

Animal Protein Production Impacts and Trends

Dr. Judith L. Capper

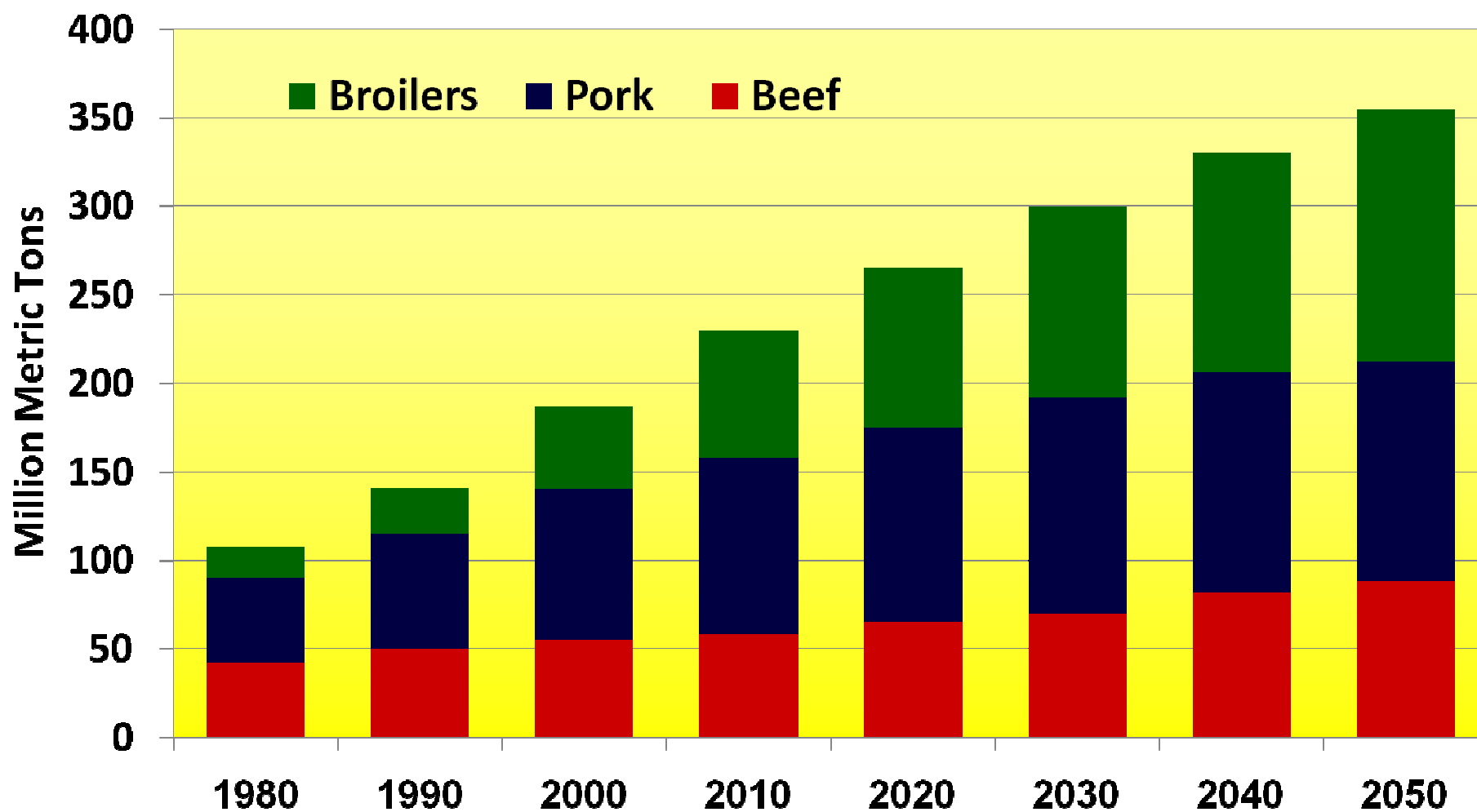


WASHINGTON STATE
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World Class. Face to Face.

**“Feeding 9 Billion and Maintaining the Planet”
A Sustainability Challenge: Food Security for All
NAS Workshop 1: Measuring Food Insecurity and Assessing
the Sustainability of Global Food Systems
Washington DC, February 15-17 2011**

World Beef, Pork and Poultry Consumption: 1980 - 2050



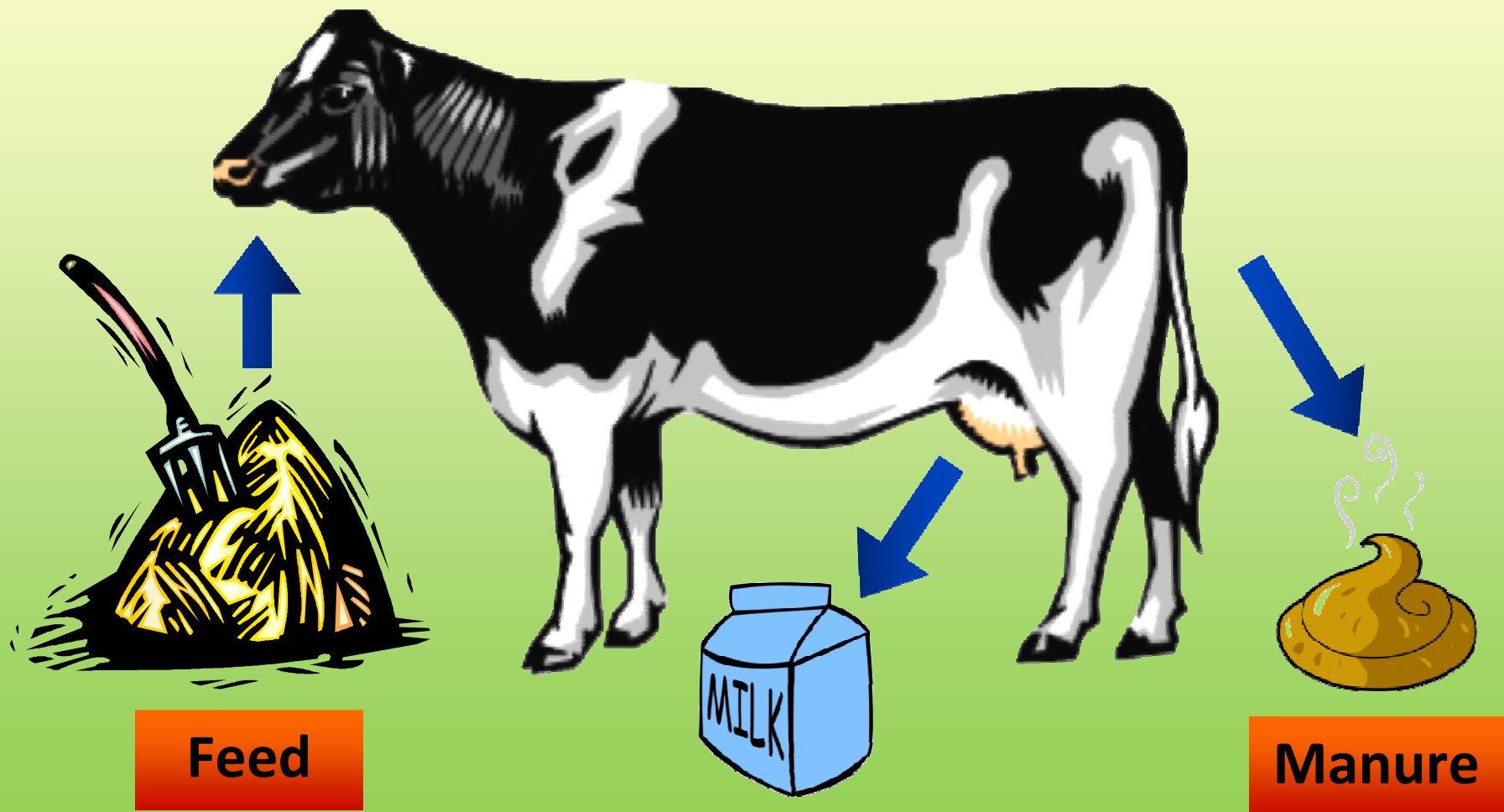
Sources: Global Insight Demand Analysis to 2050

