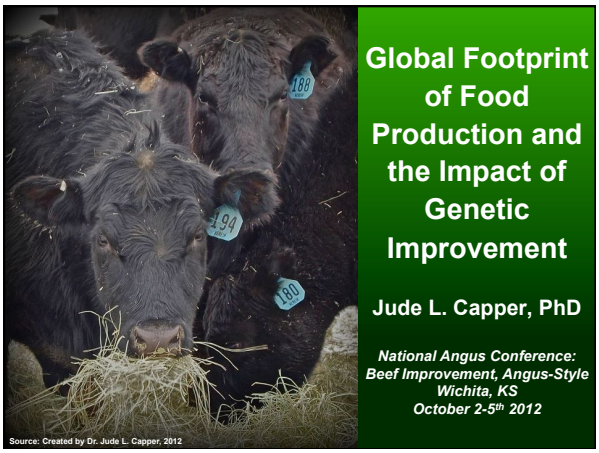
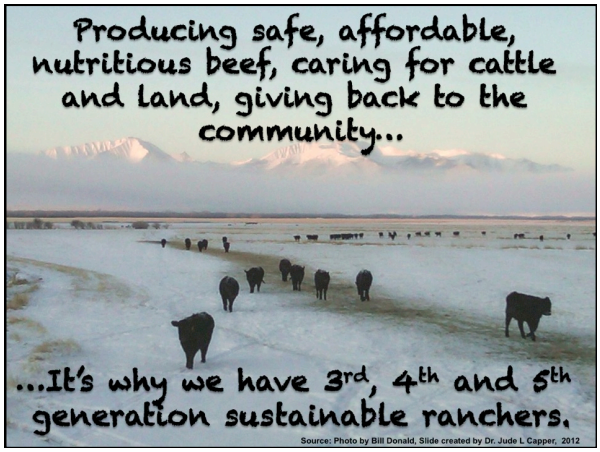
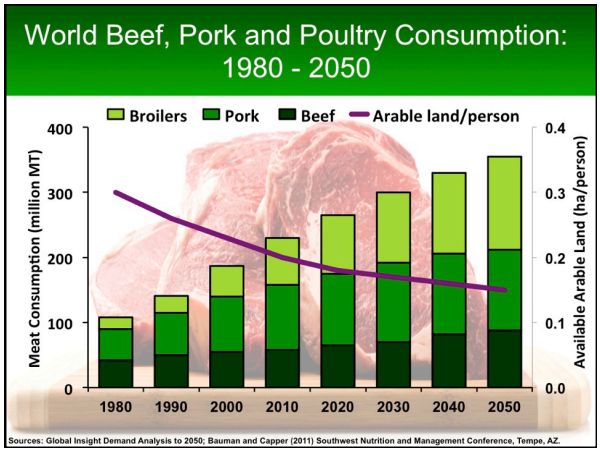

Global Footprint of Food Production and the Impact of Genetic Improvement
Jude L. Capper, PhD
National Angus Conference: Beef Improvement, Angus-Style Wichita, KS October 2-5th 2012
Source: Created by Dr. Jude L. Capper, 2012


Sustainable beef...
GRASS-FED
EYE OF RIBEYE
29/lb
...does not just mean organic, natural or grass-fed...
Source: Created by Dr. Jude L. Capper, 2012


Every single production system can be sustainable
Source: Created by Dr. Jude L. Capper, 2012


Producing safe, affordable, nutritious beef, caring for cattle and land, giving back to the community...
...It's why we have 3rd, 4th and 5th generation sustainable ranchers.
Source: Photo by Bill Donald, Slide created by Dr. Jude L Capper, 2012


Turning forages & by-product feeds that we can't eat into food..
THAT's sustainability
Source: Created by Dr. Jude L. Capper, 2012


World Beef, Pork and Poultry Consumption: 1980 - 2050
Broilers
Pork
Beef
Arable land/person
Meat Consumption (million MT)
Available Arable Land (ha/person)
400
300
200
100
0
0.4
0.3
0.2
0.1
0.0
1980
1990
2000
2010
2020
2030
2040
2050
Sources: Global Insight Demand Analysis to 2050; Bauman and Capper (2011) Southwest Nutrition and Management Conference, Tempe, AZ.

