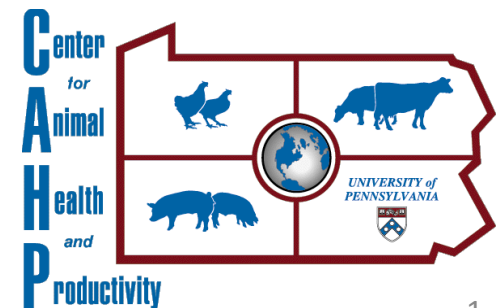




# The US Dairy Industry A Model of Efficiency?

D Galligan, VMD MBA





**WHEN YOU'RE AT A PARTY**

**AND NOBODY WANTS TO  
TALK ABOUT COWS**

# Challenge

- In the next **50 years**, agriculture will have to produce **more food** than has been consumed in the **entire history of mankind** (Megan Clark)
- The Generational Challenge – How do we meet this demand in a manner that is sustainable for future generations?
- What is the role of animal agriculture?  
70% of US agricultural land is “marginal” – only suitable for ruminants!

# Livestock Long Shadow 2006

livestock's long shadow  
environmental issues and options

"that livestock are responsible for **18 percent** of greenhouse gas emissions" (from table 7.1)

.... "an even **larger contribution** than the **transportation** sector worldwide" pp 272



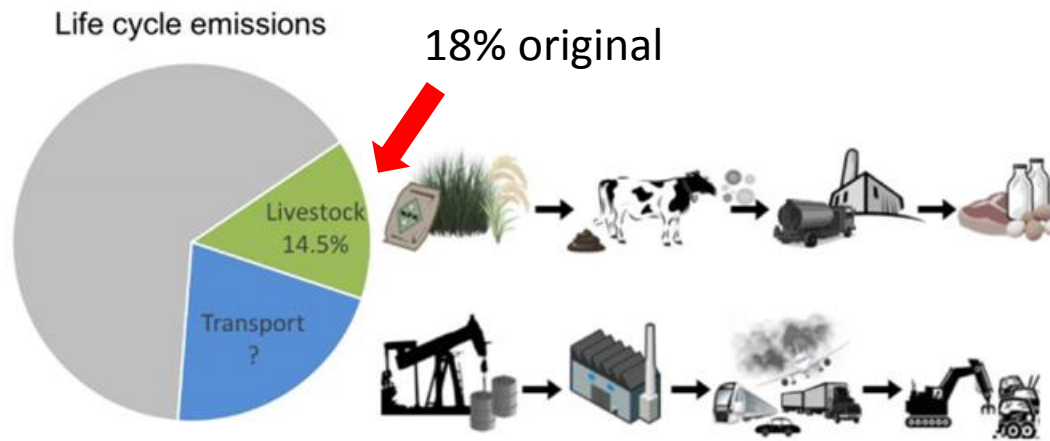
# Cars or livestock: which contribute more to climate change?