All Food has an Environmental Impact – Yet Modern Agriculture is Often Demonized

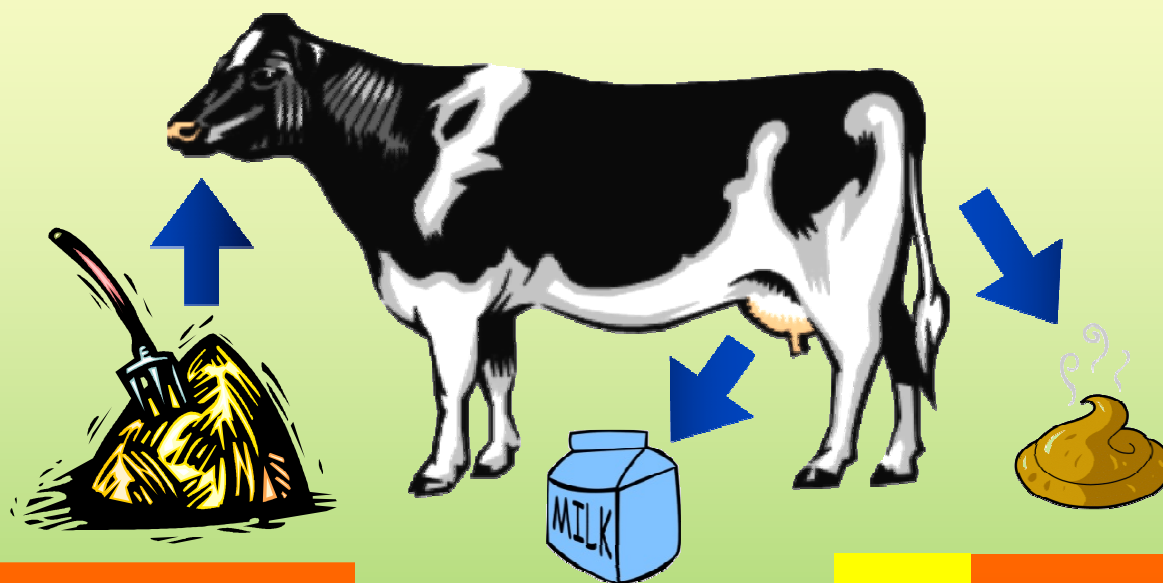


Sources: Created by Dr. Judith L. Capper, Washington State University, 2010; TIME(2009) <http://www.time.com/time/covers/0,16641,20090831,00.html>; Go Veg (2010) <http://www.goveg.com/environment-globalwarming.asp> Accessed July 29 2010; PETA (2010) <http://www.peta2.com/meatsnotgreen/index.asp>;

Every Animal has a Maintenance Nutrient Requirement that Must be Supplied Daily



Daily Maintenance Feed and Manure are Proxies for Resource Use and Waste Output



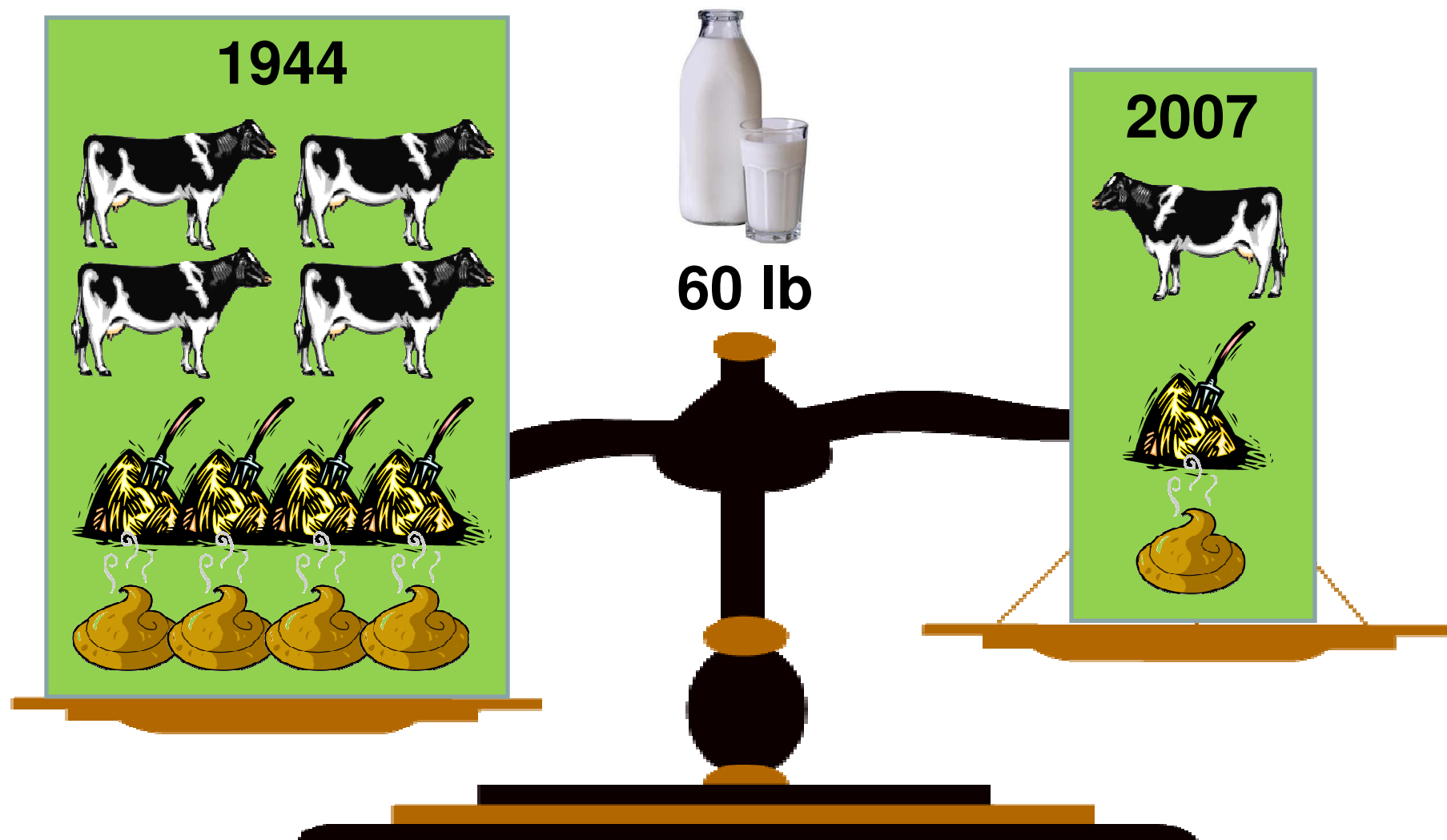
RESOURCES

- Crops
- Land
- Water
- Fertilizers
- Fuels

WASTE

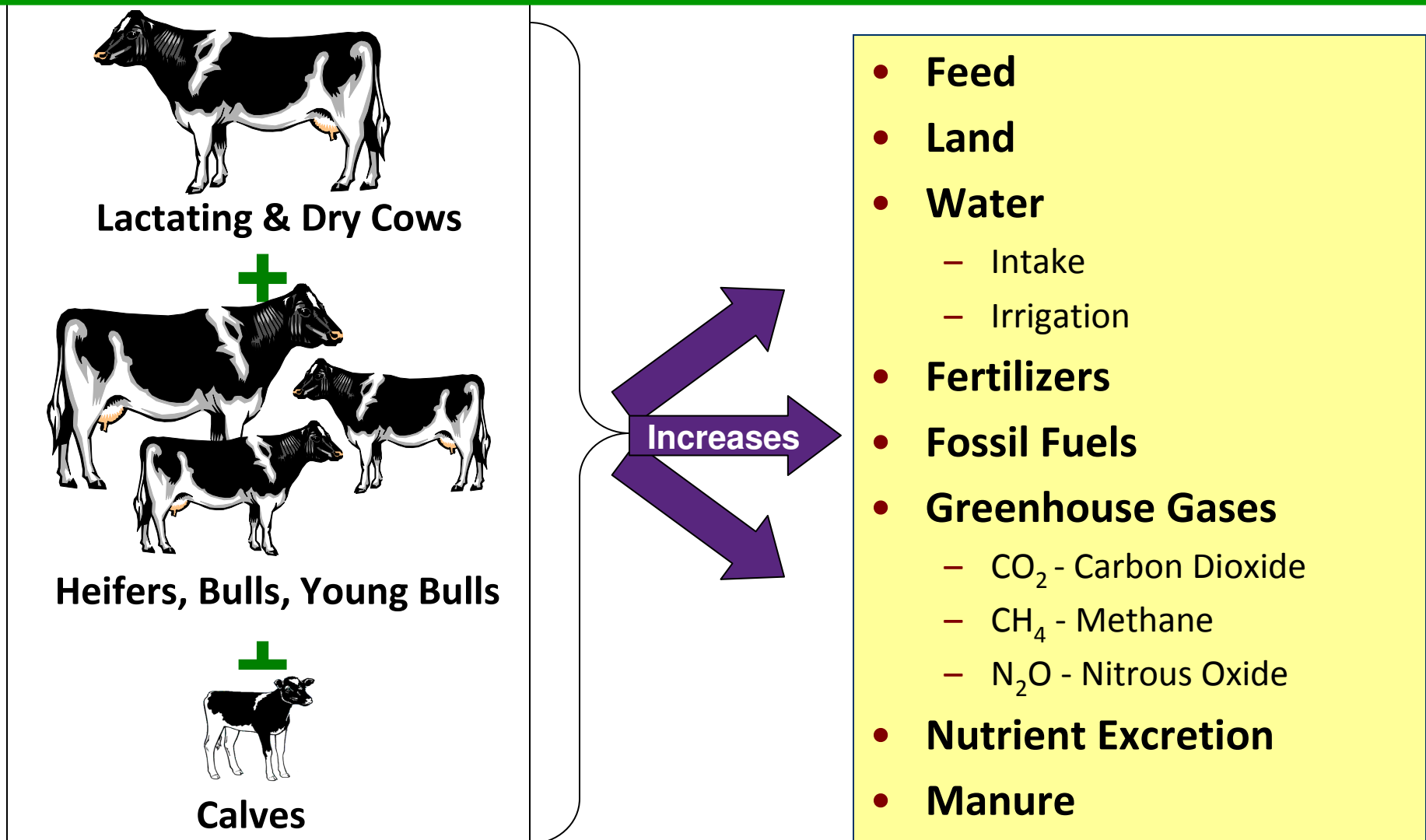
- Manure
- Nutrient excretion
- Greenhouse gases

