Turning Tables

AHA-CSU research will document Hereford sustainability advantages.

by ***Wes Ishmael***

Negative, fictitious chatter about the role cattle play in environmental sustainability rightfully maddens and disheartens those whose way of life is caring for livestock and land. But it's too easy to assume such negative comments are isolated to a few special-interest groups.

For purposes here, think about climate change, which is currently the most common sustainability topic amid the societal conversation.

"A large portion of the public has been convinced that the cause of climate change is ruminants," explained Ruaraidh Petre at the recent Beef Improvement Federation Research Symposium. He is the executive director of the Global Roundtable for Sustainable Beef.

"We need to give them the data that shows ruminant agriculture is one of the few ways of providing food that can actually sequester more carbon and be more carbon neutral than any other form of agriculture," Petre said. "The facts are on our side, but we need to get these facts across. We need data, we need transparency."

That's one reason the American Hereford Association (AHA) established a research project this spring with Colorado State University (CSU) to characterize genetics associated with production efficiency, which plays a key role in environmental and economic sustainability.

Evolution of AHA Research

1999 — AHA participated in the checkoff-funded Carcass Merit Project (CMP), which was initiated to develop genetic selection tools for carcass and consumer-satisfaction traits, such as marbling, tenderness and meat composition. This was in response to two decades of declining domestic consumer beef demand and challenges revealed by the National Beef Tenderness survey. Olsen Ranch, Harrisburg, Neb., and Stahly Ranch, Cavour, S.D., provided and fed some of the Hereford and Hereford-influenced cattle that were part of the CMP.

For AHA, this project also served as the template and starting point of the National Reference Sire Program (NRSP), as founders recognized the opportunity and value of comparing sires via larger contemporary groups in order to prove merit and increase prediction accuracy faster.

2001 — AHA established Whole Herd Total Performance Records (TPR™), building upon the early performance programs of the late 1960s. This enabled collection of complete calf crop information and eliminated reporting bias.

2004 — AHA and Hereford associations in other countries conducted the national genetic linkage project demonstrating the efficacy of intercontinental genetic evaluation.

2005 — AHA conducted the Harris Ranch Project, which validated the direct and maternal heterosis advantages of Hereford genetics. The study documented a $30 advantage for Hereford-sired black baldies, compared to purebred Angus contemporaries, due to health, pounds produced and efficiency throughout the finishing phase. Black baldy females also had a 7% advantage in pregnancy.

2007 — AHA conducted the Circle A Ranch Project to validate the direct and maternal advantage of Hereford genetics. Economist Vern Pierce demonstrated the baldy female had a $51 advantage over straightbred Angus due to fertility and longevity.

2009 — The first Pan American Cattle Evaluation was released.

2010 — Olsen Ranch implemented feed intake systems, adding individual feed efficiency data to the NRSP.

2010 — Simplot Ranch, Inc. became an NRSP test herd and validated that Hereford genetics could be used successfully on heifers.

2011 — AHA collaborated in the National Feed Efficiency Project. This project established collection of multiple genotypes that would serve as the foundation of the AHA's genomic-enhanced expected progeny differences (GE-EPDS). This project also served as the basis for the first across-breed comparison for feed intake developed by the U.S. Meat Animal Research Center (US-MARC).

2017 — US-MARC released the first across-breed comparison for feed intake, showing Hereford has a feed intake advantage of nearly 2 pounds.

2017 — AHA transitioned its genetic evaluation to a mixed marker effect model using only data from progeny born after 2001, when TPR was established, but including three generations of pedigree.

2019 — Mershon Cattle LLC, Buckner, Mo., became an NRSP test herd.

2019 — Oklahoma State University published research results showing the baldy female consumes 2 pounds less feed per day while carrying a 0.5 higher body condition score (BCS), compared to straightbred Angus cows.

2020 — AHA established a research project with the University of Illinois to fully characterize the maternal efficiency advantages of the baldy female. This project expands on previous research — Harris Ranch, Circle A Ranch and Oklahoma State University — documenting direct and maternal heterosis.

2022 — AHA established a research project with Colorado State University to enhance understanding of the genetic differences in seedstock relative to enteric methane production and nitrogen excretion. The research includes identifying selection tools that can help reduce beef's carbon and environmental footprint. HW

"The AHA has always supported research developed by universities and the U.S. Meat Animal Research Center (US-MARC), including the germ plasm project. This research continues to document Hereford advantages and their benefit as a component in crossbreeding to increase efficiency, fertility and longevity. This data, alongside that collected through the CSU project will further support the Hereford advantage in all areas of sustainability," says Jack Ward, AHA executive vice president. "As individual cattle producers and as the collective beef industry, we will continue to be asked to do

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more with less, as it relates to environmental and economic sustainability."

