

Sustaining the dairy industry for future generations

U.S. Dairy Sustainability Commitment Progress Report

December 2010

About This Report

Scope

This is the first sustainability progress report published by the Innovation Center for U.S. Dairy to summarize the priorities and progress of the U.S. Dairy Sustainability Commitment, launched in 2007.

The information in this report covers the period from 2007 through August 31, 2010, and focuses primarily on greenhouse gas (GHG) emissions and energy impacts – the first challenges to be addressed through this industrywide effort.

The economic data presented is from the years 2007-2009 and comes from information resources at national dairy organizations and government agencies.

The GHG data is from the GHG life cycle assessment (LCA) for fluid milk conducted by the University of Arkansas using 2007-2008 U.S. industry data. The GHG LCA data has been peer-reviewed by third-party experts and findings have been submitted to peer-reviewed journals for publication in 2011.

The GHG reduction project data is for the period from 2007 through August 2010.

Where relevant, data presented in this report may serve as a baseline for future reports.

Future Reports

Over the coming years, we will gradually expand the scope of reporting to include industrywide data for additional sustainability dimensions. Ultimately, our goal is to publish an annual, comprehensive sustainability report based on the Global Reporting Initiative (GRI) Sustainability Reporting Framework.

To that end, we are working to identify relevant metrics and scope of industrywide reporting mechanisms.

For more information about the U.S. Dairy Sustainability Commitment, please contact innovationcenter@usdairy.com.

Feedback

We would like to hear your views on this first report. Please contact us at innovationcenter@usdairy.com or follow the link on the home page of usdairy.com/sustainability to a brief survey.

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TO OUR STAKEHOLDERS

In the U.S. dairy industry, we believe that healthy people and a healthy planet go hand in hand.

For centuries, dairy families and businesses have had a proud legacy of providing nutrient-rich products that promote good health and well-being throughout all stages of life. For us, responsibility for the earth and a passion for consumer satisfaction come naturally. It's the result of living on the land and producing a product as wholesome and fresh as milk.

It's no wonder the dairy industry has a vested interest in securing a healthy future for the next generation. With an ever-growing population, however, demands for nature's valuable natural resources will increase exponentially. In fact, by 2050, global demand for food is expected to double.

And importantly, research shows that more consumers care about the health and environmental impact of the food choices they make. As a result, there is a growing marketplace demand for healthy, responsibly made products.

That's why organizations at every step in our supply chain – from dairy farms to processors to the local grocer – have made a commitment to work together, so that we can continue to provide nutritious dairy products in a way that makes our industry, the earth and its people economically, environmentally and socially better, now and for future generations.

U.S. Dairy Sustainability Commitment

Launched in 2007, the Innovation Center for U.S. Dairy's industrywide commitment to sustainability is a critical contributor to that shared vision.

In an unprecedented pre-competitive collaboration, leaders and experts from within and outside the U.S. dairy industry have joined together to identify and deploy sustainability innovations that make good business sense.

Roadmap to Reduce GHG Emissions and Build Business Value

The ground-breaking greenhouse gas (GHG) life cycle assessment (LCA) for fluid milk, in conjunction with other studies, helps validate that the U.S. dairy industry contributes less than 2 percent of total U.S. GHG emissions. The study also identified opportunities for efficiency and innovation across the value chain – opportunities that will reduce emissions and build business value.

Today, more than 500 dairy stakeholders – including environmental, academic and scientific experts – are working together on 10 projects that capitalize on those opportunities.

- ▶ **Best Practices.** We have embarked on a series of projects that will drive adoption of best practices, such as energy management. Dairy businesses are sharing data and insights that will reduce energy use and GHG emissions on farms, in processing plants, and in the transportation and distribution of milk and dairy products.
- ▶ **Next Practices.** We are focusing on research and projects designed to drive the next wave of innovative technology and tools to improve profitability while reducing GHG emissions in areas such as feed production, manure management, packaging and processing.

Positive Impact on Our Industry and Our Planet

The result of these collaborative efforts will be good for the land, good for our communities and good for the dairy business. We anticipate that our current projects will reduce GHG emissions by approximately 11 percent by 2020.

Better yet, the portfolio of projects we have identified is worth an estimated \$238 million in business value to the industry.

Despite one of the most challenging economic times in history, we have made an initial investment of more than \$18 million over four years to chart our course and begin to build a foundation of science-based sustainability research. Progress is accelerating as we are joined by leading organizations, foundations and government agencies that have contributed millions more in financial, human and in-kind resources.

More important, this is just the beginning of a new way of working together to achieve our goals. The dairy industry's commitment does not end with carbon footprint reduction. Additional studies are under way on nutritional value, social and economic impacts, and other environmental measures such as water quality and use, land use, and biodiversity.

Building for a Stronger Future

U.S. dairy is an industry of great people with strong values who are passionate about the nutrient-rich products we supply and about our commitment to healthy people, healthy products and a healthy planet.

This is the first report of our progress toward our sustainability goals. Over the coming years, we will work together with our stakeholders to advance our mission of improving the dairy industry's sustainability and to provide a comprehensive view of our ongoing performance.

As we move forward, we are committed to continuous collaboration to realize our collective vision of forging a more sustainable and profitable U.S. dairy industry. And we hope you will join us on this momentous industrywide journey.

Sincerely,



Larry Jensen
Chair, Innovation Center Board of Directors



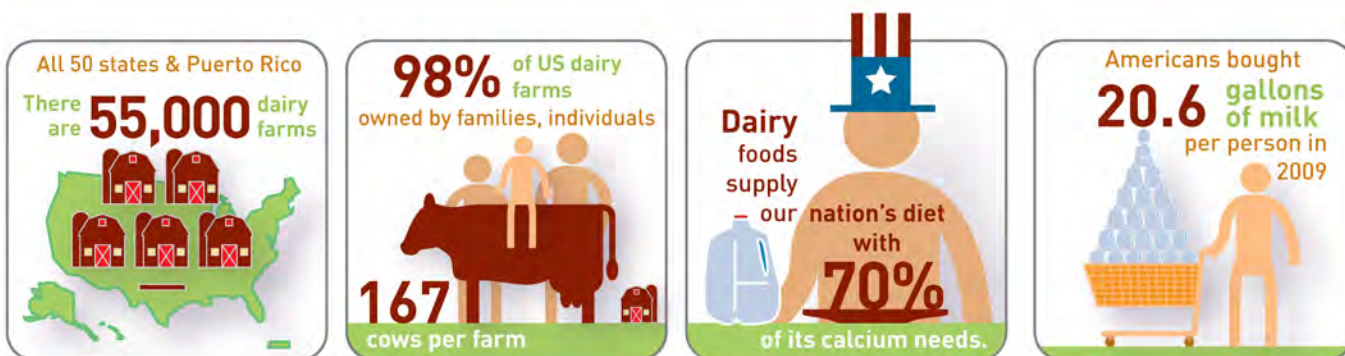
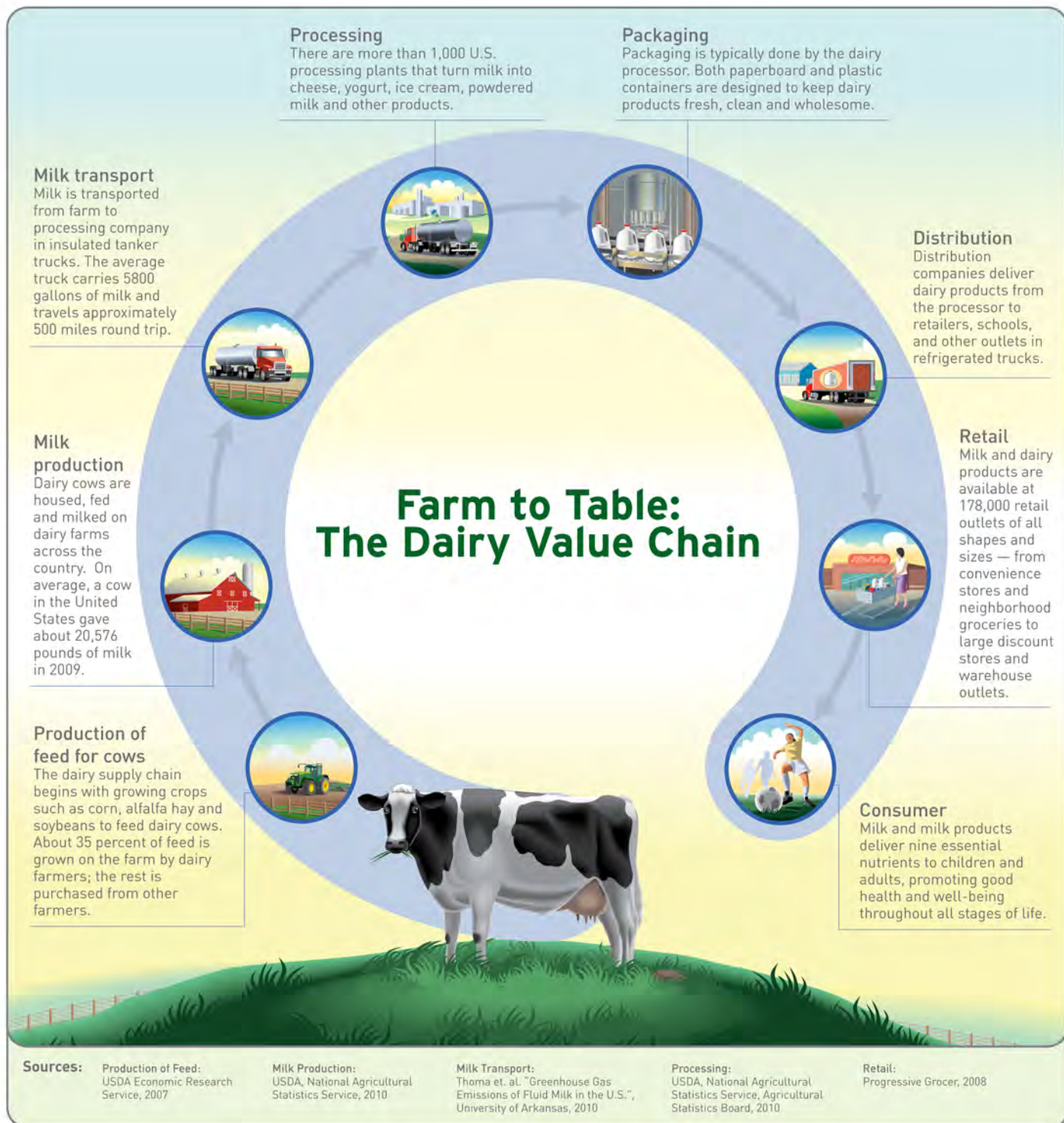
Tom Gallagher
*CEO, Innovation Center for U.S. Dairy
and Dairy Management Inc.™*

Our Sustainability Journey



In 2007, the Innovation Center and dairy industry leaders joined together to deliver a comprehensive sustainability initiative. We began our collaboration with three critical steps.

- ▶ We convened the Sustainability Council, a leadership group from across the dairy value chain, to provide strategic direction and navigate the challenges and opportunities before us.
- ▶ We embarked on a comprehensive, science-based approach to measure and improve the industry's environmental footprint, beginning with an assessment of greenhouse gas emissions for fluid milk.
- ▶ We established our first voluntary goal – to reduce GHG emissions by 25 percent by 2020 – and launched an action plan to reduce GHG emissions while building business value across the supply chain.



Sources: ^ USDA, National Agricultural Statistics Service, 2010; USDA, National Agricultural Statistics Service, Agricultural Statistics Board, 2010; Hiza, HAB, Bente L, Fungwe, 2008; USDA, Economic Research Service, 2010.



"Sustainability practices have long been common on dairy farms, from recycling water and manure to crop technologies that improve soil and prevent erosion. In an era of dwindling natural resources and a growing population that cares deeply about the health and environmental impact of the products they buy, we are committed to do more with less."

—Jerry Kozak, president and chief executive officer, National Milk Producers Federation

SUSTAINABILITY IN THE U.S. DAIRY INDUSTRY

For the dairy industry, sustainability isn't new. Innovation and efficiencies in milk production, processing, packaging and transportation have all contributed to our ability to do more with less, to be profitable and to provide wholesome dairy products to feed a growing population.

We realize, however, that we must go further. Many experts believe that by 2050, the world's population will increase by about a third – from six billion to nine billion people – while our food consumption will double. Dairy plays a key role in a healthy diet for this growing population. Health experts around the world encourage daily consumption of dairy foods such as milk, cheese and yogurt to promote good health and help prevent disease.

Like other businesses, however, production of milk and dairy products has an effect on earth's fragile ecosystems and regenerative capacities. Pressure is increasing to minimize that impact. Retailers, regulators and investors are requesting information about sustainability performance.

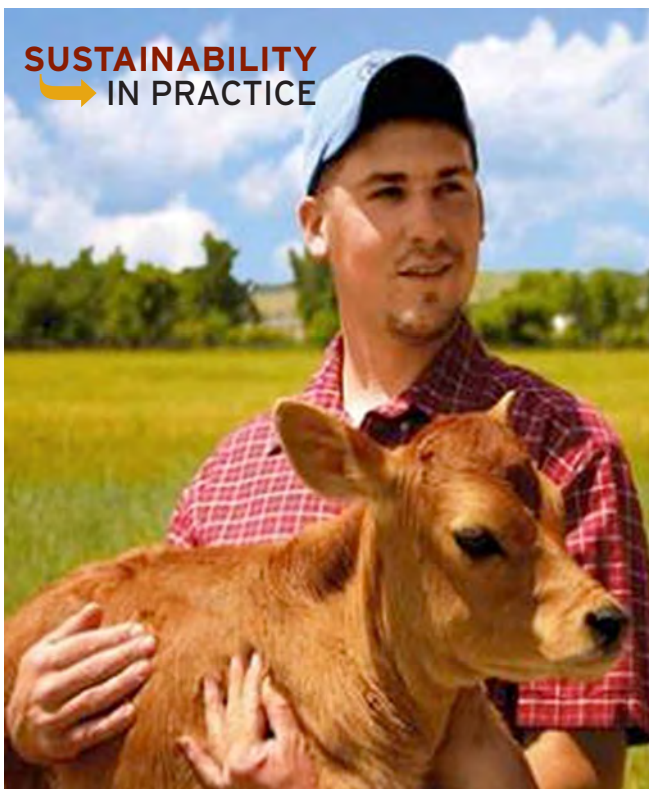
Building on Our Heritage of Stewardship

Meanwhile, the general population is changing how and what they buy, as well as how they dispose of products, in order to lead a more environmentally friendly lifestyle. Research shows that many frequent milk users – people who drink milk at least once per day – are concerned with their personal impact on the environment, and may even increase their consumption of milk if they believe it is not only healthy, affordable and good-tasting, but also responsibly produced.¹

Thus, improving our sustainability performance presents a prime business opportunity in the 21st century for dairy. It can lead to increased business value and competitive advantage through cost savings, innovative business models and new markets.

By preparing for the challenges of population growth and intensifying competition for natural resources, the dairy industry will be positioned to recognize new business opportunities and help to secure the availability of healthy, affordable, low-impact foods for future generations.

SUSTAINABILITY IN PRACTICE



Besancon Farms | Ohio

Besancon (Beh-ZAN-son) Farms is a 260-head dairy in Ohio. At first glance, the dairy might seem traditional in its practices – and that's by design. Brent Besancon credits his father with instilling the philosophy of doing things right and making them last a long time. On the farm, that deceptively simple approach means making changes that make sense for this dairy.