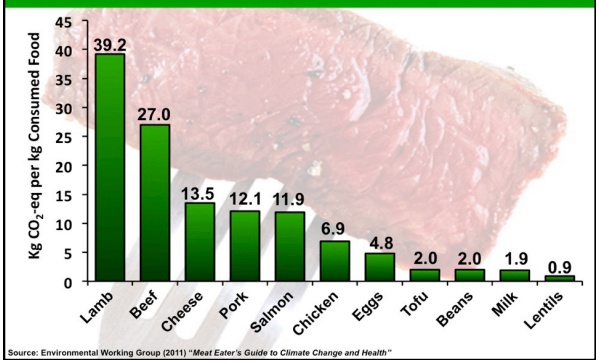
Citizens of Currently Impoverished Countries will be the New Global Middle-Class

Source: Created by Dr. Jude L. Capper, 2012; Photo sourced from: http://ascjportfolios.org/mmm/wp-content/uploads/2011/02/mcdonalds-india.jpg

The Global Livestock Industry is Under Threat

Sources: http://culturemap.com/news/detail/09-03-10-is-sex-in-the-shower-killing-our-water-supply-relax-beef-production-is-a-bigger-culprit; http://animals.change.org/blog/view/save_the_animals_save_the_planet_blog_action_day_09_climate_change PETA (2010) http://www.peta.org/mc/ads/PAMeantPETA300.jpg and http://www.goveg.com/environment-globalwarming.asp All accessed Sept 10 2010

Environmental Working Group Suggests Carbon Footprint of Meat is Unfavorable



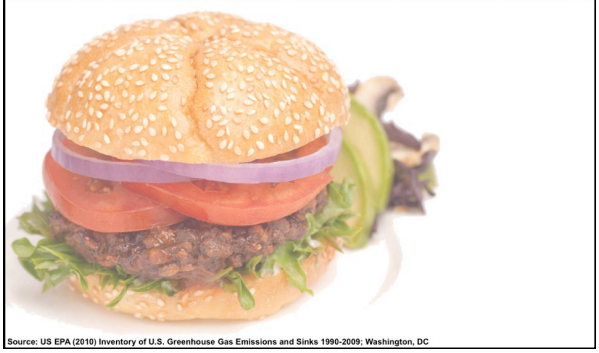
Source: Environmental Working Group (2011) *"Meat Eater's Guide to Climate Change and Health"*

Carnegie-Mellon Study Claims Meatless Mondays Considerably Reduce Carbon Footprint

"Shifting less than one day per week's worth of calories from red meat and dairy products to chicken, fish, eggs, or a vegetable-based diet achieves more GHG reduction than buying all locally sourced food."

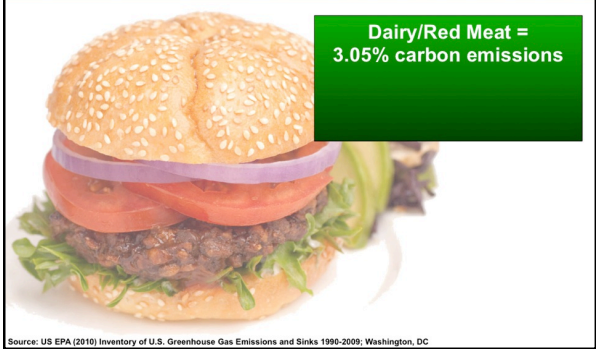
Source: Weber and Matthews (2008). Food-miles and the relative climate impacts of food choices in the United States. *Env Sci Tech*

Meatless Mondays have Negligible Environmental Impact… and Lead to Further Questions



Source: US EPA (2010) Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2009; Washington, DC

Meatless Mondays have Negligible Environmental Impact… and Lead to Further Questions



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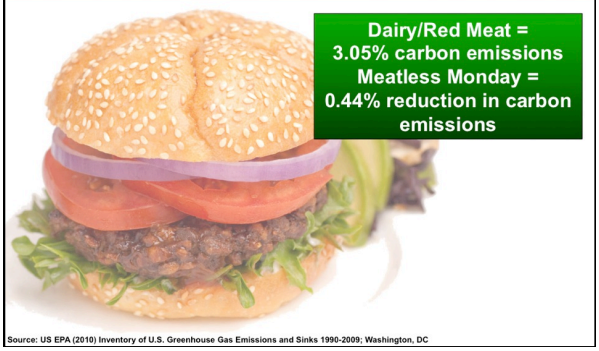