In 1944, it Took Four Cows to Produce the Same Amount of Milk as One Cow in 2007

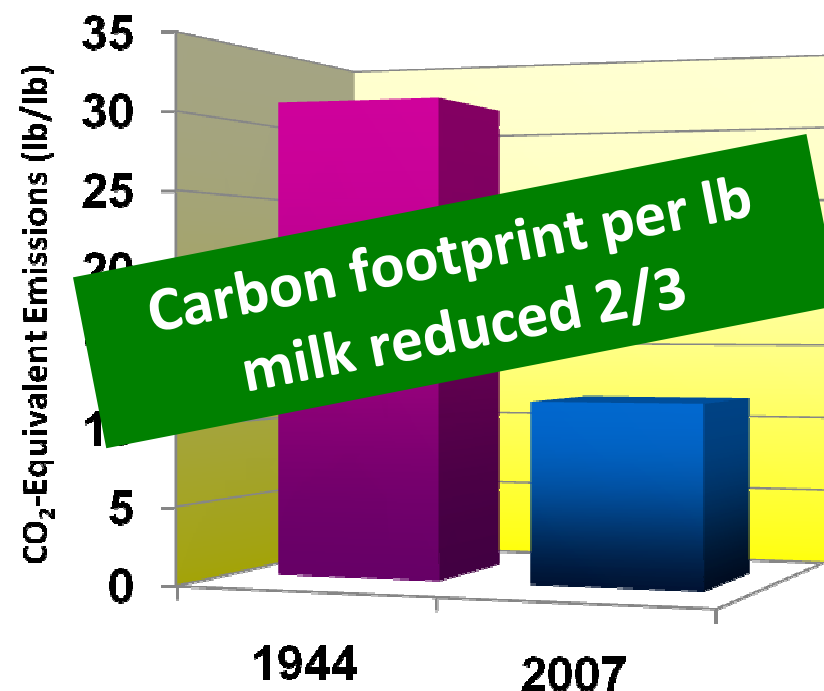
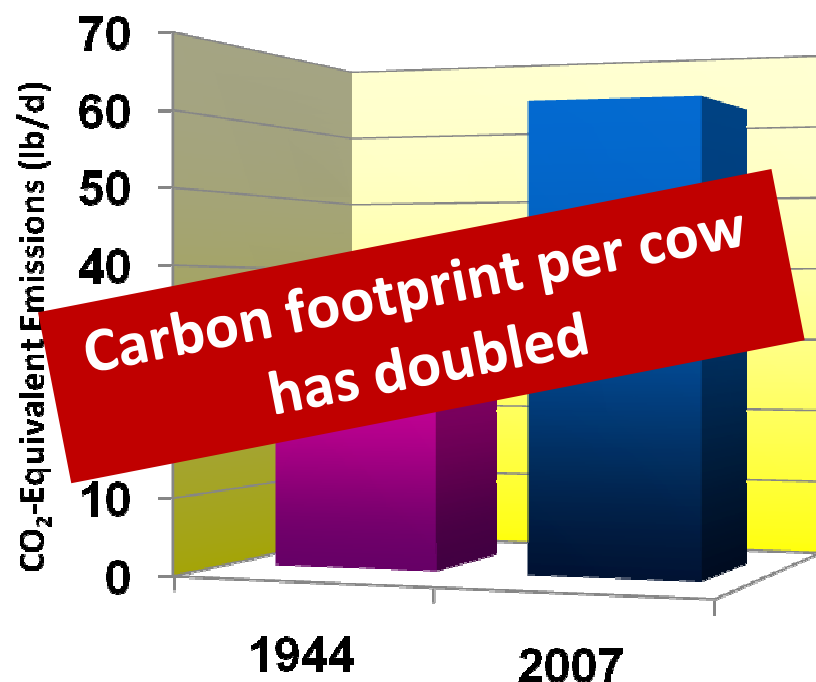


Source: Capper et al. (2009) "The environmental impact of dairy production: 1944 compared with 2007" *J. Anim. Sci.*

Supporting Population Must be Included - It Takes a Herd to Make Milk

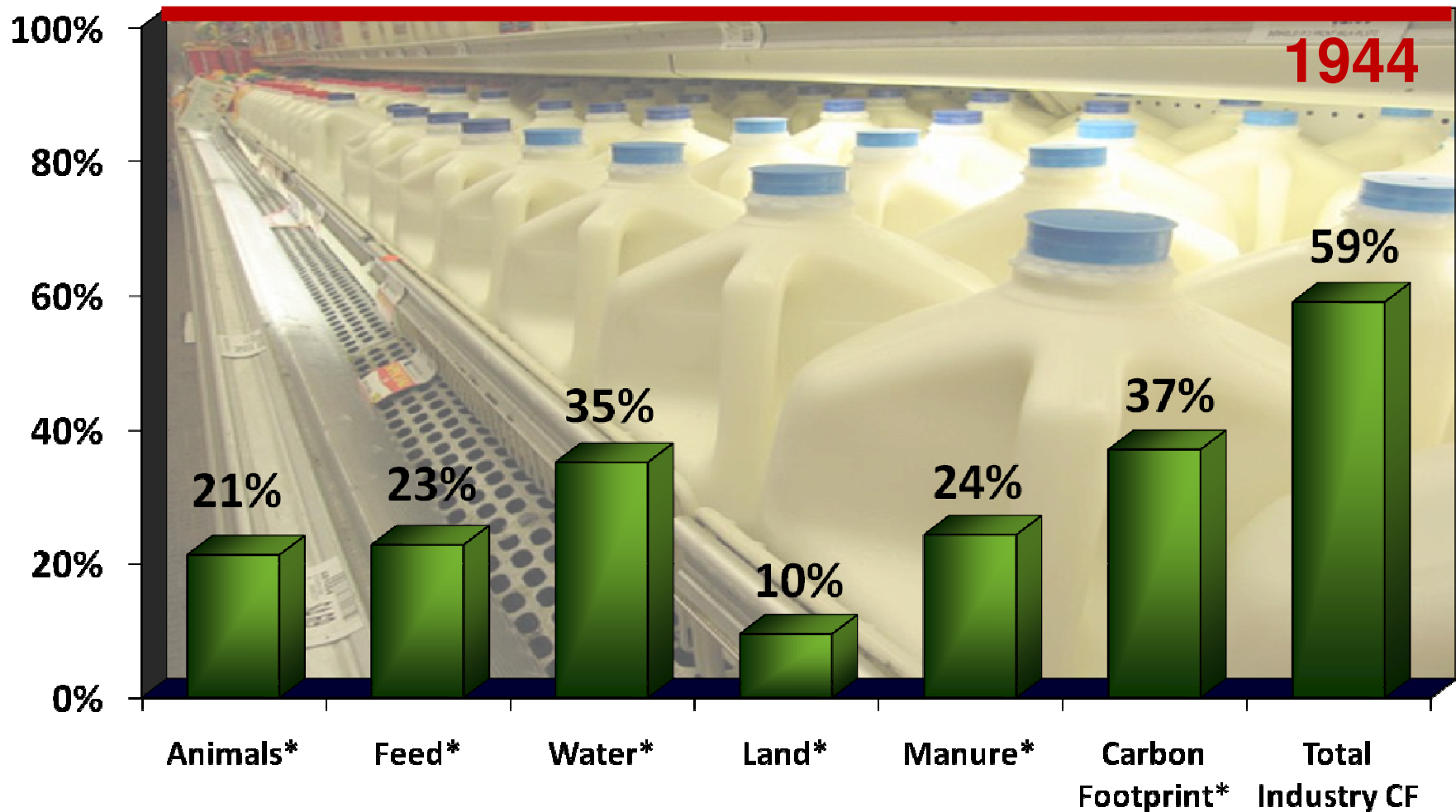


The Dairy Industry Must be Evaluated on the Basis of Production, Not Per Cow



Other metrics: Dairy per acre of land? Dairy per gallon of water? Calories per acre? Protein per acre? Carbon sequestered /unit of production?

