Industry Leadership in Feed Efficiency Research

There's a new buzz word in the dairy cattle industry around the world... "Feed Efficiency". What is this trait? How is it measured? What is the Canadian industry doing in this area? Let's take a closer look.

What is Feed Efficiency?

In dairy production, we feed cows primarily to produce milk and its components. Some cows need to eat more to produce the same amount of output as other cows that eat less. This difference among dairy cows is a function of their "efficiency" to convert "feed" nutrients into milk and its components, therefore called Feed Efficiency. Given that cows in different herds consume different feed rations, the measurement of feed intake is standardized in units of dry matter intake. A cow with better feed efficiency will produce more kilograms of milk, fat and protein per kilogram of dry matter intake consumed. Interest in Feed Efficiency has grown in recent years since it contributes to higher profit margins while also decreasing the production of methane emissions that negatively affect the environment.

Factors Affecting Feed Efficiency

The dietary energy that a dairy cow consumes is used for various purposes including body maintenance, growth, pregnancy and milk production. Therefore, factors that affect any of these body functions can also affect feed efficiency. Examples include the number of days in milk during a lactation, a cow's age since she is usually still growing in first lactation, the type of forages in the diet, and stress or disease experienced by the cow.

How is Feed Efficiency Measured?

One of the major challenges with monitoring and improving feed efficiency is the recording of accurate data in terms of both input and output. To start with, dry matter intake needs to be measured accurately for each cow in the herd and include both the amount of feed provided to each individual cow as well as the amount left over after eating. This is obviously a very expensive process and not feasible on most dairy farms without sophisticated equipment. The output side of the feed efficiency equation is also more complex than generally assumed. Standard milk weights and sample analysis collected by DHI at 4 to 6 week intervals is not accurate enough - daily or weekly data is required.

In terms of expressing each cow's performance for feed efficiency, one strategy is to simply use the actual dry matter intake measured throughout the lactation. This approach is sub-optimal since dry matter intake is highly correlated to milk production, which makes sense since high producing cows need to consume more feed. To solve this problem, the overall consensus amongst scientists globally is the use of Residual Feed Intake (RFI) when assessing feed efficiency. RFI is simply the difference in dry matter intake between a cow and her herdmates after adjusting for the energy used for milk production, body weight and changes in body weight over time.

Canadian Feed Efficiency Research Initiative

On behalf of its industry partners, Canadian Dairy Network (CDN) prepared a 4-year research proposal aimed at improving feed efficiency and reducing methane emissions in Canadian dairy cattle using genomic evaluation and selection. The total project budget is $10.3M, including a total contribution of $860,000 from CDN, and Genome Canada approved financial support

totalling $3.8M. The research will be led by Dr. Filippo Miglior, Chief of Research and Strategic Development at CDN and Adjunct Professor at the University of Guelph, while Dr. Paul Stothard, Professor at the University of Alberta is project co-leader. There are a several critical components to this research project including:

- Consolidating dry matter intake and methane emissions data collected for groups of dairy cows in Canada, Australia, United Kingdom, Switzerland and United States into a common database at CDN;
- Establishing a database of genotypes for all cows with feed efficiency and/or methane emissions performance data;
- Quantifying the accuracy of milk mid-infrared spectroscopy data as a predictor of feed efficiency and methane emissions in dairy cattle;
- Development of genetic and genomic evaluation systems at CDN for Feed Efficiency and Methane Emissions that would be used for genomic selection of young bulls by A.I. organizations in Canada; and
- Assessment of the social benefits, costs and acceptance towards genomic selection for feed efficiency and reduction of methane emissions.

Given the importance of accurate data collection towards the success of the major research initiative, one of the major project partners is GrowSafe Systems Ltd., located in Airdrie, Alberta (www.growsafe.com). GrowSafe has developed and manufactured equipment to accurately collect daily feed intake on an individual cow basis. In addition to this type of data being collected in two state-of-the-art research herds in Canada, one owned by the University of Guelph and the other by the University of Alberta, the project proposal includes the involvement of two producer-owned dairy operations that include 200 or more milking cows. CDN is in the process of seeking out those two producers for this important project so those interested should contact CDN.

Summary

Dairy cattle producers around the world have a growing interest to improve the feed efficiency of their animals since it has a major impact on herd profitability. The dairy industry has also an increased awareness of the importance of reducing methane emissions from dairy production from an environmental and social perspective. On behalf of the dairy cattle improvement industry in Canada, CDN has taken the leadership role in developing a major research initiative, involving international partners, that targets the use of genetics and genomics for improving feed efficiency and reducing methane emissions in dairy cattle. This project has received $3.8M in funding from Genome Canada and will involve the collection of accurate individual cow feed intake data and genotypes from two research herds and two producer-owned herds in Canada. The ultimate goal is the implementation by CDN of new genetic and genomic evaluation systems for these traits in the coming years.

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