Proceedings from Sustainable Western Dairy and Related Industries Workshop

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Sponsored by: Center for Advanced Energy Studies, UNIVERSITY of Idaho and College of Southern Idaho

September 16-17, 2014
Herrett Center, College of Southern Idaho, Twin Falls, ID

CAES Center for Advanced Energy Studies
University of Idaho
CSI College of Southern Idaho

Proceedings from Sustainable Western Dairy and Related Industries Workshop

SPONSORED BY: CENTER FOR ADVANCED ENERGY STUDIES, UNIVERSITY OF IDAHO AND COLLEGE OF SOUTHERN IDAHO

EXECUTIVE SUMMARY

This report summarizes events and findings developed from the Sustainable Western Dairy and Related Industries Workshop held September 16-17, 2014, at the College of Southern Idaho (CSI) campus in Twin Falls, ID. The workshop was sponsored by the Center for Advanced Energy Studies (CAES), the University of Idaho (UI) and CSI. The goal of the workshop was to identify and frame the major issues that must in part be addressed to achieve sustainable dairy and related industries and communities in Idaho and the arid Western United States (U.S.).

The workshop was organized around the following three focus areas:

- Financial sustainability: Efficiency, profitability, and an educated workforce
- Social and community sustainability: Community resilience in the face of change
- Environmental sustainability: Air, water, soil, and energy resources

Key findings and issues identified during the workshop:

1. Sustainability and intensification of dairies and related industries are complex and dynamic situations. This complexity necessitates a multimedia, process-based, integrated, systems-level approach that includes behavioral, economic, and environmental considerations. Mathematical assessments and integrated models are important tools in analyzing these events.
2. The highest priority topic for research and education is environmental quality. Nutrient recycling and recovery, soil and water degradation, redefinition of "Waters in the U.S," net-zero waste, water quality/quantity regulations, and greenhouse gas emissions are all elements of environmental quality.
3. Special attention needs to be placed on removal of nutrients, pharmaceuticals, pathogens, and other chemicals from dairy wastes. Water recycling is also important to water quantity.
4. Technology is available to remove undesirable constituents from effluent emanating from digesters that are used to process dairy manure. This includes fibrous solids, fine solids, phosphorous, ammonia, nitrogen and dissolved salts. Remaining water could be recycled back into the dairy.
5. Workforce education and immigration policy are critical to the achievement of sustainability. A guest worker program and educational opportunities may help to ensure an adequate supply of skilled workers, not only for dairies and related industries, but for agriculture at large. Analysis and communication between industry, agencies, educational providers and cultural organizations is required to ensure appropriate programs.
6. Value-added products from waste (including bio-plastics, fertilizers and soil amendment materials), energy use efficiencies, and efficient management practices will all contribute to industry vitality and sustainability. Economical approaches must be developed to produce value-added products and better approaches must be designed to enhance energy efficiency and efficient management practices.
7. It is desirable that a research dairy facility be built to conduct research and analysis on the issues identified above. This will mitigate liability risks for dairymen that could occur if this research is conducted in private dairies.
8. Dr. Chuck Staben, UI President, announced that the University is committed to leading a major dairy research and education initiative, including the design and build out of appropriate research and education facilities. He encouraged parties from all sectors to work collaboratively and cooperatively on implementation of the research and education agendas.

Action items from workshop:

1. Organize a research roadmap workshop on environmental quality, addressing issues like nutrient recovery, recycling and management and water, soil, and air quality.
2. Organize a research and education roadmap workshop on workforce and community development and social/cultural issues associated with the industry. Topics should include workforce education and training, immigration policies, and social-cultural and community integration.
3. UI continue to foster a research and education partnership approach to the sustainable dairy and related industries initiative. Research and education agendas and priorities should integrate environmental,

economic and social factors. Partners should include federal agencies, state agencies, industries, industry associations, non-profit organizations, and universities.

4. Begin identifying the requirements and design for a dairy research facility in southern Idaho. The two workshops discussed above will help identify requirements.