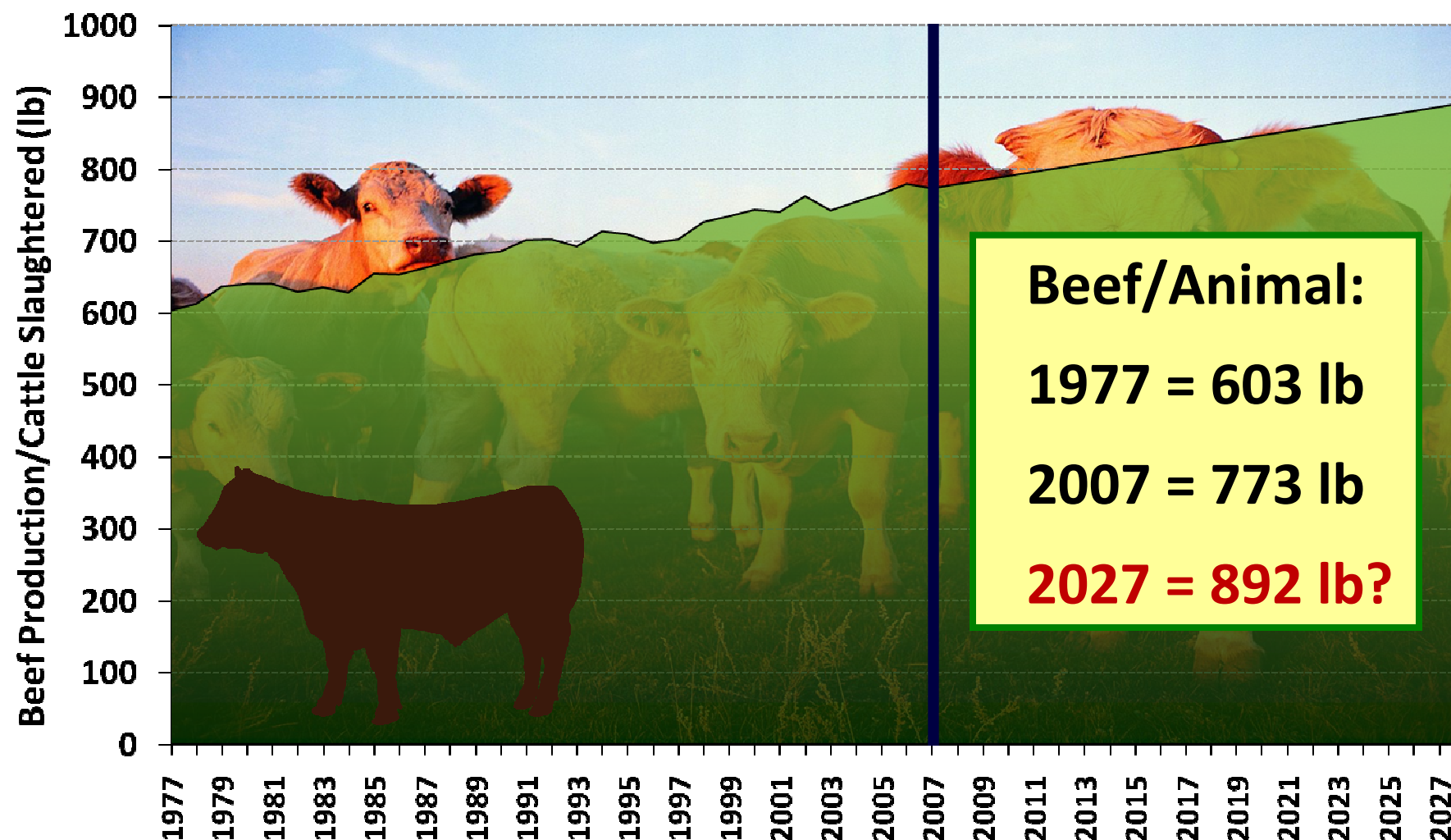
Modern US Milk Production Has Considerably Lower Resource Use and Carbon Emissions



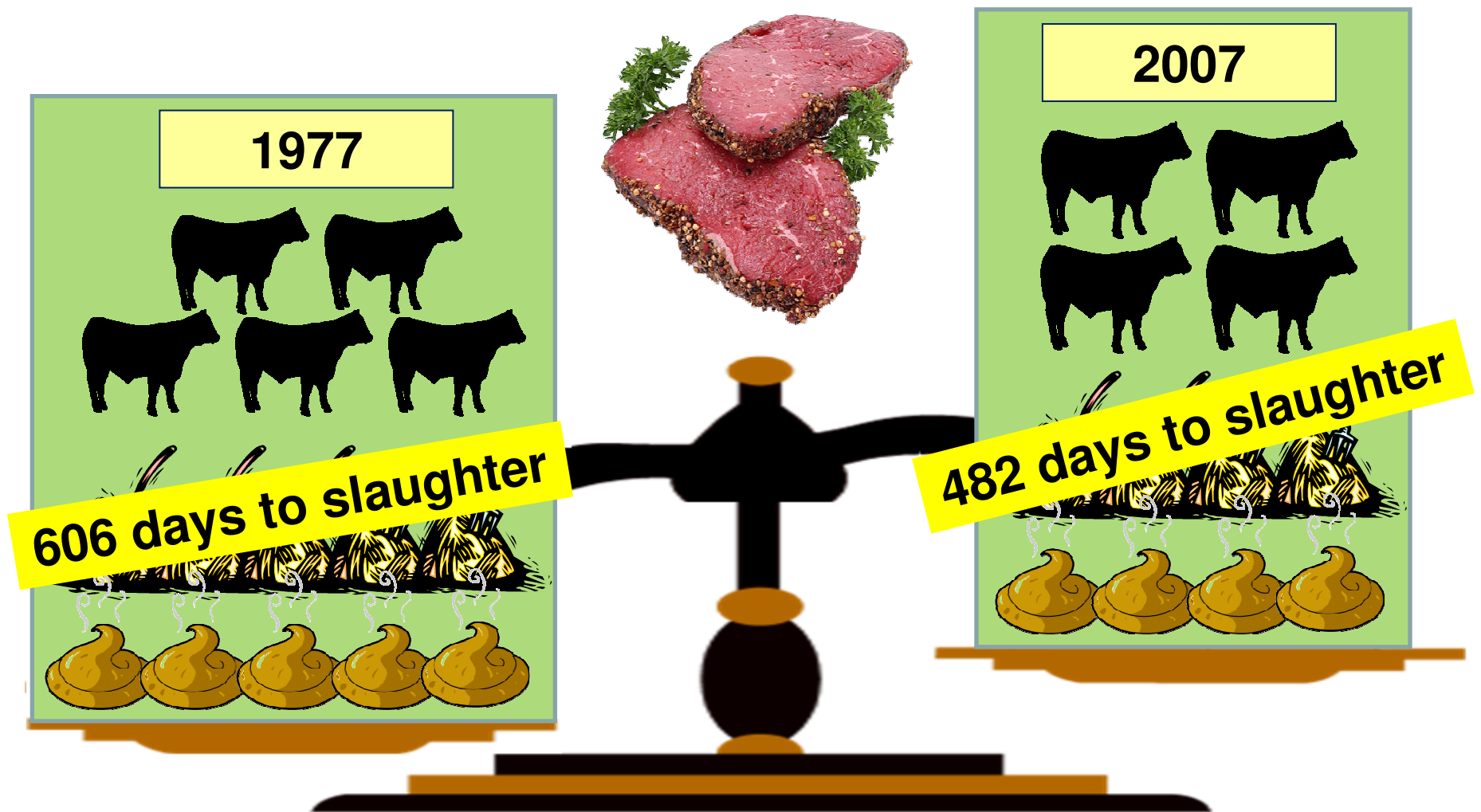
* Per unit of milk

Source: Capper et al. (2009) "The environmental impact of dairy production: 1944 compared with 2007" *J. Anim. Sci.*

