




Assessing the Carbon Footprint of Animal Agriculture

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What is a Carbon Footprint?

Total GHG (greenhouse gas) emissions caused directly and indirectly by an individual, organization or state in a given time

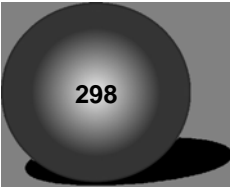
- Measured in CO₂-equivalents in terms of environmental heat capturing capability



1
CO₂



23
CH₄



298
N₂O

Source: http://pcc-wq1.ucar.edu/wq1/Report/AR4WG1_Print_Ch02.pdf
Last accessed, July 26, 2009

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Sustainability is Not a Passing Fad



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...Consumers want to hear about sustainability, affordability, and efficiency—in that order

"In the United States, we need _____".

More earth-friendly dairy farming	23%
More affordable milk	21%
More efficient milk production methods	15%
More environmentally friendly milk production tools	15%
More innovation in dairy farming	8%
More sustainable milk	7%
More land available to grow other foods	6%
More land set aside for parks and recreational use	4%

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Retailers Are Responding and Accelerating the Movement

THE WALL STREET JOURNAL

Corporate Focus
Big Firms to Press Suppliers on Climate --- PB&G, Others to Join In Pushing Plants For Emissions Data
 By Jane Spencer
 708 words

A group of multinational companies is embarking on a campaign to encourage their suppliers to report greenhouse-gas emissions, pressuring thousands of vendors and factories to show they are taking steps to battle climate change.

In the future, consumers may be able to shop for even small items with a carbon footprint in mind. Cadbury Schweppes is one of a number of European companies trying to label individual products with carbon-emissions data. Cadbury is trying to figure out how much carbon is released in the process of making a Dairy Milk chocolate bar, from the dairy farm through the factory. Eventually, the company plans to stamp the bars with a carbon footprint number, alongside the calorie count.

The announcement comes just two weeks after Wal-Mart Stores Inc. announced similar plans to begin asking suppliers for data on their energy efficiency, in partnership with the CDP. Wal-Mart has started monitoring emissions at 25 to 30 companies that collectively supply seven products: DVDs, toothpaste, soap, milk, beer, vacuum cleaners and soft drinks.

Oakhurst Dairy in Portland, Maine, one of Wal-Mart's major milk suppliers in New England, was recently asked by the retailer to measure the carbon footprint of a case of milk. Oakhurst says it ultimately found the internal energy audit process useful.

Excerpted from: Wall Street Journal, Oct. 9, 2007

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Meat, Milk & Egg Production is Clearly Being Held Accountable

livestock's long shadow
 environmental issues and options

- Livestock production accounts for 18% of Greenhouse Gas emissions worldwide (UN/FAO, 2006)
- In the USA, contribution of Agriculture (in total) to GHG emissions is approximately 6% (EPA Report on GHG Emissions, 2008)
- Ability to discuss environmental benefits is critical for development of animal productivity products

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In Fact – Animal Ag is Under Attack