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INTRODUCTION

Providing an efficient, safe and secure food supply for an increasing population is a major global issue. Many humans are undernourished, changes in demographics and climate are reducing land available for food production systems, and water and soil issues are reducing harvests.

Animal protein is important to human nutrition, and dairy products are expected to provide a greater proportion of total protein as population grows and worldwide standards of living rise. However, the intensification of livestock and dairy operations will occur in the context of competing societal demands for limited land, water, and other resources. As a consequence, food processing industries need to grow their outputs of quality protein and other products in a sustainable manner. This includes attention to overall efficiency – boosting net gains for the quantity and quality of food while continuing to be effective stewards of natural and other resources and respected citizens in their communities.[1]

Over 40% of domestic commercial milk production is from dairies located in the arid Western United States, with two-thirds of this Western production in California and Idaho[2]. Continued growth of this Western dairy industry should be sustainable. A sustainable growth agenda will include: actively managing fresh water use and methane emissions, generating new energy, preserving soil and ground and surface-water resources, generating new income through energy production and producing value added products within the context of changing demographics and land use, community resilience, and the availability, education, and compensation of a skilled industry workforce.

The University of Idaho in collaboration with its Center for Advanced Energy Studies partners and the College of Southern Idaho sponsored a workshop to better understand the issues associated with sustainable dairy and food production in Idaho and the arid West and to begin to formulate a multi-institutional trans-disciplinary research agenda to address these issues. The *Sustainable Western Dairy and Related Industries* workshop brought together over 70 participants from industry, government, university and non-profit sectors (Figure 1), in Twin Falls, Idaho on September 16-17, 2014. Workshop attendees (Appendix A) provided a wide variety of expertise and perspectives on the subject of sustainability and intensification of Western dairies and related industries.

[1] Eisler MC, MRF Lee, 2014 Steps to Sustainable Livestock Nature, v. 507, 6 March 2014, pp. 32-34.

[2] USDA, Economic Research Service, Milk Cows and Production by State and Region (Annual), last update 5/1/2014. http://ers.usda.gov/data-products/dairy-data.aspx.

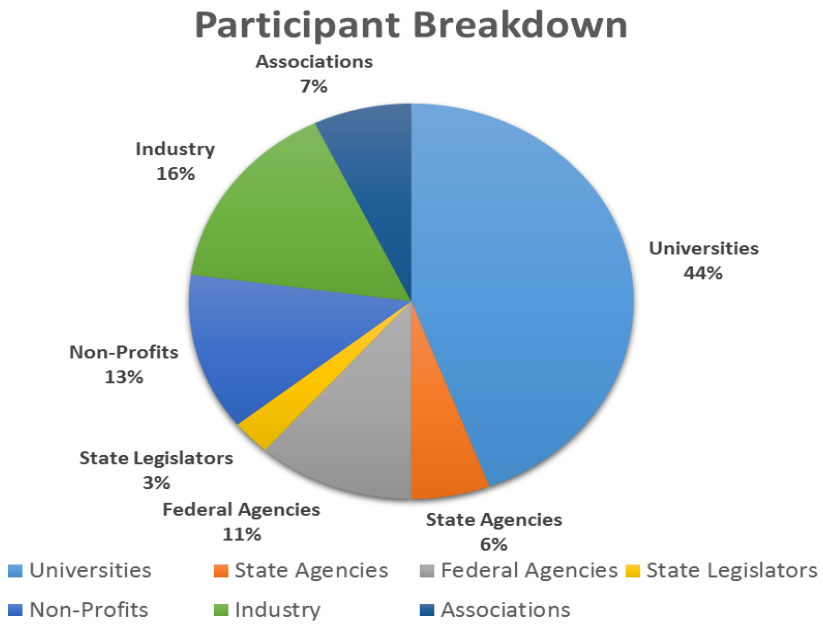

FIGURE 1: WORKSHOP DEMOGRAPHIC BREAKDOWN

The goal of the workshop was to identify and frame the major issues that must, in part, be addressed to achieve sustainability and intensification of dairies and related industries and communities in Idaho and the arid western United States. See Appendix B for the workshop agenda.

