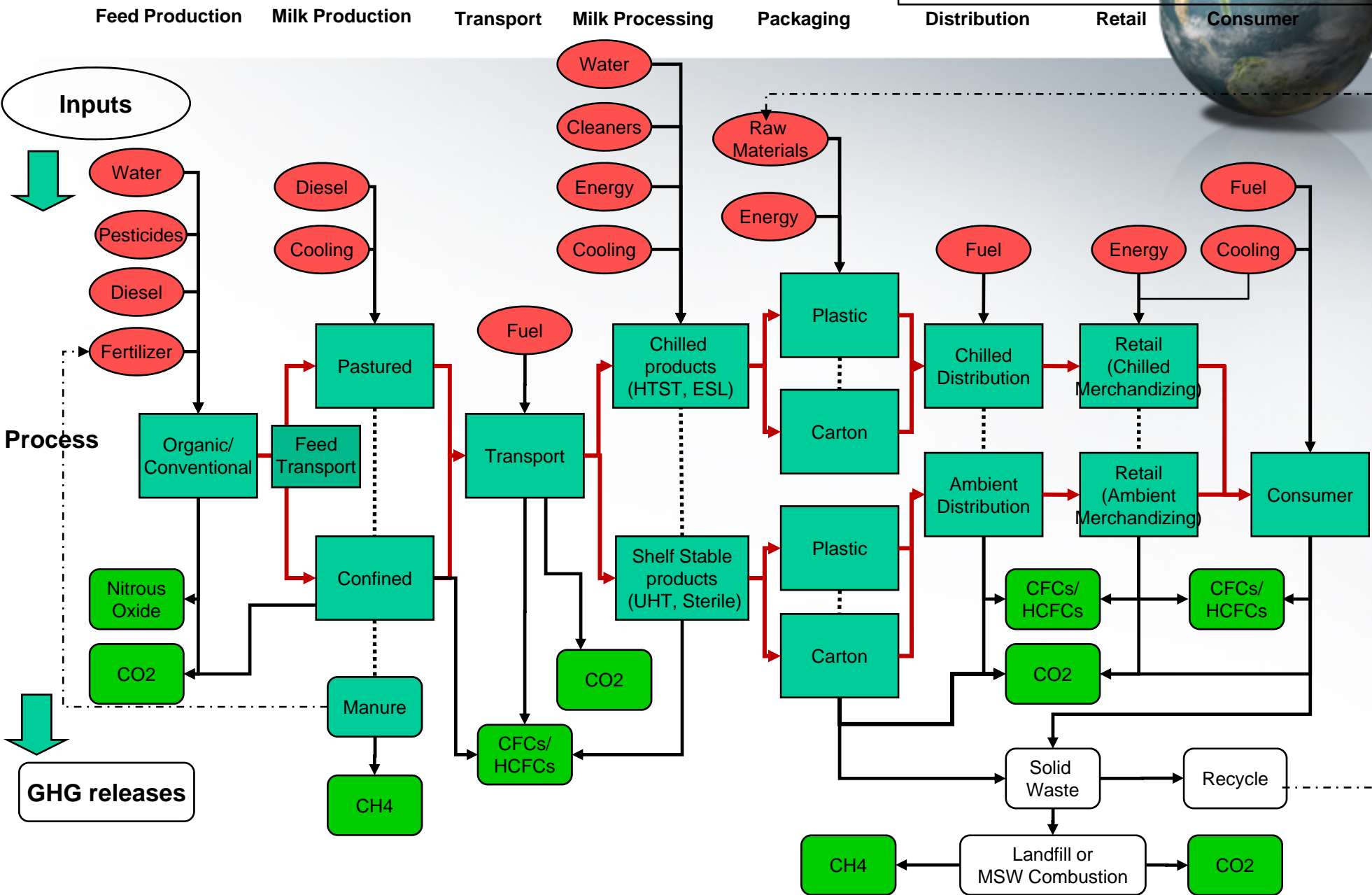
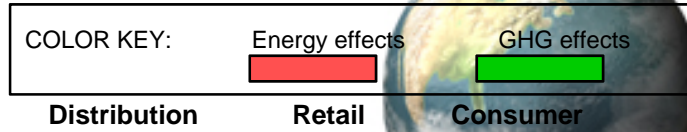




# **LCA Methodology for fluid milk**

# Milk Supply Chain



# Milk LCA: Data Inventory



## Surveys:

- 1) Dairy Producer (planned 15 Jan)
- 2) Milk Processor (51 plants responded)
- 3) Retail outlets (data request pending)