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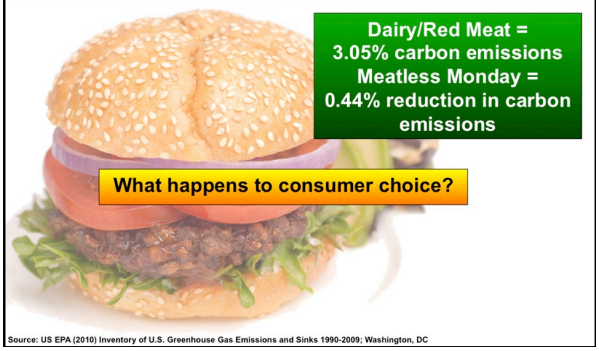

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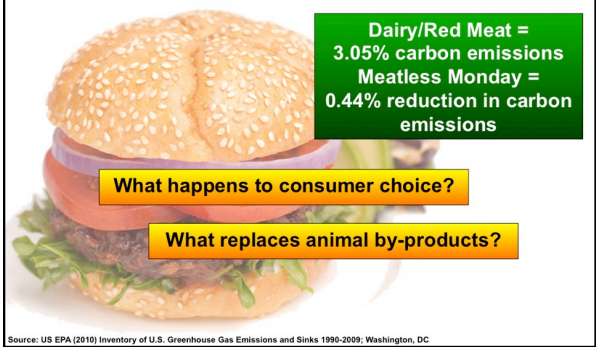
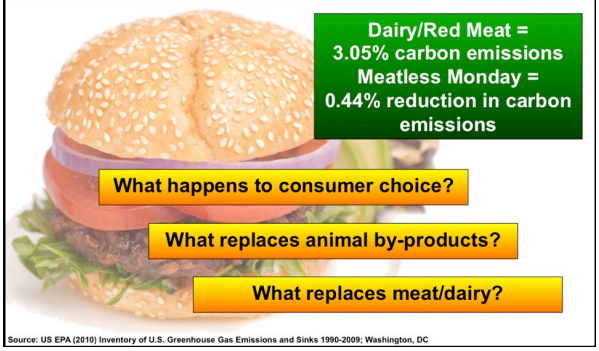
Meatless Mondays have Negligible Environmental Impact… and Lead to Further Questions



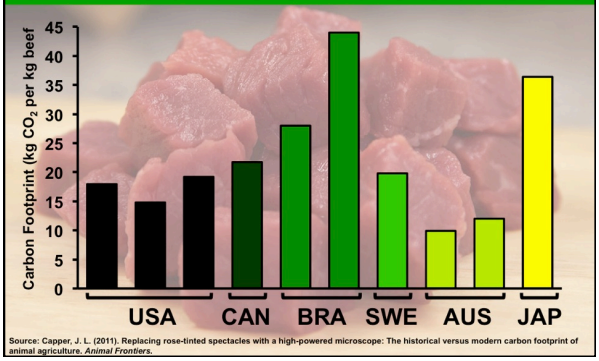
Source: US EPA (2010) Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2009; Washington, DC

Meatless Mondays have Negligible Environmental Impact… and Lead to Further Questions



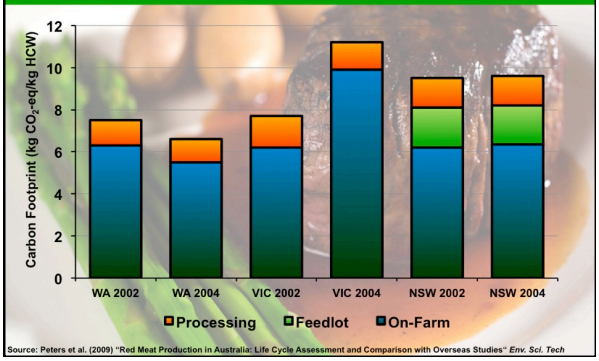
Source: US EPA (2010) Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2009; Washington, DC