The workshop began with a tour of Glanbia Foods, Inc.'s research and development (R&D) facilities and whey plant. This tour gave attendees the opportunity to gain a deeper understanding of the dairy and food industry and the various players in dairy production and consumption process.

Following the tour, attendees returned to the Herrett Center at the College of Southern Idaho (CSI) to begin 1.5 days of keynote presentations, panel presentations and open discussions. Keynote speakers (see Appendix B) provided introductory remarks and challenges for the participants, setting the stage for the panel discussions. Keynote messages included:

1. Agriculture and energy each use co-equal amounts of fresh water and account for approximately 80% of domestic use. Food systems contribute up to 32% of global anthropogenic GHG emissions.
2. Dairy and related industries are part of the total food system, so research and education conducted on dairy issues must be done in this larger food systems context.
3. Workforce education is not only vital to sustainability and intensification of the dairy industry but to agriculture in general.
4. Extraordinary opportunities exist for an integrated Western dairy and food system, but this will require understanding of a complex system, better analysis tools, better information systems, and integrated science.
5. Customers are setting sustainable sourcing goals which require the industry to have responsive plans to meet those goals.
6. Dairy producers in Idaho are focusing on operational efficiency more than herd expansion.
7. Leadership is needed to advance a plan and agenda for achieving Western dairy sustainability. Leaders from all sectors should encourage and support collaborative research

and education among agency, industry and university players. This workshop should provide a pathway forward for collaborative research and education.

8. Discussions should begin to define the purpose and design for a major dairy research facility in southern Idaho. Existence of an adequate dairy research facility may reduce the liability risks associated with research being conducted on private dairy farms.

Panel discussions followed. Panel topics included: 1) Ecosystem/Environmental Quality; 2) Profitability; and 3) Urbanization, Community Development, Society and Workforce Perspectives.

SUMMARY OF SESSION PRESENTATIONS AND RELATED DISCUSSIONS

This section presents highlights of the presentations and related discussions for each panel session of the workshop. Links to panel presentations are provided in Appendix C. The audience provided commentary and asked questions following each panel presentation. Many of the comments are captured in the following summary highlights.

Session 1 Highlights: Environmental Perspective (Moderator, Andrew Gillespie, Associate Director, National Exposure Research Laboratory, USEPA)

1. Basic definitions of water sustainability and intensification are that the assimilative capacity of the receiving water resource is able to prevent long-term degradation and maintain its designated beneficial uses.
2. Water quality/quantity is at the forefront of consideration for sustainability for the dairy industry.
3. Nutrient recycling and recovery from dairies and associated agriculture operations will play a prominent role in development of net-zero waste scenarios.
4. The five-step treatment process discussed by Craig Frear for processing effluent from digesters has the potential to provide for zero waste from the digester to the field (see appendix C).
5. Complex questions involving sustainability and future climate change necessitate a multimedia, process-based and systems-level approach that explicitly includes behavioral, economic, as well as environmental factors.

Session 2 Highlights: Profitability Perspective (Moderator, Chad Frahm, Vice President, Innovation Center for U.S. Dairy)

1. Inside their plants, Glanbia Foods has a systematic focus on minimizing waste and optimizing their resources. Their philosophy is that profitability and environmentalism fit together.
2. Savings from energy consumption directly impacts the bottom line. A systems approach should be employed to determine the most efficient and effective use of energy. This approach should include an integrated design, modeling, communication, controls, and human factors.
3. It is not currently economical to deploy digesters at dairies in the Western United States, except California, unless nitrogen and phosphorus can be removed from digester effluent and sold as fertilizer or soil amendment. This is primarily due to low electricity and methane gas prices in the West (except California).
4. Digesters at dairies could be an integral part of a plan to move the dairy industry towards a zero waste scenario. However, more economical approaches must be developed to process digester products into valuable commodities in order to make this scenario work.
5. The Governor's trade mission is a good resource for sale of Idaho dairy products. Idaho dairy exports for January-June 2014 are up $239 million compared to last year during this time period, partly attributed to these trade missions.