SILENT BUT DEADLY

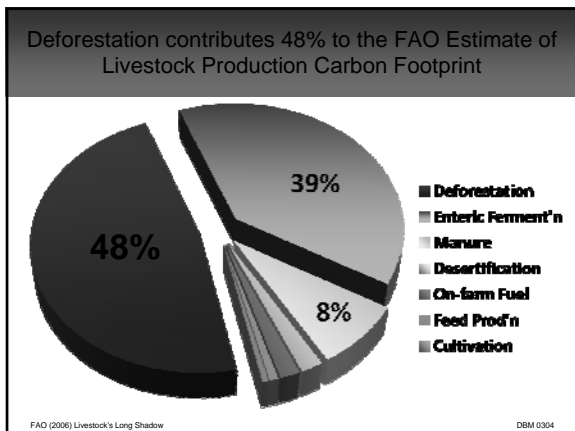
SILENT BUT DEADLY

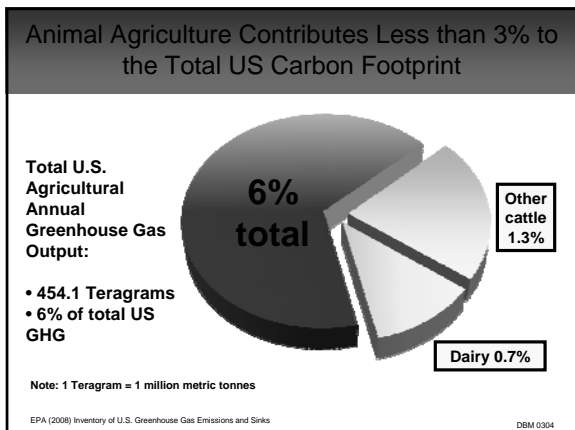
Did you know that farmed animals produce more greenhouse gas emissions (18%) than the world's entire transport system (13.5%)? Or that nitrous oxide from animal manure is around 300 times as damaging to the climate as carbon dioxide? Or that methane (cow and sheep flatulence to you and me) has 25 times the global warming impact of carbon dioxide?

Makes you think doesn't it?

Vegetarian Society (2008) <http://www.vsgsoc.org>. Last accessed, July 26, 2009

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Dairy Industry Response: Established an Industry-Wide Goal

25% Reduction of Greenhouse Gas Emissions from Fluid Milk by 2020

- Equivalent to removing 1.25 million passenger cars from the road annually
- Committed to
 - Sound science
 - Establishing an industry benchmark
 - Life Cycle Assessment



Source: <http://www.environmentalleader.com/2009/04/14/dairy-industry-to-cut-milk-related-emissions-25-by-2020/>
Last Accessed July 26, 2009

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“Greenwashing” Undermines the Value of Responsible Efforts and Is Unacceptable

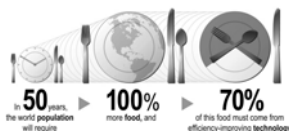


1. Carbon-free sugar
2. Organic rocks
3. Certified organic sea salt (NaCl)
4. Organic cigarettes
5. No-calorie energy drinks
6. Organic charcoal
7. Carbon-neutral insurance
8. Zero-carb alcoholic drinks
9. Carbon-free shipping
10. Carbon-free computing

Source: <http://www.supplyfirst.com/2009/05/04/sugar-coated-consumerism-or-just-plain-cruc/>, Last accessed July 26, 2009

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The Real Challenge: Global Demand Requires More Food



Technology's Role in the 21st Century: Food Economics and Consumer

- Challenge to meet 100% increase in global food demands in 50 next years
- The global food industry needs technology
- Consumers need choice
- The food production system can mitigate the food economics challenge and achieve an "ultimate win."
- Requires the continued use of safe and efficacious technology and close collaboration across the entire global food chain.

Sources: Green, B. et al. January 2005. "Farming and the Fate of Wild Nature." Science 307:5709: 550-555; and Timan, D. et al. August 2002. "Agricultural sustainability and rice production practices." Nature 418:688: 671-677.

"World Agriculture: toward 2015/2030." 2002. United Nations Food and Agriculture Organization, Rome. Accessed: 10/30/08. <http://ftp://ftp.fao.org/docrep/04/02/027a12027a.pdf>

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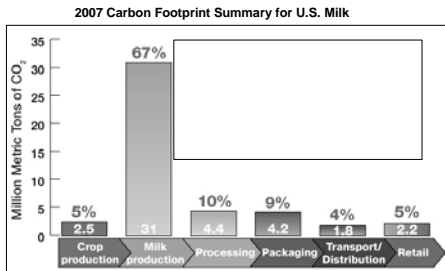
Scientific Efforts Have Focused on Reducing Animal and Farm Emissions

- ✓ Improve metabolic (feed) efficiency
- ✓ Improve nutrition
 - Ration balancing
 - Feeding management
- ✓ Improve cropping practices & technology
- ✓ Improve manure management
 - Storage
 - Processing
 - Application



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Dairy Industry is the Most Well Defined Animal System to Date



Source: 2009, Capper et. al, JAS, & Blue Sky Sustainability Consulting

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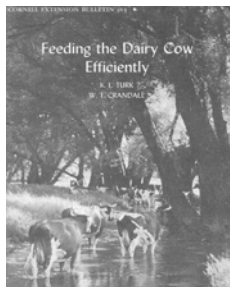
Productivity is Not a New Concept

