

Waste Not: Maximizing the Economic Potential of Byproducts in the California Dairy Industry

Sustainable Conservation's Dairy Summit

May 9-10, 2013
Modesto, California

Meeting Summary

I. Overview

Sustainable Conservation hosted a two-day Summit in Modesto in May 2013 to explore new ideas, technologies, and business models that reduce the environmental impact of California dairies while providing profitable revenue streams and/or avoiding costs. The Summit brought together representatives from the dairy industry, technology experts, entrepreneurs, scientists, regulators, and environmentalists, to achieve three objectives: 1) explore new ideas, technologies, and business models, 2) develop a shared understanding of the most promising opportunities and the key barriers to their success, and 3) identify the next steps that Sustainable Conservation and others can take to support efforts by the dairy industry to reduce environmental impacts.

II. Welcome and Introductory Remarks

After a brief welcome from Ashley Boren, Sustainable Conservation's Executive Director, opening remarks were provided by Karen Ross, Secretary of California's Department of Food and Agriculture, and Paul Martin, Deputy Director of Permit Assistance of the Governor's Office of Business and Economic Development. Secretary Ross stressed the importance of the dairy industry to California and expressed her optimism despite the many challenges facing the dairy industry, pointing to the industry's visionary leaders and the current solutions-oriented administration. Mr. Martin reviewed the history of innovation in the dairy industry and echoed Secretary Ross in his optimism for dairy farmers. He encouraged the group to be methodological and thorough in assessing solutions, and outlined a six-step approach. He particularly highlighted the importance of the first step, identifying the problem that needs to be solved for the dairy producer.

The group then heard from Kathy Viatella, Managing Director of Programs for Sustainable Conservation, and Sarah Weldon, Senior Associate at California Environmental Associates (CEA). Ms. Viatella provided a brief overview of Sustainable Conservation's work with California's agricultural producers over the last decade, explaining the organization's collaborative and business-oriented approach to achieving its goals of improving air and water quality and wildlife habitat on agricultural lands in California. Ms. Weldon shared highlights from the study that CEA conducted on behalf of Sustainable Conservation to identify and evaluate the range of opportunities to reduce methane and nitrogen pollution from California dairies in ways that are positive additions to the dairy business model.

The remainder of the day was focused on hearing presentations from a set of speakers selected for their expertise with discrete technologies and/or business opportunities that could potentially be added to the traditional California dairy business model. The presentations were followed by small-group and full-

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group discussions to identify both barriers and opportunities to wide-scale adoption of these models in California.

III. Summary of Speaker Presentations

Adding Value: Nutrient Recovery and Fiber Products – Dr. Craig Frear, Washington State University’s Center for Sustaining Agriculture and Natural Resources

Dr. Frear introduced a new technology he has been working to develop and commercialize that recovers ammonia nitrates from post-dairydigester effluent. Technologies that can help take excess nitrogen off of the farm are of interest in California due to the increased regulatory pressure around nitrate waste discharge requirements (WDRs). His technology is able to recover nutrients from dairy effluent without using chemicals. The stripped nutrients are then put into contact with sulfuric acid to alter the pH and create a concentrated liquid fertilizer (8% nitrogen). His demonstration facility is producing 2,300 gallons per day from 1,500 cows. While the fundamental economics of this technology are enticing, the costs associated with storing and transporting the final product and the uncertainty of pricing available for the end product create economic challenges. The key concerns brought up by audience members were, 1) the viability of this technology on flush dairies, 2) what to do with the remaining effluent, which will have relatively high concentrations of phosphates and salt, and 3) if the ammonia nitrate is exported from the dairy, what will the dairy use to fertilize its own crops?

Dr. Frear further explained that most of the eight digesters in operation in Washington State are economically successful because they use additional substrates for co-digestion, adding to the electricity generation potential. Electricity prices in Washington State are low due to the abundance of cheap hydro-electric power. He noted that co-digestion revenues are starting to erode now that increased competition for the substrates is reducing tipping fees. Also, additional nutrient loading can occur with co-digestion and as a result developers need to pay attention to the nutrient content of added substrates.