## Published Literature:

- 1) Peer Reviewed Literature
  - a) Comparison of feed composition to methane models to provide a realistic range for on-farm enteric methane
  - b) Life cycle inventory data for crop production (fuel, fertilizer, pesticides)
- 2) Inter/National Publications (e.g. IPCC, EPA)

# Current status:



- *Processor* survey:
  - Complete, reports sent to processors
  - Represents 54% of U.S. fluid milk
- *Retail* survey
  - 30% complete
  - 20% of all dairy retail to be surveyed
- Farm to processor *transportation* survey
  - 50% complete
- Finished product *distribution* survey
  - Complete

# Current status: Producer Survey



- Draft survey reviewed by key producers for feedback
  - 100% complete
- Fielded Beta test with 40 producers
  - 15 responses; 100% complete
  - Interviewed all respondents
- On-farm visits to farms
  - Intensive grazing; large CAFO; mid sized CAFO; small operation
- Overall on-farm survey release
  - Tentative release date 15 Jan 2009

# Process for completing Producer Survey



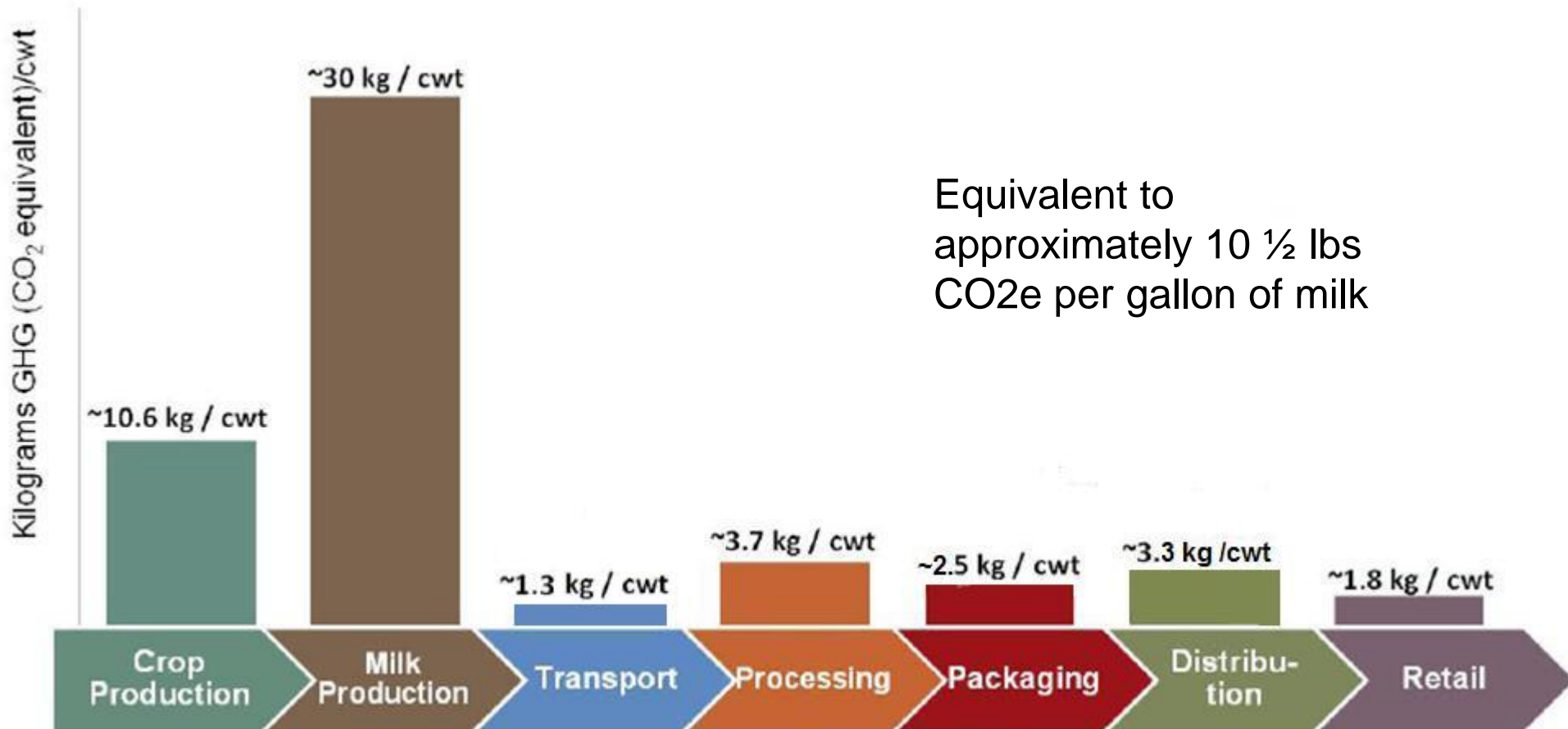
## Surveys in Field -- Five Weeks

- Producers complete survey and return to UA in the postage paid envelopes
  - UA never receives or identifies names of producers -- only serial numbers returned
  - Serial numbers on the survey ensure there are no duplicates & help with follow-up
- Periodic follow-up mailings (2-3 times) sent urging producers to respond
- Weeks 2-5, UA provides reports to each co-op with serial numbers of those who respond
- Co-ops encouraged to compare serial number to their producer list and conduct individual follow-up calls to producers who have not responded
  - Follow-up calls not needed if voluntary producer response rate is high enough in each region