1927

1953

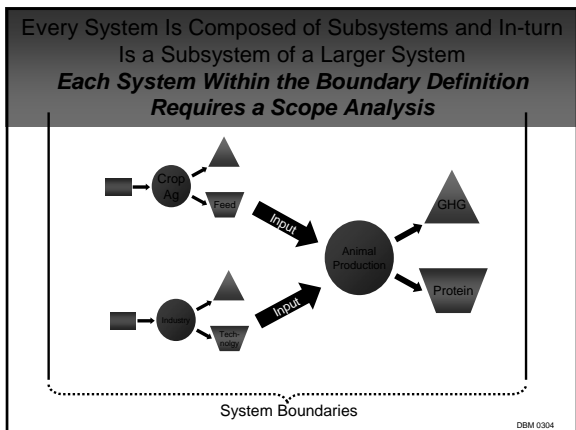
"When the population of this country increases to 200,000,000 it should be easily possible for the additional supply of dairy products needed to be produced not by more, but by better dairy cows...."

The average milk production of US cows is about 4,500 pounds a year. If this were increased at a rate of 100 pounds a year, in 45 years the average milk production per cow would be doubled. The present number of cows could then supply sufficient dairy products at the present rate of consumption for considerably more than 200,000,000 people."



J.C. McDowell, US Yearbook of Agriculture (1927)

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Overview of LCA

From Earth back to Earth Tracking

<p>Four Basic Stages</p> <ul style="list-style-type: none"> • Goal & Scope Definition • Inventory Analysis • Impact Assessment • Interpretation 	<p>Key Components</p> <ul style="list-style-type: none"> • Raw material acquisition • Materials manufacture • Production • Use/reuse/maintenance • Waste management • System boundaries • Assumptions • Conventions used • By-product output expressed per unit of output
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Source: <http://www.epa.gov/ttn/t1/access/ta101.html>, May 12, 2009

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Essential to Assess Impact per Unit of Output Rather Than per Unit of the Production Process

	<u>Vehicle 1</u>	<u>Vehicle 2</u>		
Fuel Burned in 5 hrs:	70 gal	10 gal	}	
Distance Traveled:	350 mi (5 mpg)	350 mi (35 mpg)		Production Process
Passengers:	50	4	}	
People Miles:	17,500	1,400		Output
People MPG:	250	140		

Winner

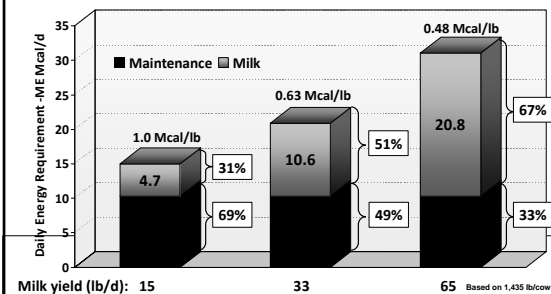
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Appropriate Food Animal Production Units

- **Dairy** – per unit of milk (eg. lb, kg, g, or l) or dairy product (eg. cheese)
- **Meat** – per unit of meat (eg. lb or kg) and/or no. of specific type of cut
- **Eggs** – per number of eggs

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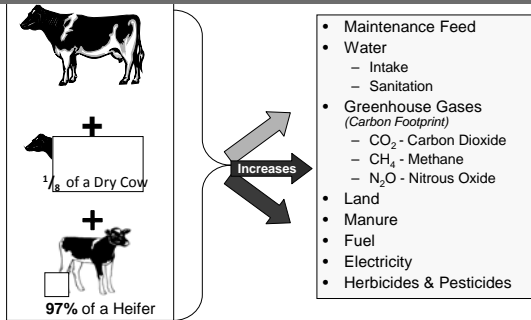
Animals are Not Cars: They Have a Maintenance Cost Dilution of Maintenance is a Key Consequence of Productivity