Opportunities to Further Improve Beef Yield per Animal may be Limited

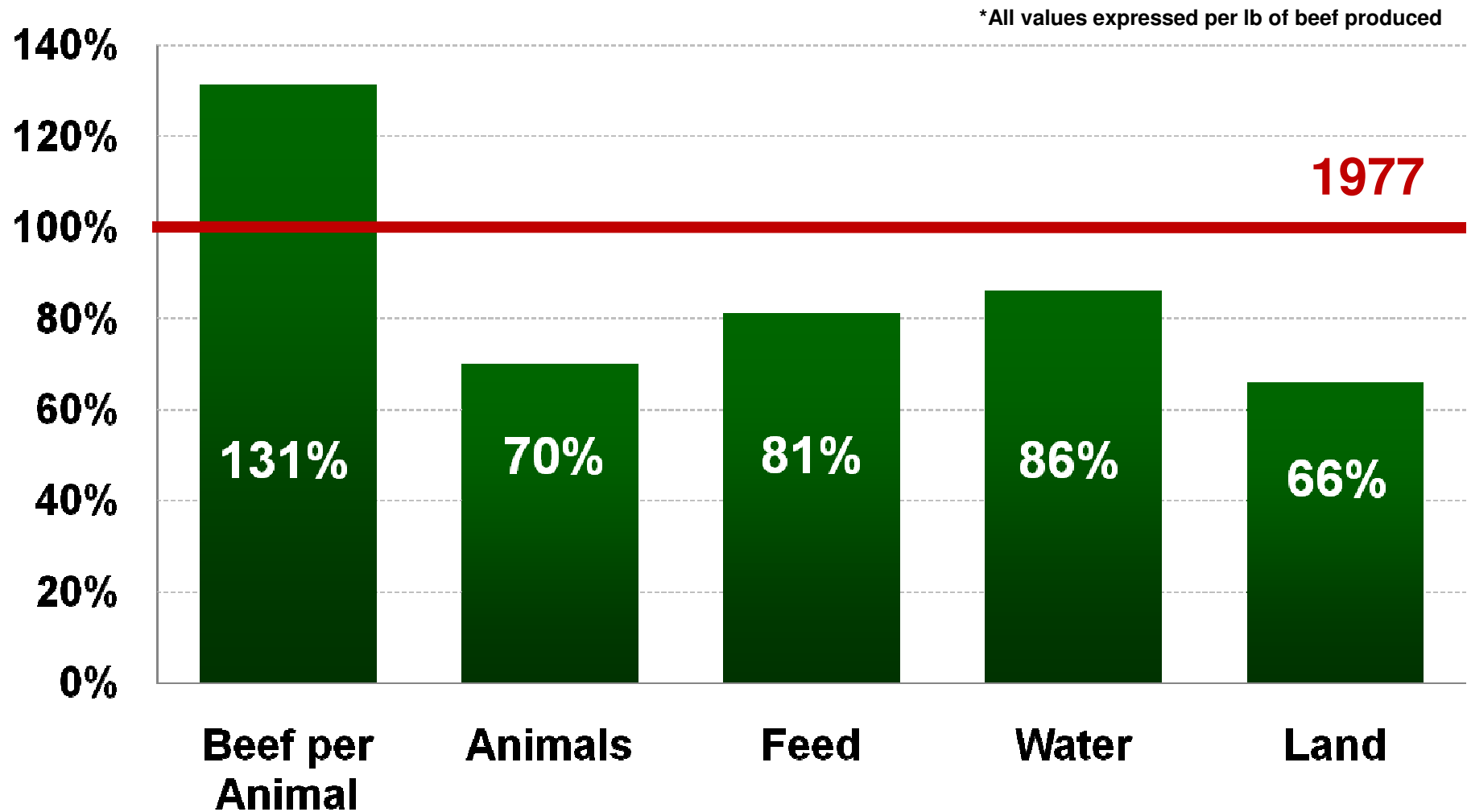


In 1977, it Took Five Animals to Produce the Same Amount of Beef as Four Animals in 2007



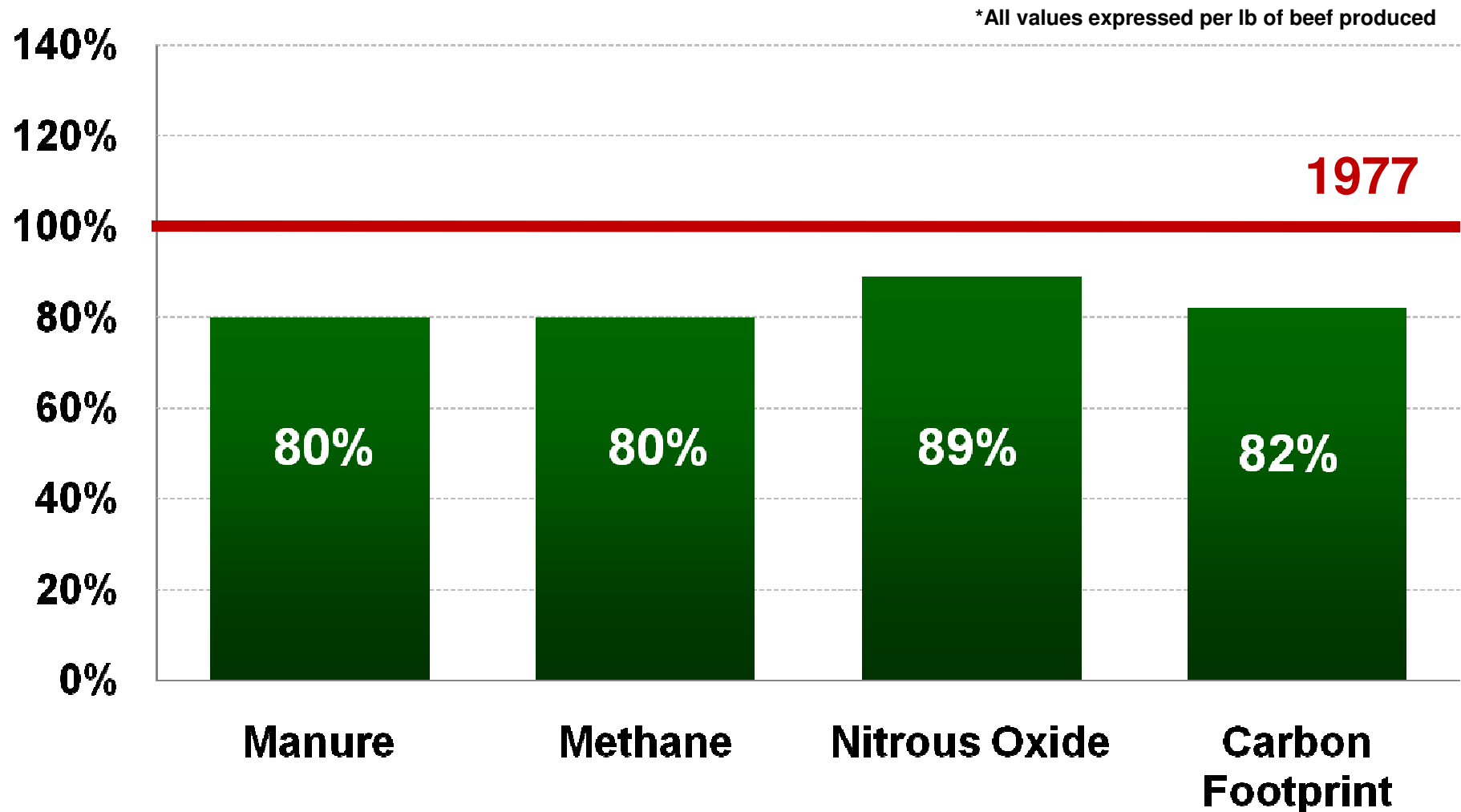
Source: Capper, J. L. (2010). Comparing the Environmental Impact of the U.S. Beef Industry in 1977 to 2007. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada

Environmental Impact of U.S. Beef Production has been Reduced by Improved Productivity



Source: Capper, J. L. (2010). Comparing the Environmental Impact of the U.S. Beef Industry in 1977 to 2007. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada

