

ON-FARM GENETIC SELECTION FOR FEED EFFICIENCY

INTRODUCTION

The ability to produce more beef with fewer resources is the goal as both the global population and demand for meat sharply increases. As feed costs have climbed to over 70% of the cost of production, skilled labor costs have risen sharply, and consumer demand for increased animal and environmental welfare measures grows, beef producers are under significant economic and social pressure. In the past, feed to gain ratios were the gold standard used to push for more feed efficient animals, resulting in larger animals that often had even greater maintenance requirements. Today, selecting for residual feed intake (RFI) is the best way to produce more feed efficient cattle that reduce costs and increase profit, while doing so in an ethical and sustainable manner. A 10% improvement in feed efficiency can lead to a 43% improvement in profit (Fox et al., 2001), and selecting for low RFI can reduce feed intake by 12%, reduce methane production by up to 30% and reduce manure by 17% (Agri-facts, 2006).

WHAT IS RFI?

RFI is a measure of feed efficiency calculated as the difference between an animal's actual feed intake and its predicted feed intake, for a given level of production (Koch et al., 1963; Basarab et al., 2003). Each animal's predicted feed intake is based on its actual measured performance and size, as compared to its contemporaries. Cattle with low or negative RFI are efficient as they eat less than predicted, while cattle with high or positive RFI are inefficient as they eat more than predicted.

RFI AS A VALUABLE GENETIC SELECTION TOOL

RFI is a moderately heritable trait with a range in heritability of 26% - 58% (Koch et al., 1963; Arthur et al., 2001 a, b; Crews et al., 2003; Schenkel et al., 2004). When RFI is used as a genetic selection tool, the resulting progeny will consume less feed for the same level of production. And, as RFI is independent of growth, body size and other performance traits (Koch et al., 1963), selection for animals with low RFI will lead to reduced feed intake and improved feed efficiency without compromising body size, carcass quality or growth. Improvements in feed efficiency can thus be

selected for and incorporated into a breeding program to produce more efficient offspring.

While RFI testing of bulls is quite advantageous, replacement heifer testing also adds value on-farm and can increase the efficiency of the entire herd. Better herd management relies on better data. Phenotypic information is a critical piece of the puzzle which cannot be understood by simply looking at genetic markers. Rather, the value of the feed intake data that Vytelle provides is the key to keeping genomic indicators accurate. Thus, feed efficiency testing on commercial farms of both bulls and the cow herd can allow for improvements that stack generationally and bring increased value across the supply chain.

LIFETIME PRODUCTIVITY AND EFFICIENCY OF THE HERD ON PASTURE

Although RFI trials are conducted in controlled drylot environments, for relatively short periods of time, their results can offer insight into how an animal will perform within the herd over its

lifetime. Collecting RFI results from animals that will be spending long periods of time in your herd, like replacement heifers slated to become multiparous cows, is especially important because they are expensive to develop and maintain. Choosing to keep the efficient females over the inefficient ones will make a significant impact on the herd's long-term feed requirements and feed costs. Due to the difficulty of measuring dry matter intake on pasture, it is challenging to know for sure whether cattle identified as feed efficient in a drylot environment will continue to be feed efficient while foraging on pasture. Previous studies identified RFI as having moderate repeatability when cattle were on different diets (Crews et al., 2003), suggesting that low RFI animals on drylot will continue to be efficient throughout their lifetimes. Because the trait is independent of other economically viable traits, selection for RFI in replacement heifers will not sacrifice the longevity and productivity of the herd and it will reduce feed consumption and feed related costs.

MEASURING RFI IN COMMERCIAL ENVIRONMENTS

Calculating RFI requires measuring both feed intake and body weight gain at the same time. Historically, while it has been possible to measure feed intake on a pen-basis, doing so on the individual animal level was too cumbersome and impractical to be commercially viable. With the introduction of Vytelle's Beef Genetics Program, the ability to do so is now practical and economical for on-farm testing. Every animal has an industry-standard HDX radio frequency identification (RFID) ear tag which uniquely identifies that animal and, in conjunction with an RFID-equipped Feed Intake Node, continuously and automatically captures data on feed disappearance every second that animal feeds, to a 10-gram resolution, while allowing for and maintaining natural animal behavior.

The In-Pen Weighing Positions in front of the water trough use RFID-enabled metalwork to non-invasively capture each animal's identification when it comes to the trough, along with capturing partial body weights for each animal every second and

every time it takes a drink, as they step on a purpose-built scale. Those measurements are then calculated to provide daily live weights, average daily gains (ADG), growth trends and a host of other parameters. Feed Intake Nodes coupled with In-Pen Weighing Positions make up the Vytelle SENSE™ system. This system allows incredibly accurate feed intake and weight measurement information that can be used to determine the feed efficiency of individual animals.

As discussed above, feed intake and growth need to be measured in unison to accurately calculate RFI. Using Feed Intake Nodes to measure feed intake and In-Pen Weighing Positions to measure weight, RFI trials can be completed over a 49-day period, following a 10- to 14-day warm up. Vytelle's continuous weight and feed monitoring technology, coupled with Vytelle INSIGHT™ decision-support tools, accurately identify cattle with the highest and lowest RFI values in a shorter time frame than traditional RFI trials, as accurate and precise weights and growth curves can be established in less time via the collection of several partial body weights daily. This not only increases the accuracy of ADG calculations, but it also shortens the overall trial period, allowing breeders to run more trials per year.

THE VALUE OF THE VYTELLE NETWORK

Vytelle has been helping cattle operations ensure their herds are always progressing since 1990. As such, it is the largest multi-breed database of RFI Expected Progeny Differences (EPDs) in the world. Currently, our database includes records of more than 262,000 animals in a multi-breed database to determine EPDs based on RFI (and other) phenotypes. When you partner with Vytelle and share three generations of pedigree for each animal tested, you become part of this vast network, which will assist you with benchmarking and improving your herd. Among other parameters, Vytelle provides RFI EPDs, ADG EPDs and dry matter intake (DMI) EPDs to the network.

When running RFI trials, the values are valid for that contemporary group, with 50% of the animals having a negative RFI and 50% of the animals having a positive RFI. The greatest advantage of these tests can be seen, however, when partners share pedigrees, thus allowing the RFI EPDs and Estimated Breeding Values (EBDs) to be compared within the expansive Vytelle Network. These comparisons among and across tests are possible due to the strict standardization of Vytelle's methods.

SUSTAINABILITY

Vytelle's technology sets the stage for whole farm efficiency by enabling cattle operations to reduce feed intake, reduce greenhouse gas emissions, reduce manure and reduce the overall environmental impact of beef production. In addition to lowering feed-related costs, Vytelle partners will have the opportunity to file for carbon offsets in those areas where carbon trading markets exist. Indeed, genetic selection for RFI increases both the efficiency and profitability of cattle operations while reducing an operation's carbon footprint and preparing it for success in the years to come, as the global demand for meat, and local demand for sustainability and ethically responsible practices, increases.

LITERATURE CITED

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Vytelle

Vytelle is a precision livestock company reshaping how cattle producers worldwide optimize their herds. Through Vytelle's integrated technology platform, generations of genetic gains can be made in just a few years. This allows producers to sustainably deliver more protein with fewer inputs, helping to ensure meat and milk are viable, competitive food choices for future generations.

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