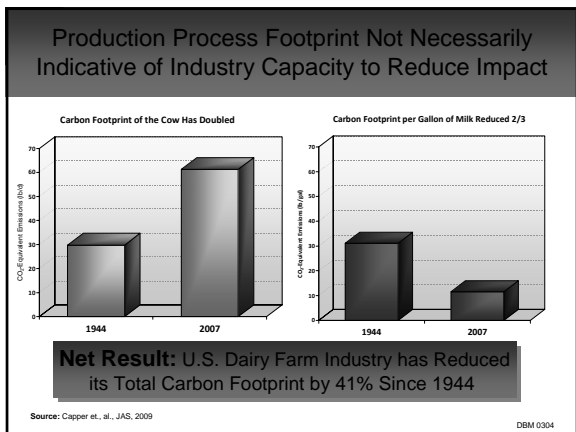
Adapted from Clapper et al. (2008), PNAS

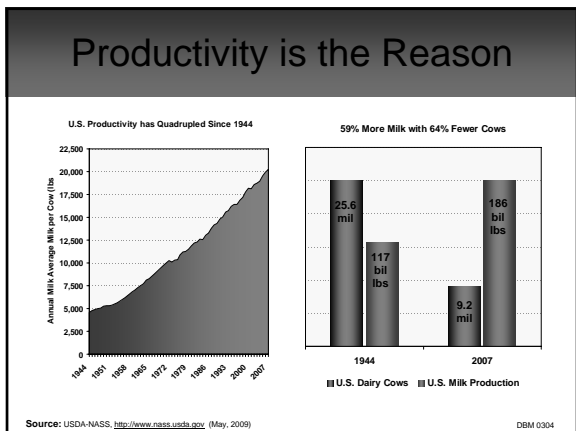
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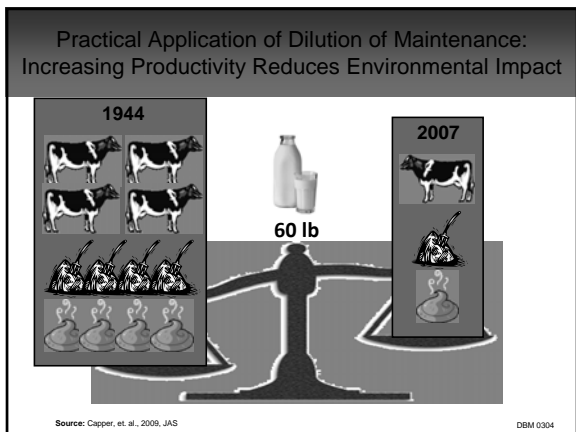
Infrastructure Maintenance Must Also Be Assessed It Takes a Herd to Make Milk



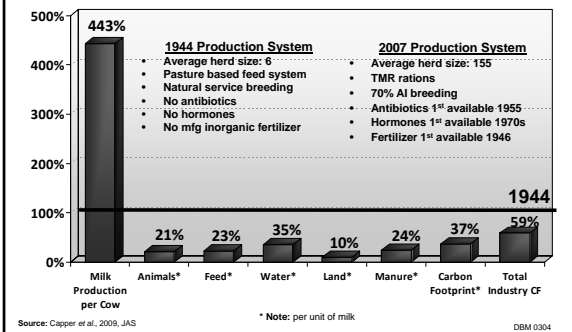
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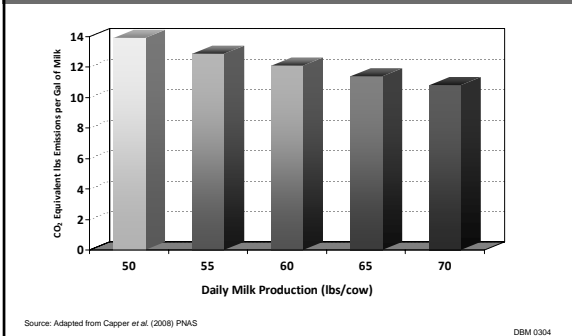




Environmental Impact of Milk Production Has Been Considerably Reduced Since 1944



Increased Production Reduces Carbon Footprint Per Gallon of Milk



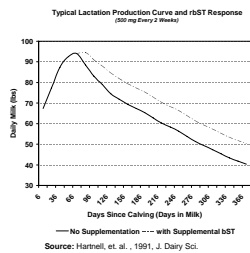
Key Components of 2008 Cornell rbST Impact Study