Sustainability practices abound at the farm – especially social sustainability. It starts with Brent's hiring philosophy. The farm only hires locally, within their county, and 90 percent of the workforce is high school or college-age.

Brent was 22 when he purchased the dairy from his father, and he is committed to building the next generation's workforce in the same way. He acknowledges it takes a bit more work to manage a large staff of kids who are working around school and other commitments, and there's certainly a great deal of teaching involved. But for Brent, that's the most rewarding thing he can do. In fact, he recently attended the graduation ceremony for a longtime employee of his (since 6th grade!) who is now a veterinarian – and he couldn't be prouder.

For more *Sustainability in Practice* stories, go to usdairy.com/sustainability.

Dairy's Economic, Environmental and Social Impacts

For the dairy industry, sustainability means *providing nutritious dairy products in a way that makes our industry, the earth and its people economically, environmentally and socially better – now and for future generations*. The following table shows ways we are beginning to measure the “triple bottom line” impact of our industry.



Economic

The U.S. dairy industry is a vital part of our nation's food system and contributes thousands of jobs, income and vitality to communities across the country.

Dairy is the fourth-largest agricultural commodity in the United States, at 8.6% of total receipts.²

The United States is the largest dairy producer in the world, producing 189.9 billion pounds of cow milk, followed by India with 98.8 billion pounds and China with 80.3 billion pounds.³

Dairies create a ripple effect on both the agricultural economy and the economic well-being of rural America. Dairy farmers pump an estimated \$2.50 into their local economies for every dollar they spend.⁴

Milk, cultured products, cheese and frozen desserts are produced and marketed by more than 530 manufacturing plants and marketing institutes and their suppliers. This had an estimated value of \$110 billion in 2008.⁵



Environmental

Dairy farms and businesses have a heritage of advancing their operations in a way that makes good economic and environmental sense. According to Cornell University, the dairy industry has already reduced its carbon footprint by more than 60 percent between 1944 and 2007 due to production efficiencies, improved cow nutrition and comfort, nutrition management and other improvements.⁶

U.S. dairy GHG emissions are approximately 2 percent of total U.S. emissions.

The carbon footprint of a gallon of milk – from farm to table – is 17.6 pounds of carbon dioxide equivalents (CO₂e) per gallon of milk consumed (or 2.05 kg CO₂e per kg of milk consumed).⁷

Milk performed better than other beverages in the new Nutrient Density to Climate Impact (NDCI) Index, which establishes the relation of beverage nutrient density to climate impact.⁸



Social

The dairy food group (milk, cheese and yogurt) is a substantial contributor of many nutrients in the U.S. diet that are important for good health, including calcium, vitamin D, potassium, phosphorus, magnesium, zinc, protein, vitamin A, vitamin B12 and riboflavin. At about 25 cents a glass, milk is a nutritional bargain.⁹

Milk is Americans' No. 1 food source of calcium, potassium and vitamin D in the diet – nutrients that many Americans fall short on each day. For example, only 36 percent of Americans meet current calcium recommendations, 31 percent meet current vitamin D recommendations and less than 5 percent meet current potassium recommendations.¹⁰

Higher dairy intake as part of a healthy diet leads to higher nutrient intake, better diet quality and bone health. It also may help maintain a healthy weight and has been associated with reduced risk of several diseases and conditions, including osteoporosis, hypertension, colon cancer, metabolic syndrome and type 2 diabetes.¹¹

A 2004 study reported that if adult Americans increased their intake of dairy foods to three to four servings a day, more than \$25 billion could be saved in unnecessary health care costs after just one year.¹²

Committed to the Health of America's Families



Milk plays a vital role in helping to build strong families, because it is naturally nutrient-rich like no other beverage.

Milk provides nine essential nutrients, including calcium and vitamin D for strong bones and high-quality protein for lean muscles. The unique combination of nutrients in milk is especially important for growing children.

Decades of nutrition research and in-school programs have helped the dairy industry take a leading role in the fight against poor nutrition, inactivity and overweight/obesity among our nation's youth.

Obesity in children is of particular concern, as they are more likely to be at risk for health problems once faced only by adults, such as cardiovascular problems and type 2 diabetes.

A 2007-2008 National Health and Nutrition Examination Survey revealed that an estimated 17 percent of children and adolescents aged 2 to 19 were obese.


Among pre-school children 2 to 5 years of age, obesity increased from 5 to 10.4 percent between 1980 and 2008. And among adolescents 12 to 19, obesity more than tripled, increasing from 5 to 18.1 percent during the same period.¹³

One recent program designed to encourage healthy lifestyles among children is **Fuel Up to Play 60**, a student-led movement developed by dairy industry leaders and the National Dairy Council in partnership with the **National Football League**.

Its goal is to make measurable and sustainable changes in healthier eating and physical activity in schools. Students are given the resources they need to implement tailored programs that improve the wellness environment at their school.

The ultimate goal is to ensure that changes made at school are sustainable, so that children have more opportunities to be physically active and to eat nutrient-rich foods like low-fat and fat-free milk, fruit, whole grains and vegetables.

Fuel Up to Play 60 reaches 36 million students in 66,000 schools – two-thirds of all U.S. public schools.



"For our businesses to thrive for generations to come, we must continue to identify and share new ways to sustain the resources we need for healthy products, a healthy dairy industry, and a healthy planet."

—Connie Tipton, president and chief executive officer,
International Dairy Foods Association

THE U.S. DAIRY SUSTAINABILITY COMMITMENT

In 2007, leaders from across the dairy industry came together to chart a bold path forward. Our initiative began with a definition of sustainability for our industry:

To provide consumers with the nutritious dairy products they want in a way that makes our industry, the earth and its people economically, environmentally and socially better – now and for future generations.

The following year, participants at the inaugural Sustainability Summit drafted and committed to a vision and set of guiding principles. This provides us with the framework for pursuing a sustainability strategy that builds on dairy's heritage and establishes a new way of working together pre-competitively.

Sustainability Vision

The changing social, environmental and economic landscape of our planet, nation and industry calls for a unified response from all participants in the dairy industry. With both challenges and opportunities in mind, we are committed to working together to achieve a positive and lasting contribution; therefore:

"We commit to being leaders in sustainability, ensuring the health and well-being of our planet, communities, consumers and the industry."

Guiding Principles

The U.S. dairy industry is committed to:

- ▶ Recognizing and appreciating all members in the value chain from farm to table
- ▶ Working collaboratively with all stakeholders, consistent with the vision
- ▶ Taking responsibility for our environmental impacts and celebrating our positive contributions to the planet
- ▶ Ensuring economic fairness across the value chain
- ▶ Preserving and enhancing the health and wellness of all people
- ▶ Utilizing both sound science and a transparent process to foster continuous improvement





Environmental Research

As with our decades-long approach to nutrition research, the dairy industry values science as the foundation of our commitment to sustainability. Peer-reviewed scientific research grounds our decisions, informs the development of best management practices and helps establish goals and measure accomplishments for every segment of the dairy value chain.

To ensure the credibility and accuracy of our research, the principle of scientific integrity serves as the base for each commissioned research study. We pledge to:

- ▶ Pursue knowledge through scientific discovery, subject to the highest ethical standards in scientific and clinical research, to advance knowledge of the role of dairy in human nutrition and health, our impact on the environment and our role in the global marketplace on behalf of the dairy industry of America
- ▶ Adhere rigorously to accepted scientific principles, methods and conduct to guide discovery and study design, including peer review by qualified reviewers
- ▶ Apply a science-based approach to the development of all dairy labeling and advertising claims, and adhere to all applicable labeling and advertising laws and regulations

Life Cycle Approach

A life cycle assessment (LCA) studies the entire life cycle of a product, starting with raw materials extracted from nature and ending after consumer use and disposal.

An LCA:

- ▶ Calculates an accurate baseline for measuring environmental and social impact
- ▶ Provides a system-level view from which to identify opportunities for innovation and improvement
- ▶ Scientifically informs decisions on future options
- ▶ Provides a common benchmark and language

The following LCAs are under way to provide insight into the major environmental impacts – such as carbon, water, waste, land use and biodiversity – for the production and consumption of dairy products.

GHG LCA for Fluid Milk (Carbon Footprint)

Principal investigator:

Dr. Greg Thoma, University of Arkansas

Timeline:

- ▶ Scan-level blueprint using secondary sources completed in 2008
- ▶ LCA data collection completed in 2009
- ▶ Findings presented at the International Food LCA Conference, September 23, 2010
- ▶ Publication in peer-reviewed journals in 2011

Comprehensive LCA for Fluid Milk

Principal investigator:

Dr. Olivier Jolliet, University of Michigan

Co-principal investigator:

Dr. Greg Thoma, University of Arkansas

Timeline:

- ▶ Scan-level blueprint to be completed in 2010
- ▶ Data collection to be completed in 2011
- ▶ Publication in peer-reviewed journals in 2012

Comprehensive LCA for Cheese

Principal investigator: Dr. Greg Thoma,
University of Arkansas

Co-principal investigators: Dr. Greg Norris,
University of Arkansas, Harvard University;
Dr. Darin Nutter, University of Arkansas; and
Dr. Franco Milani, University of Wisconsin-Madison

Timeline:

- ▶ Data collection to be completed in 2011
- ▶ Publication in peer-reviewed journals in 2012

Comprehensive Processing and Packaging LCA for Fluid Milk

Principal investigator: Dr. Greg Thoma,
University of Arkansas

Timeline:

- ▶ Data collection to be completed in 2011
- ▶ Review of findings in 2011
- ▶ Publication of findings in 2012

Sustainability Milestones

Since its inception, the sustainability initiative of the Innovation Center has been geared toward supporting the industry in our sustainability commitment, focused first on reducing GHG emissions and building business value across the dairy supply chain. Major milestones through August 2010 appear in the accompanying table.

Date	Milestone
October 2007	Dairy Management Inc. board approves sustainability initiative.
January 2008	Carbon (now Sustainability) Council formed – a leadership council of experts from across the industry as well as academic and nongovernmental organizations (NGOs).
May 2008	Scan-level carbon footprint conducted; briefing paper <i>Greenhouse Gas Reduction Opportunities in the U.S. Fluid Milk Value Chain</i> published.
June 2008	U.S. Dairy Sustainability Summit: <ul style="list-style-type: none"> ▶ 250 participants focused on opportunities to build business value and reduce GHG emissions across the supply chain. ▶ Dairy 2020 goals drafted and 27 viable projects identified. ▶ U.S. Dairy Sustainability Commitment Vision and Guiding Principles established.
June-December 2008	Project teams develop business cases for GHG reduction projects; Council approves portfolio of 10 projects. <i>Roadmap to Reduce Greenhouse Gas Emissions and Build Business Value</i> published; it is estimated to increase business value by \$238 million and reduce GHG emissions by 11 percent by 2020.
January 2009	Innovation Center Board of Directors endorses Roadmap, including GHG reduction goal (minus 25 percent by 2020) and action plan. Project teams start working.
February 2009	Partnership with World Wildlife Fund established.
October 2009	Worldwide Food Expo Sustainability Pavilion features the U.S. Dairy Sustainability Commitment.
December 2009	Innovation Center and USDA sign Memorandum of Understanding providing access to research and financial resources. Innovation Center recognized by USDA at United Nations Framework Convention on Climate Change in Copenhagen as an example of voluntary leadership.
April 2010	USDA announces energy conservation and efficiency initiative through the Natural Resources Conservation Service (NRCS).
May 2010	GHG Life Cycle Assessment for Fluid Milk completed. Key findings presented at the International Conference on LCA in the Agri-Food Sector (September 2010) and submitted for publication in 2011.
August 2010	Comprehensive LCA for fluid milk and cheese launched.



"Sustainably managed operations improve efficiencies and reduce costs, but also have significant environmental benefits, such as conserving and preserving natural resources, helping protect watersheds and improving soil health. The dairy industry's approach to measuring and improving its carbon footprint can serve as a model for other industries."

—Bryan Weech, director of Livestock Agriculture, World Wildlife Fund

OUR FIRST GOAL: REDUCING DAIRY'S CARBON FOOTPRINT



At the Sustainability Summit in June 2008, more than 250 stakeholders came together to craft the U.S. dairy industry's *Roadmap to Reduce Greenhouse Gas Emissions and Increase Business Value*.¹⁴ The objective was to identify and implement actionable projects to reduce GHG emissions and build business value across the entire dairy value chain.

Leaders from within the industry – dairy farmers, processors, transporters and retailers – were joined by scientists, academics, suppliers and individuals from government and nongovernmental organizations. This “system in the room” approach broke down barriers to innovation and set a new standard for collaboration.

To achieve our commitment, we identified and launched a portfolio of 10 projects that are estimated to reach nearly halfway to the goal and to deliver \$238 million in business value. For more information about these 10 projects, refer to Section Four: Sustainability Projects and Progress.

At the same time, these sustainability efforts are expected to help promote dairy as a preferred product among the increasing number of socially conscious consumers.

The U.S. Dairy Sustainability Commitment now includes more than 500 people actively involved in implementing the *Roadmap*.

Our first industrywide, voluntary goal is to reduce GHG emissions for fluid milk by 25 percent by the year 2020, using 2007/2008 as a baseline.

U.S. Dairy Sustainability Summit, June 2008

250 participants
72 hours
27 opportunities identified

Objective

Reduce GHG emissions and build business value across the dairy supply chain

2020 Goal

Reduce GHG emissions by 25 percent

Action plan

Launch 10 projects = ~11 percent GHG reduction and an estimated \$238 million increase in business value

Why We're Starting With GHG



In addressing the sustainability challenge, our industry is focusing as a first priority on reduction of GHG emissions and energy usage. Here are just a few of the reasons we have prioritized GHG reduction as our starting point for the industrywide sustainability commitment:

- ▶ The energy source for our society is currently based on fossil fuel, which causes GHG emissions to be released into the atmosphere. Fuel efficiency can offer dairy businesses (large and small) the opportunity to reduce costs and GHG emissions. What's more, converting manure and processing by-products into renewable energy could provide new sources of revenue for farms and processors.
- ▶ Seeking efficiencies and responding to consumer trends, retailers are asking their suppliers to provide quantifiable information on how they are working to reduce their carbon footprint.
- ▶ Competitors in the beverage and snack industries are measuring their footprint as a way to show consumers that they are good stewards.
- ▶ Measuring our footprint now helps us be prepared for potential legislative changes in the future.

What's Next

Studies of the environmental footprint for cheese and packaging are under way, as is a comprehensive life cycle assessment of fluid milk that considers other factors such as water use and quality, land use, biodiversity and eco-toxicity. These studies will help us identify and prioritize other opportunities to build business value and reduce our environmental impact across the supply chain.

Worldwide Dairy Industry Signs Global Declaration on Climate Change



On September 24, 2009, the worldwide dairy industry made history with the signing of a Global Dairy Agenda for Action during the World Dairy Summit in Berlin, Germany.

The Global Dairy Agenda for Action is an industry pledge to reduce carbon emissions and support the long-term sustainable supply of milk and dairy products by promoting the development of standard methodology for assessing the carbon footprint of dairy products based on robust science; the adoption of world's best practices for reducing emissions and driving innovation; the development of tools to measure and monitor emissions; and the alignment of research efforts to develop cost-effective mitigation technologies for both on-farm and manufacturing applications.