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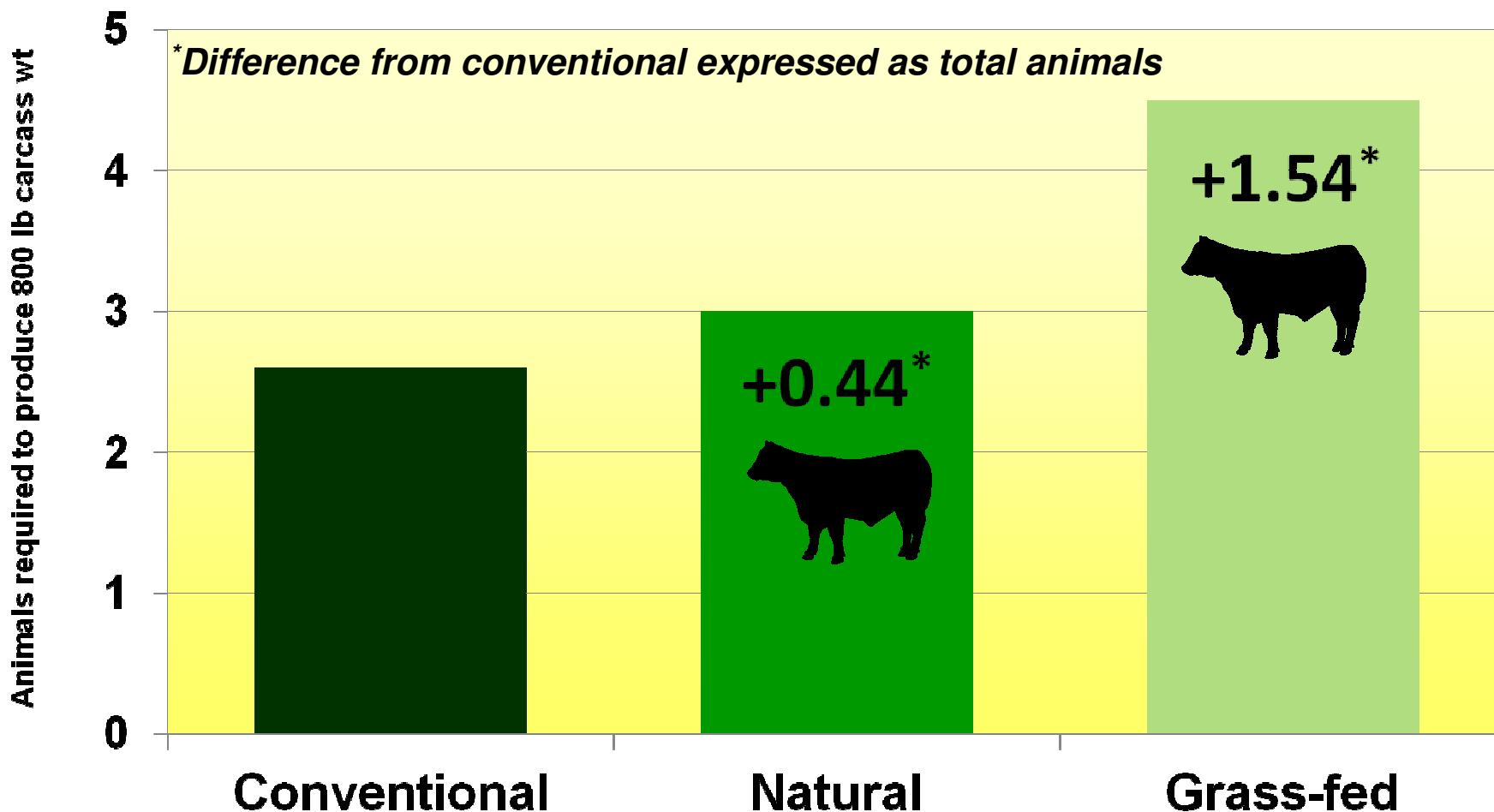
The Herbivore's Dilemma: Is Grass-Fed Beef Better for the Planet?



“We have succeeded in industrializing the beef calf, transforming what was once a solar-powered ruminant into the very last thing we need: another fossil-fuel machine.” Michael Pollan, NY Times

Source: <http://drhewitt.wordpress.com/> <http://www.fackrellfarms.com/templates/piedmonthome/images/explanation2.jpg>; and Pollan, M. (2002) “Power steer” NY Times Magazine, March 31, 2002

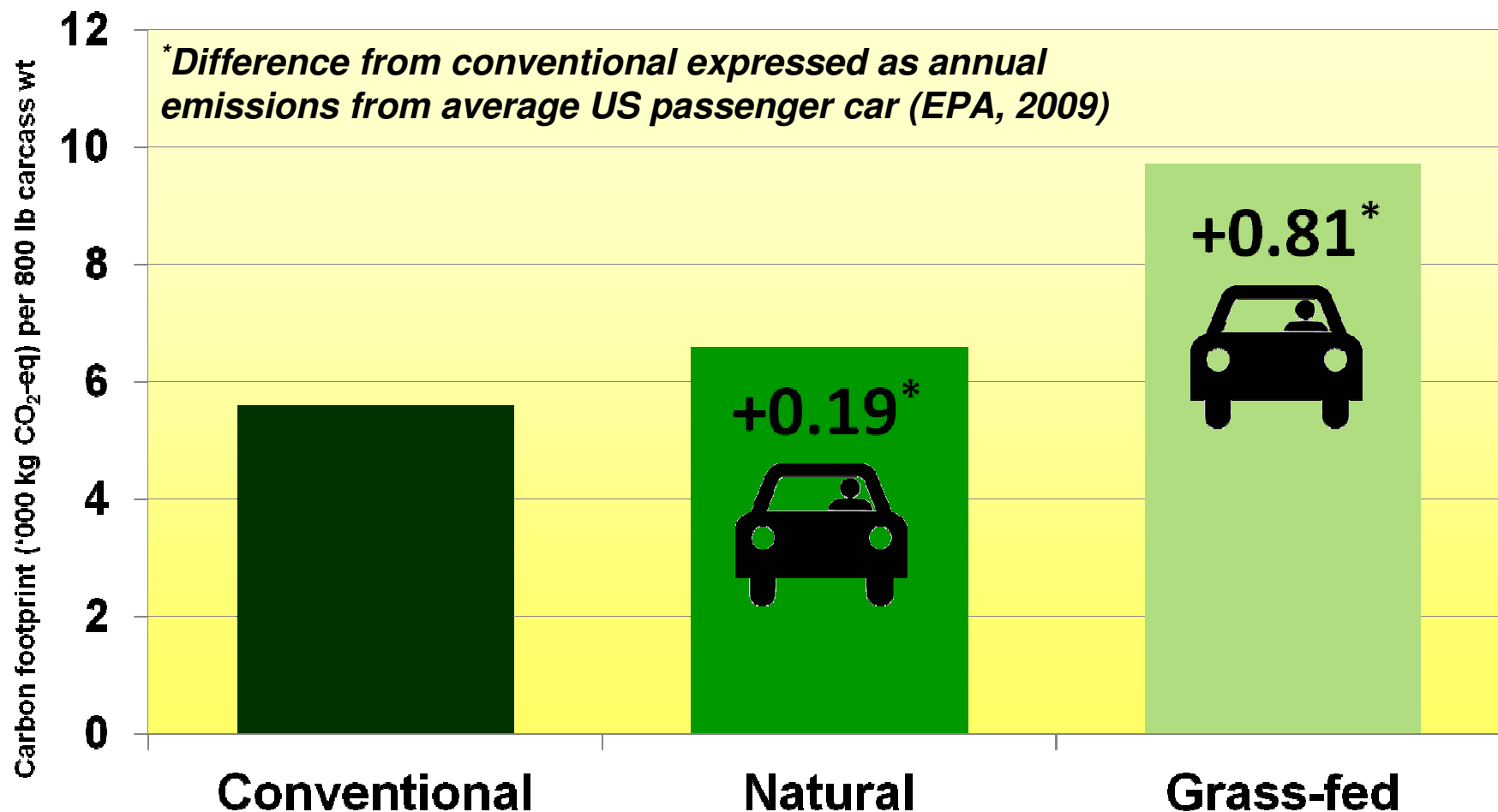
Total Animal* Numbers Required for Beef Production are Reduced by Technology Use