Beef's Carbon Footprint Varies According to Region and Methodology



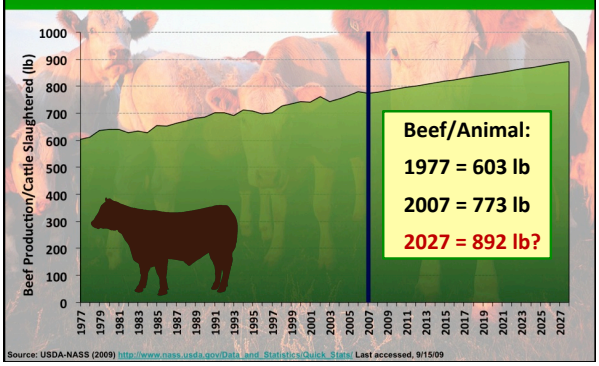
Source: Capper, J. L. (2011). Replacing rose-tinted spectacles with a high-powered microscope: The historical versus modern carbon footprint of animal agriculture. *Animal Frontiers*.

The Majority of Beef Production's Environmental Impact Occurs On-Farm



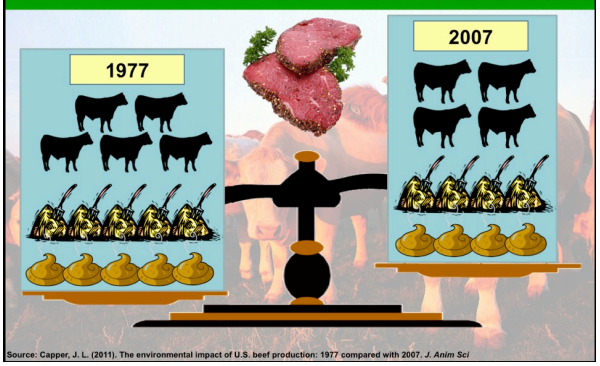
Source: Peters et al. (2009) "Red Meat Production in Australia: Life Cycle Assessment and Comparison with Overseas Studies" *Env. Sci. Tech*

Opportunities to Further Improve Beef Yield per Animal may be Limited



Source: USDA-NASS (2009) http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/ Last accessed, 9/15/09

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



Source: Capper, J. L. (2011). The environmental impact of U.S. beef production: 1977 compared with 2007. *J. Anim Sci*

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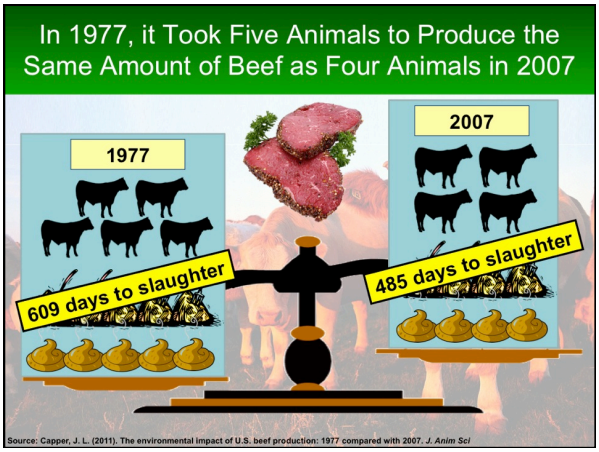

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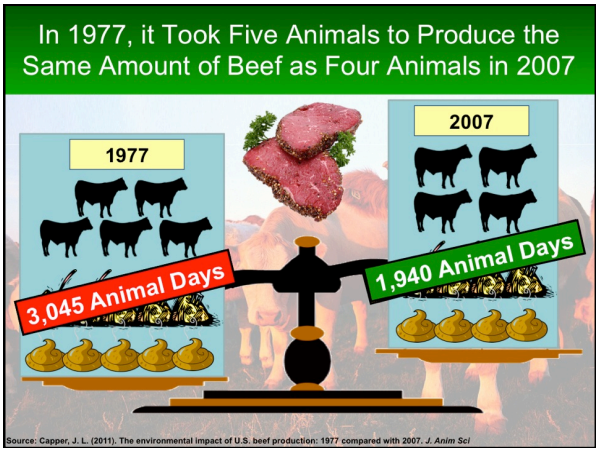
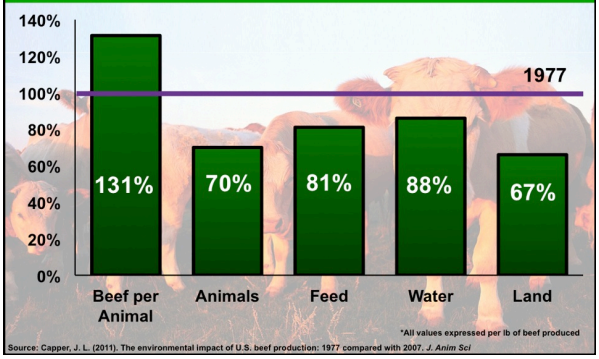