The pledge was signed by seven organizations on behalf of the world's dairy associations and companies, including Eastern and Southern African Dairy Association (ESADA), European Dairy Association (EDA), Pan-American Dairy Federation (FEPAL), Global Dairy Platform (GDP), International Dairy Federation (IDF), International Federation of Agriculture Producers (IFAP) and Sustainable Agricultural Initiative (SAI) Platform.

The Current State of Carbon in the U.S. Dairy Industry

In July 2010, the Innovation Center for U.S. Dairy completed the first national GHG LCA, or carbon footprint study, of fluid milk. This study was conducted by the Applied Sustainability Center of the University of Arkansas, one of the nation's leading agricultural LCA research groups.

Goal

To determine GHG emissions associated with production and consumption of one gallon of milk to the U.S. consumer.

Scope and Methodology

This LCA measures GHG emissions for fluid milk from crop production through disposal of the container by the consumer. This unprecedented effort gathered data from more than 500 farms and 50 processing plants across the United States, while analyzing 210,000 round trips transporting milk from farm to processor.

The study is compliant with the leading framework for conducting and reporting LCA studies, the ISO 14044 protocol, and the allocation method was adopted by the International Dairy Federation. It is under review for submission to the Life Cycle Inventory Library as the first U.S. national-level fluid milk carbon footprint study.

Peer Review and Publication Process

Following the standard protocol for all research commissioned by the dairy industry, the Innovation Center called on experts to conduct a third-party critical review of the fluid milk carbon footprint study (see accompanying sidebar on page 18). This process will help ensure that the LCA accurately and adequately addresses milk's true carbon footprint in a manner that is credible and transparent.

Leading academics and scientists from agricultural universities (Washington State University, UC Davis, Purdue University, University of Wisconsin-Madison and others) and government agencies (United Nations Environment Programme, USDA's Agricultural Research Service and others) also participated in a review of the study findings.

Findings were presented at the International Food LCA Conference in Italy in September 2010 by Dr. Greg Thoma. Articles are expected to be published in peer-reviewed journals in 2011.

Scientific Baseline

Based on data from 2007-2008, the carbon footprint of a gallon of milk, from farm to table, is 17.6 pounds of carbon dioxide equivalents (CO₂e) per gallon of milk consumed (or 2.05 kg CO₂e per kg of milk consumed) with a range from 15.3 to 20.7 pounds CO₂e due to natural variability and uncertainty in input parameter values. The total fluid milk carbon footprint is approximately 35 million metric tons, with a 95 percent confidence range from 30 to 45 million metric tons.

The study, along with data from other resources, validates that total U.S. dairy GHG emissions are approximately 2 percent of total U.S. emissions.¹⁵

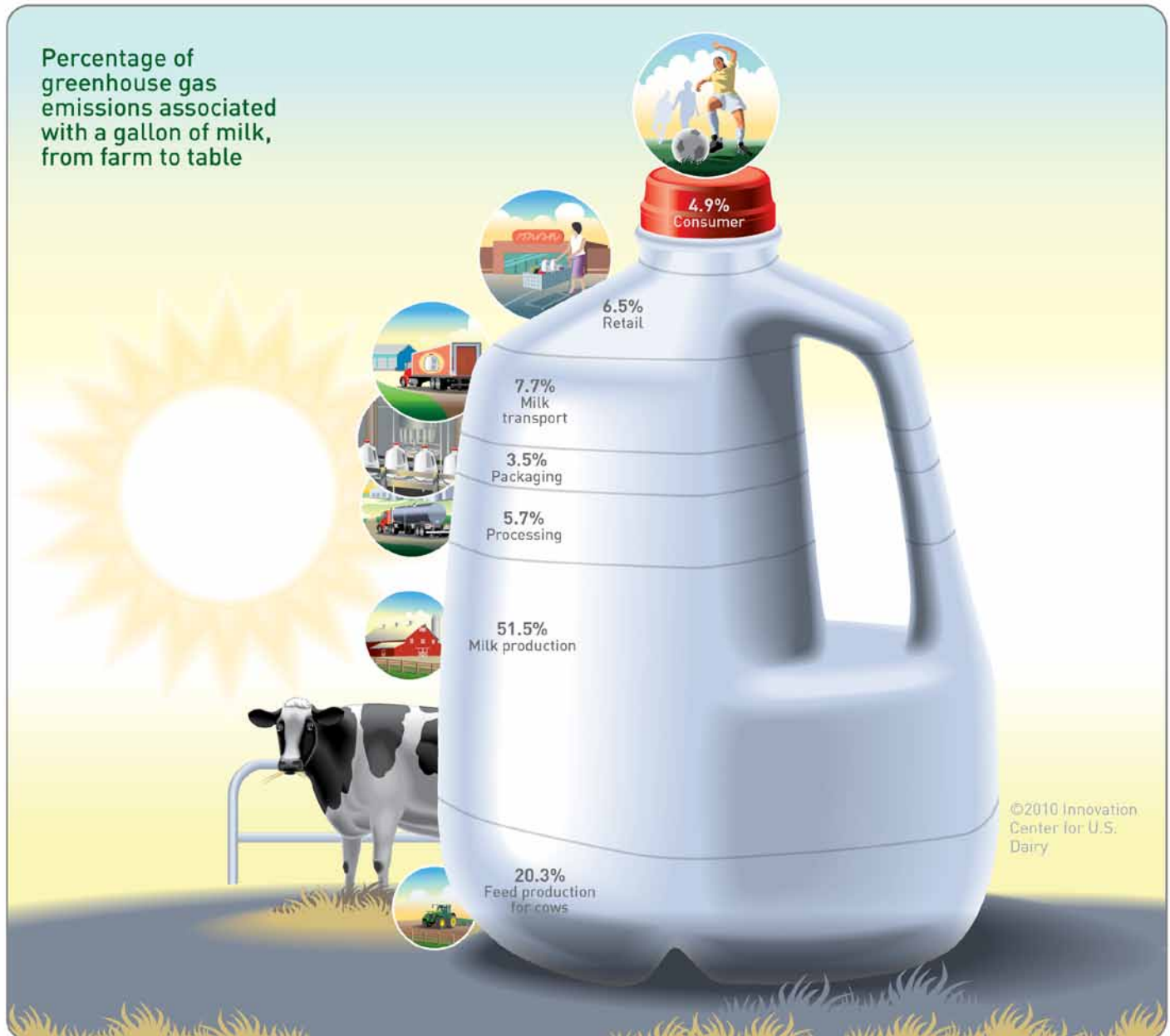
Key Learnings From the Carbon Footprint Study

Management practices matter. According to the study, the use of best management practices, rather than the size or location of the farm or processing facility, makes the biggest difference in reducing GHG emissions – and these best practices also deliver economic benefits.

There are opportunities for improvement across the supply chain. The carbon footprint study identifies opportunities to be more efficient and further reduce GHG emissions along the entire dairy supply chain. For example, on the farm, feed efficiency (how effectively a cow's diet helps her produce milk) and manure management (manure storage), represent the greatest opportunities to further reduce GHG emissions. Businesses at each stage of the value chain have opportunities to cut costs and emissions from fossil fuels and electricity. Refrigerants are a key source of emissions in the retail sector.

We have a scientific foundation to measure progress. The carbon footprint study shows the dairy industry is productive with our use of natural resources. It also provides a scientific foundation for all dairy businesses to make independent decisions about management practices that are both economically and environmentally feasible for their operation.

Value Chain Emissions



Source: ⁸ Thoma et. al, *Greenhouse Gas Emissions of Fluid Milk in the U.S.*, University of Arkansas, 2010. Carbon footprint = 17.6 lbs CO₂e per gallon of milk consumed. Natural variability and uncertainty in data ranges from 15.3 to 20.7 lbs. CO₂e. Based on 2007-2008 data.



The executive summary of the GHG LCA is available for review at usdairy.com/sustainability.

Peer-Reviewed Science

The lead researcher for the GHG LCA for fluid milk is Dr. Greg Thoma, Professor of Chemical Engineering, University of Arkansas. Dr. Thoma has expertise in LCA and environmental footprint assessment. He works with the Applied Sustainability Center, which is based at the University of Arkansas Sam M. Walton College of Business. Its vision is to accelerate the creation of a sustainable, global consumer goods economy.

In addition, the Innovation Center assembled the following critical review panel:

Dr. Olivier Jolliet, Critical Review Chair

Associate Professor, Environmental Health Services, University of Michigan

With expertise in LCA science, Dr. Jolliet co-initiated the United Nations Environment Program (UNEP)/SETAC Life Cycle Initiative and is currently the scientific manager of its Life Cycle Impact Assessment Program. He is the editor and reviewer for several scientific journals.

Dr. Robert P. Anex, Co-Reviewer

Associate Professor, Ag and Biosystems Engineering, Iowa State University

Dr. Anex has expertise in life cycle assessment of bio-renewable resources and bio-based industries.

Dr. Pascal Lesage, Co-Reviewer

Associate Professor, Canadian Interuniversity Research Centre for the Life Cycle of Products, Processes and Services (CIRAIG)

Dr. Lesage brings specific expertise in data mining.

The panel focused first on the goal definition and inventory analysis, including methodology used for data collection, making selective checks and focusing on possible inconsistencies. The process took place in an open and constructive atmosphere, and the final report reflect a complete consensus of the reviewers.

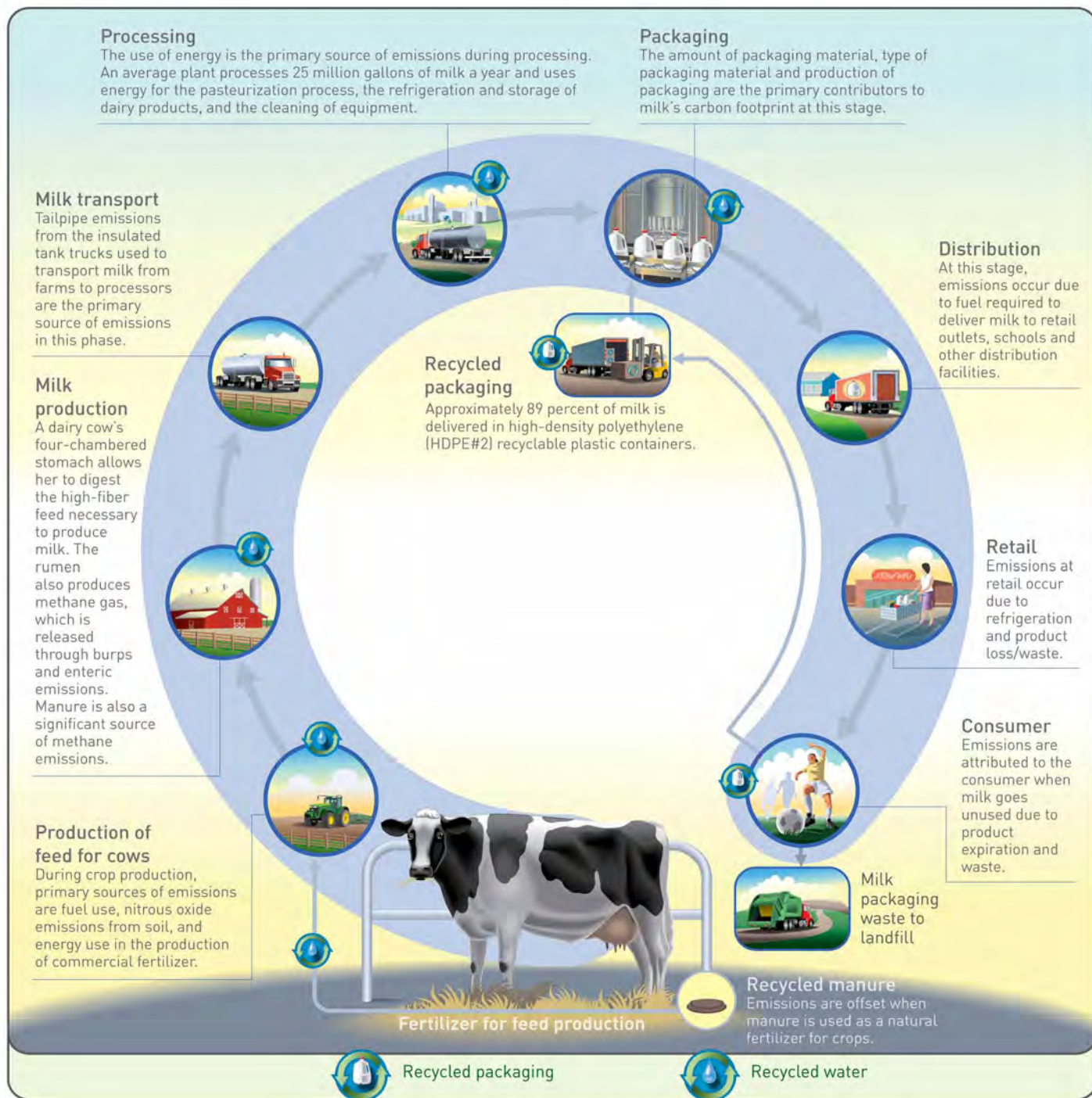
Contributing to Universal LCA Science

The critical reviewers of the fluid milk carbon footprint study confirmed that the research met ISO standards. They concluded that the fluid milk carbon footprint study provides a significant contribution to the field with the following unique aspects:

- ▶ Important data collection in the form of a survey involving more than 500 farms provided unique insight on variations of the carbon footprint between farms.
- ▶ The allocation procedure between beef and milk, based on estimates of the feed energy deposited in beef and milk products, is of high interest as a causal-based relationship.
- ▶ The analysis of transportation, processing, packaging and distribution combined with the detailed farm analysis enables the coverage of the entire milk supply chain, from fertilizer and feed production through distribution and consumption.
- ▶ The quality of the study reflects an up-to-date carbon footprint of fluid milk supply based on state-of-the-art data availability.

Because this study was limited to measuring the carbon footprint of fluid milk, the panel recommended that the dairy industry conduct a comprehensive study on the total LCA of fluid milk. The complete report from the panel is available for review at usdairy.com/sustainability.

Farm to Table: GHG Emissions Sources and Opportunities



Source: ^c Thoma et. al, Greenhouse Gas Emissions of Fluid Milk in the U.S., University of Arkansas, 2010.

GHG Emissions Sources and Opportunities

Feed Production

Feed Production: 20.3 percent – 3.56 lbs CO₂e/gallon – 7.2 Tg

During the production of feed, several processes cause the release of GHG emissions into the atmosphere, including soil tillage, fertilizer production and direct energy usage for equipment.

Causes:

Growing crops to feed dairy cows is a GHG-intensive process. Primary sources of emissions are fuel use, nitrous oxide emissions from soil and energy use in the production of commercial fertilizer.

Feed consists of pasture, corn silage, alfalfa hay and alfalfa silage, as well as items such as distiller's grain, high-moisture corn, protein mixes, supplements, seeds and green mixes.

While many farmers currently incorporate best practices into their crop production, they often lack the specific data that is relevant to their farm in terms of climate, air quality, soil, land and watershed – information that can lead to “greener” decisions as well as reduced costs in the production of feed.

Opportunities:

Opportunities exist to explore the relationship among manure and feed efficiency, precision agriculture, good no-till management, better grazing management and better irrigation and fertilization management.

Best-in-class tools already exist that provide computer simulation models to predict crop growth, soil temperature, moisture regimens, soil carbon dynamics, nitrogen spillover and water quality levels.