- LCA evaluation
- Impact assessed on industry-scale dairy production system (population) basis
- All animal diets, intakes and metabolism based on NRC₂₀₀₁ nutrient requirements
 - Includes heifers, milking cows, dry cows and bulls
- Resource and output data sourced from peer-reviewed scientific publications and government reports
 - No undocumented assumptions
 - USDA milk and crop yields
 - USDA crop production inputs
- Scopes included: animals, cropping, manure, fertilizer and fossil fuels as sources of GHGs and nutrient flows
- rbST manufacturing impact acknowledged

Source: Capper, et al., PNAS, June 2008

rbST Has a Positive Environmental Impact Because of More Milk per Cow

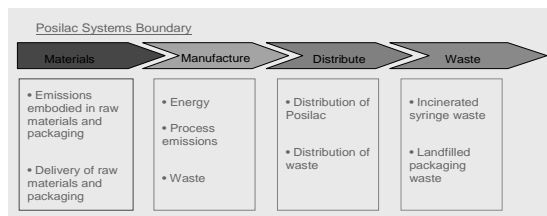
- Avg. daily response is 10 lbs (1.2 gal) during supplementation*
- In a typical year, that is 2,380 lbs (287 gal)
- Higher producing cows → fewer cows needed to meet milk demand
- Fewer cows means
 - fewer resources used (land, labor, energy)
 - less manure and waste produced



*Elanco Ref. ID1763.

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Example of a Product Impact Analysis: rbST Subsystem Scope Analysis



Source: Camco, 2009



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Annual Environmental Implications of rbST for Producing 1 Billion lbs Cheese (10 Billion lbs of Milk)

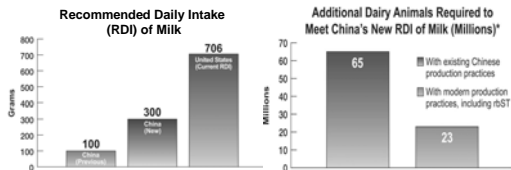
- ❖ 96,600 animal impact (52,800 cows, 43,800 heifers)
- ❖ 721,000 fewer tons of feed
- ❖ 156,000 fewer acres cropland (244 sq mi)
- ❖ Saves enough
 - fuel to heat 4,500 households
 - electricity to power 3,600 households
 - water to supply 2,700 households
- ❖ 874,000 fewer tons of manure produced
- ❖ Reduces carbon footprint by 532,000 metric tonnes
 - Removing 112,000 cars from the road
 - Planting 83.5 million trees

Adapted from Clapper et al., (2008), PNAS

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Real Life Challenge: Meeting China's New 2008 RDI for Milk

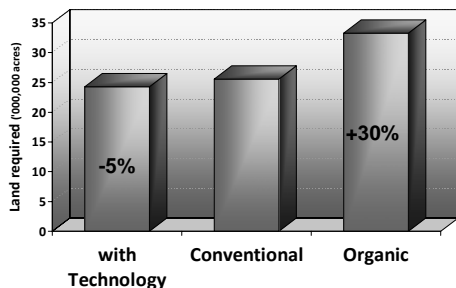
- Chinese Recommended Daily Intake (RDI) of milk raised to 300 g
- Represents a three-fold increase in the Chinese RDI
- 300 g is a modest requirement, only 44% of the US RDI



Source: U.S. Dairy Export Council, July 2008

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Future US Demand for Dairy Products Best Met via Improved Productivity



Capper et al. (2008) PNAS

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Summary

- ✓ Environmental stewardship is a critical responsibility of food animal agriculture
- ✓ Science-based standards are in place for assessing environmental impacts
- ✓ Essential to evaluate environmental impact per unit of output rather than simply by unit of production
- ✓ Productivity is an important contributing factor in reducing the food animal industry's environmental impact
- ✓ Essential need exists to understand and discuss the role and environmental consequences of technology

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What Does This Represent?



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Thank you!

Questions?

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Supplement lactating dairy cows every 14 days beginning at 57-70 days in milk until the end of lactation. When calculating net carbon footprint, manufacturing processes and total environmental costs must be considered. The label contains complete use information, including cautions and warnings. Always read, understand, and follow the label and use directions.

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