

Beef on dairy: A case study of sustainable animal protein production

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Human society has evolved over thousands of years, but in the last 35 years we have gained access to multiple advanced technologies that can change how animal protein is produced. As members of society, we all have a responsibility to ourselves, our families, our neighbors, our friends and our fellow citizens to utilize the available technologies to provide a sustainable future. The word “sustainability” has been used freely by many, but I believe that it truly has only two meanings in our industry. For the producers of animal protein, it is the economic sustainability of the farmer producers. For the consumers of animal proteins, it is the production of that protein in a manner that derives in a highly nutritious product that is produced in an environmentally friendly system.

In today’s presentation will look at how the production of beef from dairy cattle in a “sustainable” system can take advantage of multiple advanced technologies that are available to producers. The combination of biotechnology, bioinformatics, and biosensors to produce sustainable animal protein is a win, win for everyone. Technologies can deliver a solution to feeding a sustainable world with naturally produced animals and without the need of genetically modified cattle.

According to the United Nations, the human population will grow from the current 8 billion people to 10 billion people by 2050 (Figure 1). That is only 27 years. At the same time, the global GDP is expected to grow by 130%. Which means a significant increase in per capita income for the entire 10 billion people we will have by 2050. FAO is telling us that we need to increase food production by 60%. We need to produce more food with less land and at the same time reducing greenhouse emissions.

The answer to the challenge that The World Resources Institute places on us, is relatively simple to solve when it comes to animal protein production. It is genetic improvement. The poultry industry has already proven it. Over a period of 50 years (1957 to 2005), the growth rate of broilers increased by 400% while improving feed efficiency (feed conversion) improved by 50%. They utilized genetics and management; they produce more with less. We can achieve it with cattle.

Cattle deliver 2 of the most essential and nutritious foods that exist. Milk and beef contain protein, carbohydrates, essential vitamins and minerals. Milk is a nearly perfect food source. Beef can deliver the iron, copper and manganese that milk is missing. Add fiber and you have a nearly complete diet.

Genetic improvement is a simple formula:

Selection Accuracy × Genetic Variability × Selection Intensity
while reducing generation interval

In the dairy cattle population, we can predict with an accuracy of 80% the genetic potential for milk production, fat, protein and many other traits. With assisted reproductive technologies like embryo transfer, IVF and sexed semen, we can multiply accurately the genetic improvement. We can identify premium

genetics in a large population and accelerate the genetic improvement by decreasing generation interval.

The technologies to accomplish our task are:

- Genomics
- Advanced reproductive technologies
- Premium genetics
- Bioinformatics and biosensors

At ST we have been working for the last 11 years with the multiple technologies to create progress in one specific trait. Feed efficiency for beef and for dairy. The ECOFEED® program is based on a large scale accurate phenotypic data collection system. Building correlations between the phenotypes and genotypes. Identifying the genotypes via genetic analysis and delivering the progress using sexed semen and artificial insemination.

Since 2014 we have collected over 800,000 daily feed intake record for growing dairy heifers, over 400,000 daily intake records for lactating cows, and over 750,000 daily intake records for beef on dairy animals. We have animals with genotypes that can convert 3 lbs. of feed to a pound of gain instead of 9 lbs. of feed to a pound of gain, a 300% improvement. We have identified genotypes that can produce 3 lbs. of milk to a pound of feed instead of 1 lb. of milk to 1 lb. of feed. The heritability of the traits is medium to high. For feed efficiency in lactating cows, it is .37. The heritability for beef on dairy growing calves is .2. A lot of progress can be made via genetics relatively quick.

High Ecofeed® animals consume 15% less feed per pound of gain. High Ecofeed® lactating cows consume 15% less feed per pound of energy corrected milk. They consume 21% less water and have a reduction in methane emissions of 15%. Progeny tested bull’s offspring have been proven to deliver genetics producing 300 to 400 kg less kgs of CO₂ emissions.

In summary there are bovine genetic lines that can produce nutritious food while utilizing less arable land, while reducing methane emissions. These animals are the sustainable solution to feeding a growing world population. In a digital world we can utilize multiple technologies to collect phenotypes, identify genetic sequences and monitor the well-being of the animals without having to genetically modify animals.

The final challenge is for those of us involved in the industry to work together to deliver the solution.

Figure 1: Creating a Sustainable Food Future by 2050