Integrating these models into a farmer-friendly decision tool can help mitigate the levels of carbon, nitrogen and phosphorus emissions that occur during fertilization and other aspects of crop production. Such a tool can allow farmers to maximize the use of manure as an alternative to commercial fertilizer, which decreases the use of fossil fuels and GHG emissions. It will also lead to less nitrogen and phosphorus runoff into the watershed.



GHG Emissions Sources and Opportunities

Milk Production

Milk Production: 51.5 percent – 9.07 lbs CO₂e/gallon – 18.2 Tg

On the dairy farm, several processes cause release of GHG emissions into the atmosphere: enteric emissions, manure emissions and energy usage.

Enteric Emissions: 25.1 percent – 4.42 lbs CO₂e/gallon – 8.9 Tg

Causes:

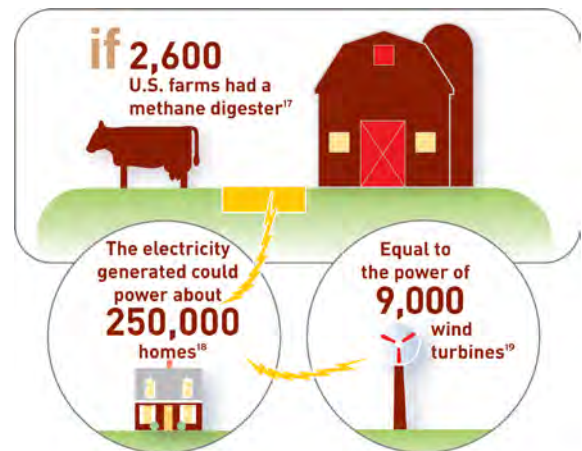
In milk production, the primary source of GHG emissions is the cow herself. A dairy cow's unique four-chambered stomach allows her to digest the high-fiber feed necessary for milk production. This process also produces methane gas, which is 25 times more potent than carbon dioxide as a GHG.¹⁶

Methane gases are released by dairy cows primarily through burps or enteric emissions.

Opportunities:

Hundreds of studies have been performed or are under way to determine best and next practices for reducing enteric emissions. Some practices under consideration include:

- ▶ **Feed improvements.** These can include the use of mineral supplements and probiotics or reducing feed particle size. Improving dairy feed can create a more efficient dairy cow, meaning fewer cows are needed to meet production requirements – resulting in less methane emissions all around.
- ▶ **Natural additives.** Use of fatty acids (such as flaxseed with its nutritional Omega-3s) and plants (such as yucca and brown seaweed) have shown potential in reducing methane emissions.
- ▶ **Reducing rumen organisms.** Microorganisms in a cow's stomach are a significant contributor to the enteric methane emissions. Developing safe and effective methods of reducing or eliminating these microorganisms could contribute to the overall reduction of a cow's methane emissions.



Manure Emissions: 22.8 percent – 4.02 lbs CO₂e/gallon – 8.1 Tg

Cause:

Manure is a significant source of methane, as it releases methane when it anaerobically decomposes. Methane gas emissions are 25 times more potent than carbon emissions.

Opportunities:

Better manure practices can help reduce methane releases. There are a variety of manure management best practices, including:

- ▶ Farmers can reduce the use of fossil-fuel based fertilizer by applying manure to fields as fertilizer.
- ▶ Anaerobic digestion technologies, where bacteria decompose organic matter in the absence of oxygen, convert manure into biogas for use both on and off the farm. Biogas production can reduce a farm's energy costs, provide communities with a renewable energy source and offer farmers an additional revenue stream from the sale of the energy. The anaerobic digestion process also reduces odors normally associated with manure.

There are approximately 124 anaerobic digesters on U.S. dairy farms,²⁰ out of a total of approximately 55,000 dairy farms. An EPA AgSTAR analysis shows the potential for 2,600 additional digesters on dairy farms.²¹ While methane digesters hold great environmental and economic potential, their adoption in the United States is currently challenged by technology application, high-capital outlays, regulatory barriers, low renewable energy prices and limited financing programs.

GHG Emissions Sources and Opportunities

Milk Production

On-Farm Energy Usage: 3.6 percent – 0.62 lbs CO₂e/gallon – 1.3Tg

Causes:

Keeping cows comfortable and productive, and their milk fresh and cold, can take a significant amount of energy. Energy is used on the farm to keep cows cool in summer and to power equipment in the milking parlor, barns and fields. Dairy farms on average spend approximately \$40 per cow per year on electricity, assuming 504 kWh hours per cow per year at \$0.08/kWh.²²

Opportunities:

Some best practices might be as simple as starting up motors at different times so as not to trigger high peak-use rates, and repairing outdated machinery and equipment.

Other common energy conservation practices include variable-speed vacuum pumps (for milking), water-cooled plate cooler (speeds the cooling process from cow to storage) and energy-efficient ventilation fans (keeps the cows cool and stress-free).

Farm operations	% of energy use ²³
Milk cooling	26%
Ventilation	24%
Milking	18%
Lighting	17%
Other	15%



Prairieland Dairy | Nebraska

SUSTAINABILITY
IN PRACTICE

Dan Rice, co-owner of Prairieland Dairy, milks about 1,500 cows in Firth, Nebraska. Prairieland's sustainability philosophy is one of producing zero waste. That means tracking all the outputs from the dairy and making sure each is as sustainable as possible. All of Prairieland's manure is composted and turned into fertilizer. Its compost operation even brings in waste from the town to add to its fertilizer mix.

Under this zero-waste philosophy, Prairieland Dairy has been talking about sustainability for quite some time – and he is excited to see the industry focus on the topic. He believes that with greater industry support and efforts, sustainable practices will become even more profitable for producers. Rice's sustainability efforts extend all the way to the packaging he uses on his farm. Prairieland milk is packaged in corn-based plastic that can be composted and recycled. This product and the fertilizer he makes are two unconventional outputs of a dairy farm that help make it sustainable.

For more *Sustainability in Practice* stories, go to usdairy.com/sustainability.

GHG Emissions Sources and Opportunities

Milk Processing



Milk Processing: 5.7 percent – 1 lb CO₂e/gallon – 2.0 Tg

The average milk bottling plant processes 25 million gallons of milk a year and uses 27,500 million BTUs during milk processing. The main activities causing GHG emissions are the pasteurization, refrigeration and cleaning processes. About 75 percent of emissions are due to electricity use, 23 percent from fuel use for heating and 2 percent from refrigerant leakage.

Energy management – efficiency, reduction and use of renewable energy – provides opportunities to reduce GHG. There are many low-cost improvements that can be made to existing equipment. Along with going straight to the bottom line, energy-efficiency updates can improve system reliability, avoid maintenance and shutdown costs, increase productivity and add new revenue streams. In addition to energy efficiency, today's best practices to reduce GHG emissions include co-generation and the use of alternative energy sources, such as solar, wind and cow power.

Several case studies have already been published at www.usdairy.com/sustainability that demonstrate sizable cost savings potential and reduction in GHG emissions with minor changes to lighting, refrigeration or steam systems. At one processing plant, installation of solar thermal and hot water recovery systems are resulting in 20 years of free energy after an eight-year payback period. Even a simple upgrade to the air compressor controls in one plant is helping to reduce energy use and saves \$54,000 annually.

The following processes require significant energy and present opportunities to cut both GHG emissions and energy costs.

Pasteurization

Causes:

Pasteurizing the billions of gallons of milk produced in the U.S. each year consumes significant energy due to the need to heat all of the milk from 35°F, the transport temperature, to 167°F, the temperature required for pasteurization, and then cool the milk back down to 35°F for bottling and storage.

Opportunities:

Non-thermal processes, such as ultraviolet (UV) technology, have the potential to increase shelf life of milk when used as an adjunct process to pasteurization. While some countries have explored these technologies, there have been no commercial demonstrations of UV milk processing in the United States. Proof of concept and regulatory change are the primary hurdles.

Cleaning

Causes:

Frequent cleaning of a milk plant's processing equipment and piping system is necessary to maintain product safety and to abide by the FDA's Pasteurized Milk Ordinance. To ensure sanitary conditions, the inner surfaces of the pasteurized equipment and pipes are cleaned once a day, and raw milk storage tanks at least once every 72 hours. Because of this rigorous schedule, more than half of a milk processing plant's energy is devoted to cleaning equipment and pipes.

Opportunities:

Emerging technology is enabling reduced-temperature cleaning that can lower a processing plant's fuel demands and GHG emissions.

The benefits of reduced temperature cleaning technologies include easy installation, no changes to the monitoring systems, less rinse water and less waste. While the Pasteurized Milk Ordinance has no minimum temperature requirements for cleaning, the industry still has technical issues to overcome that require cooperative problem solving.

GHG Emissions Sources and Opportunities

Milk Packaging

**Milk Packaging: 3.5 percent –
0.61 lbs CO₂e/gallon – 1.2 Tg**

Causes:

Currently, more than 6 billion gallons of fluid milk are processed and packaged in the United States each year. Material production alone accounts for more than 25 percent of the emissions due to the energy required to transport, process and convert raw materials into fluid milk containers of different formats and sizes.

Opportunities:

Collecting and evaluating the data on materials, energy and waste flows is complex and costly. A comprehensive life cycle assessment will enable both individual companies and the industry to calculate and benchmark environmental impacts and improvements to existing and emerging packaging formats and processing technologies for fluid milk.



GHG Emissions Sources and Opportunities

Milk Transportation, Retailing and Consumption



Transport/Distribution: 7.7 percent – 1.35 lbs CO₂e/gallon – 2.7 Tg

Causes:

Emissions from this phase of the value chain are dominated by tailpipe emissions from the trucks. Insulated tank trucks are used for transportation of raw milk from dairy farms to processors. The average round trip was 515 miles, delivering 5,800 gallons of milk. Resulting emissions were 0.051 kg CO₂e/kg milk delivered. Refrigerated trucks deliver packaged milk to the retailer; emissions result from the tailpipe and the loss of refrigerants from refrigeration units.

Opportunities:

Adopting fuel-efficiency best practices can save trucking companies a substantial amount in fuel costs while also reducing emissions.

The EPA SmartWay™ Program²⁴ helps long-haul fleets and professional drivers reduce their fuel consumption through a range of advanced technologies, financing programs and driver best practices, such as:

- ▶ Retrofitting trucks with trailer aerodynamics, idle reduction systems and tire upgrades can reduce fuel consumption by 8 percent.
- ▶ Driver training on simple techniques like coasting on hills and mapping more efficient routes can save 5 to 25 percent on fuel usage.
- ▶ Electronic on-board recorders can be installed on each truck to measure speed, total and moving miles per gallon, idle time, abrupt starts/stops and more. This data can be shared with drivers to help modify their driving habits to improve fuel efficiency.

Milk Retailing: 6.5 percent – 1.35 lbs CO₂e/gallon – 2.3 Tg

Causes:

The storage and sales of fluid milk to retail consumers carries a GHG burden from energy use (electricity and natural gas) in the form of refrigeration electricity and overhead electricity (for example, ventilation, lighting, space heating) and from fugitive emissions associated with refrigerant loss.

Opportunities:

Refrigeration and overall energy management can reduce fugitive refrigeration emissions and increase energy efficiency and reductions at retail outlets.

Milk Consumption: 4.9 percent – 0.96 lbs CO₂e/gallon – 1.7 Tg

Causes:

Food loss reports indicate that spoilage and waste by the consumer are not insignificant contributors.²⁵

Opportunities:

Reduction of product loss/spoilage could present a significant reduction opportunity. Additional data is needed to fully assess.



According to Stan Bennett, CEO, Oakhurst Dairy, "If it's good for the environment, it's good for business."

Oakhurst Dairy | Maine

Family-owned Oakhurst Dairy is northern New England's largest independent dairy. Based in Portland, Maine, the dairy has a solid tradition of environmental stewardship, expressed in its long-time commitment to "The Natural Goodness of Maine." As one of New England's environmental leaders, Oakhurst has focused in recent years on the effort to reduce greenhouse gases.

Oakhurst was one of the first organizations to sign on to a voluntary State of Maine program in 2004 aimed at cutting GHG emissions. Under the Governor's Carbon Challenge, Oakhurst set an aggressive goal of reducing carbon by 20 percent by 2010. In 2008, Maine's Department of Environmental Protection and the Governor's administration recognized Oakhurst for meeting part of its carbon reduction goal ahead of schedule, with a significant 12 percent reduction reported in carbon emissions.

Oakhurst networked with an environmental group to identify resources to help develop and implement a carbon management strategy. The company is finding ways to operate more efficiently in an increasingly competitive marketplace, with less impact on the environment. In recent years, Oakhurst Dairy has taken dramatic steps to reduce its carbon footprint:

- ▶ **Rerouting Software** – Reduces travel time for delivery fleet, resulting in a savings of 88,000 gallons of diesel in the first year.
- ▶ **Plant Expansion** – Integration of energy-efficient and conservation projects in multimillion-dollar expansion project that included insulated cold tanks and a hot water recovery system.
- ▶ **Transportation** – Conversion to biodiesel fuel of fleet, resulting in a reduction of more than 1,332 metric tons of CO₂ per year.

- ▶ **Solar Panels** – Installation of approximately 2,500 square feet of panels on the roof of Portland headquarters helps reduce the consumption of heating oil by more than 7,500 gallons per year. Photovoltaic solar panels at one of its distribution units has reduced electrical usage by more than 15%.



At Oakhurst, the Bennett family, the employees and the farms that produce the milk are all part of the local community. For that reason, Oakhurst does what it can to give back to the community by donating 10 percent of its profits to organizations that support healthy kids and a healthy environment. In 1993, Oakhurst planted 1,000 trees to restore both shade and beauty to the city of Portland. It is estimated that these trees removed 26,000 pounds of CO₂ from the air and released 13,000 pounds of oxygen into the city of Portland.

Oakhurst isn't going to stop there. Future plans include possible addition of more solar panels and identifying ways to reduce methane gas on farms. Additionally, Oakhurst President Bill Bennett is a member of the Sustainability Council.

A clear glass filled with white milk, with a white straw inserted into it. The glass is sitting on a reflective surface, and the background is a soft, out-of-focus white.

"Sustainability is a challenge that requires industrywide solutions, and our efforts establish a new standard for industry collaboration. Decision makers from across the dairy value chain are working together to commit to concrete, innovative solutions."

—Mike McCloskey, owner, Fair Oaks Farms
and chair, Sustainability Operating Committee, the Innovation Center for U.S. Dairy

SUSTAINABILITY PROJECTS AND PROGRESS

The dairy industry's voluntary goal to reduce GHG emissions for fluid milk by 25 percent by 2020 is supported by the *U.S. Dairy Roadmap to Reduce Greenhouse Gas Emissions and Increase Business Value*, which defines the initial action plan for how we can reach our goal.

In addition to the efforts of individual farms and businesses across the industry, the *Roadmap* defines a portfolio of 10 projects across the dairy supply chain – from production of feed for dairy cows to processing, packaging and distribution of milk.

Each project went through rigorous business planning and review to ensure the assumptions were sound, the potential fully assessed and the best resources of the industry were incorporated. By 2020, the projects are estimated to reduce GHG emissions by 11 percent and increase business value by \$238 million per year in today's dollars. The estimated increase in business value is the result of lower operating costs and increased revenue opportunities.