Session 3 Highlights: Workforces, Communities, and Transportation Perspectives (Moderator, Steven Daley-Laursen, Administrator and Professor, University of Idaho)

1. The Dairy industry in Idaho is comparatively large and consequently there is great demand for movement of materials and products within the state. This requires the use of special facilities such as intermodal and trans-modal shipping facilities. In order to expand such shipments it is important that such facilities be constructed.
2. Hispanics make up a majority of farm workers and in 2011 they were 11% of Idaho's population. Over 70% of Idaho's Latino population was born in America.
3. It may be important that a robust guest worker program be instituted for the dairy industry to flourish in the United States because so many workers in the industry are non-citizen Hispanics.
4. It is important that educational institutions engage with industry to identify their future workforce needs—degree levels, disciplines, and focus of disciplines. Investment by industry in workforce education is requisite.
5. Agricultural science and technology and education systems must respond to emerging issues and develop approaches to address climate change, population growth, land use change, rapid urbanization, and the resulting transformation of food systems.

6. Social-Ecological-Systems models can be used to understand systematic approaches to the sustainability process. Using these models will help to illustrate how changes to the ecosystem will impact various stakeholders.

Luncheon Address on September 16: Dr. Ying Wang, Director for Sustainability Research, Innovation Center for U.S. Dairy

The Innovation Center for U.S. Dairy has a program on sustainability research. They provide coordination at the national level to promote sustainability for the industry. Dairy sustainability starts with open-source, peer-reviewed science about the environmental impact of dairy products. This requires that scientific research is conducted by teams working together to address issues like greenhouse gas emissions from dairy operations, recovery and recycling of nutrients from dairy waste, and water quality and quantity implications in watersheds where dairies exist. The Center has developed an analysis tool (Farm Smart) to aid in communication with the dairy industry and to provide transparency on identified issues related to sustainability. The Farm Smart model can be used to determine where we need to go in the future relative to sustainability and intensification for the industry.

SYNTHESIS OF WORKSHOP—JACK MCIVER, VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT, UNIVERSITY OF IDAHO

Dr. McIver offered the following comments/questions in his synthesis of the workshop:

1. It is important to consider the role of the dairy in the total food system and total resource management system.
2. What is the dairy footprint, and how resilient must that footprint be?
3. How important is the dairy industry in a water constrained environment?
4. What is the long-term impact of any policy on the dairy industry, especially on water and land use?
5. How serious is the issue of nutrient cycling regarding impact of water quality and quantity.
6. We need to determine what manure really is and how do we can alter it to mitigate environmental concerns.
7. What other products can be derived from manure in order to enhance profitability of processing manure?
8. What does zero mean with regards to zero-nutrient watershed?
9. How much additional animal science is needed to produce more milk per cow and can we influence the waste produced from cows such as enteric gas?
10. A major effort should be made in making dairy data more readily available.

CONCLUSIONS AND RECOMMENDATIONS

1. A large number of issues exist that must be addressed when evaluating sustainability of the dairy and related industries. The most critical issue, at the present time, is environmental quality. Sub-issues include: water quality and quantity; nutrient recovery and recycling; nutrient management; nitrogen emissions and fertilizer overuse; enteric gas emissions and interaction of air, water, and soil. Another workshop should be held soon to develop a research road map that will address these issues.
2. Use of digesters and alternative methods for processing manure may significantly reduce waste from manure and point toward net-zero waste for dairies. However, significant work remains to develop economical processes for removal of constituents (nutrients, ammonia, solids, and salts) from effluent solutions emanating from digesters. Removal of these constituents will allow the remaining water to be recycled back into the dairy and provide for water conservation.
3. Complex questions involving sustainability and intensification necessitate a multimedia, process-based, system-level approach that includes behavioral, economic, and environmental variables and inquiry. Mathematical tools are available to assess these complex issues. A Social-Ecological Systems framework may be useful.
4. Immigration is a significant issue confronting the dairy industry today. Hispanics comprise a large fraction of workers within the dairy industry and in order to be assured that there is an adequate workforce one approach may be to institute a guest worker program.
5. Workforce education for current and prospective employees is critical to sustainability. It is important that the industry communicate their education and training needs and that industry invest in educational processes and facilities.
6. A comprehensive dairy research facility is needed to support the research and education needed to achieve sustainability in the dairy and related industries in the arid Western U.S. A research facility should have the capacity to accommodate both small and large scale testing and research, sufficient land for environmental research, and facilities for analytical and educational purposes.