by [Anne Mottet and Henning Steinfeld](#) | FAO

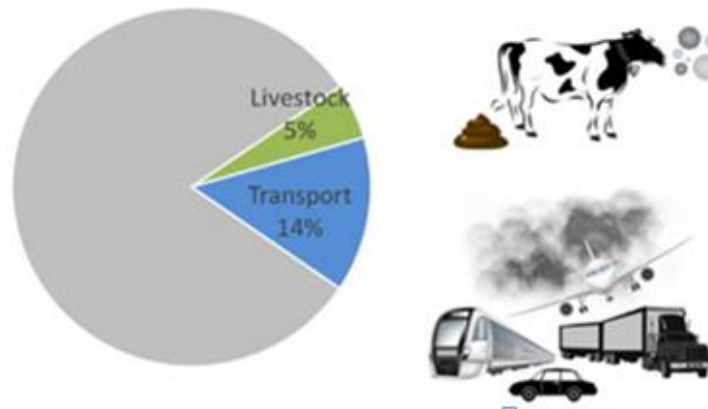
Tuesday, 18 September 2018 08:36 GMT



# Problem in “Livestock Long Shadow”: Life cycle emissions vs “tail pipe emissions”

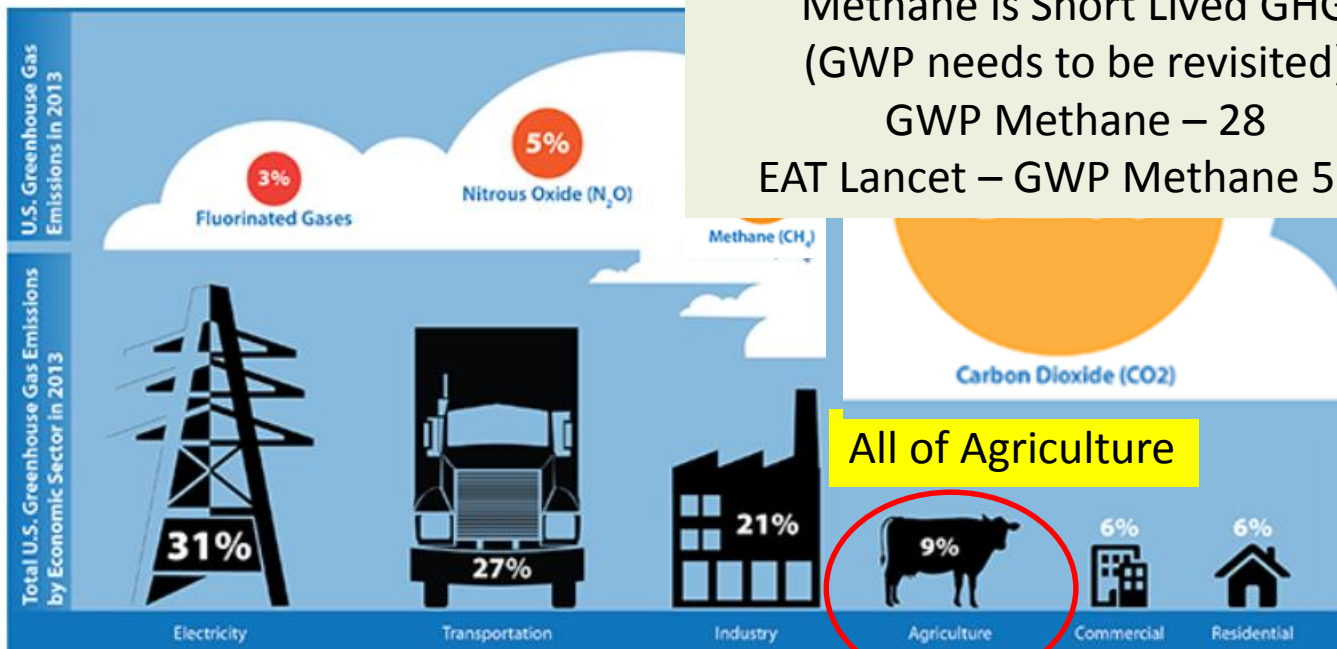


Direct emissions  
(IPCC sectorial approach)



