

Cattle Business in Mississippi – April 2013 “Beef Production Strategies” article

Putting Average Daily Gain in Context

Jane Parish – Extension Beef Cattle Specialist, Mississippi State University

What is ADG?

Average daily gain (**ADG**) is a performance measure that many beef cattle producers monitor. Average daily gain is simply the rate of weight gain per day over a specified period of time. For example, if a calf weighs 600 pounds on June 1 and later weighs 750 pounds on July 31 of that same year, then it gained 150 pounds in 60 days. Divide 150 pounds by 60 days, and the ADG comes out to be 2.5 pounds per day.

What affects ADG?

Average daily gain is affected by many factors. The animal's diet (including forages, grain-based supplements, mineral and vitamin supplements, and feed additives) is important in determining ADG. Whether or not cattle have received growth-promoting implants or are fed ionophores may notably affect ADG. These technologies are designed to boost ADG on existing diets. For implants to be effective, however, a minimum ADG of around 1.3 pounds per day is needed.

Genetics plays a key role in determining ADG. Continental breeds of cattle generally gain weight more rapidly than other breed groups. Within breeds, expected progeny differences are based on individual genetics and predict growth rate differences among individual cattle. Crossbreeding can be used to capitalize on heterosis (where the calf performs better than the average of its parents) and enhance ADG. The influence of genetics on ADG does not stop there. Cattle genetics and environment interact to affect performance traits such as ADG. Even before a calf is born, the maternal environment and diet affect embryonic and fetal development in such a way that the lifetime performance of the calf-to-be is impacted. So, post-weaning ADG is affected in the womb among other factors.

Why does ADG vary so much?

A wide range of ADG values occur on beef cattle operations. Cows losing body condition and weight after calving have negative ADG for a period of time. Cattle that neither gain nor lose weight have an ADG of zero. These cattle are maintaining their body weight. Positive ADG values indicate that cattle are gaining weight. Throughout the production cycle, mature cattle may experience periods of positive, neutral, and negative ADG. Growing cattle, on the other hand, should consistently gain weight and have positive ADG. Furthermore, minimum ADG thresholds are typically desired for growing cattle, though these targets may change as the calf ages.

Performance targets for ADG must consider production conditions. Declines in the quality of late summer grazing on warm-season perennial pastures often lead to lower ADG during that time of year as compared with grazing earlier in the season when more vegetative forage is available. In addition, the effects of heat stress on cattle are often

more profound in August than in May potentially affecting forage intake, cattle nutrient needs, and ADG. Likewise, extended periods of cold, wet weather may decrease ADG if management changes are not implemented to offset these potential lesser gains.

The class and production status of cattle are also determining factors in appropriate ADG targets. Realistic and economically justified ADG values for developing bulls are obviously greater than those for replacement heifers or mature cows. With calves, the rate of growth tends to slow as they approach maturity compared with earlier growth stages. With heifers, if a breeding weight is targeted, then an adequate ADG over the entire development period is needed to meet the target. However, monthly ADG may vary as the longer-term development period progresses. With cows, both nutrient demands and body weight generally increase throughout late pregnancy as calving approaches. Rapid fetal growth and fluid accumulation during late pregnancy account for much of this weight gain besides any adjustments to body condition score.

Expected market conditions at the beginning and ending of a period over which ADG is determined are very important for determining an appropriate ADG. When market prices for nutritional inputs are relatively low (grain is cheap), then additional supplementation to produce greater ADG may be warranted. When cattle prices are improving, then greater returns may be realized for ADG improvements, justifying investing more to get greater animal gains. If cattle are forward contracted to weigh a certain amount by a particular date, then attaining a target ADG is critical to meet contract specifications and avoid penalties or defaults.

What role does ADG play in gain per acre?

Whereas, ADG indicates rate of cattle growth, it is only one factor in determining gain per unit of land area. Gain per acre is a commonly used performance measure that considers both the output (cattle weight gain) and input (land area utilized to produce that weight gain) sides of the profit equation. Average daily gain only tells the output story. Gain per acre puts ADG in the context of one of the inputs used to produce that output.

Gain per acre is calculated by multiplying the average ADG of a group of cattle by the number of cattle in the group to determine total weight gain of the group over a particular period of time. Then divide that result by the number of acres of land utilized for those cattle. This usually focuses on land used for grazing but can include other land in the operation to get a larger picture of output per unit of land input. Stocking rate (number of cattle grazed divided by total acres grazed) is a component of the calculations. Essentially, ADG is multiplied by stocking rate to get gain per acre.

To achieve a 25% improvement in gain per acre for 80 calves stocked on 40 acres with an ADG of 2 pounds per day for 100 days (i.e., going from 400 pounds per acre to 500 pounds per acre), which one of the following scenarios would be more practical and economically efficient?

- 1) 25% increase in ADG (i.e., going from ADG of 2 to 2.5 pounds per day) at same stocking rate and for same duration
- 2) 25% increase in stocking rate (i.e., going from 80 to 100 calves on 40 acres or from 2 to 2.5 calves per acre) at same ADG and for same duration

Achieving the 25% improvement in ADG in the first scenario might require more supplemental feed, improved forage quality, better cattle genetics, use of implants, or a combination of several of these factors. Alternately, increasing stocking rate by 25% as in the second scenario would require very good management of forage production and utilization. Both scenarios would incur more total costs, and both would realize additional returns from greater total cattle weight to be marketed.

In reality, changing stocking rate and ADG usually occur simultaneously. If grazing cattle are supplemented with grain-based feedstuffs, then both ADG and stocking rate may increase at the same time and both positively contribute to increased gain per acre. Interestingly, incremental increases in stocking rate may increase ADG if pastures are understocked and forage rapidly becomes too mature, but further increases in stocking rate will eventually cause ADG to be less as forage availability becomes limiting to dry matter intake. When ADG and stocking rate changes move in opposite directions, then the overall effect on gain per acre depends upon the magnitude of each change. In practice, stocking rate changes often have more profound impacts on gain per acre than ADG changes, meaning that the percentage change in stocking rate usually exceeds the percentage change in ADG that occurs at the same time.

Why should ADG be monitored?

Monitoring ADG can help identify problems in production. If cattle are underperforming compared with ADG expectations, then investigate why this is occurring. Maybe a health issue is lurking in the background, or maybe the nutritive values of forages are less than expected. Develop reasonable ADG targets, and then monitoring progress toward these production goals. This is a useful exercise if that information is subsequently used to adjust production and marketing decisions. Remember to focus on more than just ADG and the output side of the profit equation. Input use levels affect productivity and enterprise costs. Be sure to balance both aspects of production for improved profitability. For more information about beef cattle production, contact an office of the Mississippi State University Extension Service or visit msucares.com/livestock/beef.