What kind of dairy cow should you be creating?

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In 2019 Cargill conducted a Feed4Thought survey of consumers from the United States, China, Mexico, and Spain. In this survey, they asked consumers to identify the word that best described what they wanted a farmer to be. The survey showed 30% of respondents wanted farmers to be "sustainable." The second most-used word to describe what they wanted farmers to be was "efficient" (28%). [1]

Sustainability has different meanings depending on whom you ask. To a consumer, this could mean farmers are using the best practices to be good stewards of the land and natural resources. For a dairy farmer that produces not only feed for their animals but milk for the consumer, how can they be good stewards and efficient? The use of genetics can play a role. We have seen this through genetic selection of plants that allow the farmer to use fewer chemicals and other inputs to grow a crop. What about animal genetics? Can farmers create more sustainable or more efficient cattle using genetic selection?

Shifting demand and genetic selection

We have all seen that the demand for milk in the United States has been on the decline. However, what may not be obvious is that the demand for dairy products, like butter and cheese, is on the rise. This change in consumption demand suggests altering the genetic selection goals of a dairy animal. In the early days of dairy farming when the demand for fluid milk was high, animals with the greatest milk production were selected to be parents of the next generation. However, with a shift in consumer demand for products like butter and cheese, the selection pressure no longer needs to be on pounds of milk produced. In essence, the water content of milk has become an expense to the farm, making it no longer adequate to look at just total production per cow.

Today many herds in the United States produce over 6 pounds of fat and protein per cow per day. Some herds accomplish these high values with lower dry matter intake than others. Genetic residual feed intake is now calculated by the Council for Dairy Cattle Breeding, a partnership of DHI testing associations, USDA, artificial insemination companies, and dairy cattle breed associations.[2] With this calculation, we can now include the efficiency of production in genetic selection programs.

A tale of three heifers

If we look at three heifers that start out with similar body weights and average daily gains, we expect them to have similar growth performance and feed consumption. However, as these animals grow, we find that this is not the case (see Table below).

	Heifer A	Heifer B	Heifer C
Initial birthweight (BW), lb	575	567	582
Average dairy gain (ADG) lb/day	2.16	2.18	2.14
Expected Feed Intake, lb	18.5	18.5	18.5
DMI, lb	12.1	18.5	25.6
Estimated CH_4 emissions, mcal/d	1.8	2.7	3.7

Heifer A eats less than expected at 12.1 pounds per day, Heifer B eats the expected 18.5 pounds per day, and Heifer C eats 25.6 pounds per day. When we look at this difference over multiple heifers in a herd, other differences become more prominent.

If we focus on genetically selecting animals that perform like Heifer A, feed costs and methane emissions can be reduced. Selecting animals with reduced methane emissions allows us to create a more carbon-neutral dairy farm. In contrast, animals like Heifer C will have a much greater feed cost and methane emission, which has a greater impact on the environment and decreased sustainability.

Residual feed intake has a high heritability of approximately 19%; this is comparable to the heritability for milk or butterfat.[3] Selection for residual feed intake can lead to changes in feed efficiency. With declining land resources and expanding urban centers, it is essential to create animals that efficiently utilize the nutrients they are supplied with.

Beef x dairy crosses

When we look at the overall beef population in the United States, we see the population of beef animals has declined since 1996. The decline in beef animal numbers and an increase in reproductive efficiencies has allowed dairy producers to become significant producers of beef. Therefore, dairy cattle produce protein in the form of fluid milk, and in the form of beef. Historically, animals who could not get

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