Future Threats to Livestock Production

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There are More People Living Inside than Outside the Circle

World Beef, Pork and Poultry Consumption: 1980 - 2050

Sources: Global Insight Demand Analysis to 2050; Bauman and Capper (2011) Southwest Nutrition and Management Conference, Tempe, AZ.
Sustainability Comprises Three Factors:
Environmental, Economic, & Social

Source: Created by Dr. Jude L. Capper, 2015
Threats to the Economic Stability and Sustainability of Livestock Enterprises

- Social Perception
- Climate
- Feed Cost
- Global Trade
- Operator Age
- Regulation

Source: Created by Dr. Jude L. Capper, 2015
Animal Agriculture was Better in the “Good Old Days”…or was it?

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

<table>
<thead>
<tr>
<th>Category</th>
<th>1977 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals</td>
<td>70%</td>
</tr>
<tr>
<td>Feed</td>
<td>81%</td>
</tr>
<tr>
<td>Water</td>
<td>88%</td>
</tr>
<tr>
<td>Land</td>
<td>67%</td>
</tr>
<tr>
<td>Carbon Footprint</td>
<td>84%</td>
</tr>
</tbody>
</table>

*All values expressed per lb of beef produced*

The U.S. Swine Industry Has Reduced its Environmental Impact Since 1959

*All values expressed per gal of hot dressed carcass weight poultry produced

Source: Created by Jude L. Capper, 2012; Data from Cady et al. (2013) A 50-year comparison of the environmental impact and resource use of the US swine herd: 1959 vs. 2009. ADSA-ASAS Annual Meeting, 2013, Indianapolis, IN
U.S. Egg Industry Uses Fewer Resources and Emits Less GHG than in 1960

Source: Created by Dr. Jude L. Capper, 2014; Data from Xin, H. et al. (2013) A Comparative Assessment of the Environmental Footprint of the U.S. Egg Industry in 1960 and 2010. Egg Industry Center, Iowa State University, Ames, IA.
Modern US Milk Production Has Considerably Lower Resource Use and Carbon Emissions

*All values expressed per gal of milk produced at the farm gate

The Dairy Industry Must be Evaluated on a Production Basis, Not per Cow

U.S. Dairy Farm Industry has Reduced its Total Carbon Footprint by 41% Since 1944

Environmental Impact Reduction due to Improved Productivity

Average annual milk yield has quadrupled since 1944

Environmental Impact Reduction due to Improved Productivity

U.S. produces 59% more milk using 64% fewer cows

“Mega” Farms Are Vilified by the British Media

Mail Online

Spectre of Britain's first cattle factory: £50m plan for megafarm that houses 8,000 cows in sheds the size of 22 football pitches

By DAVID DERBYSHIRE FOR MAILONLINE
UPDATED: 11:07, 6 August 2010

Plans for Britain's first cattle factory where 8,100 'battery cows' will be milked around the clock were unveiled yesterday.

The industrial-scale farm will house the UK's largest dairy herd in Western Europe inside giant metal sheds with little access to green grass or sunshine.

Created by Dr. Jude L. Capper, 2015. Screenshot from: http://www.dailymail.co.uk/news/
Agricultural Reality Doesn’t Tie in with Consumer Perceptions

53% of consumers believe that the majority of today’s farms are “Large, corporate-owned factory farms”.

Small Herds (<100 Cows) Dominate U.S. Dairy Operations

Large Herds (>500 Cows) Dominate U.S. Milk Production

Milk Yield per Cow Increases With Herd Size

Ultimately…. Size Doesn’t Matter, It’s What You Do With It That’s Important.
Global Dairy Industry Currently in Crisis

Global oversupply leads to decreased milk price, excess product at processors and farmers going out of business.

No whey forward - future of Britain’s dairy industry hangs in the balance

Years of falling milk prices could spell an end to the fresh, safely produced dairy products we take for granted.