Adding Value: Co-digestion – Chris Pierce, Organic Management Solutions (OMS)

Mr. Pierce provided an overview of what it takes to run a successful co-digestion business, emphasizing the industrial management approach that his company brings to anaerobic digesters. Co-digestion can optimize the energy output of a dairy digester. OMS’s goal is to provide third party management of manure, turning it into a profit center while allowing dairy farmers to stay focused on milk production. Mr. Pierce underscored the importance of understanding the customers (waste substrate providers) and providing a reliable service to them, as the market for their waste streams is competitive. He also stressed the need to treat the digester as a production system and to keep product quality consistent by making a recipe for the sludge and using an equalizing tank. Mr. Pierce acknowledged that the biggest liability in bringing on co-digestion is the potential to further complicate nutrient management for the dairy. Further challenges are the mismatch between contract periods with substrate providers and the time needed to pay off the upfront investment, and the risk that oversaturation will lead to substrate supply constraints, which depresses tipping fees.

Spatial analysis of opportunities for new business models – Daniel Smith and Joel Kimmelshue, Newfields

Sustainable Conservation commissioned Newfields to develop a preliminary set of GIS maps of Merced and Stanislaus counties, showing the density of dairies and dairy cows alongside a range of other potentially relevant resources. The resulting maps showed the proximity of dairies to potential feedstock substrate providers (e.g., food processors), existing biogas producers (e.g., wastewater treatment plants and landfills), and potential renewable natural gas (RNG) customers (e.g., vehicle fleets and existing fueling stations). The group discussed a range of possible steps for further mapping, including existing nutrient loading, land available for dairies, and transportation time or route maps between key clusters or facilities.

Scaling Up Energy Production – Biogas for Vehicle Fuel – John Boesel, CALSTART

Mr. Boesel provided an informative and optimistic overview of clean fuels, hybrid and natural gas vehicles, their adoption by major corporate fleets, and the potential for RNG from dairy manure and other organic waste streams (e.g., municipal solid waste). He stressed that recent advances in truck engine design and expanding infrastructure for natural gas fueling make it feasible for almost any fleet to convert to natural gas. RNG is interchangeable and blendable with natural gas in vehicles. Clean fuels markets are policy driven, with financial incentives available for RNG through both the federal Renewable Fuel Standard and California's Low Carbon Fuel Standard. Unfortunately, considerable uncertainty surrounding both policies is creating price volatility in the credits associated with their incentive programs, creating risk for any long-term investments.

Tomorrow's Digester – How Technology is Changing to Optimize Revenue Streams

Neil Black, California Bioenergy; Ray Brewer, CH4 Power; Daryl Maas, Farm Power Northwest; Chris Pierce, Organic Management Solutions. Moderator: Ashley Boren, Sustainable Conservation

The panel addressed a wide range of questions from the moderator and from the audience. They began with a discussion of the evolution of the digester business model, noting that the third party owner and operator model is now standard in the industry. The panelists pointed out that a significant amount of customization is still needed for each dairy, and therefore the relationship fit between the dairy and the developer is critical to a project's success. They agreed that the core digester technology has not changed much, but that selective catalytic reduction costs have come down for generator engines.¹ As developers gain more experience in digester management, they will continue to optimize the core technology for different dairy farms. The panel emphasized that though potential additional technologies and revenue streams (such as those discussed at the Summit) can be added on to digesters, it is important that the fundamental electricity generating digester model be profitable on its own. Co-digestion is particularly compelling given the enhanced energy generation capacity that additional substrates enable. However, securing a reliable supply of these substrates can be difficult. One panel member explained that it is really just a thin sliver of substrates that are a good fit for digesters, noting "if it's edible by a chicken, pig, or cow, it's too clean. If it has metals or human waste,

¹ Selective catalytic reduction is an after-treatment equipment required in the San Joaquin Valley to get power generators to comply with regional NOx emissions requirements.

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it's too dirty." Further, co-digestion can be problematic for dairies unless they have sufficient acreage to land-apply the increased nutrient output.

Daryl Maas spoke about his experience in developing a regional digester for five dairies in Washington State. He explained that while it is easier to develop a digester on a single dairy, a regional system may be a necessary way to get to scale if the dairies are small. A regional system can also provide some resiliency to the system by reducing dependency on one dairy for a long-term and reliable supply of manure. The group agreed that there are many ways of capturing efficiencies of scale without actually consolidating manure. For example, a developer's operations and maintenance costs decline when several digesters are operating in proximity to one another. Further, establishing electronic controls and sharing the costs of grid interconnection are other ways to reduce costs. The panel commented on the potential for selling high-end compost or capturing nutrients, noting that while adding these revenue streams could improve the bottom line, making a high quality product requires an investment, and it has been difficult to find reliable markets. Most dairies and digester operators will not take on the risk without a ready market.