**Animal refers to cows, calves, heifers, bulls, stockers and finishing animals*

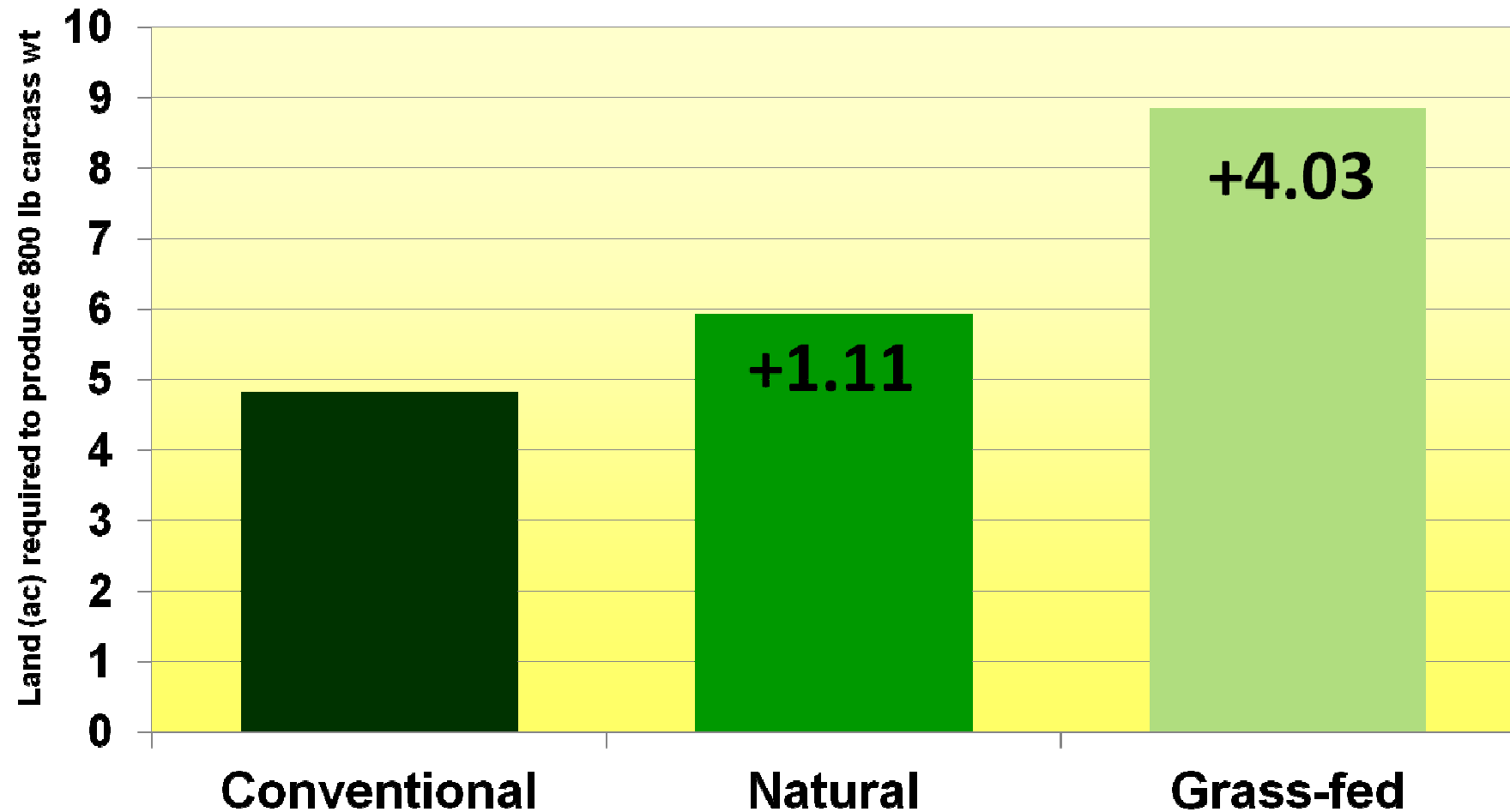
Source: Capper, J. L. (2010). The Environmental Impact of Conventional, Natural and Grass-fed Beef Production Systems. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada

Carbon Footprint of Beef Production is Reduced by Technology Use



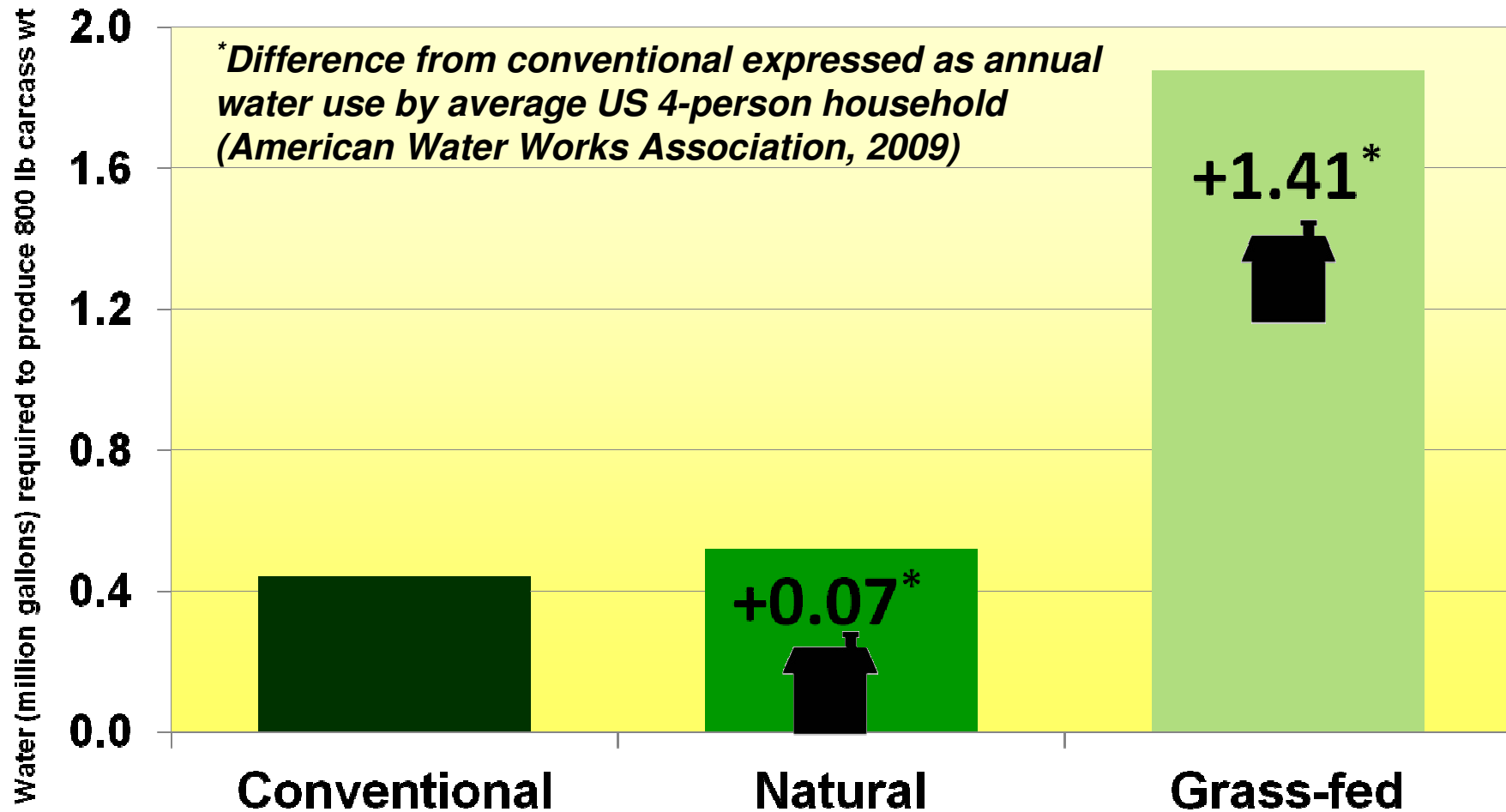
Source: Capper, J. L. (2010). The Environmental Impact of Conventional, Natural and Grass-fed Beef Production Systems. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada; EPA (2009) "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2009"

Land Use for Beef Production is Reduced by Technology Use



Source: Capper, J. L. (2010). The Environmental Impact of Conventional, Natural and Grass-fed Beef Production Systems. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada

Water Use for Beef Production is Reduced by Technology Use



Source: Capper, J. L. (2010). The Environmental Impact of Conventional, Natural and Grass-fed Beef Production Systems. Greenhouse Gases and Animal Agriculture Conference, Banff, Canada; American Water Works Association (2009) <http://www.drinktap.org/consumerdnn/Default.aspx?tabid=85>