Output per Unit Bodyweight May Be the Most Important Efficiency Metric

Herd bodyweight dictates resource use: improving output per unit bodyweight improves economics... and environmental impact

Source: Created by Dr. Jude L. Capper, 2013.
Animal Characteristics to Maintain and Improve System Sustainability

Nutrition
- Growth Rate
- Maternal Bodyweight
- Yield

Management
- Fertility
- Health
- Longevity
- Product Quality
- Mortality

Technology

Welfare

Source: Created by Dr. Jude L. Capper, 2014
Ranchers' Biggest Influence on Economic Sustainability May Be Through Calving Rate

Production costs per unit of beef as index of 100% calving rate

USA +5.5% $ cost per lb of beef

Brazil +58% $ cost per lb of beef

Source: Created by Dr. Jude L. Capper, 2013. Data from Capper, J. L. 2013. The environmental and economic impact of calving rate within U.S. beef production. ADSA-ASAS Annual Meeting, 2013, Indianapolis, IN
Ranchers’ Biggest Influence on Environmental Sustainability May Be Through Calving Rate

USA
+7% carbon per lb of beef

Brazil
+46% carbon per lb of beef

Source: Created by Dr. Jude L. Capper, 2013. Data from Capper, J. L. 2013. The environmental and economic impact of calving rate within U.S. beef production. ADSA-ASAS Annual Meeting, 2013, Indianapolis, IN
Ranchers’ Biggest Influence on Environmental Sustainability May Be Through Calving Rate

US calving rate of 90% =
6.7% more cattle
8.1% more land
5.2% more water per lb of beef

Source: Created by Dr. Jude L. Capper, 2013. Data from Capper, J. L. 2013. The environmental and economic impact of calving rate within U.S. beef production. ADSA-ASAS Annual Meeting, 2013, Indianapolis, IN
Conventional (U.S.) Technologies Improve Economic and Environmental Sustainability

Feed Cost: $1.37  
Water: 556 litres  
Carbon: 5.28 kg

Resources Saved per kg Boneless Beef

Animal Health and Welfare are Paramount within Beef Production Systems

Dichotomy exists between consumer’s desire for excellent cattle health, and concern over chemical use in livestock

Source: Created by Dr. Jude L. Capper. 2013. Data from Capper, J. L. 2013. The environmental and economic sustainability impact of withdrawing parasite control (Fenbendazole) from traditional U.S. beef production systems. ADSA/ASAS Annual Meeting, 2013. Indianapolis, IN.
Withdrawing Effective Parasite Control Reduces Performance

Fenbendazole withdrawal reduced pregnancy rate (81% vs. 91%), weaning weight (227 kg vs. 248 kg) and ADG (1.10 kg/d vs. 1.31 kg/d)

Source: Created by Dr. Jude L. Capper, 2014. Data from Capper J. L. 2013. The environmental and economic sustainability impact of withdrawing parasite control (Fenbendazole) from traditional U.S. beef production systems. ADSA/ASAS Annual Meeting, 2013, Indianapolis, IN.
Withdrawing Effective Parasite Control Increases Economic and Environmental Impact

Source: Created by Dr. Jude L. Capper, 2013. Data from Capper, J. L. 2013. The environmental and economic sustainability impact of withdrawing parasite control (Fenbendazole) from traditional U.S. beef production systems. ADSA/ASAS Annual Meeting, 2013, Indianapolis, IN.
Effective Parasite Control Has a Positive Impact on Social Sustainability

Extra Beef Produced Via Effective Parasite Control in a 35-Cow Herd Supplies 19 Families With Their Annual Beef Demand

Source: Created by Dr. Jude L. Capper, 2013
Vegetarian Agenda Heavily Promoted
Feed Efficiency is One of the Principal Issues Used to Denigrate Animal Agriculture

IF EVERY AMERICAN STOPPED EATING MEAT THERE WOULD BE ENOUGH GRAIN TO FEED 1.4 BILLION PEOPLE.

