2016

National Program for Genetic Improvement of Feed Efficiency in Beef Cattle

Jerry Taylor
University of Missouri

Monty Kerley
University of Missouri

Robert Schnabel
University of Missouri

Daniel Pomp
GeneSeek (a Neogen company)

Dorian Garrick
Iowa State University, D.Garrick@massey.ac.nz

See next page for additional authors

National Program for Genetic Improvement of Feed Efficiency in Beef Cattle

University of Missouri
Dr. Jerry Taylor, Project Director
Dr. Monty Kerley
Dr. Robert Schnabel

GeneSeek (a Neogen company)
Dr. Daniel Pomp

Iowa State University
Dr. Dorian Garrick
Dr. Stephanie Hansen
Dr. Dan Loy
Dr. J R Tait

Kansas State University
Dr. Robert Weaber

Texas A&M University
Dr. Chris Seabury

University of Illinois
Dr. Jon Beever
Dr. Dan Faulkner
Dr. Dan Shike

University of Minnesota
Dr. Scott Fahrenkrug

University of Nebraska
Dr. Matt Spangler

USDA-BELTSVILLE
Dr. Tad Sonstegard

USDA-MARC
Dr. Harvey Freetly
Dr. John Pollak

Washington State University
Dr. Kris Johnson
Dr. Holly Neibergs

Our goal is to sustainably reduce feed resources required to produce beef via the rapid development and deployment of novel nutritional, genomic and genetic improvement technologies.

We will strengthen the international competitiveness of US agriculture and enable increased food production by increasing the animal protein produced without additional feed inputs and with a reduced greenhouse gas footprint.

What is the project?

✓ The project involves a consortium of scientists, industry partners, breed associations, and cattle producers who will collect DNA samples and feed intake, growth and carcass composition data from over 8,000 animals (8 breeds).

✓ Over 2,400 animals will be genotyped to generate across-breed molecular expected progeny differences (**MEPDs**) for feed efficiency, feed intake, growth and carcass traits.

✓ In addition to creating and validating selection tools for producers, we will also be examining the DNA of efficient animals and seeking straightforward methods to identify efficient animals without measurement of individual intakes.

✓ This project involves developing tools for marker assisted selection (MAS) and also for marker assisted management (**MAM**). MAM is application of specific management practices (e.g. diet, days on feed, etc.) based on an animal's genotype so that it reaches a given outcome group (i.e. choice) with the least feed inputs.

Why is this important?

A 1% improvement in feed efficiency has the same economic impact as a 3% increase in rate of gain.

The traits that beef producers routinely record are outputs which determine the value of product sold and not the inputs defining the cost of beef production. The inability to routinely measure feed intake and feed efficiency on large numbers of cattle has precluded the efficient application of selection despite moderate heritabilities (h^2 = 0.08-0.46). Feed accounts for approximately 65% of total beef production costs and 60% of the total cost of calf and yearling finishing systems. The cow-calf segment consumes about 70% of the calories; 30% are used by growing and finishing systems.

Table 1 shows the potential cost savings to the US beef cattle industry that could occur with selection for feed intake, feed efficiency, growth, and carcass traits. Calves and yearlings selected for residual feed intake (RFI) have the same ADG but eat less feed thus saving feedlot operators money. Assuming 27 million cattle are fed per year and that 34% of cattle in the feedlot are calves and 66% are yearlings, the beef industry could save over a billion dollars annually by reducing daily feed intake by just 2 lb. per animal.

Table 1. Estimated cost savings to the US beef cattle industry from selection for a 2 lb reduction in residual feed intake.

In Wt.	Out Wt.	Lb. Gain	ADG	Days on Feed	RFI	Reduced Feed Intake (lb)	Feed Cost Savings $/hd	% of Fed Mix	Total Feed Cost Savings
Calf Feds									
600	1250	650	3.5	186	0.0	0			
600	1250	650	3.5	186	-2.0	-372	(54.72)	34	$ 502,620,656
Yearling Feds									
775	1300	525	4.0	131	0.0	0			
775	1300	525	4.0	131	-2.0	-262	(38.67)	66	$ 689,539,820
								Total Savings:	**$ 1,192,160,476**
Annual fed slaughter cattle: 27 million head; Delivered feed cost: $ 294.62 as fed									

Weaber, 2011

How will this benefit me?

You will have genetic selection tools and techniques (**MEPDs**) that will allow you to create a cow herd that is more efficient at converting nutrients to calf gain. Additionally, the steers and heifers you send to a feedlot will use less feed to produce the same amount of high quality protein for human consumption.

Will this really work?

✓ MEPDs have been successfully employed for output traits (i.e. growth and carcass) on a within-breed basis in beef cattle. Results from the dairy industry have shown tremendous advantages, particularly in evaluating young sires, through the use of MEPDs.

✓ A large demonstration project that aims to illustrate the efficacy of tools developed from this project includes a group of approximately 20 seedstock producers from seven states representing the seven major U.S. beef breeds along with a large commercial ranch. Producer owned sires will be used to generate crossbred progeny that will have growth, feed intake and carcass data collected. These steer progeny and their sires will be genotyped.

✓ The demonstration component enables a validation of discovery work from the project and a visible demonstration utilizing academic and industry resources working towards a common goal, the development and employment of genomic tools to improve feed efficiency.

✓ Producer collaborators will provide DNA samples on females within their herds to examine the relationship between female fertility/longevity and feed efficiency. Inclusion of fertility/longevity traits in the project enables selection decisions to be made with a more complete understanding of potential genetic antagonisms across a suite of economically important beef production traits.

How can I keep up to date?

✓ Go to: www.beefefficiency.org

✓ Watch for episodes on NCBA's Cattlemen to Cattlemen television show.

✓ Attend meetings or presentations by members of the research team.

Producer Resources

Website
www.beefefficiency.org

Broadcast Media
NCBA's Cattlemen to Cattlemen

Multimedia Presentations
Webinars

2-day Conferences
Research updates
Feed efficiency component traits
Strategies for genomic selection
Commercial herd sire selection
Feedlot marker-assisted management (MAM)

Youth Leadership Conferences

Educational materials
Powerpoint™ presentations
eXtension materials

Software
Decision support software for sire selection and evaluation of economics of implementing MAM

Field demonstration projects

This project is supported by Agriculture and Food Research Initiative Competitive Grant no. 2011-68004-30214 from USDA National Institute of Food and Agriculture.