can assist in downsizing cow size but their genetics might offset the gains from increased stocking rates. Here, our analyses find a small economic advantage with Aberdeen-influenced cows bred to larger framed sires in comparison to Angus and Red Angus cows.

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs and has been prepared and distributed at a cost of 20 cents per copy. January 2023 AF.