Source: Capper, J. L. (2011). The environmental impact of U.S. beef production: 1977 compared with 2007. *J. Anim Sci*

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



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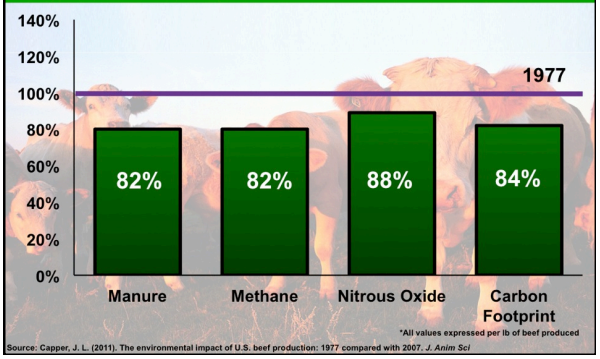


Source: Capper, J. L. (2011). The environmental impact of U.S. beef production: 1977 compared with 2007. *J. Anim Sci*

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

Consumers Have Three Production System Choices When Buying Beef

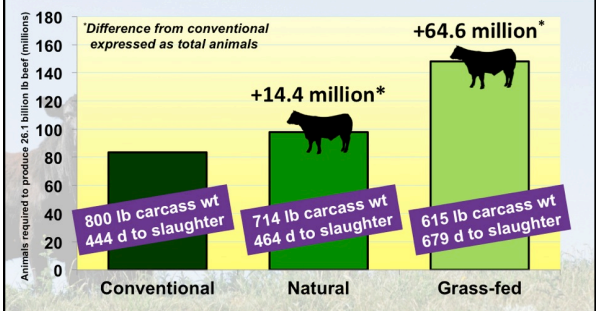
Conventional:
- ✓ Extensive pasture-based system until weaning (7 mo)
- ✓ Animals enter feedlot either at weaning (calf-fed) or 12 mo of age (yearling-fed)
- ✓ Production-enhancing technology* used in each sector

Natural:
- ✓ Identical to 'conventional' system but production-enhancing technologies are not used

Grass-fed:
- ✓ Extensive pasture-based system from birth to slaughter
- ✓ Production-enhancing technologies are not used

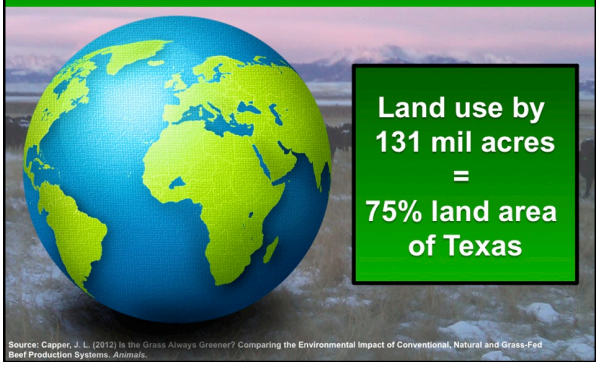
*Technologies included in model: ionophores, implants, MGA, β-agonists

Converting to Grass-Fed Beef Considerably Increases Animal Numbers



Source: Capper, J. L. (2012) Is the Grass Always Greener? Comparing the Environmental Impact of Conventional, Natural and Grass-Fed Beef Production Systems. *Animals*.

If All U.S. Beef Was Grass-Fed it Would Increase…



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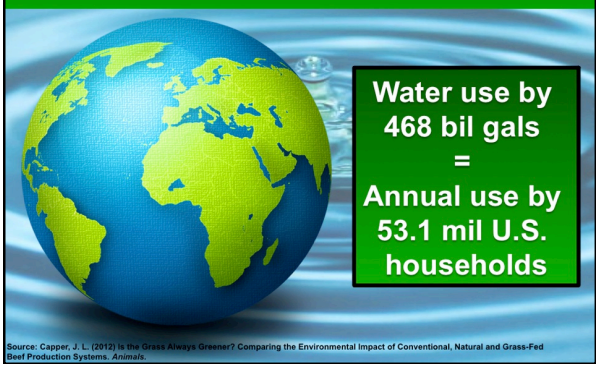