The AHA-CSU project leverages decades of AHA research and data collected by AHA members (see Evolution of AHA Research), including individual feed intake records collected through the National Reference Sire Program since 2010. Ward emphasizes AHA began securing complete calf crop information and eliminated reporting bias in 2001 when the Association adopted whole-herd reporting.

Specifically, AHA-CSU cooperative research will enhance the understanding of the genetic differences in seedstock relative to enteric methane production and nitrogen excretion. The research includes identifying selection tools that can help reduce beef's carbon and environmental footprint.

The AHA-CSU project builds upon previous research documenting Hereford's inherent efficiency advantages.

Methane emission, as a genetic trait in cattle, appears to be moderately heritable with genetic correlations (modest to strong) to economically relevant production traits, such as measures of growth, dry matter intake and various estimates of feed efficiency.

Direct emissions from the animal agriculture sector accounts for 3.8% of U.S. greenhouse gas (GHG) emissions, according to the nation's Environmental Protection Agency. Enteric methane accounts for approximately 27% of methane emissions in the U.S.

Worldwide attention is also focusing more intently on nitrogen — a byproduct of rumen fermentation. Previous research suggests genetics play a significant role in nitrogen excretion by cattle, and when selected for an individual animal's environmental footprint can be reduced.

"We know genetic improvement of our industry is driven by gains made in the seedstock sector. One only needs to look at changes in carcass meat yield and quality over the last two decades to realize the potential for improvements in seedstock genetics to transform the entire beef industry," says Mark Enns, CSU beef cattle geneticist and a key member of the research team.

Multiple values

"Often, we hear criticism leveled at the beef industry regarding greenhouse gas emissions and the impact of cattle on the environment, but with little context," Enns says. "Cattle also sequester carbon and contribute to environmental health. This project will contribute to the beef cattle industry's goal of demonstrating carbon neutrality by 2040[1]."

Given the Hereford breed's inherent genetic advantages associated with production efficiency, documented by the US-MARC, Ward says documenting the relationship between traits associated with efficiency and GHG emissions is the logical next step for the breed and the industry.

"Beef industry stakeholders including the National Cattlemen's Beef Association have committed to improving the environmental impact of U.S. cattle production. This project aims to develop a selection tool for the American Hereford Association and the broader cattle industry that helps producers identify genetics that will have reduced greenhouse gas emissions without sacrificing animal productivity," says Kim Stackhouse-Lawson, director of CSU's AgNext, a pioneering research collaborative developing sustainable solutions for agriculture.

By leveraging existing animal performance data and monitoring animal emissions, Stackhouse-Lawson explains the project goal is identifying genetic traits that influence environmental emissions from individual animals and then develop selection indices that can be used to reduce the environmental impact of cattle, while maintaining, and ideally improving, economic returns to producers.

"This project will also position the American Hereford Association as a sustainability leader in the beef industry through the development of genetic selection tools that can identify and inform

[1] Demonstrating climate neutrality of U.S. beef production by 2040 is one of the industry sustainability goals developed by members of the National Cattlemen's Beef Association.

breeders of genetics that meet climate goals without sacrificing quality, performance and efficiency," says Stackhouse-Lawson.

Further, Enns notes the project has potential to pave new paths of revenue for cattle producers. These could include such things as verified sustainable production claims, in addition to commonly discussed carbon credits.

"AHA continues to identify and support programs that create demand for Hereford genetics across all sectors, including cow-calf, cattle feeding, beef packing, restaurant and food service and the ultimate beef consumer," Ward says. "An added benefit of this newest research is that our Certified Hereford Beef® team will have a more comprehensive sustainability message to share with food service clients asking the questions their customers are asking about where their food comes from, how it's raised and the environmental impact."

Adding to beef's positive story

Ward emphasizes the U.S. beef cattle industry has a long history of demonstrating extraordinary gains in efficiency over time, using genetics, technology and management to produce more beef with fewer cows and less land.

"We believe this research will help us identify ways to magnify the gains the industry has already achieved," Ward says.

"CSU is involved in this project because we are passionate about beef production and the beef industry, and the societal benefits it brings from the upcycling of human-inedible plant materials and byproducts into high-quality protein," Enns says. "From a genetic improvement standpoint, CSU has a long history of new trait development and delivery of selection tools to the industry. As such, we feel we have much to contribute to this realm, striving to produce cattle that meet consumer demands, yet have a smaller environmental footprint."

"AHA is excited to work with CSU's talented scientists and researchers that are part of the industry-leading AgNext team," Ward says. HW

Editor's Note: AHA and CSU will host a free webinar July 12, which will summarize current understanding of the role U.S. beef cattle play in domestic and global greenhouse emissions. The webinar will provide more detail about specific beef cattle traits associated with GHG emissions, their heritability and potential use in selection tools to reduce the beef cattle industry's carbon footprint.