# EPA-

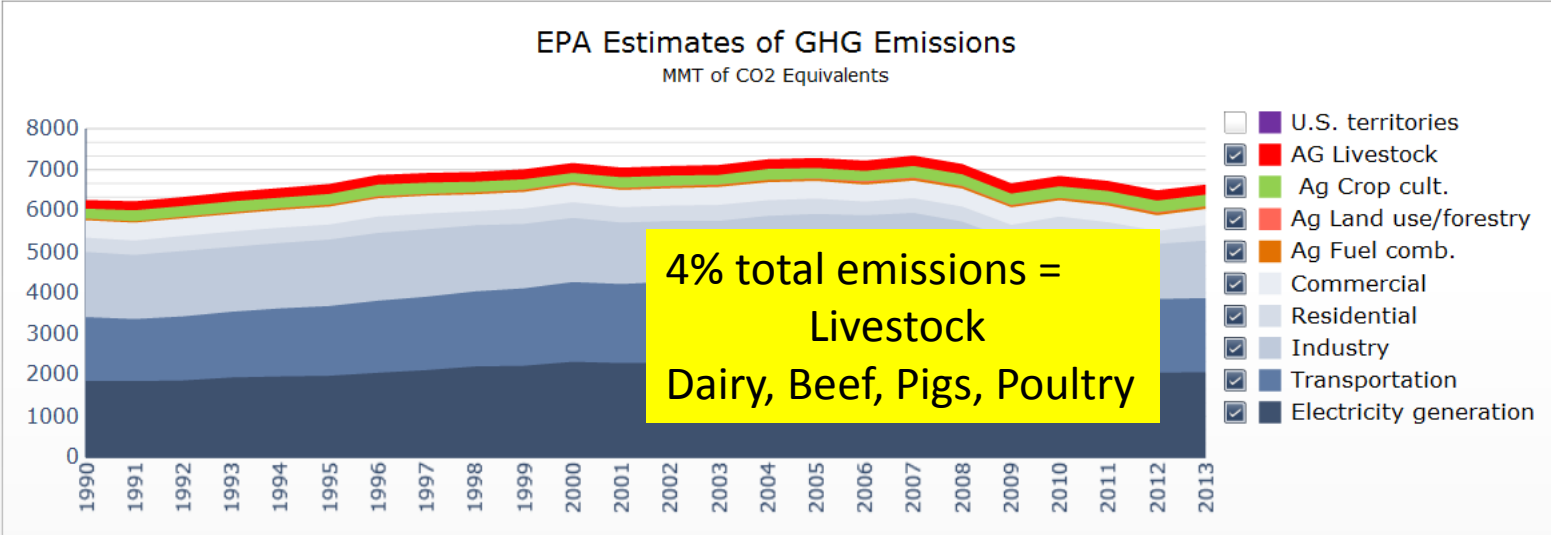
<b>1. Choose a sector:</b>	<b>2. Choose a greenhouse gas:</b>	<b>3. Break out by:</b>	<b>4. Year(s):</b>
Select	All gases	Select	All years



[EPA Estimates of GHG emissions](#)

# United States GHG Emissions - EPA

- GHG MMT
- % Total
- Agriculture MMT
- Ag % of Total
- % within Ag
- Impact of Meatless d



EPA Study  
Galligan, 2016

If US went Vegan = 2.6% reduction GHG (White and Hall PNAS, 2017)  
- Increased synthetic fertilizer use (limits of “natural nitrogen”)

[EPA PDF version of GHG Emissions](#)



