



THE FUTURE OF BEEF IS RESILIENT

For this industry, sustainability is more than a buzzword. And it's coming to our farms and dinner plates

By **Lisa Szabo**, '16 BA

SOME THINGS HAVEN'T CHANGED FOR BEEF PRODUCERS SINCE KARIN SCHMID, '04 BSc(Ag), '07 MSc, grew up on her family's farm in Alberta. Kids still chase farm cats around the barn, spend summers working in the fields and learn to drive a little earlier than the law says they should. Cattle producers continue to keep meticulous records—though the calving book that once sat on the kitchen counter, filled with breeding and health information for the herd, has been replaced by an app. And cattle producers still have a profound understanding of their connection to the land and to the food they produce.

Alberta remains the largest beef cattle producer in the country, home to 40 per cent of Canada's cattle herd. Research and technology still drive agricultural practices. What has changed is people's perception of cattle farming.

In recent years the beef industry has come under fire for heavy use of resources, including land and water, and its contribution to greenhouse gas emissions. In 2013, the Food and Agriculture Organization of the United Nations reported that the world's livestock sector was responsible for 14.5 per cent of human-induced greenhouse gas emissions—most from enteric fermentation (better known as cow burps) and the production and processing of feed.

People are also more aware of big-picture items like sustainability and animal welfare, says Schmid, who works on behalf of the province's 18,000 beef cattle producers as lead, beef research and extension, with Alberta Beef Producers. A hundred years ago, many people would have had a parent or grandparent who farmed. But with most Albertans now three generations removed from farming, Schmid says, "there's an increased drive from customers to have a connection to food and how it's produced and wanting to know why we do the things we do."

That shift in perspective has caused a change in the industry, from advancements in pain control during procedures like castration to reducing environmental impact. (Since 1981, Schmid says, Canadian beef farmers have reduced their greenhouse gas emissions by 15 per cent.) A sustainable beef industry has to have a small carbon footprint. It also has to support viable businesses for farmers, healthier animals and a resilient food supply. And U of A grads and researchers are coming at it from all angles.

Isha Datar, '09 BSc, is one such grad. In 2012, when she gave a TED Talk on in-vitro meat, the world of cultured animal products—known now as cellular agriculture—was fringe. Datar is the executive director of New Harvest, a non-profit organization supporting cellular agriculture research.

Most people had no idea that by removing a few muscle cells from a cow and soaking them in a liquid rich with

amino acids, carbohydrates and other nutrients, the cells would grow and divide. But Datar did. She was championing change in the beef industry well before the world's first lab-grown burger made headlines in 2013.

By developing the field of cellular agriculture, Datar says we would use far less land and water. She wants to reduce greenhouse gas emissions by growing only the parts of the animal used for food.

Her goal isn't to end cattle production or have everyone eat cultured meat. She expects cellular agriculture will someday be more akin to microbreweries than factory farming. Given global growing population and reliance on animals for protein, the answer isn't to cancel beef, she says. It's to feed the world in a sustainable way. "We want sellers to increase the diversity of protein production methods, because diversity is resilience."

Alberta has been a centre of research in the beef industry since 1955 when U of A researcher **Roy Berg**, '50 BSc(Ag), challenged the belief that purebred cattle were superior to crossbreeds. It took 10 years but his research proving that hybrid lines were 30 to 40 per cent more productive than purebred made Alberta a world leader in beef production and research — and made crossbreeding cattle a new global norm.

Today, innovation and research in the beef industry continue to converge at the U of A. With funding from the university's new BCRC-Hays Chair in Beef Production Systems, Gleise M. Silva is helping translate her colleagues' work into practical industry advice. She's building on decades of research. (Read more on page 7.)

John Basarab, '76 BSc(Ag), '81 PhD, is working toward the same goal. He hopes to reach it by building a better cow.

As a senior beef research scientist with the Department of Agricultural, Food & Nutritional Science, Basarab studies the relationship between genetics and a host of characteristics in cattle. By identifying regions of an animal's DNA that are responsible for traits such as meat quality, fertility and disease resistance, genomics researchers like Basarab are helping ranchers build more efficient, sustainable herds. One of the ways he's doing this is through feed efficiency.

"We found that some animals consume a lot of feed but they don't do anything with it," he says. "They're just eating for fun." One heifer could eat as much as 20 kilograms of food per day, while another ate much less for its size — as little as 14 kilograms per day — but would grow and gain as much weight as a big eater without any adverse health effects.

Through his research, Basarab and co-workers determined the regions in the genome that contribute to making an efficient eater. By bringing a sample of hair from a breeding bull or heifer into

one of the province's testing sites, ranchers can use this research. Breeding for feed-efficient cattle promises to save ranchers money on the cost of feed and help reduce greenhouse gas emissions from feed production — reducing methane emissions to boot.

Working with researcher Thomas Flesch, Basarab and his co-workers measured the methane output of a group of feed-efficient cattle. They emitted around six per cent less methane than a control group. Over time, as efficient animals breed and bear efficient offspring, Basarab says the changes will add up. "Genetic selection is permanent and cumulative," he says. "We're not talking about one animal. We're talking hundreds of thousands."

Feed efficiency is one part of building a better herd. The Global Roundtable for Sustainable Beef defines sustainability as a socially responsible, environmentally sound and economically viable production that prioritizes the planet, people, animals and progress. "Sustainability means safe food. It means the welfare of animals. It means the use of technology in a responsible way to make things better," Basarab says. Reducing greenhouse gas emissions is just one part of that. Long-term sustainability means developing an industry that can withstand disaster and bounce back from global threats.

"Sustainability means that we're more robust to changes in climate, economics, health," he says. "Our grasslands are healthier, our animals more efficient and resilient to disease." It adds up to agricultural systems that can better adapt to change.

Now, nine years after her TED Talk, Datar hopes cellular agriculture can be part of that resilience. "I'd love to see a world in which you have animal meat, plant-based versions, cell-based versions and combinations," she says. "Look at how the dairy aisle has changed over the past few years." Where cow's milk was once the only option, nut and grain versions have slipped effortlessly into people's buying habits. If a blip in the dairy supply chain causes a shortage, people can turn to almond or soy. Datar sees investing in cellular agriculture as another strand in the beef industry's safety net — another way to produce protein, particularly in times of need.

We need to diversify, Schmid agrees. "We're going to have nine billion people in the next decade or so, we need to explore options to ensure there's protein for everyone who needs it." She's hopeful. We've never had a safer food supply, she says, and advances in research continue to shape the foundation of a sustainable industry. "Research forms the backbone of how we improve our sustainability, competitiveness and profitability," Schmid says, by applying the advances of science and technology in a cost-effective manner. "We don't do things because that's the way they've always been done."

But change takes time, and cultured meat is a long way from your dinner plate. Companies will need regulatory approval to sell their products in stores as well as investment to scale up. Plus, Datar says, they'll have to mind their own environmental impact. In the meantime, increasingly sustainable cows are born every day.

The burger of the future will be backed by research and steady innovation. But mostly, it will be delicious.