The 10 sustainability projects are a mix of:

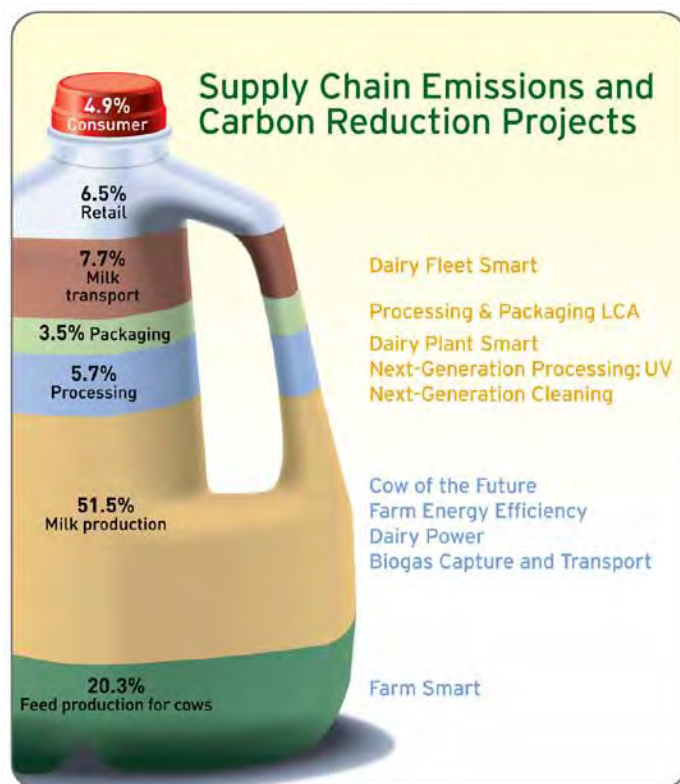
- ▶ **Quick wins** – changes that can be implemented almost immediately, such as in the area of energy management
- ▶ **Innovation projects** – ideas requiring development of new technology or business models, such as renewable energy generation
- ▶ **System changers** – opportunities involving regulatory or systemwide changes

The GHG reduction projects got under way in January 2009 when the Innovation Center board of directors endorsed the *Roadmap*.

The projects are in the early stages of implementation. The Sustainability Council coordinates and oversees the work of the project teams.

In total, stakeholders involved in the 10 GHG reduction projects contributed more than 106,000 hours of time and expertise, with an estimated value of nearly \$4.2 million. For details, see the GHG project summaries.

In 2011, we will put metrics in place to track reduction in GHG emissions and generation of business value, and we will communicate progress in upcoming reports.



Value Chain Goals

In 2008, the Innovation Center's Sustainability Council used data from a scan-level footprint analysis, research on best practices and information gathered by the project teams to draft GHG reduction goals for each step in the value chain. The following portfolio of projects is the first part of an action plan to achieve the overall emissions reduction goal of 25 percent for fluid milk by 2020. Additional efforts for reduction achieved by individual dairy businesses will bring the industry the rest of the way to achieving the 25 percent goal.

We reported segment goals, business value and CO₂e reduction potential in the *U.S. Dairy Roadmap to Reduce Greenhouse Gas Emissions and Increase Business Value*, December 2008, and these are in reference to emissions for fluid milk only. CO₂e reduction potential was updated in August 2010 when the GHG LCA for fluid milk was completed.

Project scope and goals will be updated in 2011 and reported in the 2011 Sustainability Report.

GHG Reduction Goals and Action Plan

Value Chain Impact and Goals*		GHG Action Plan			
CO ₂ e Emissions** (metric tons)	2020 Reduction Goal	Project Description	Estimated Reduction Potential by 2020 (annual metric tons)	Estimated Reduction %	Estimated Business Value by 2020 (annual savings/income)
Feed Production = 7,156,487 (20.3%)	17%	Farm Smart: Provide farmers easy access to robust, real-time, on-field data to make smart decisions that are better for business and better for the environment.	230,000	0.65%	\$8 million
Milk Production = 18,202,920 (51.5%)	27%	Farm Energy Efficiency: Reduce on-farm energy use and costs through energy management information, efficiencies and improvements.	50,414	0.14%	\$17 million
		Cow of the Future: Reduce dairy cow enteric emissions through feed improvements, natural additives and other innovations.	600,000	1.70%	\$20 to \$250 million
		Dairy Power: Increase adoption of technology to capture methane gas emitted from manure and turn it into a source of local renewable power.	1,800,000	5.09%	\$38 million
		Biogas Capture and Transport: Create a biogas pipeline to send digester-generated methane to a central facility for processing and sale.	See Dairy Power	See Dairy Power	See Dairy Power
Dairy Processing = 1,998,539 (5.7%)	25%	Dairy Plant Smart: Increase energy management at fluid milk processing plants; reduce associated greenhouse gas (GHG) emissions and costs.	162,779	0.46%	\$50 million
		Next-Generation Cleaning: Lower energy use in milk plants through the adoption of reduced-temperature cleaning systems.	64,842	0.18%	\$12 million
		Next-Generation Processing: UV: Produce safe, nutritious, great-tasting milk products incorporating non-heat processes to reduce energy use, costs and GHG emissions.	284,863	0.81%	\$35 million
Packaging = 1,238,969 (3.5%)	25%	Processing and Packaging LCA: Reduce the environmental impact of milk processing and packaging as a result of decisions made with science-based information.	Unknown	Unknown	Unknown
Transportation/ Distribution = 2,713,389 (7.7%)	20%	Dairy Fleet Smart: Accelerate adoption of best practices that reduce fuel consumption, costs and GHG emissions in the transport and distribution of milk.	542,678	1.54%	\$58 million
TOTAL: 31,310,305	25% of total fluid milk emissions		3,735,576	11%	\$238 million

* Retail and consumer segments not included.

** Thoma et. al. Greenhouse Gas Emissions of Fluid Milk, University of Arkansas, 2010. Based on 2007-2008 data.

Farm Smart

The goal of the Farm Smart project is to provide farmers with a robust, real-time, on-field decision support tool for dairy and crop production management that is better for business and better for the environment. It will allow farmers to assess, measure and mitigate their environmental impacts on climate, air quality, soil, land and watershed.



2020 Goal

- ▶ Reduce use of nitrogen fertilizer by 10 percent
- ▶ Reduce GHG emissions for fluid milk by 230,000 metric tons
- ▶ Save \$8 million in feed costs through reduced use of nitrogen fertilizer

Team Report

The Farm Smart project (formerly Dairy Feed Systems) initially focused on opportunities to collaborate with organizations with a common purpose. As a first step, the Innovation Center became a member of Field to Market, the Keystone Alliance for Sustainable Agriculture, to help establish standard measurement tools for sustainable agriculture.

In 2010, we defined a five-year vision for the project with an expanded scope of one-third research and two-thirds implementation. Our long-term goal is to develop a decision-support tool to help dairy producers utilize precision agriculture techniques that reduce their environmental impact and increase their bottom line. We were pleased to receive a planning grant from

the National Institute of Food and Agriculture (NIFA), which sets us up to pursue larger multimillion-dollar grants in 2011. We have an impressive team assembled, and are actively recruiting additional expert researchers to join us.

Milestones

▶ Develop and Test Integrated Tool – 2010-2011

The tool is being developed based on best-in-class existing modeling processes that assess carbon and nitrogen biochemistry and water use and quality. When completed, the tool will integrate these modeling processes with other relevant information requested by farmers.

▶ Site Testing of Decision Support Tool – 2011

The tool will be tested on dairy farms to determine ease of use, value in decision-making and ability to interpret results. Evaluations from these pilots will guide additional tool development.

▶ Migrate Tool from PC to Web-Based Delivery for Rollout – 2012-2016

Developing a web-based tool will allow access to more customized information, more frequent data updates and modeling choices by farmers.

Meet the Team

The team includes eight prominent agricultural universities and more than 50 leading institutions, including Sustainable Food Lab, Sustainable Conservation, Organic Valley, Spruce Haven Farm, Monsanto and the USDA.

Team Captains: Al Heber, Purdue University; Eileen McLellan, Environmental Defense Fund; William Salas, Applied GeoSolutions; Michael Doane, Monsanto; Marty Matlock, University of Arkansas; Greg Thoma, University of Arkansas.

Funding

- ▶ \$250,000 grant from Walton Family Foundation
- ▶ \$50,000 grant from USDA for NIFA grant planning
- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 7,042 hours, an estimated value of \$232,375.

Farm Energy Efficiency

The project provides farmers with information and resources to reduce on-farm energy use, costs and GHG emissions.



2020 Goal

- ▶ Conduct 600 energy audits annually, for a total of 7,200 by 2020
- ▶ Improve energy efficiency by 10 to 35 percent per farm, for annual savings of \$400 to \$42,000 annually per farm
- ▶ Reduce GHG emissions for fluid milk by more than 50,000 metric tons

Team Report

In 2009, the Farm Energy Efficiency project helped facilitate 67 audits of U.S. dairy farms, identifying more than 4.6 million kWh in energy savings.

Our first task was to collect, compile and share information on funding and audit resources with dairy cooperatives and farmers across the country. USDA Natural Resources Conservation Service (NRCS) contributed financial and human resources to assist with this effort.

In 2010, we gained momentum by working state-by-state to help farmers access funding opportunities. Specific progress has been made in Pennsylvania and Minnesota. In Missouri, we held a webinar to promote the availability of 300 audits over the next few years.

We are putting more resources toward achieving our goal. As a result of the memorandum of understanding between the Innovation Center for U.S. Dairy and USDA, NRCS has hired a full-time liaison to work with the Innovation Center beginning in October. Additionally, we were awarded a Conservation

Innovation Grant to train 50 data collectors in 10 states over the next three years.

Looking ahead, we are pursuing additional incentive opportunities from government agencies to help cover costs of on-farm improvements, and we will work with cooperatives to communicate the benefits of energy audits to their members.

Milestones

▶ Identify Auditing and Financing Programs – 2009 and ongoing

The USDA, states and utilities provide funding for audits and energy-saving equipment. A current list of energy audit financing opportunities and resources by state has been compiled and shared on usdairy.com.

▶ Expand Capacity and Resources – October 2010 - October 2013

The project received a Conservation Innovation Grant from the USDA to train data collectors in 10 states.

▶ Education Outreach Campaign – Ongoing through 2020

An ongoing education and communication campaign will include the development of case studies, tip sheets and webinars. Materials will be distributed to farm owners through a partnership with dairy cooperatives and other milk marketers.

Meet the Team

The team includes government, GreenTech leaders and other organizations committed to reducing the environmental footprint of farms, including the USDA and EnSave, a leading designer and implementer of agricultural energy efficiency programs.

Team Captain: Craig Metz, EnSave

Funding

- ▶ \$200,000 contribution agreement from USDA NRCS to support the energy audit work, and an energy audit liaison valued at \$200,000
- ▶ \$225,000 Conservation Innovation Grant from USDA NRCS for training energy audit collectors
- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 7,800 hours, an estimated value of \$444,600.

Go to usdairy.com to learn about best practices in energy management on farms, in processing and in transportation.



SUSTAINABILITY
IN PRACTICE

Immediate Returns in Energy Management

Electricity and fuel together are responsible for more than 35 percent of the carbon footprint of fluid milk – and for the majority of emissions contributed by the processing and transportation sectors of the value chain. Reductions in electricity and fuel use often are achieved by implementing best management practices. Since costs are based on usage, savings are immediate.

Here are just a few examples.

Craig Stevens of **Otsquago View Farms** in Fort Plains, New York, conducted an on-farm energy audit to identify energy-saving opportunities that would increase efficiency while reducing operating costs. Stevens took the recommendations of the energy assessment and made a large investment to install two scroll compressors, a vacuum pump and a variable-speed drive.

The adjustments resulted in an immediate reduction in energy use of more than 13,000 kWh annually and a savings of more than \$1,500 in electricity bills. Stevens expects a full return on investment in approximately eight years, and during that time he will have saved enough energy to have operated his farm for nearly two years before the improvements.

Land O'Lakes, based in St. Paul, Minnesota, has cut its energy use by seven percent thanks to a number of energy-saving initiatives, including equipment and facility enhancements. In 2009, the national farmer-owned food and agricultural cooperative established a companywide Energy Council, which set a goal to

reduce energy use per pound of product by 25 percent over a 10-year period using 2008 as a baseline. The company expects to meet this goal through energy awareness and education; equipment/facility enhancements; consumption tracking and adjustment; and the use of alternative and renewable energy sources.

Ruan Transport Corporation in Des Moines, Iowa, has made strides in fuel efficiency by loading more milk into shorter truck runs. Ruan recently reduced a major client's transportation costs by four percent by rerouting more than 80 percent of its milk to travel less than 10 miles to its destination. Additional savings have resulted from driver improvement techniques, decreasing idling time at dairy farms and modifying milk pump power levels.

Co-ops such as **Dairy Farmers of America, Inc.**, and **Michigan Milk Producers Association** provide assistance to members who are interested in identifying energy-saving opportunities with an energy audit of their farm. The audit process involves a phone interview and a farm visit to collect data in order to provide a thorough analysis of the farm's energy usage and reduction opportunities.

Others, such as **United Dairymen of Arizona (UDA)**, are pursuing efficiency opportunities of their own. UDA is implementing a series of short-term and long-term efficiency projects expected to save the cooperative more than \$1 million annually.

For more *Sustainability in Practice* stories, go to usdairy.com/sustainability.

Cow of the Future

The project aims to identify opportunities to reduce enteric methane, the single largest component of the dairy industry's carbon footprint, through feed improvements, natural additives, genetic improvements and other innovations.



2020 Goal

- ▶ Reduce GHG emissions for fluid milk by 600,000 metric tons
- ▶ Increase business value by \$20 to \$250 million depending on rate of feed efficiency, yield improvements and adoption rate

Team Report

Leading agricultural scientists and industry researchers from around the world have performed hundreds of studies to determine best and next practices for reducing enteric emissions. Early in the process, we began working with the U.S. Dairy Forage Research Center, which helped to facilitate a comprehensive review of research studies on enteric emission reduction opportunities.

We are actively exploring funding opportunities through various grants and are seeking a resource with a focus on animal and/or ruminant nutrition to direct the project and move ahead with the research. It is our intent to create and publish a research agenda on enteric methane research in collaboration with top-tier animal scientists.

This project is inspiring significant cooperation from universities throughout the world. We are optimistic that there are viable strategies that, once identified and implemented, could lead to a long-term reduction in GHG emissions from dairy herds around the world.

Milestones

- ▶ **Comprehensive Review of Research Studies – completed mid-2010**
We reviewed more than 125 cutting-edge studies to identify the most promising areas of research.
- ▶ **Establish a National Panel of Experts – to be completed end of 2010**
Comprising industry, academic and government experts, this panel will be responsible for identifying the most effective enteric methane reduction opportunities for a dairy farm. A subset of this panel will also work to establish a national research agenda to meet 2020 goals.
- ▶ **Implementation of Updated Research and Best Practices – ongoing through 2020**
As research continues to reveal the most promising best practices based on methane footprint reduction, economic viability and scalability, we will disseminate this information to dairy farmers across the country for implementation.

Meet the Team

This team has 50 members, including researchers from top agricultural universities as well as the World Wildlife Fund, Land O'Lakes and the USDA Agricultural Research Service.

Team Captains: Dana Allen, Gar-Lin Dairy; William Wailes, Head of Animal Sciences, Colorado State University; Garth Boyd, Camco Global.