Outcomes of the Workshop

1. Dr. Chuck Staben, UI President, announced that the University is committed to leading a major dairy research and education initiative, including the design and build up of appropriate research and education facilities. He encouraged parties from all sectors to work collaboratively and cooperatively on implementation of the research and education agendas.
2. A workshop will be held to define the research and education priorities associated with environmental quality and interconnected concerns and begin pursuing resources to support the research and education agenda. Outcomes of the workshop will be a research and education road map and inputs to the design of a research and education facility. The workshop will be held in January or February 2015 in Boise, ID.
3. A workshop on workforce education/development and social/culture issues will be convened in a few months following the workshop on environmental quality.

4. UI and partners will begin to plan, design, and establish facilities to house and support an integrated research and education agenda.

Common Themes

Common themes that were frequently discussed regarding environmental quality during the workshop were as follows:

1. Soil ecology
2. Nutrient management, climate changes
3. Genotype to phenotype
4. Environmental interactions
5. Manure, emissions, and nutrient cycling
6. Research implications on the Dairymen's Association
7. Delivering quality data to dairymen
8. Water management infrastructure, quality, quantity
9. Nitrogen emissions, fertilizer overuse, enteric methane
10. Impending regulations
11. Full cycle nutrient capture
12. Production efficiency
13. Nutrient income

APPENDIX A: LIST OF WORKSHOP ATTENDEES

Last Name	First name	Title	Company
Morales	Leo	Interim Executive Director	ACLU of Idaho
Feris	Kevin	Associate Professor	Boise State University
Gardner	John	Professor and Speaker	Boise State University/ CAES
Fox	Jeff	President College of Southern Idaho	College of Southern Idaho
Patterson	Terry	Instructional Dean	College of Southern Idaho
Schwarz	Todd	Executive VP and Chief Academic Officer	College of Southern Idaho
Turnipseed	Brandi	Director, Workforce Dev.	College of Southern Idaho
Cativiela	Jean-Pierre	Program Coordinator	Dairy Cares (CA)
Cooter	Ellen	Research Physical Scientist	Environmental Protection Agency
Fisher	Ralph	Nutrient Management Specialist	EPA
Peak	Nicholas		EPA Region 10
Brown	Michael	Director of Dairy Economics and Policy	Glanbia Foods Inc.
Inouye	Chris	Sales and Marketing Manager	High Desert Milk
Shroll	Randall	Program Manager	Idaho Department of Commerce
Washburn	Courtney	Community Conservation Director	Idaho Conservation League
Naerebout	Rick	Speaker	Idaho Dairymen's Association
Tolman	Brent	Regional Business Specialist	Idaho Department of Labor
Inouye	Winston	Chairman	Idaho Freight Advisory Committee (IFAC)
Newby	Deborah	Senior Staff Scientist	Idaho National Lab
Wahlen	Brad	Post-Doctoral Research Associate	Idaho National Lab
Carpenter	Michael V.	Budget Manager	Idaho National Laboratory
Guillen	Donna	Distinguished Staff Engineer	Idaho National Laboratory
Wilson	Aaron D.	Research Chemist	Idaho National Laboratory
Pollow	Chris	Senior Engineer	Idaho Power Company
Johnson	Laura	Bureau Chief	Idaho State Department of Agriculture
Bell	Maxine	Idaho State Representative	Idaho State Legislature
Magnuson	Tim	Professor	Idaho State University
Tracy	John	Director	Idaho Water Resources Research Institute
Frahm	Chad	VP, Business Development	Innovation Center for U.S. Dairy