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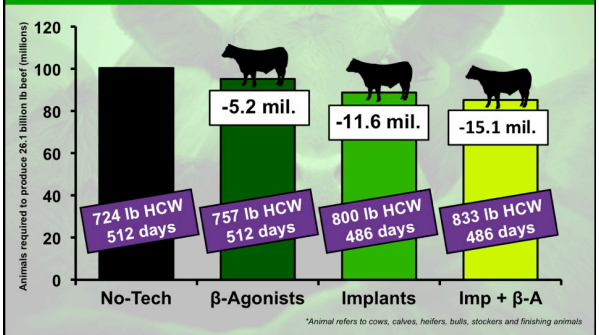
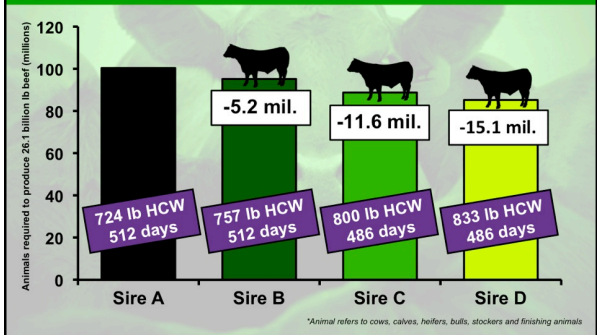
Technology Use Reduces Days from Birth-Slaughter and Improves Weight at Finishing



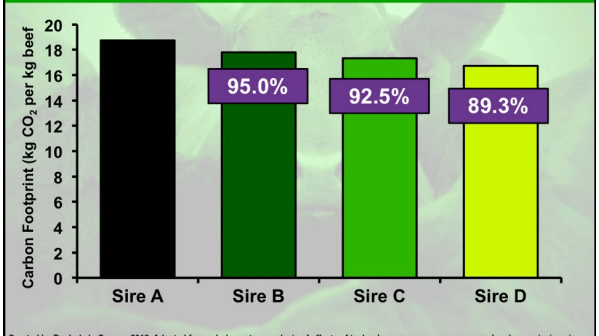
Created by Dr. Jude L. Capper, 2012. Based on whole-system analysis of effects of technology use on resource use and carbon emissions in four beef production systems with technology adoption at 100% wherever used

Improved Genetics Could Reduce Days from Birth-Slaughter and Improve Weight at Finishing



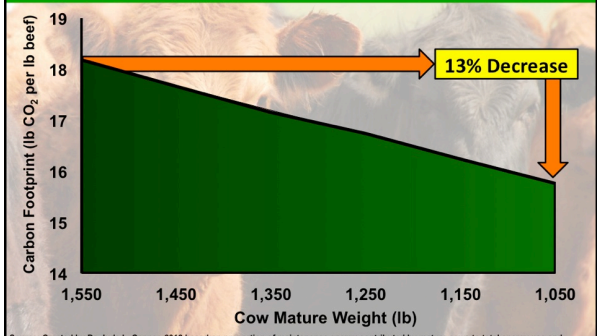
Created by Dr. Jude L. Capper, 2012. Adapted from whole-system analysis of effects of technology use on resource use and carbon emissions in four beef production systems with technology adoption at 100% wherever used

Improved Genetics Could Reduce Carbon Footprint per Pound of Beef



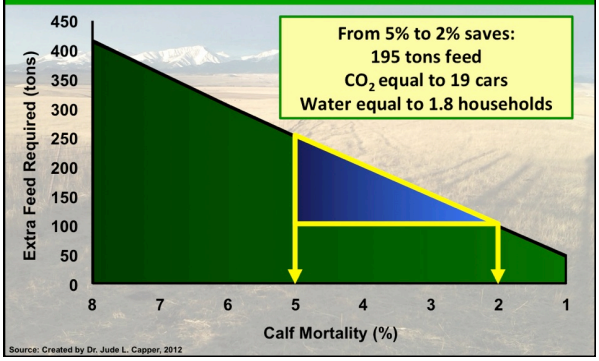
Created by Dr. Jude L. Capper, 2012. Adapted from whole-system analysis of effects of technology use on resource use and carbon emissions in four beef production systems with technology adoption at 100% wherever used