Funding

- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 5,417 hours, an estimated value of \$178,750.

Dairy Power

The project addresses barriers to the adoption of methane digesters that capture methane gas emitted from manure and turn it into a source of local renewable power.

2020 Goal

- ▶ Construct methane digesters on 1300 farms
- ▶ Reduce GHG emissions for fluid milk by 1,800,000 metric tons
- ▶ Increase business value by \$38 million

Team Report

Dairy Power has tremendous potential to deliver environmental and economic benefits to the industry, and we have made progress on several fronts. The Dairy Power Summit, held in October 2009, resulted in an action plan to accelerate adoption of methane digesters in New York; other regions are exploring a similar approach. One outcome of the summit was the launch of the American Biogas Council, a formal entity to manage policy issues affecting digester development and incentives.

As a result of the memorandum of understanding between the Innovation Center and USDA, USDA appointed a staff liaison to work with the Innovation Center and is working to streamline access to programs that could help achieve our goals.

In 2010, we increased the GHG reduction potential to account for the fossil fuel offset from energy generation. The Innovation Center added a full-time Project Director to the team in October 2010 and is pursuing funding to maintain momentum.

Milestones

▶ Stakeholder Engagement Summit – 2009

With sponsorship from GE, 200 stakeholders set goals and identified an action plan to accelerate adoption of methane digesters in New York. Summit attendees set a 2020 goal that 40 percent of all manure from New York dairy farms will go through the anaerobic digestion process.

▶ Facilitate Access to Resources and Financing – 2010-2011

Helping farmers secure access to information and economic support is imperative. We will work with USDA to connect farmers to tools and resources, including AgSTAR; and explore innovative financing vehicles, such as loan guarantees and tax-exempt bonds.



▶ Research Cooperative Models – 2010

Work with rural electric cooperatives and dairy cooperatives to explore cooperative models that support digester-generated electricity and connections to the nation's power grid.

Meet the Team

This team includes nearly 100 members from leading academic institutions such as Cornell University and the University of California-Davis, the World Wildlife Fund, Walmart, Dean Foods, Dairy Farmers of America, National Milk Producers Federation and the USDA.

Team Captains: Mark Stoermann, Fair Oaks Farms; Michael Flint, Flint Group; Bill Jorgenson, AGreen Energy LLC; Shonodeep Modak, GE Energy

Funding

- ▶ \$200,000 value of liaison provided by USDA
- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 10,925 hours, an estimated value of \$ 437,000.

Biogas Capture and Transport

The project assesses the viability of creating a pipeline to send digester-generated methane to a central facility for processing and sale.



2020 Goal

- See Dairy Power goals

Team Report

This project (formerly known as Dairy Underground) is in pursuit of the same goals as Dairy Power. We will begin with an evaluation of costs and operational needs prior to the launch of a pilot project. We will then evaluate several locations for a pilot study. We are pursuing funding to begin this work.

Milestones

- **Conduct Economic Feasibility Assessment – 2011**
Analyze the economics of pipeline construction and biogas distribution to determine the right technology and seller markets.
- **Develop Pilot Project – to be determined**
Develop a biogas pipeline project among multiple neighboring dairies with a minimum of a 500-head herd. The project will engage a qualified engineering firm to provide guidance on methane recovery options that are economically viable and environmentally beneficial.

- **Develop cooperative partnerships – to be determined**

We will share the results from the pilot project with farmers, along with input from utility regulators, state governments and electricity companies. The information will provide the decision-making support farmers need to invest in methane digester systems and pipeline construction.

Meet the Team

This team includes more than 14 energy developers and supporters, including Cornell University, Waste Management, Native Energy, Haubenschild Farms and USDA.

Team Captain: Bill Jorgenson, AGreen Energy LLC

Funding

- From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 1,213 hours, an estimated value of \$48,533.

Dairy Plant Smart

The project encourages identification and adoption of energy management best practices in milk processing plants to reduce costs and GHG emissions.



2020 Goal

- ▶ Reduce GHG emissions for fluid milk by more than 160,000 metric tons
- ▶ Reduce energy costs by \$45 to \$50 million
- ▶ Improve system reliability and operations cost control

Team Report

This project (formerly D-CREE) has already achieved a number of quick wins. We collected a series of case studies to help demonstrate examples of cost-effective updates that can significantly reduce energy expenditures (and GHG emissions) in the plant. We shared the case studies via webinars and published them on usdairy.com.

Helping to further our progress toward the goal of becoming more energy-efficient in plants, the Environmental Protection Agency (EPA) and International Dairy Foods Association (IDFA) entered into an agreement in 2010. So far, more than 30 dairy processors have accepted the ENERGY STAR Challenge to improve industrial efficiency and reduce in-plant energy usage by at least 10 percent over five years.

We hope to have even more far-reaching impact in the coming years.

Milestones

- ▶ **Gather and Disseminate Best Practices and Case Studies With Associated Economic Feasibility – 2009 and ongoing**

The team provides plants with technical data and examples of energy efficiency upgrades that have been successful for other fluid milk processing plants. These examples include identification of critical control points for energy management.

- ▶ **Encourage Processors to Set Individual Company-Level Targets – 2010 and ongoing**

Processors can use the case studies and benchmarking tools to set appropriate energy efficiency and GHG-reduction targets, and create a customized roadmap for implementing energy management projects in their plants.

- ▶ **Develop a Validated Plant Process Simulation Model – 2011**

This model will provide the fluid milk industry with high temperature, short time (HTST) processing and ultra high temperature (UHT) plant performance indices, benchmarks and industry statistics. Researchers will develop the model, which will then be used to help identify fluid milk plants with the greatest potential for significant energy and GHG reductions.

Meet the Team

This team has more than 75 team members, including 26 of the country's largest milk processors; more than 20 companies serving the industry in the areas of packaging, cleaning and energy use; as well as involvement from the U.S. Environmental Protection Agency (EPA) and its ENERGY STAR program, the USDA's Agricultural Research Service and researchers from major universities.

Team Captains: Dr. Darin Nutter, Department of Mechanical Engineering, University of Arkansas; Peggy Tomasula, USDA/ARS/ERRC, Dairy and Functional Foods Research Unit

Funding

- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 31,200 hours, an estimated value of \$1,216,800.

Next-Generation Cleaning

The project promotes identification and adoption of reduced-temperature cleaning technologies that have potential to reduce costs and GHG emissions for processors.

2020 Goal

- ▶ Reduce GHG emissions for fluid milk by nearly 65,000 metric tons
- ▶ Reduce energy use by 15 percent for average savings of nearly \$40,000 per plant and total industry savings of nearly \$12 million

Team Report

We've had tremendous participation in this project, with many dairy processors involved in pilot tests of new reduced temperature clean-in-place technology. Early indications are excellent. Recently completed pilots experienced a 40 to 50 percent energy reduction via lowered water temperature. The team is currently investigating alternatives to the program that has already been tested.

Milestones

▶ Pilot Tests of Reduced-Temperature Technologies – 2010-2011

We conducted pilot tests, and initial results indicate a 40 to 50 percent energy reduction in cleaning (5 to 15 percent of total energy) by lowering the temperature.

▶ Modeling of Dairy Plant Energy – 2011

We will model a typical milk plant's energy usage to determine the carbon footprint of a single plant. This will give a baseline for measuring the impact of a reduced-temperature cleaning system.

▶ Conduct Feasibility Assessments – 2011

We will meter energy use and cost savings of a next-generation cleaning system and compare that to traditional cleaning methods. We will share results with processors to demonstrate the value of adopting a reduced-temperature cleaning system.

Meet the Team

This team includes 15 team members who are exploring the potential application of next-generation cleaning, including International Dairy Foods Association (IDFA), General Mills, Ecolab, Tetra Pak, HP Hood LLC, LALA USA, Prairie Farms, Solution Dynamics, Leprino Foods and Grassland Dairy Products.

Team Captain: Howard Depoy, LALA USA

Funding

- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 9,100 hours, an estimated value of \$354,900.



Next-Generation Processing: UV

The project explores UV illumination as an adjunct to pasteurization to produce safe, nutritious, great-tasting milk products.

2020 Goal

- ▶ Reduce GHG emissions for fluid milk by nearly 285,000 metric tons
- ▶ Reduce energy costs by \$30 to \$35 million

Team Report

We got under way almost immediately with active participation and financial support. Extensive testing (including microbial and food safety) in the lab is complete and we are moving into the final stages of sensory and shelf life testing before commercialization. Because of possible additional food defense benefits, and as a result of guidance by the U.S. Food and Drug Administration (FDA), the team is pursuing the use of UV illumination as an adjunct to heat pasteurization. It's our goal to have dairy products using this new approach on supermarket shelves in 2011.

Milestones

▶ Microbiological Testing – complete

The results of microbiological testing demonstrate the ability of this approach to reduce micro-organisms to a level unlikely to present a public health risk under normal conditions.

▶ Pursue Amendment of the Pasteurized Milk Ordinance – 2011

We will present a proposal to use UV illumination as an adjunct to pasteurization at the National Conference on Interstate Milk Shipments (NCIMS) in early 2011. If approved, the Pasteurized Milk Ordinance (PMO) will be amended to allow for test pilots in commercial facilities.

▶ Develop Test Pilot of UV Illumination – 2011 and beyond

If approved, UV illumination as an adjunct to pasteurization will be included in the PMO, and pilots to evaluate quality, taste and environmental impact under commercial conditions will be allowed. GHG reduction potential will also be re-evaluated due to the project's change in scope.



Meet the Team

This team has more than 35 leading international organizations, including the University of California-Davis, California Polytechnic State University, SurePure, Dairy Innovation Australia Limited, Dean Foods, LALA USA and Walmart.

Team Captain: Dr. Gail Barnes, Innovation Center for U.S. Dairy

Funding

- ▶ SurePure has invested \$500,000
- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 9,100 hours, an estimated value of \$282,100.

Processing and Packaging Life Cycle Assessment

The project assesses the environmental impact of existing and emerging packaging formats and associated processing technologies for fluid milk products, helping identify areas for improvement and innovation.

2020 Goal

- Develop science-based data for improved decision-making

Team Report

The environmental impact of packaged milk is about more than just the container. It includes the complete dairy delivery system, spanning the production of the packaging material through processing to product consumption and disposal of packaging by the consumer.

This project (formerly named Dairy Delivers Systems) will examine the GHG emissions for white, value-added milks and coffee creamers across usage occasions (in-home and on-the-go), pack sizes (gallon configurations to single-serve) and methods of distribution (chilled and ambient). We launched the study in 2009 and will complete it in 2011.

Milestones

- **Packaging and Processing Life Cycle Inventory (LCI) Data Collection and Analysis – 2010-2011**
Collect and compile data on inputs (resources and intermediate products) and outputs (emissions, wastes) for all the processes in the fluid milk packaging and processing system.
- **Review and Publication of Findings – 2011**
We will compile key findings and have them reviewed by researchers and the LCA Packaging and Processing team.
- **Share LCA Findings, Identify Opportunities – 2012**
We will share the LCA findings with stakeholders including processors, packaging material manufacturers and retailers to benchmark environmental impact and drive innovations based on sound science.



Meet the Team

This team has more than 50 members, including the University of Arkansas, Michigan State University, Dean Foods, Tetra Pak and Walmart.

Team Captain: Dr. Gail Barnes, Innovation Center for U.S. Dairy

Funding

- This project is funded by dairy farmers as part of the development of scientific research on environmental impact; data will be provided by processors and packaging companies.
- From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 20,800 hours, an estimated value of \$811,200.

Dairy Fleet Smart

The goal of Dairy Fleet Smart is to accelerate adoption of transportation and distribution best practices that reduce fuel consumption, costs and GHG emissions.



2020 Goal

- ▶ Reduce GHG emissions for fluid milk by more than 542,000 metric tons
- ▶ Reduce fuel costs by nearly \$58 million
- ▶ Trucker payback: approximately one year, depending on fuel cost and usage

Team Report

We have invested a lot of time communicating to the industry about the economic and environmental benefits of driving efficiency in our industry. We collected and shared best practices. We have seen more companies implementing changes to driver behaviors and routes. They are also finding ways to reduce idling time to cut fuel expenses and the industry's carbon footprint.

We are also working with EPA's SmartWay program, which provides tools and resources for increasing fuel efficiency. We continue to encourage dairy companies and cooperatives to take advantage of the program by joining as an Affiliate or Transport Partner.

Milestones

- ▶ **Industry Analysis of Fuel-Savings Initiatives – 2010**
We will meet with processors and transportation companies to understand fuel savings achieved with their efficiency programs, as well as consider technologies and practices of SmartWay Program and electronic on-board recorders.

▶ Apply SmartWay Initiatives to Dairy Trips – 2011

We will determine the most effective way to combine SmartWay Program innovations and electronic on-board recorders (EOBRs) with current dairy trucking industry fuel-efficiency practices.

▶ Create and Implement Dairy Industry Outreach Program – 2011

We will develop and disseminate dairy-specific tools and guidelines to processors and transportation companies, including case studies on refrigeration technologies, driver best practices and aerodynamics.

Meet the Team

This team has more than 16 academic institutions, government agencies and industry organizations, including the University of Arkansas, EPA, Darigold, Inc., Dairy Farmers of America, HP Hood LLC and Ruan Transport Corporation.

Team Captains: Jim Mulvenna, Ruan Transport Corporation; Dave Crowley, HP Hood LLC

Funding

- ▶ From start until August 2010, stakeholders (volunteers and DMI staff) contributed approximately 4,160 hours, an estimated value of \$170,560.

Other Sustainability Projects



The success of our effort begins with a commitment to understand and measure. This is enabled by our collaboration with a lengthy list of experts, including the Applied Sustainability Center, Field to Market, the Sustainability Consortium, Sustainable Food Lab, Manomet Center for Conservation Sciences and the University of Notre Dame, among many others. Here are some examples:

Consumer Insights. In late 2009 to early 2010, the Innovation Center commissioned a study by the Natural Marketing Institute (NMI) to understand whether, and to what extent, consumers' sustainability and environmental concerns would impact milk and dairy consumption.

Through qualitative and quantitative studies, we learned that consumers, including frequent milk users (people who drink milk at least once per day), are becoming more concerned with their personal impact on the environment. The general population is changing how and what they buy, and how they dispose of products in order to lead a more environmentally friendly lifestyle.²⁶ In fact:

- ▶ 62 percent of frequent milk users have some concern about environmental issues, along with health.
- ▶ 34 percent of frequent milk users are very interested in an environmentally friendly version of milk.

Consumers want to believe that dairy products can be part of a lifestyle that promotes health and nutrition, benefits communities and protects the environment.

Most importantly, this initial research shows that if consumers believe dairy is not only nutritious, good-tasting and delivered at a good value, but also environmentally friendly, then their consumption could increase. Additional studies will attempt to quantify the consumption opportunity.

Vital Capital Index and Toolkit. The sustainability team partnered with Manomet Center for Conservation Sciences to develop a practical tool to help dairy farmers understand agricultural stewardship across the three pillars of sustainability and to communicate their stewardship to their stakeholders and supply chain.

The tool can be used by dairy farmers to help assess what sustainability means to them on their own farm, identify and implement changes appropriate to their farm and track efforts over time. In its current draft form, it is made up of 40 field-tested, science-based, practical indicators developed in consultation with farmers and a broad range of other stakeholders, including non-agriculture landowners, agriculture land conservation organizations, citizens, land use planners and labor organizations. This index will be used as a communication and engagement tool.