The panel was asked whether or not they are optimistic or pessimistic about the future of dairy digesters in California. On average, the group was optimistic, but very measured in their optimism. They are pleased with the progress made with consolidated permitting, and continue to see a tremendous asset base in California, but stressed that there is still uncertainty in power purchase agreement pricing. They emphasized the importance of favorably modifying the California Public Utilities Commission's Renewable Market Adjusting-Tariff (ReMAT) in order for digesters to be developed profitably. The panel emphasized the value of dairy bioenergy as flexible and non-intermittent. Once there is a favorable price for dairy biogas, developers can start to come down the learning curve and the cost of capital will decline. Without a favorable policy environment, California is a high cost market. The panel members also stressed that given the current high cost of capital, state and federal grants and/or low-cost financing are still incredibly helpful.

New Financing Mechanisms – Environmental Credits and Their Applicability in California –Dick Kempka, Climate Trust

Day two of the Summit was kicked off by remarks by Mr. Kempka who provided a thorough overview of carbon offset credits and renewable fuel credits.

- Carbon: California's carbon market will be accepting agricultural offsets. Carbon offset credits are owned by the dairy digesters; contracts around ownership are very important and require careful attention. Mr. Kempka shared the findings from Climate Trust's dairy digester profitability model which showed baseline returns of 8% internal rate of return (IRR) for a digester without any environmental credits. A dairy with 5,000 cows could generate 17,500 credits per year. The floor price for carbon allowances is currently \$7/tonne and offsets trade for a 30% discount with returns of 9.5% IRR. As the market matures, the Air Resources Board projects the price for carbon allowances will reach \$20/tonne in 2020 with returns of 11% IRR. Modeling by Point Carbon shows that the price will reach \$36/tonne with returns of 12.5% IRR. American Carbon Registry projects that there will be a shortage of offsets by the second or third compliance period. The cost of compliance is in the \$8,000-10,000 range, but developers have

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seen additional costs and uncertainty to date because protocols on the voluntary markets have been continuously changing. Mr. Kempka expected this to settle down as California's compliance market comes online.

- **Renewable Fuels:** Credits for renewable fuels can also be sold through both federal and state programs. The federal Renewable Fuel Standard established Renewable Identification Numbers (RINs) as an incentive for biofuel producers, priced according to carbon intensity (higher value for greater carbon offset). RINs are generated and owned by the fueling station. In some cases, RINs are more valuable than the fuel coming off of the project. However, RIN prices have been volatile because there is still considerable policy uncertainty as the Environmental Protection Agency has the ability to change volume requirements annually. A dairy with 5,000 cows can generate 82,000 MMBtus² of biomethane per year and earn 1.06 million RINs. Climate Trust's dairy profitability model predicted returns based on three different price scenarios, at low \$0.20/RIN (11% IRR), medium \$0.49/RIN (15% IRR) and high \$0.72/RIN (18% IRR). Additionally, credits can be generated through California's Low Carbon Fuel Standard by capitalizing on the difference between the carbon intensity of crude oil and that of biomethane. Prices for these credits are also quite uncertain because California's Low Carbon Fuel Standard is currently held up by lawsuits.

Mr. Kempka summarized by projecting that under the "likely scenario" modeled by Climate Trust, environmental credits could make up 25 to 30 % of revenues from dairy biogas, but that credits are not bankable currently because there is so much policy uncertainty and price volatility. Aggregation is needed to secure the economies of scale necessary to profitably tap the carbon markets.

IV. Group Discussions

Barriers

The first group brainstorm focused on identifying barriers to nutrient recovery technologies in California, primarily responding to Craig Frear's presentation. A subsequent brainstorm added barriers specific to large-scale energy development.