# Initial Results

# Scan level carbon footprint

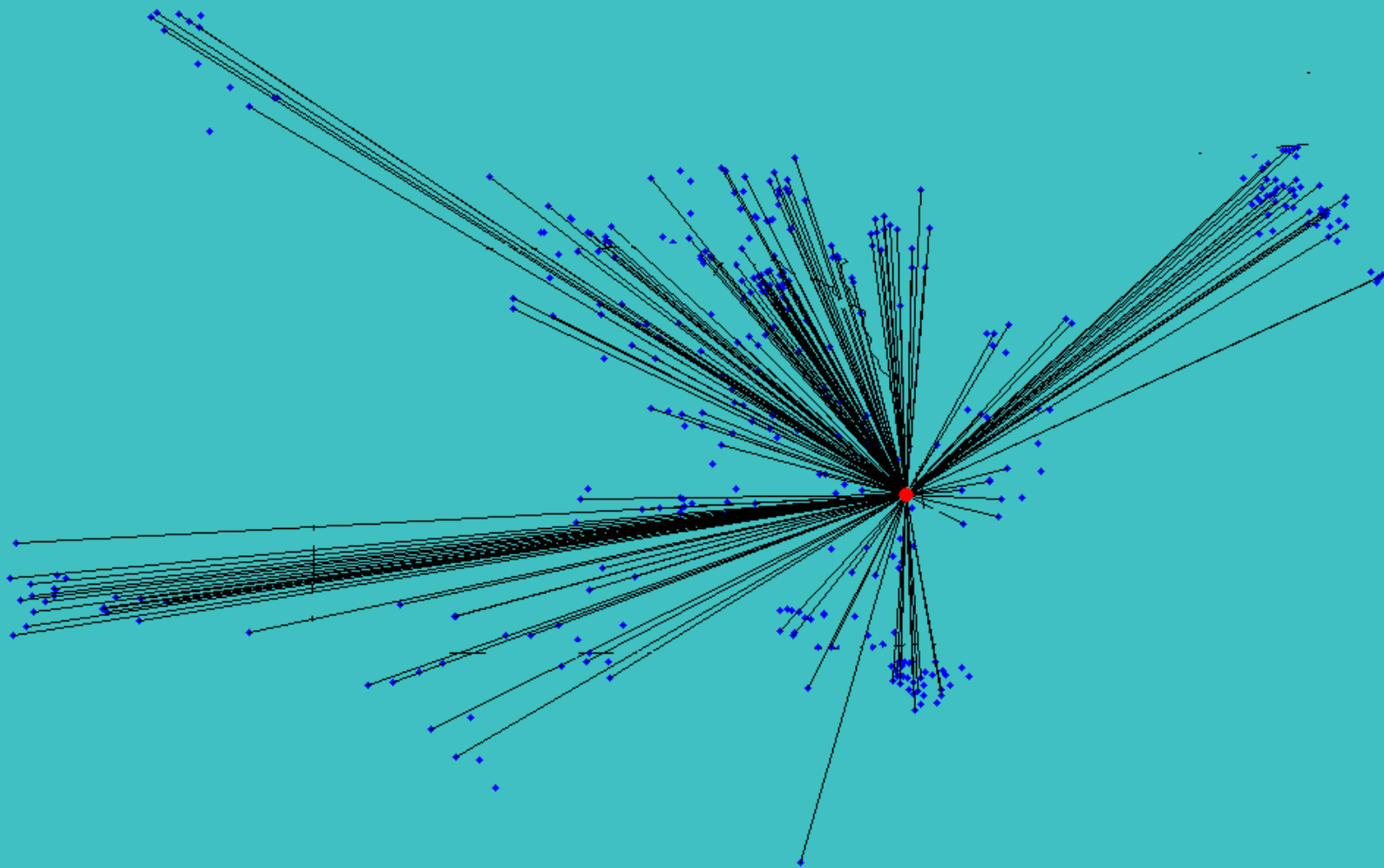


Prepared for the Dairy Summit with Blu Skye Consulting from existing literature and national scale data for crop and milk production and retail; current processor results for remaining stages.