Measuring Employee Engagement. We are currently partnering with the University of Notre Dame to conduct a research study to measure the effects of an organization's sustainability initiatives on employee engagement and morale. Together, these organizations are conducting a survey of employee attitudes towards sustainability among dairy supply chain organizations to look for a link between employee perceptions of their companies' sustainability efforts and the employees' performance.

By partnering in this study, the Innovation Center aims to understand the potential for sustainability efforts to reduce costs, increase profitability and improve revenue through better employee performance.

Massachusetts Institute of Technology (MIT) Case Study. In order to gain insight into the strengths and weaknesses of the process we have followed, the Innovation Center is working with the MIT Sloan School of Management to develop a case study of the U.S. Dairy Sustainability Commitment. Interviews with our stakeholders and leaders will be conducted, and we will analyze performance indicators. We hope this will also expose a wider audience of management students and industry leaders to the work we are doing and the stand we have taken for sustainability.

Financial Support

From the start, our work has been guided by the contributions of stakeholders from across the industry – from farm to retail – as well as academics, suppliers, scientists and experts from governmental and nongovernmental (NGO) organizations. These contributions have been in the form of expertise, time, money and in-kind services.

Between 2007 and 2010, U.S. dairy farmers invested approximately \$18 million to launch the U.S. Dairy Sustainability Commitment, covering initial costs of research, strategic planning and project development.

During that same period, stakeholders (both volunteers and staff) contributed well over 100,000 hours of time and expertise to the GHG projects and other sustainability projects, a value of nearly \$5 million. For more information, see the Stakeholder Engagement and Partnership section.

Fundraising efforts began in 2010. We continue to seek additional funding to sustain our progress.

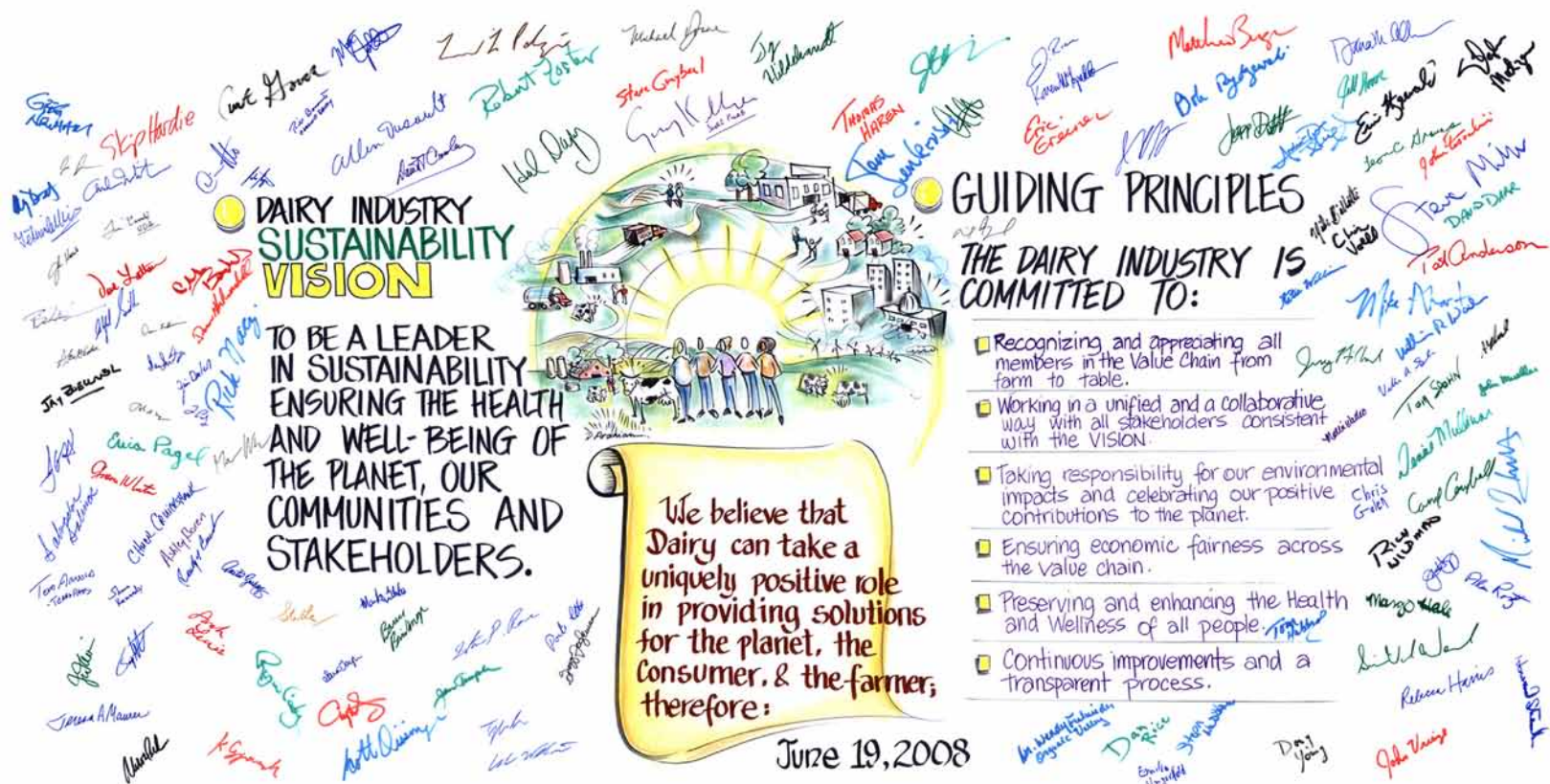
Funds Raised: January-August 2010	Start Date	Project	Amount
Grants			
Walton Family Foundation Grant	June 2010	Farm Smart	\$ 250,000
USDA-NRCS-CIG Grant	August 2010	Farm Energy	225,000
USDA-NIFA Planning Grant	October 2010	Farm Smart	50,000
Grants Subtotal			\$ 525,000
Partnerships			
USDA-NRCS Contribution Agreement + Liaison	April 2010	Farm Energy	\$ 400,000
WWF Partnership and Shared Staff Person	March 2010	General	100,000
USDA-RD Liaison	July 2010	Dairy Power	200,000
Partnership Subtotal			\$ 700,000
Innovation Center Board			
Board Member Contributions		General	\$ 211,000
Board Subtotal			\$ 211,000
TOTAL			\$ 1,436,000

Get Involved: Participate in Current GHG Projects

To find out what your dairy farm or business can do to reduce environmental impact and improve the bottom line, check out these resources:

Farm energy efficiency	<p>For a map of cost share energy audits and other information about farm energy efficiency, go to http://www.usdairy.com/Sustainability/GHGReduction/Projects/Pages/FarmEnergyEfficiency.aspx.</p> <p>Read about energy best practices in this guide provided by EnSave: http://www.usdairy.com/Sustainability/BestPractices/Documents/BestPracticesEnergyEfficiencyGuide.pdf and for more information, go to www.ensave.com.</p> <p>Contact your local utility on programs they may have to offset the costs of audits and or retrofit equipment.</p> <p>Contact your local Natural Resources Conservation Service field office to learn about cost-share opportunities now available.</p>
Plant energy efficiency	<p>For case studies about reducing energy use in plants, go to http://www.usdairy.com/Sustainability/GHGReduction/Pages/BestPractices.aspx.</p> <p>Watch for more case studies and a new best practices guide coming soon to usdairy.com/sustainability.</p> <p>Join the IDFA sponsored "Dairy ENERGY STAR Challenge for Industry." Applications are available at usdairy.com/sustainability and additional information is at http://www.idfa.org/files/ChallengeIndustry.pdf.</p>
Fleet energy efficiency	<p>Read about energy best practices in this guide provided by the EPA: http://www.usdairy.com/Sustainability/GHGReduction/Pages/BestPractices.aspx.</p> <p>Maximize your fuel reduction by becoming an EPA SmartWay Affiliate or Transport Partner; learn more at http://www.epa.gov/smartwaylogistics/.</p> <p>What is EPA SmartWay Partnership all about? Follow this link to "Frequently Asked Questions" about SmartWay. http://www.epa.gov/smartway/transport/documents/faqs/faqs.pdf</p>
Reducing enteric emissions	<p>Watch for the Innovation Center's Research Agenda to be published in early 2011.</p> <p>Join us at the Environment Symposium at the ADSA-ASAS Joint Annual Meeting July 10-14 in New Orleans; learn more at http://adsa.asas.org/meetings/2011.</p>
The business case for dairy farm anaerobic digester systems	<p>Contact AgSTAR for a free screening to determine if anaerobic digestion is feasible on your farm. http://www.epa.gov/agstar/tools/project-dev/index.html</p> <p>Check out the AgSTAR Funding Database for state, federal and private funding opportunities for anaerobic digestion projects. http://www.epa.gov/agstar/tools/funding/index.html</p> <p>DSIRE is a comprehensive source of information on state, local, utility and federal incentives that promote renewable energy and energy efficiency. http://www.dsireusa.org</p>
Next generation cleaning in plants	<p>Watch for information about the pilot programs being tested now.</p>
GET INVOLVED	<p>Visit usdairy.com/sustainability to sign up for <i>Dairy Sustainability News</i>, a periodic e-newsletter; to endorse our commitment; or to share your story. To contact us, email innovationcenter@usdairy.com.</p>

Charting a Bold Path Forward



Over the coming months and years, the U.S. dairy industry is committed to working together to create a sustainable future.

As we move forward with this unprecedented industrywide sustainability initiative, we will continue to seek out the stakeholders and industry-leading researchers to collaborate on identifying and implementing innovative sustainability practices.

At the same time, we will continue our efforts to build and sustain a strong Sustainability Council to ensure that we have an industrywide perspective that encourages an inclusive voice from dairy farmers, processors, manufacturers, distributors, retailers and others throughout the dairy supply chain. And we will work diligently to ensure additional involvement from thought leaders across the broad environmental community.

Beyond our initial focus on GHG reduction, we recognize that the dairy industry faces other challenges and opportunities in the economic, environmental and social areas. As a result, we will continue to expand our scope to drive innovations across additional aspects of sustainability.

To get involved or learn more, please contact innovationcenter@usdairy.com.

We welcome your feedback.



The farm also was the first to sell carbon credits on the Chicago Climate Exchange.

Haubenschild Farms | Minnesota

SUSTAINABILITY IN PRACTICE

Dennis Haubenschild is a longtime proponent of sustainability. If you ask him, he'll tell you that he began striving for "Earth-neutral farming," as he calls it, back in the 1970s.

He has a saying that "It only becomes waste if you waste it," and he's taken that philosophy to heart in the operation of Haubenschild Farms in Minnesota, of which he is president and owner. The state-of-the-art methane digester at Haubenschild Farms produces enough energy to run the entire dairy and 70 additional homes.

The farm is currently working with the University of Minnesota to develop a prototype for a hydrogen fuel cell technology system. They hope to find ways to fuel the farm's tractors by using hydrogen fuel cells made with biogas from the farm's digester.

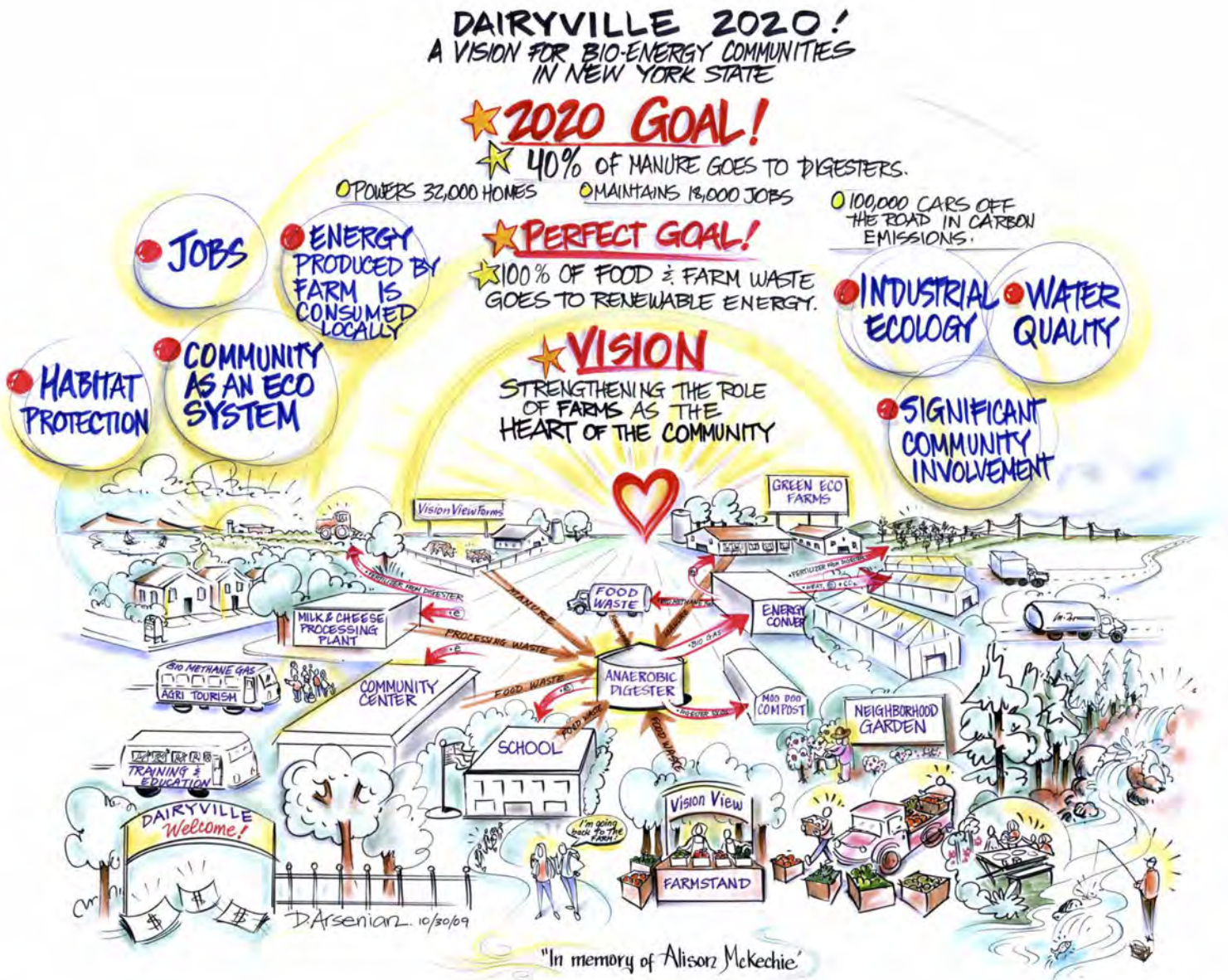
The digester isn't the only sustainable practice in use at Haubenschild Farms. All water is used twice, and variable-speed pumps are employed as well. The farm also was the first to sell carbon credits on the Chicago Climate Exchange. Haubenschild believes a dairy of any size can put these practices into place – and that agriculture has the potential to supply up to 40 percent of U.S. energy.

Haubenschild was recognized by the International Dairy Foods Association (IDFA) for his progress in sustainability and renewable energy when he was named 2010 Innovative Dairy Farmer of the Year during the IDFA Dairy Forum. The award recognizes U.S. dairy producers who apply creativity, excellence and forward thinking to achieve greater on-farm productivity and improved milk marketing.