Technical	<ul style="list-style-type: none">• Flush vs. scrape - California is considered "extreme flush"• Final liquid effluent is in a less desirable form for field application• Complexity of systems and need for technical capacity
Markets	<ul style="list-style-type: none">• Customer/market development• Uncertain environmental credits
Financial	<ul style="list-style-type: none">• High capital investment• Mismatch of lifespan of project vs. farm management needs• Changing value of end products (especially if market gets flooded)• High capital cost

² MMBtu = 1 million Btus

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	<ul style="list-style-type: none">• High interconnection cost• Model needs to work on manure to attract equity and cover debt
Regulatory	<ul style="list-style-type: none">• Future environmental regulations• Increased nitrogen and salt loading – increased land requirements
Operational	<ul style="list-style-type: none">• Is this the solution to the dairy's problem?• Lack of long-term contracts with both suppliers and buyers (reliable 3rd party vendors)• Increased project complexity; profitability of components vs. whole• Scalability/transportation costs/storage• Dependent on other parties/suppliers/substrate availability• Near-term vs. long-term objectives• Concentration of dairies and available land for field application (i.e., nutrient management may not be a problem for all dairies)• Different business model for dairies• Future availability of water and prices• Black eye of past failures

Opportunities for Nutrient Recovery and Fiber Products

Participants engaged in small group discussions around the opportunities for nutrient recovery and fiber products in California. Guided by a set of common questions, conversations focused around the costs of managing nutrients while meeting regulatory compliance, flush vs. scrape systems for manure management, and risks to the dairies in adopting these models.

- Nutrient management: While most participants agreed that the cost of nutrient management on California dairies is fairly low and is rarely an urgent issue on a day-to-day basis, the long-term concern is quite high and is causing stress. In time, the regulatory landscape could become much more stringent, potentially putting dairies out of business. In many areas, dairies are currently competing with specialty crops for land, so not only are the acquisition costs for additional land high (necessary for effective nutrient management using on land-application of effluent), but there is an opportunity cost to holding land primarily for waste application, as well as an attendant risk that dairies may exit the industry altogether and sell their land to higher value crop production.
- Flush vs. scrape: There are a range of pros and cons for both flush and scrape systems. Flush has been used historically in California because water has been inexpensive and it is a good way to distribute nutrients. Also, most dairies in California were designed for flush systems and therefore could not easily convert to scrape/dry systems. Scrape systems require more energy to operate, but also have a smaller footprint (smaller lagoon). Flush systems provide nutrients in a soluble form, so they are more plant available. Scrape systems are more at risk of incurring odor problems and scraped effluent has a higher pH, but is more transportable (lighter than

water dense flush). Scraped solids are also only land applied prior to planting and could not be distributed to cropland during the growing season, like lagoon water. Only land applying solids prior to planting could create large banks of organic nitrogen that would be very difficult to manage and is more prone to leaching. The group agreed that nutrient management is critical, but that it doesn't necessarily require a shift from flush to scrape. The decision of which manure management system to use needs to be made on a case by case basis. The issue may best be addressed on a regional basis.

- Risks and opportunities to dairies in adopting nutrient recovery technologies: The group's primary concerns were additional regulatory requirements, high capital costs, and the problem of managing remaining organic nitrogen and salts. Opportunities identified included: using reverse osmosis to remove salts (a costly process, but one that could be run using excess digester heat), pelletizing nutrients so that they can be transported out of the San Joaquin Valley, and building a fertilizer plant in the San Joaquin Valley to facilitate nutrient recovery and removal. The group cited the consolidated permitting process as a promising sign that the right environment for innovation in the dairy sector is being created.

Opportunities for Large-Scale Energy Production

Participants engaged in small group discussions around the opportunities for large-scale energy development in California, either supplying electricity or biofuel markets. The group answered the following questions:

- 1) Do you see future opportunities for large-scale energy production systems and how can those opportunities be realized?
 - Participants had a mixed review of the RNG opportunity. Some are excited about RNG markets because of the value of RINs (renewable fuel credits), recent rulemaking requiring that utilities accept biomethane injection, the potential for avoiding the challenges that have plagued bioenergy electricity markets, and the potential to partner with municipalities that might have funds available for these kinds of projects. Others pointed to the high costs associated with cleanup and compression. Participants saw an opportunity in nutrient capture, but emphasized the need for outside capital and marketing expertise to develop customer channels (i.e., third party development). Participants seemed slightly more encouraged by opportunities in electricity markets, citing the potential for bioenergy to be used as baseload power and flexible capacity, and the potential to develop rural electric co-ops. Further, the group expressed interest in combined heat and power, as using energy on-site can be more profitable than selling it to utilities.
 - Broadly, the group cautioned that stability is needed in the underlying business of any dairies that are participating in these kinds of projects because of the long-term capital investments required. The industry is in flux currently and there is risk, primarily to third party developers, that any participating dairy might convert to orchards in the near term.
- 2) How can we as a group help accelerate coming down the learning curve?