**Number of Farms = 397, Number of Trips = 7530**

**Avg Miles/Trip = 288, Longest Trip = 983, Avg Gallons/Trip = 4308,  $\text{kg CO}_{2e}/\text{kg milk} = 0.0312$ ,  $\text{kg CO}_{2e}/\text{gallon milk} = 0.1219$**



# Milk LCA: Analysis



## What do we do with this information?

- 1) Find hotspots in value chain: E.g. Dairy
- 2) Compare production methods
- 3) Make decisions
- 4) Disseminate information
- 5) Potential for Carbon Credits

# Milk LCA: Reducing Hotspots



## Examples

### Dairy Farm:

- 1) Better manure management, e.g. biogas
- 2) Nutrition management

### Processing:

- 1) Shelf-stable milk
- 2) Cogeneration e.g. capturing waste heat



# **A retrospective look at dairy GHG emissions**

# Methane production



$$\text{CH}_4 \text{ (MJ/d)} = 3.23 + 0.81 \times \text{DMI (kg/d)}$$

*Ellis et al. 2007*

	<b>2007</b>	<b>1924</b>
Daily milk, kg	25.2	5.2
Daily DMI, kg	18.9	9.7
Daily CH <sub>4</sub> , MJ	18.5	11.1
MJ CH <sub>4</sub> / kg milk	0.73	2.13
Total cows x 1,000	9,150	21,417
<b>Total CH<sub>4</sub> emissions, TJ</b>	<b>169.3</b>	<b>237.7</b>

*Garcia and Linn (2008)*



# **Carbon Credit Markets**

# Voluntary Carbon Standard

## Voluntary Carbon Standard Program Guidelines

19 November 2007

VCS Secretariat  
24 rue Merle-d'Aubigné, 1207 Geneva, Switzerland  
secretariat@v-c-s.org

**VCS** { **VOLUNTARY  
CARBON  
STANDARD**



An increasing proportion  
of offset projects are  
methane destruction  
based

# VCS Requirements



- Real
- Measurable -- above a baseline
- Permanent
- Additional -- beyond 'business as usual'
- Independently verified
- Unique -- can't be traded on multiple markets
- Transparent -- public disclosure of some info
- Conservative

# Carbon Markets:

Forging a Frontier: State of the Voluntary Carbon Markets 2008  
A report by Ecosystem Marketplace & New Carbon Finance



- **42.1 million tonnes of carbon dioxide equivalent (MtCO<sub>2</sub>e) transacted on the OTC market in 2007.**
- **22.9 MtCO<sub>2</sub>e transacted on the CCX in 2007,**
- **tripling of transactions for the OTC market compared to 2006, and more than doubling of volumes on the CCX.**
  - **completed and confirmed transactions, so these volumes should be considered conservative.**
- **~25% 'retired'; remainder used as investment**

With financial crisis, CCX prices have fallen from ~\$7 to less than \$2

# Carbon Offsets & CCX



- CCX is a voluntary cap and trade market
  - Carbon Financial Instruments®: binding contracts for CO<sub>2</sub>e reductions
- Agricultural Methane Project Offsets
  - Significant generators must be members
  - “Additionality” requirements
    - Previous practice must have had high emission potential,
    - e.g., you won’t qualify if you currently use daily spread
  - Digesters allowed: covered lagoon, mixed, PFR
  - Third party verification required

# DAIRY METHANE DIGESTER SYSTEM PROGRAM EVALUATION REPORT (2006)



	Biogas per cow per day	Electricity per cow per day	Capital Cost per cow	Cost per nameplate kW
Covered Lagoon	44.4 cf	1.84 kWh	\$585	\$4,654
Plug Flow	48.6 cf	1.73 kWh	\$1,042	\$5,159

Pay back period (with grant funding):  
Lagoons: 5-10 years  
PFR: 5-48 years



# Proposed Canadian Protocol for Enteric Methane Offsets



- Alberta Quantification Protocol
  - Edible Oils In Cattle Feeding Regimes
  - Reductions in enteric methane emissions from cattle as a result of changes to the finishing diet.
  - Feeding of edible oils which suppresses methanogenesis from the rumen of cattle.

# Conclusions



- Sustainability appears to be here to stay as a factor driving consumer and regulatory action
  - Currently this is heavily slanted toward GHG
- Dairy has significantly reduced its carbon footprint in the past 75 years, opportunities to continue improving and potentially generate additional revenue are emerging
- Producer survey to be launched in January through Coops
- LCA project completion estimated May 2009



Thank you.