Maximizing Productivity Reduces Total Maintenance Costs & Resource Use - Beef



- In Brazil, only 62% of beef cows produce a live calf
- 4 year age at first calving, 20 month calving interval
- Animals slaughtered at 3 years of age

Sources: Created by Dr. Judith L. Capper, Washington State University, 2010

Maximizing Productivity Reduces Total Maintenance Costs & Resource Use - Swine



- **Average litter size has increased from 7 to >10.5**
- **Sows farrow > 2x per year compared to 1.5x**
- **Improved productivity reduces breeding population size**

Sources: Created by Dr. Judith L. Capper, Washington State University, 2010

Maximizing Productivity Reduces Total Maintenance Costs & Resource Use - Poultry

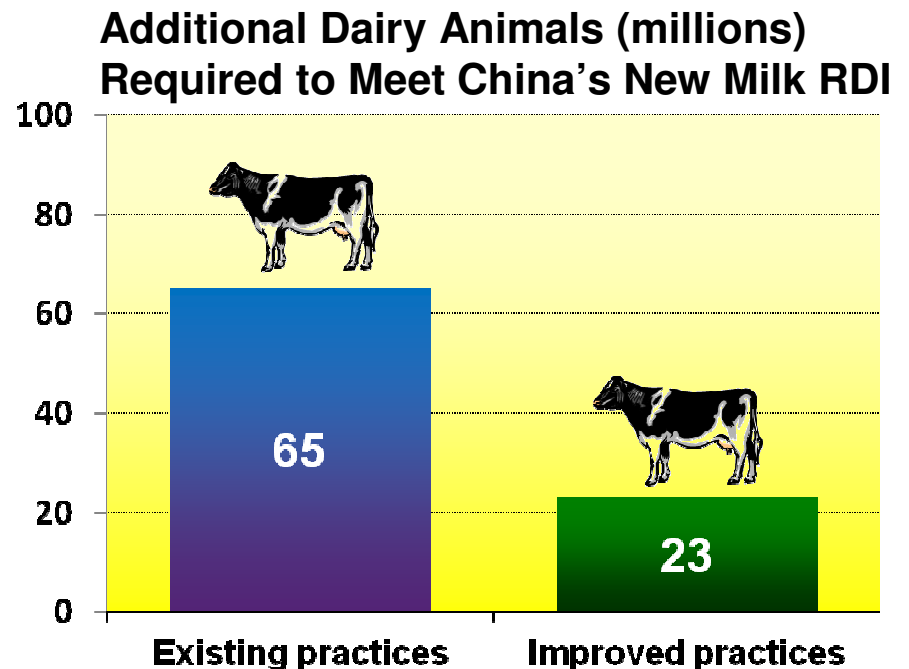
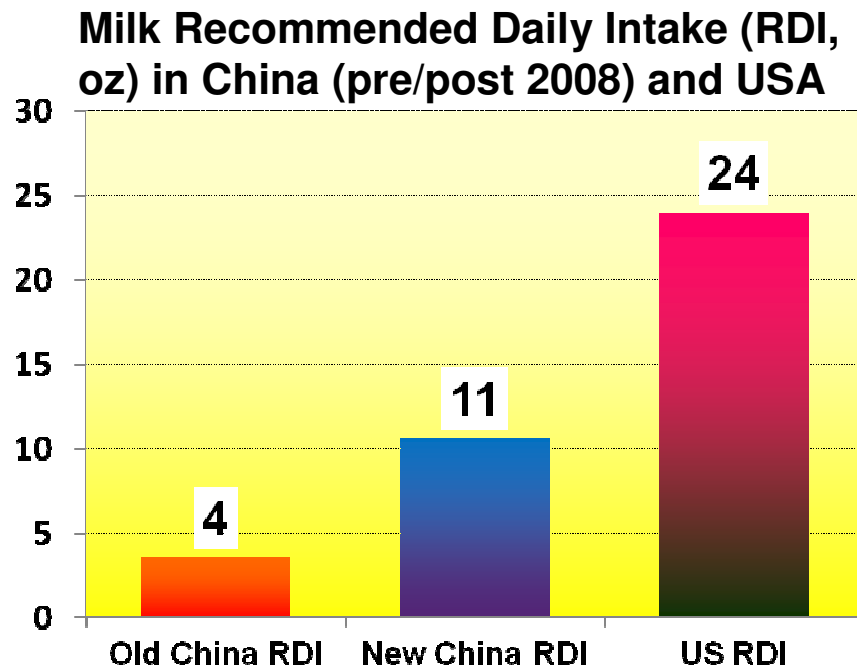


From 1925-2005:

- **Mortality cut from 18% - 4%**
- **Days from birth to slaughter cut from 112 to 42**
- **Liveweight increased from 2.2 lb- 5.3 lb**
- **Productivity improvements reduce resource use and C emissions**

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

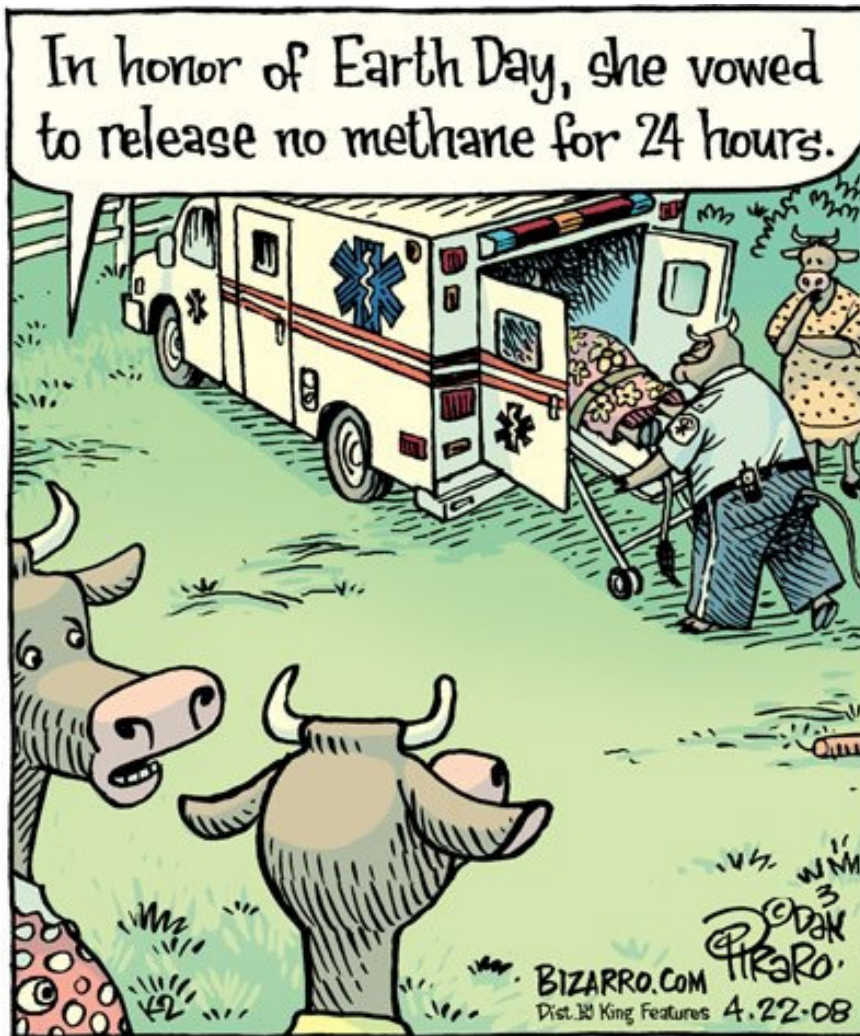
- Chinese Recommended Daily Intake (RDI) of milk raised to 10.6 oz
- Represents a three-fold increase in the Chinese RDI
- 10.6 oz is a modest requirement, only 44% of the US RDI
- Average milk yield of Chinese cattle: 24 lb/d



Source: Created by Dr. Judith L. Capper, Washington State University, 2010; Adapted from FAO(2009) <http://faostat.fao.org/> Last accessed, 8/14/09; U.S. Dairy Export Council, July 2008

Conclusions

- ✓ **All three facets of sustainability (economic, environmental, social) must balance for livestock systems to be sustainable**
- ✓ **Productivity is a key factor in reducing the environmental impact of livestock production**
- ✓ **Environmental impact must be assessed using sound science rather than ideological principles and “touchy-feely” thought processes**



Source: 2008 <http://snipurl.com/methanecartoon>, Last accessed May 7, 2010

Thank you!

Email:
capper@wsu.edu



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Source: Created by Dr. Judith L. Capper, Washington State University, 2011