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- Participants identified a number of ways in which Sustainable Conservation and other stakeholders could accelerate adoption of these models, including: sharing knowledge and helping develop more transparency and dialogue, additional mapping to help provide access to government data, involving UC Extension in evaluating technologies (particularly nutrient recovery technologies), and advocating for more incentives to help overcome the risks.
- 3) Is there merit in piloting some of the value added products (fiber/compost), and what is the best approach to do that?
- The group agreed that while pilots are important, participants need to be selected carefully to help ensure success. Further, the group stressed the importance of getting a range of experts involved (e.g., engineers, producers, agronomists) and not just academics.

Additional comments included the importance of soil as a natural resource that is being depleted and the valuable role that manure can play in regeneration, and the need for a “game-changer” to dramatically increase the scale of adoption of digesters and other environmental management models for dairies.

Review of New Business Opportunities				
Opportunity	Problem addressed for the dairies	How promising? (1 low-10 high)	Actions needed	Notes
Standard Digester (electric power, combined heat and power, co-digestion)	<ul style="list-style-type: none"> - Additional revenue stream (or cost avoidance if on-farm demand) - Opens opportunities for other revenue streams (e.g. biofuels, nutrient capture) - Reputational/PR value - Methane control - Reduced odor - Pathogen control - Potentially an improved N form for fertilizing crops 	5-6 for dairies; 8 for developers	<ul style="list-style-type: none"> - Reliable third party developers (good match with dairies) - Strong incentives from utility partners - Improved regulatory process - Policies like the million solar roofs initiative - Capital financing - Regional cooperative model (like rural electricity coops) - Risk reduction 	Co-digestion: It is not possible to outsource liability for co-digestion nutrients because of regulatory enforcement. If power generation is the goal-then there will be misaligned incentives between 3 rd party and farmer.
Nutrient recovery	<ul style="list-style-type: none"> - Helps get rid of excess nutrients, especially important for dairies with little land - Opens manure application to more crops because pathogens are removed - Additional revenue stream - Makes nutrients more transportable and more marketable 	Ranged from 2-9, depending on location/need and also consideration of model maturity	<ul style="list-style-type: none"> - Customer identification and market development (e.g. organics market) - Further development of technology - Address issue of remaining salts 	<ul style="list-style-type: none"> - Options will depend on location - Business model is not yet proven
Renewable Natural Gas (vehicle fuel) & RINs	<ul style="list-style-type: none"> - Additional revenue stream - Predictable fuel costs if used on farm - Reputational/PR value - Methane control - Reduced odor - Pathogen control - Potentially an improved N form for fertilizing crops 	Between 2 and 8 depending on market proximity/on farm demand; 4 for developers	<ul style="list-style-type: none"> - Advocate for LCFS and viable environmental credits - More NG infrastructure - Better understanding of the market - Better understanding of aggregation potential (central facility) and storage challenges 	Production must be at scale. Need 1200 cubic feet/min (done with a 8,600 cow dairy) or 2,000 cow dairy if 30% substrate. Likely to be driven by third party developers.

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Review of New Business Opportunities, continued				
Compost	<ul style="list-style-type: none">- Additional revenue stream- Distributes salt more evenly- Relatively easy to implement, low capital costs, good fit with existing business model- Improves soil health- Opens manure application to more crops because gets rid of pathogens- Kills weed seeds- Converts nutrients to a more usable form	7/9 for on-farm uses; 2 – 9 for off farm uses (depending on to what extent regulatory hurdles are considered); 7 for developers	<ul style="list-style-type: none">- Address regulatory hurdles (air district, CalRecycle), potentially develop consolidated permitting- Assess markets and key customers- Better testing mechanisms to determine value of product- Cultivate 3rd party developers given risk and expense of selling commercially	<ul style="list-style-type: none">- Works best with a scrape system because nutrients are better captured in organic solids- Risk to selling commercially (e.g., food safety scare in Salinas Valley)

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V. Final Recommendations

The final group conversation of the Summit focused on two questions: 1) What outstanding questions need to be answered and 2) What role could Sustainable Conservation and others play to help realize these opportunities?