"Dennis Haubenschild is an innovative leader, a friend to the environment and a steward of the industry who uses education and experience to teach others," says Greg Steele, vice president of Agribusiness Capital for AgStar Financial Services, who nominated Haubenschild for the award.

Imagine 'Dairyville 2020'

Dairyville is a biofuel-driven community committed to reducing its environmental footprint. Energy produced on farms is consumed locally, generating revenue for the dairy industry, jobs in the community, electricity for buildings and a more sustainable lifestyle for all.





"The U.S. Department of Agriculture commends the Innovation Center for U.S. Dairy for its foresight and commitment to advance the sustainability of the dairy industry. USDA and the industry are working together to identify key priorities, expand on-farm renewable energy opportunities and make energy audits more affordable for dairy farmers."

—USDA Secretary of Agriculture Tom Vilsack

STAKEHOLDER ENGAGEMENT AND PARTNERSHIPS

The goal of strengthening our economic, environmental and social sustainability is not an easy task. It cannot be done by one farm or by one cooperative or even by one segment of our value chain. We need to work together as an industry and include multiple viewpoints in order to improve how we do business.

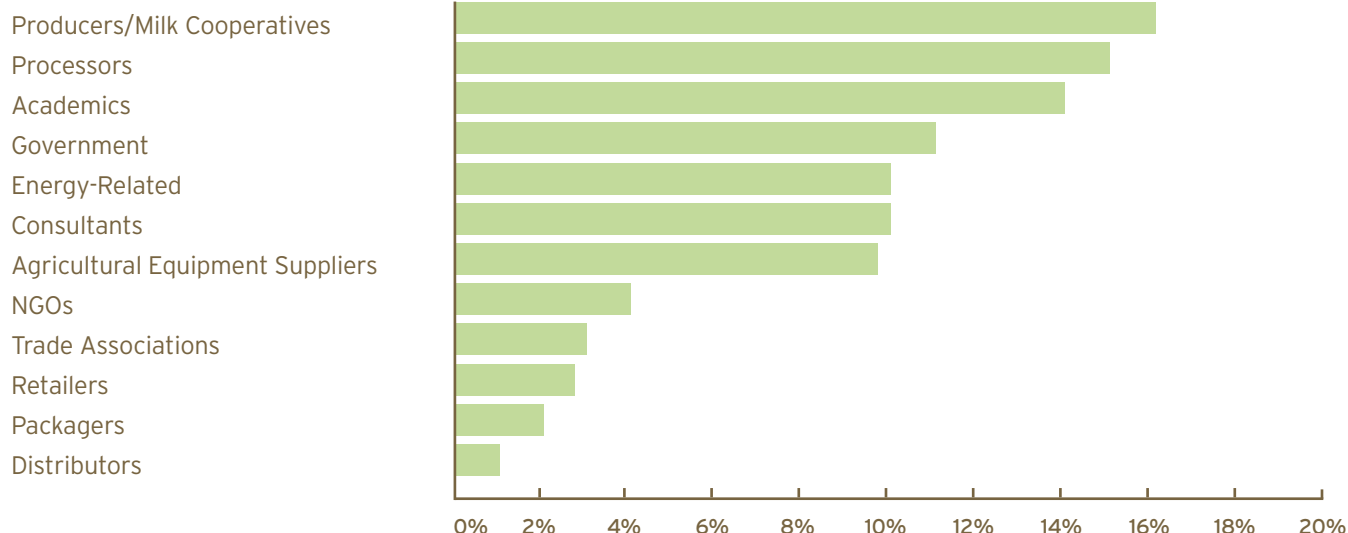
Today, more than 500 stakeholders and leaders from across the dairy industry – as well as thought leaders from universities, financial institutions, associations and government and nongovernment organizations – have joined forces to help the U.S. dairy industry reach our sustainability goals.

As we move forward, stakeholders involved in the sustainability initiative are volunteering their time and critical thinking to move our sustainability projects forward. From 2007 until August 31, 2010, it is estimated that these dedicated stakeholders have contributed a staggering 116,217 hours of time to the sustainability commitment – which amounts to nearly 15,000 working days, with a conservative value approaching \$5 million.*



**The total value is calculated by using the May 2009 National Occupational Employment and Wages Estimate (bls.gov).*

More than 500 stakeholders from 300 organizations are involved in the U.S. Dairy Sustainability Commitment.



The table shows stakeholders who are working on the GHG reduction projects as well as those serving on the Innovation Center Board, the Sustainability Council, and the Common Voice communications team.

The Power of Partnerships



The Innovation Center seeks out strategic partnerships with key organizations that share our goal of advancing sustainability in the dairy industry. The Innovation Center can leverage their expertise in creating our overall strategy. Sustainability partners include:

- ▶ **World Wildlife Fund (WWF).** WWF has been part of the sustainability initiative since the beginning and has maintained a formal partnership with the Innovation Center since both organizations signed a memorandum of understanding in the first quarter of 2009. The partnership has since included WWF's participation on the Innovation Center's Sustainability Council and recently resulted in the WWF sharing an experienced staff person dedicated to helping the Innovation Center tap into WWF expertise and advice on research, management practices and outreach for all Innovation Center initiatives, both on-farm and beyond the farm.
- ▶ **USDA.** On December 15, 2009, the USDA recognized the work of dairy producers and the entire industry with a memorandum of understanding. In it, the USDA and the Innovation Center for U.S. Dairy agreed to work jointly in support of the U.S. dairy industry's goal to reduce GHG emissions by 25 percent over the next decade. Together, we have identified various projects that can help the dairy industry achieve those GHG reduction goals and increase financial and environmental sustainability.
- ▶ **Manomet Center for Conservation Sciences.** Manomet Center for Conservation Sciences is a well-established nonprofit organization working to create a sustainable planet. The center is dedicated to conserving natural resources through research and collaboration. The sustainability team partnered with Manomet to create the Vital Capital Index and Toolkit, a tool to help dairy farmers identify opportunities for improving agricultural stewardship and to communicate their stewardship to their stakeholders and supply chain.



USDA Partnership Delivers Positive Results

In December 2009, the Innovation Center for U.S. Dairy became the first agricultural group to sign a sustainability-focused memorandum of understanding (MOU) with the U.S. Department of Agriculture (USDA). One year later, that partnership is helping dairy producers across the country manage resources more efficiently. Developments since the signing of the MOU include:

- ▶ A \$50,000 planning grant was awarded for the Farm Smart project.
- ▶ A \$200,000 contribution agreement from USDA will help farmers gain information and access to on-farm energy audits and energy conservation practices.
- ▶ Twenty-one awards for anaerobic digesters for dairies were granted in fiscal year 2010.
- ▶ Natural Resources Conservation Service launched an energy efficiency pilot program in 22 states. \$2 million was made available to U.S. dairy and other livestock producers to cover the cost of approximately 1,000 energy evaluations; more than 200 producer energy evaluations were conducted in fiscal year 2010.
- ▶ \$450,000 was committed to dairy processor research needs through the Dairy Plant Smart project.
- ▶ Through a new Farm Service Agency conservation loan program, producers are eligible for either a \$300,000 direct loan or a guaranteed loan of up to \$1.1 million to finance activities such as energy conservation and manure management strategies.
- ▶ Through a new Biomass Crop Assistance Program, matching grants of up to \$45 per ton may be available for producers to offset costs of delivering plant feedstock to a digester facility.
- ▶ Rural Development is providing up to \$50,000 per facility to conduct economic feasibility studies on manure digesters.



Alliances

The Innovation Center partners with other organizations and academia with specific areas of expertise, including the following:

- ▶ **Field to Market, the Keystone Alliance for Sustainable Agriculture**, is a collaborative group of grower organizations, agribusinesses, food and retail organizations, conservation organizations, universities and agencies, which are working to create opportunities across the agricultural supply chain for continuous improvements in productivity, environmental quality and human well-being. The group is developing indicators to estimate the environmental, economic, social and health outcomes of agriculture in the United States. The Innovation Center for U.S. Dairy is partnering with Field to Market to share findings and coordinate efforts to reduce the GHG emissions of the crops grown to feed dairy cows.
- ▶ **Sustainable Food Lab** is a consortium of business, nonprofit and public organizations working together to accelerate the shift toward sustainability and to develop tools and resources that help farmers improve their sustainability practices. Together, the Innovation Center and the Sustainable Food Lab are working to bring together the various stakeholders involved in improving the sustainability of the food system.
- ▶ **The Sustainability Consortium (TSC)** is an independent organization, administered by the Global Institute of Sustainability of the University of Arizona and the Applied Sustainability Center of the University of Arkansas. Members include global companies, universities and nongovernment organizations working to build a scientific foundation that drives innovation to improve consumer product sustainability through all stages of a product's life cycle. The Innovation Center is a steering committee member and involved in various TSC working groups.

Achieving More Through Partnerships



Our approach to enact system-wide change based on sound science and pre-competitive collaboration is unique. Because the whole system is involved, our commitment extends from goal-making and action-planning to measurement and implementation.

Working together ensures that our action plans are focused on projects that stakeholders want to help create individually, in partnerships and as a whole. People work on what they have the most a passion about and believe will make a positive difference.

As part of its own commitment to sustainability, DeLaval – a leading supplier to dairy farmers – made a contribution in support of the partnership between the Innovation Center for U.S. Dairy and the World Wildlife Fund.

“DeLaval welcomes the opportunity to work with the Innovation Center for U.S. Dairy and to assist with the entire U.S. dairy industry to address environmental challenges and opportunities. This includes recognition of the progress that has already been made, not least by dairy farmers throughout the country, and encouragement for new research, products, services and management techniques. To achieve more, we recognize the need to engage organizations outside of the industry and are therefore proud to support this cooperation between the dairy industry and WWF.”

–Dr. Wyatt Smith, General Manager, DeLaval

"The Innovation Center is a tremendous value to the industry because it's solving problems that can best be solved collectively. We are committed to a bright future for dairy, providing healthy products, healthy businesses and a healthy planet to future generations."

—Paul Rovey, Chairman, Dairy Management Incorporated and dairy farmer, Glendale, Arizona



ABOUT THE INNOVATION CENTER FOR U.S. DAIRY

The Innovation Center for U.S. Dairy was created in 2008 when Dairy Management Inc. (DMI), the National Milk Producers Federation (NMPF) and the International Dairy Foods Association (IDFA) recognized the need for the industry to collaborate to increase sales of milk and milk products.

Today, the Innovation Center aligns the collective resources of the industry to offer consumers nutritious dairy products and promote the health of people, communities, the planet and the industry. The Innovation Center is focused on a pre-competitive collaborative approach to:

- ▶ Overcoming barriers to innovation
- ▶ Identifying a competitive advantage for dairy
- ▶ Increasing category sales
- ▶ Driving demand for dairy and dairy-based products

Mission

The Innovation Center for U.S. Dairy provides a forum for the dairy industry to work together pre-competitively to address barriers and opportunities to foster innovation and increase sales.

Leadership

The Innovation Center board of directors includes 31 leaders from 30 key U.S. producer organizations, dairy cooperatives, processors, manufacturers and brands. The board's leadership and commitment to sustainability is a way for the dairy industry to continue to build on our positive environmental story in order to promote and protect dairy.

The Innovation Center is supported and staffed by DMI – the nonprofit domestic and international planning and management organization responsible for increasing sales of and demand for U.S.-produced dairy products and ingredients on behalf of America's dairy producers. DMI manages the American Dairy Association, National Dairy Council, U.S. Dairy Export Council and the U.S. dairy check-off program, which supports milk producers in marketing their products.



Commitment to Innovation

The right products...in the right place...at the right time...in the right way. Through the Innovation Center, the entire dairy industry is working together to offer consumers the dairy products they want – when and where they want them.

We are committed to serve as a catalyst for innovation in the dairy industry – with a focus on turning insights into innovation. We are also committed to using comprehensive research and testing to better understand the needs of consumers – of varying ages, genders and lifestyles –and responding with dairy products that satisfy those needs.

Commitment to Science

The Innovation Center values science as the foundation of our commitment to innovation. Peer-reviewed scientific research grounds decisions, informs the development of best management practices and helps establish goals and measure accomplishments for every segment of the dairy value chain.

In July 2010, the Innovation Center for U.S. Dairy formed the Dairy Research Institute™, a 501(c)(3) non-profit organization whose goal is to strengthen the dairy industry's access to and investment in the technical research needed to drive demand for dairy products and ingredients, globally. The institute brings together leadership from across the dairy industry, scientific community, academics, government and other organizations to plan and fund leading-edge dairy research in three key priority areas: nutrition science, product development and sustainability.



Operating Committees

The Innovation Center has formed five Operating Committees to address critical issues and opportunities in the U.S. dairy industry:

- ▶ **Health and Wellness** – bringing the entire industry together to focus on ways to ensure the future health of the nation
- ▶ **Research and Insights** – helping the dairy industry understand what consumers want and providing the knowledge and tools needed for innovation by dairy brands
- ▶ **Sustainability** – building a foundation of science to help us tell the story of our longstanding commitment to the environment.
- ▶ **Consumer Confidence** – protecting and promoting dairy's value and wholesomeness in the marketplace.
- ▶ **Globalization** – working to better understand the global dairy landscape so that the U.S. dairy industry can meet the needs of consumers worldwide.

Sustainability Council

The Sustainability Council is a leadership team of producers, processors, manufacturers, retailers and dairy industry experts from non-governmental organizations and academic institutions.

The Council convened for the first time in early 2008, and it meets monthly (by phone or in person) to shape vision and goals, shepherd the sustainability process and plan the next steps for the U.S. Dairy Sustainability Commitment.

From the beginning, the Council has modeled a new way of working together pre-competitively to encourage innovation in the sustainability area. The Council also works to inspire teams of dairy industry experts who volunteer valuable time and resources to develop and implement actionable plans.



Common Voice

A top priority for the industry is to increase awareness of the longstanding heritage of environmental stewardship that the dairy industry has earned, as well as our commitment to the future.

The **Innovation Center Common Voice** team is a network of several hundred dairy communicators who have a shared goal to communicate actionable, relevant information from the Innovation Center with a common voice in order to help individual companies and the U.S. dairy industry succeed both domestically and internationally. We have shared news and information about the U.S. Dairy Sustainability Commitment through this network since it was formed in 2010.

The **Sustainability Common Voice** team is an industrywide team that works together to tell our sustainability story and open doors to dialogue and engagement. This report is one part of a broader set of publications and outreach activities, including:

- ▶ ***Sustainability in Practice***, a story book that highlights best practices throughout the value chain
- ▶ Our website, usdairy.com/Sustainability, which features background information, case studies and communication tools
- ▶ The U.S. Dairy Video Channel on youtube.com/USDairyVideo, which includes speeches, interviews and presentations
- ▶ Media relations, which has resulted in more than 10,000 articles or mentions in online or print articles or blogs, primarily in dairy industry, agriculture and environmental news media
- ▶ Presentations and exhibits at key dairy events



"By engaging all the people you need to accelerate change, multipartner efforts like this one can drive systemwide innovation. The dairy industry understands the importance of involvement not just across the dairy supply chain, but with other critical stakeholders as well."

*—Andrew Winston, author of *Green to Gold**

MEET OUR STAKEHOLDERS

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U.S. DAIRY SUSTAINABILITY
COMMITMENT



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