#IMAGREENMONSTER

Source: Created by Dr. Jude L. Capper, 2015. Picture from: https://www.crcpress.com/animal-studies-and-bioeconomics/McIntosh-Parks/9781420096767
What Do These Industries Have in Common? They All Provide By-Products Fed to Animals
Feed Efficiency Ratios Vary Between Different Systems and Species

<table>
<thead>
<tr>
<th>Feed Efficiency Ratio (lb input/lb output)</th>
<th>Dairy</th>
<th>Suckler beef</th>
<th>Cereal beef</th>
<th>Pork</th>
<th>Poultry</th>
<th>Eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.1</td>
<td>27.5</td>
<td>7.8</td>
<td>3.6</td>
<td>2.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Source: Created by Dr. Jude L. Capper, 2012; Data from Wilkinson (2011) Re-defining efficiency of feed use by livestock. Animal.
Feed Efficiency Metrics Must Consider Competition for Human-Edible Foods

Source: Created by Dr. Jude L. Capper, 2012; Data from Wilkinson (2011) Re-defining efficiency of feed use by livestock. Animal
Dairy and Beef Have Favorable Human-Edible Protein Input to Output Ratios

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Protein (kg/kg edible protein in animal product)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>0.7</td>
</tr>
<tr>
<td>Suckler Beef</td>
<td>0.9</td>
</tr>
<tr>
<td>Cereal Beef</td>
<td>3.0</td>
</tr>
<tr>
<td>Pork</td>
<td>2.6</td>
</tr>
<tr>
<td>Poultry</td>
<td>2.1</td>
</tr>
<tr>
<td>Eggs</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Source: Created by Dr. Jude L. Capper, 2012; Data from Wilkinson (2011) Re-defining efficiency of feed use by livestock. Animal.
“Meat Free Mondays” are Heavily Promoted

Source: Created by Dr. Jude L. Capper, 2014. Photos from:
http://www.thetimes.co.uk/sto/multimedia/archive/00274/Meat_Free_Monday_Ph_276456a.jpg and
https://beatlesm00.files.wordpress.com/2015/06/1126309_1291981375143_53res_500_707.jpg
Meat Production is Not the Only Contributor to UK Carbon Emissions

According to data from the Dept. of Energy and Climate Change (2011), meat production accounts for 3.9% of total UK greenhouse gas emissions.

Source: Created by Dr. Jude L. Capper, 2012; information from: Department of Energy and Climate Change (2011) "UK climate change sustainable development indicator: 2009 Greenhouse gas emissions, final figures." NB – CH₄ and N₂O only.
IF EVERYBODY IN THE UK WENT MEATLESS EVERY MONDAY FOR AN ENTIRE YEAR...

...THE NATIONAL CARBON FOOTPRINT WOULD DECREASE BY LESS THAN ONE PERCENT

Source: Design, wording and data copyright held by Dr. Jude L. Capper, 2012. Photo from: http://www.laverstokepark.co.uk/@@content/pub/image_1813/200g_Pie_20498.jpg
Lack of Food Production Transparency is a Common Complaint

45% of consumers don’t believe the agriculture community is transparent about food production (vs. 22% who do)

Source: Created by Dr. Jude L. Capper, 2013. Data from Sullivan, Higdon & Sink (2013) “Building Trust in What We Eat.”
http://www.shsfoodthink.com
“Sustainable” Lacks a Widely-Agreed Definition and Metrics Among Food Service Companies

“It means that whenever possible we use meat from animals raised without the use of antibiotics or added hormones.”

- Chipotle “Food With Integrity” Website
“Sustainable” Lacks a Widely-Agreed Definition and Metrics Among Food Service Companies

“Can we say we’re buying any sustainable beef today? No we can’t. Could we be buying sustainable beef? We might be.”
- Bob Langert
VP of Sustainability at McDonalds

Source: Created by Dr. Jude L. Capper, 2012
Social Example: “Pink Slime” Removed from Food Supply due to Consumer Pressure

Removal of LFTTB increased beef retail price by 1.6% and cattle numbers to maintain production by 1.7 million head.

What Will the Future Hold?

- Increasing pressure on resource use and impacts
- Intensification may be inevitable in all sectors
- New technologies vital
- Regulation through market, not government
- Consumer support paramount to industry survival

Source: Created by Dr. Jude L. Capper, 2015.