Outstanding questions

Standard Digester

- Are there enough incentives to be attractive to dairies? To be attractive for 3rd parties?

Nutrient Recovery

- What are the dairy characteristics that are a fit for this technology?

Renewable Natural Gas/Vehicle Fuel

- A CA specific feasibility study to help determine: What are the real savings at play for dairies? Dairies with fleets?
- How would CARB react to siting a new CO₂ source (i.e., emissions from the biogas upgrading facility)?

Compost

- What are the regulatory implications of on-farm and off-farm compost use/sales? Can the consolidated permitting process be used?
- What role can compost play in salt management?
- What are the differences between scrape and flush in terms of nutrient flow and composition of compost (share existing data)?
- What is the water board's position on salt prioritizations?

Role for Sustainable Conservation

Standard Digester

- Matchmaking services between dairies and third party developers
- Engage municipal utilities and irrigation districts
- Create or revive technology review panel with diverse expertise
- Weigh in on the Senate Bill 1122 ReMAT
- Map supply and demand for co-digestion

Nutrient Recovery

- Map and identify dairies with biggest need
- Monitor the implementation of the irrigated lands program
- Technology review for nutrient technologies
- Monitor fertilizer fees – exceptions for organic?

Renewable Natural Gas/Vehicle Fuel

- Map fleet opportunities (customers)
- Policy advocacy around RINs and Low Carbon Fuel Standard

Compost

- Partner with the Interagency Dairy Digester Taskforce on the possibility to utilize the consolidated permitting process for a regional composting facility.
- Help develop agronomic studies to better determine the value of compost
- Develop a market assessment and help identify key customers

All presentations from the Summit and CEA's full report are available at: www.suscon.org/dairysummit

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VI. Summit Attendees

Kevin Abernathy <i>Milk Producers Council</i>	Amy Dickie <i>California Environmental Associates</i>
Bob Adams <i>Sustainable Conservation</i>	Craig Frear <i>Center for Sustaining Agriculture and Resources, Washington State University</i>
Chuck Ahlem <i>Ranch and Hilmar Cheese Company</i>	John Harrington <i>Natural Resources Conservation Service, USDA</i>
Andrew Altevogt <i>Central Valley Regional Water Quality Control Board</i>	Sean Hurley <i>California Polytechnic State University, San Luis Obispo</i>
Ladi Asgill <i>Sustainable Conservation</i>	Richard Kempka <i>The Climate Trust</i>
Neil Black <i>California Bioenergy</i>	Karen Khamou <i>Pacific Gas and Electric Company</i>
John Boesel <i>CALSTART</i>	Joel Kimmelman <i>NewFields</i>
Ashley Boren <i>Sustainable Conservation</i>	Eric Lee <i>Sustainable Conservation</i>
Ken Brennan <i>Pacific Gas and Electric Company</i>	Marco Lemes <i>Sacramento Municipal Utility District</i>
Cindy Brewer <i>CH4 Power, Inc.</i>	Jody London <i>Jody London Consulting</i>
Ray Brewer <i>CH4 Power, Inc.</i>	Karl Longley <i>California State University, Fresno</i>
John Cardoza <i>Sustainable Conservation</i>	Daryl Maas <i>Farm Power Northwest; Co-Founder, Maas Energy Works</i>
J.P. Cativiela <i>Dairy Cares</i>	Paul Martin <i>Office of Business & Economic Development, Office of Edmund G. Brown, Jr.</i>
Margaret Cederoth <i>Parsons Brinckerhoff</i>	Shell Macpherson <i>PacLand</i>
Joe Choperena <i>Sustainable Conservation</i>	
James DeJong <i>Rabobank, N.A., Food & Agribusiness Research and Advisory</i>	