Last Name	First name	Title	Company
Wang	Ying	Director Sustainability Research/Luncheon Speaker	Innovation Center for U.S. Dairy
Schroeder	Jeff	Executive Director	Jerome County Commerce Authority
McCray	Jeff	Plant Manager	McCain Foods
Olmstead	J. Brent	Executive Director	Milk Producers of Idaho
Hagevoort	Robert	Extension Dairy Specialist	New Mexico State University
Barrow	Pamela	Director, Energy & Sustainability	Northwest Food Processors Association
Thornton	John	Energy Advisor/Principal Consultant	Northwest Food Processors Association/CleanFuture
Herring	Carleen	Senior Vice President	Region IV Development Association, Inc.
Pate	Ron	Principal Member of Technical Staff	Sandia National Laboratories
Elgethun	Leif	Senior Vice President	Site Based Energy
Rogers	Jan	Executive Director	Southern ID Economic Development Organization
Ahmadzadeh	Amin	Professor of Dairy Science	UI Animal Veterinary Science
Chen	Lide	Waste Management Engineer	University of Idaho
Coats	Erik	Assoc. Professor Civil Engineering	University of Idaho
Daley-Laursen	Steven	Senior Executive to VP Research and Development	University of Idaho
de Haro-Marti	Mario E.	Extension Educator	University of Idaho
Eigenbrode	Sanford	Professor	University of Idaho
Gessler	Paul	Professor, NKN Co-Director	University of Idaho
Griffith	David	Research Assistant	University of Idaho
Mahler	Robert	Professor	University of Idaho
Means	Mindy	Associate Director Corp. & Federal Relations	University of Idaho
Norell	Richard	Extension Dairy Specialist	University of Idaho
Staben	Charles	President, University of Idaho	University of Idaho
Stauffer	Larry	Dean College of Engineering	University of Idaho
Stegner	Joe	Special Assistant to the President	University of Idaho
Utigkar	Vivek	Professor	University of Idaho
Van Gerpen	Jon	Associate Dean	University of Idaho
Flynn	Jennifer	Executive Assistant	University of Idaho - Idaho Falls
Jacobson	Julie	Conference Assistant	University of Idaho - Idaho Falls

Last Name	First name	Title	Company
Keiser	Dennis	CAES Bioenergy Core Capability Coord. & Professor	University of Idaho - Idaho Falls
Merrick	Marci	Administrative Assistant	University of Idaho - Idaho Falls
Smith	Bob	AVP UI-Idaho Falls, Assoc. Director CAES	University of Idaho - Idaho Falls
McIver	Jack	VP of Research and Economic Development	University of Idaho
Costa	Allison	AgSTAR Program manager	U.S. Environmental Protection Agency
Gillespie	Andrew	Associate Director	EPA, National Exposure Research Laboratory
Leytem	April	Speaker	USDA Agricultural Research Service
Bjorneberg	Dave	Research Leader	USDA Agricultural Research Service
Boggess	Mark	Director	USDA U.S. Diary Forage Research Center
Frear	Craig	Assistant Professor	Washington State University
Vijn	Sandra	Director, Dairy	World Wildlife Fund
Brackett	Bert	Idaho State Senator	

APPENDIX B: WORKSHOP AGENDA

Sustainable Western Dairy and Related Industries Workshop

The Herrett Center for Arts and Science, 315 Falls Avenue, Twin Falls, ID

Tuesday, September, 16, 2014 Field Trip Touring Glanbia Foods Inc. Facilities

9:00–11:30 am Board Bus at Herrett and visit Glanbia Food Inc. R&D Facilities and Glanbia Whey Plant

11:40–12:30 pm Lunch in Centennial Park (Roy Raymond Shelter)

12:30–12:45 Return to Herrett Center for Workshop

Tuesday, September 16, 2014 Sustainability Workshop

1:00–1:30 Welcome Program Overview: **Dr. Robert Smith,** Associate Vice President, University of Idaho and Associate Director, Center for Advanced Energy Studies (CAES)