Reducing Mature Cow Bodyweight Reduces the Carbon Footprint per lb of Beef



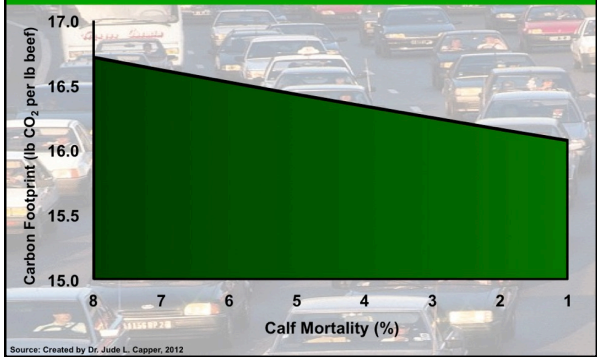
Source: Created by Dr. Jude L. Capper, 2012 based on proportion of maintenance energy contributed by mature cows to total energy use and carbon footprint per kg beef

Each 1% Reduction in Calf Mortality Saves 65 tons of Feed for a 1,000 Cow Herd



Source: Created by Dr. Jude L. Capper, 2012

A National 1% Reduction in Calf Mortality is Equivalent to taking 220,000 Cars off the Road



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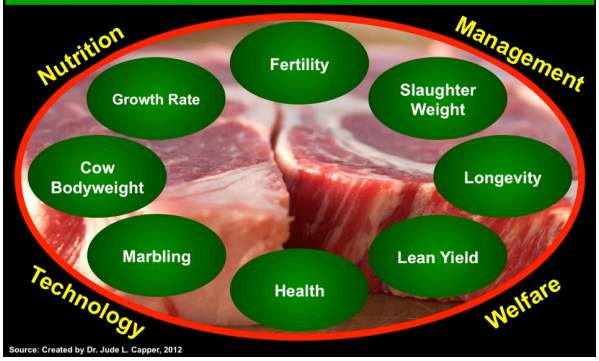
Genetic Selection Characteristics to Maintain and Improve Beef Sustainability



Source: Created by Dr. Jude L. Capper, 2012

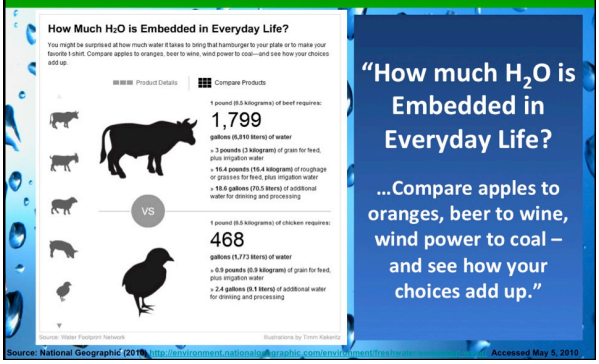
Cattle Genetic Potential is Only Achieved Through Optimum Management

Source: Created by Dr. Jude L. Capper, 2012

Water Use is Employed as a Rationale for Vegetarianism and Veganism

Source: http://www.reasonstogovegan.com/viewAllReasons.php Accessed 7/10/2011

'Water Footprint' Data was Recently Highlighted in National Geographic Magazine



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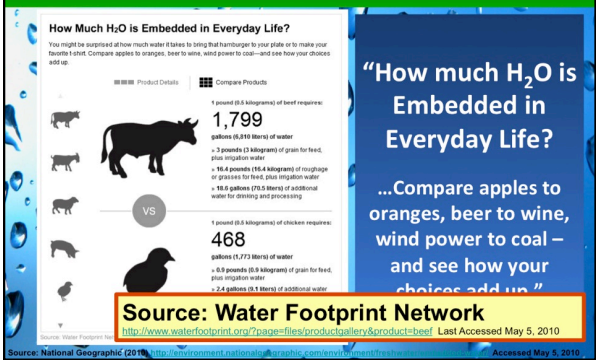

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Incorrect Data Misleads the Consumer and May Bias Food Choices

Source: Water Footprint Network (2010) http://www.waterfootprint.org/?page=files/productgallery&product=beef, Last Accessed May 5, 2010

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Incorrect Data Misleads the Consumer and May Bias Food Choices

	Water Footprint Network	US Average
Boneless beef yield (lb)	441	605
Dressed carcass weight (lb)		
Slaughter weight (lb)		
Days to slaughter		
Overall growth rate (lb/d)		
Water (gal) per lb boneless beef		