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Deanne Meyer <i>UC Davis & California Dairy Quality Assurance Program</i>	Stacey Sullivan <i>Sustainable Conservation</i>
Denise Mullinax <i>California Dairy Research Foundation</i>	Paul Sousa <i>Western United Dairymen</i>
Greg Norris <i>Natural Resources Conservation Service, USDA</i>	Matt Summers <i>West Biofuels</i>
Chris Pierce <i>Organic Solution Management</i>	Arlan Van Leeuwen <i>Hew Hope Dairy, LLC</i>
Evan Powers <i>California Air Resources Board, Stationary Source Division</i>	Kathy Viatella <i>Sustainable Conservation</i>
Karen Ross <i>California Department of Food & Agriculture</i>	Casey Walsh Cady <i>California Department of Food and Agriculture, Division of Marketing Services</i>
Patrick Saxton <i>California Energy Commission</i>	Dave Warner <i>San Joaquin Valley APCD</i>
Sandra Schubert <i>California Department of Food and Agriculture</i>	Sarah Weldon <i>California Environmental Associates</i>
Daniel Smith <i>NewFields</i>	Dan Weller <i>California Air Resources Board</i>
	Doug Williams <i>Williams Engineering Associates</i>

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VII. Summit Agenda

Thursday, May 9

- I. 8:30 – Breakfast and Registration
- II. 9:00 – Welcome & Goals
Ashley Boren, Executive Director, Sustainable Conservation
- III. 9:05 - Opening Remarks
Significance of the California Dairy Industry
Karen Ross, Secretary of the California Department of Food and Agriculture
California's Dairies – Leaders in Innovation
Paul Martin, Director of Permitting Assistance, Office of Business & Economic Development, Office of Edmund. G. Brown, Jr.
- IV. 9:25 – Partnering with the Dairies to Enhance Environmental & Economic Sustainability
Kathy Viatella, Managing Director of Programs, Sustainable Conservation
- V. 9:35 – Environmental Solutions for California's Dairy Industry – New Business Models
Sarah Weldon, California Environmental Associates
- VI. 9:50 –Adding Value: Nutrient Recovery & Fiber Products
Craig Frear, PhD., Assistant Research Professor, Center for Sustaining Agriculture and Natural Resources, Washington State University
- VII. 10:20 – Break
- VIII. 10:35 – Adding Value: Codigestion
Chris Pierce, President, Organic Solutions Management
- IX. 11:05 –Adding Value: Nutrient Recovery & Fiber Products– Group Discussion
 - Barriers -- Group Brainstorm
 - Opportunities – Small group discussions
 - Small groups report out on Opportunities
 - Question & Answers
- X. 12:15 – Lunch
- XI. 1:15 – Spatial Analysis of Opportunities for New Business Models
Daniel Smith, Newfields
- XII. 1:45 –Scaling-Up Energy Production – Biogas for Vehicle Fuel
John Boesel, President and CEO, CALSTART
- XIII. 2:15 -- Tomorrow's Digester- How Technology is Changing to Optimize Revenue Streams
Moderator: Ashley Boren, Sustainable Conservation
Daryl Maas, Farm Power Northwest
Ray Brewer, CH4 Power, Inc.

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Neil Black, California Bioenergy
Chris Pierce, Organic Solutions Management

XIV. 3:15 Break

XV. 3:30 Large-Scale Energy Production – Group Discussion

- Barriers -- Group Brainstorm
- Opportunities – Small group discussions
- Small groups report back on opportunities
- Question & Answer

XVI. 5:00 – Closing Remarks

Ashley Boren, Executive Director, Sustainable Conservation

XVII. 5:15 – Reception

Friday, May 10

I. 8:00 – Breakfast

II. 8:30 – Overview of Objectives for the Day

Ashley Boren, Executive Director, Sustainable Conservation

III. 8:45 – New Financing Mechanisms – Environmental Credits and Their Applicability in California

Dick Kempka, Vice President of Business Development, Climate Trust

- Barriers to Environmental Credit Markets– Group Brainstorm (15 min)

IV. 9:30 – Discussion of New Business Opportunities - Small groups

V. 10:30 – Break

VI. 10:45 – Small Groups Report & Full Group Discussion

VII. 11:45 – Lunch

VIII. 12:30 – Discussion of Action Plan

Facilitated by Sustainable Conservation and California Environmental Associates

IX. 1:30 – Closing Remarks

Ashley Boren, Executive Director, Sustainable Conservation

X. 1:45 – Adjourn