Welcome to Twin Falls and CSI: **Dr. Jeff Fox**, President, College of Southern Idaho

1:30–1:50 Challenge to Participants: Expected Workshop Outcomes and Products
Dr. Charles Staben, President, University of Idaho

1:50–2:20 National Keynote: "A Vision for Leadership in Sustaining the Western Dairy and Related Industries"; **Dr. Mark Boggess,** Director-U.S. Dairy Forage Research Center, USDA-Agricultural Research Service (ARS)

2:20–2:40 National Dairy Perspective: **Chad Frahm,** Vice President, Innovation Center for US Dairy

2:40–3:00 Western Dairy Perspective: **Rick Naerebout,** Assistant Director, Idaho Dairymen's Association

3:00–3:20 Networking Break

3:20–5:15 Session 1: Ecosystem/Environmental Quality Perspective (**Dr. Andrew Gillespie,** Moderator, US Environmental Protection Agency (US EPA)

Panel Speakers:

- Water Quality/Quantity
  - **Dr. John Tracy,** Professor and Director, Idaho Water Resources Research Institute, University of Idaho
- Emissions and Nutrient Issues
  - **Dr. April Leytem,** Research Scientist, USDA ARS, Kimberly, Idaho
- Waste and Nutrient Management
  - **Dr. Craig Frear,** Professor, Washington State University
- Climate Change Effects
  - **Dr. Ellen Cooter,** Research Physical Scientist, Atmospheric Modeling and Analysis, EPA
- Panel Speakers/Audience Discussion

6:00–7:30 pm Reception: Red Lion Canyon Springs, Invited Speakers
(heavy hors d'oeuvres and informal poster session)

Wednesday, September 17, 2014 Sustainability Workshop continued

9:00–11:30 am Session 2: Profitability Perspective
(**Chad Frahm**, Moderator, Vice President, Innovation Center for US Dairy)

Panel Speakers:

- Increased Efficiency in Milk Production and Food Processing
  - **Michael Brown** Director of Dairy Economics & Policy, Glanbia Foods Inc.
- Energy Management/Efficiency
  - **Dr. John Gardner**, Professor, Boise State University and CAES
- Additional Revenue Sources
  - **Dr. Dennis Keiser**, CAES Bioenergy Core Capability Coordinator and Professor, UI and CAES
- International Trade
  - **Laura Johnson**, Section Manager, Market Development Division, Idaho Department of Agriculture
- Panel Speakers/Audience Discussion

11:30–1:00 pm Lunch at Kinney Court, Herrett Center (CSI)
Speaker: **Dr. Ying Wang**, Director for Sustainability Research, Innovation Center for US Dairy

1:00–3:00 Session 3: Urbanization, Community Development, Society and Workforce Perspectives
(**Dr. Steven Daley-Laursen**, Moderator, Office of Research and Economic Development, University of Idaho)

Panel Speakers:

- Transportation Networks and Needs
  - **Winston Inouye**, Chairman, Idaho Freight Advisory Committee
- Preparing and Educating the Future Workforce
  - **Dr. Todd Schwarz**, Executive Vice President and CAO, College of Southern Idaho
- Immigration and the Workforce
  - **Leo Morales**, Executive Director, American Civil Liberties Union of Idaho
- Social-Ecological Systems Perspectives
  - **David Griffith**, Research Assistant, University of Idaho
- Panel Speakers/Audience Discussion

3:00–3:45 Wrap Up and Synthesis Session (**Dr. Jack McIver**, Moderator, Vice President for Research and Economic Development, University of Idaho)

3:45–4:00 Closing Remarks: **Dr. Robert Smith**, University of Idaho, CAES

APPENDIX C: WORKSHOP PRESENTATIONS

Refer to the link below for copies of the presentations given at the workshop.

https://www.dropbox.com/sh/nmipfzfxefkhkv6/AABaj3-ADnVStd4GfTXgi0Ysa?dl=0

If you need assistance accessing files on drop box, please contact Julie at:

jjacobson@uidaho.edu