Source: Created by Dr. Jude L. Capper, 2012. Weight and growth rate data for US average based on AMTS ration formulation for Angus x Hereford calf-steer grown from 75 to 1,300 lb; *Beckett & Oltjen (1994)

Incorrect Data Misleads the Consumer and May Bias Food Choices

	Water Footprint Network	US Average
Boneless beef yield (lb)	441	605
Dressed carcass weight (lb)	588	806
Slaughter weight (lb)		
Days to slaughter		
Overall growth rate (lb/d)		
Water (gal) per lb boneless beef		

Source: Created by Dr. Jude L. Capper, 2012. Weight and growth rate data for US average based on AMTS ration formulation for Angus x Hereford calf-steer grown from 75 to 1,300 lb; *Beckett & Oltjen (1994)

Incorrect Data Misleads the Consumer and May Bias Food Choices

	Water Footprint Network	US Average
Boneless beef yield (lb)	441	605
Dressed carcass weight (lb)	588	806
Slaughter weight (lb)	948	1,300
Days to slaughter		
Overall growth rate (lb/d)		
Water (gal) per lb boneless beef		

Source: Created by Dr. Jude L. Capper, 2012. Weight and growth rate data for US average based on AMTS ration formulation for Angus x Hereford calf-steer grown from 75 to 1,300 lb; *Beckett & Oltjen (1994)

Incorrect Data Misleads the Consumer and May Bias Food Choices

	Water Footprint Network	US Average
Boneless beef yield (lb)	441	605
Dressed carcass weight (lb)	588	806
Slaughter weight (lb)	948	1,300
Days to slaughter	1,095	415
Overall growth rate (lb/d)		
Water (gal) per lb boneless beef		

Source: Created by Dr. Jude L. Capper, 2012. Weight and growth rate data for US average based on AMTS ration formulation for Angus x Hereford calf-steer grown from 75 to 1,300 lb; *Beckett & Oltjen (1994)

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Slaughter weight (lb)	948	1,300
Days to slaughter	1,095	415
Overall growth rate (lb/d)	0.80	2.95
Water (gal) per lb boneless beef		

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Days to slaughter	1,095	415
Overall growth rate (lb/d)	0.80	2.95
Water (gal) per lb boneless beef	1,857	441*

Source: Created by Dr. Jude L. Capper, 2012. Weight and growth rate data for US average based on AMTS ration formulation for Angus x Hereford calf-steer grown from 750 to 1,300 lb; *Beckett & Oltjen (1994)

Stockholm International Water Institute claims there's not enough water to feed the global population

Do we all need to be vegetarian to feed the world in 2050?

Source: Created by Dr. Jude L. Capper, 2012

Significant Opportunities for Improvement Exist in Other Beef-Producing Regions

Brazilian Production

68% of cows bear a calf
Heifers first calve at 40 months
Steers slaughtered at 40 months

Source: Created by Dr. Jude L. Capper, 2012. Data from R. R. Barcellos, Elanco Animal Health, Brazil

Sustainability is Not a Race

It's about suiting your system to the animal, feed, land and labor resources available…

Source: Created by Dr. Jude L. Capper, 2012

Sustainability is Not a Race

…When we make the best use of resources we can feed a hungry world - sustainably

Source: Created by Dr. Jude L. Capper, 2012

Technology Use Has Positive Social Sustainability Impacts

Extra Beef from Implants and β-Agonists on a Single Carcass Will Supply **Seven** Children with School Lunches for a Whole Year

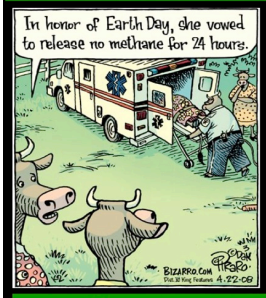
Source: Created by Dr. Jude L. Capper, 2012

Conclusions

- ✓ Every production system has its niche
- ✓ Conventional beef production is sustainable and will stay sustainable through continuous improvement
- ✓ Productivity is a key factor in improving sustainability
- ✓ The beef industry must demonstrate continuing dedication to improving sustainability to remain viable
- ✓ Sustainability must be assessed using sound science not touchy-feely ideology

Source: Created by Dr. Jude L. Capper, 2012

Thank you!



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