# Make you an expert!

## Fundamental Principles:

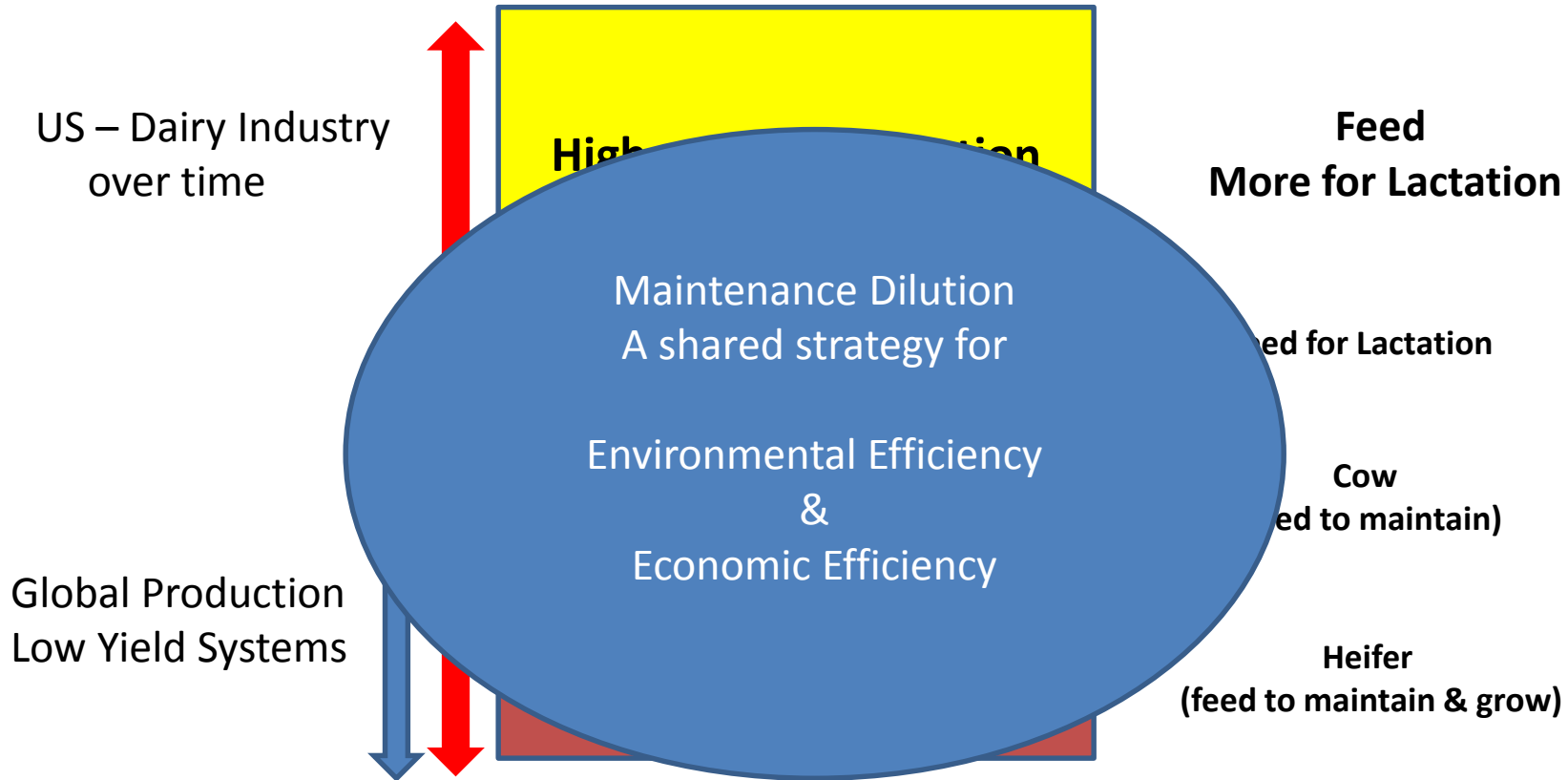
animal nutrition

animal production economics

these concepts will help you understand what  
shaping the animal industry

how animal production impacts the environment

# Basic Animal Unit (Dairy)

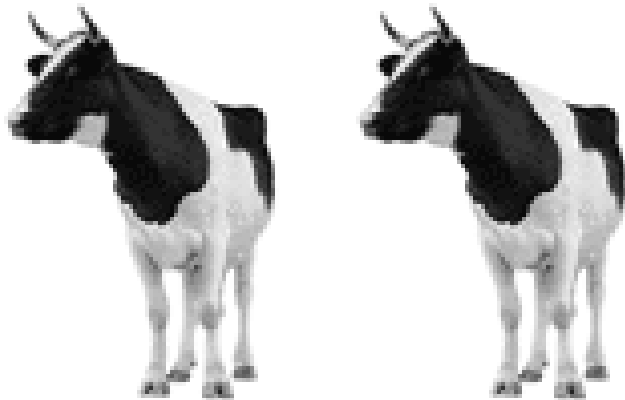


# Extensive vs. Intensive

## Total Yield = 100 lbs of milk

Extensive System

---



50 lbs of milk/cow



Replacements

Intensive System

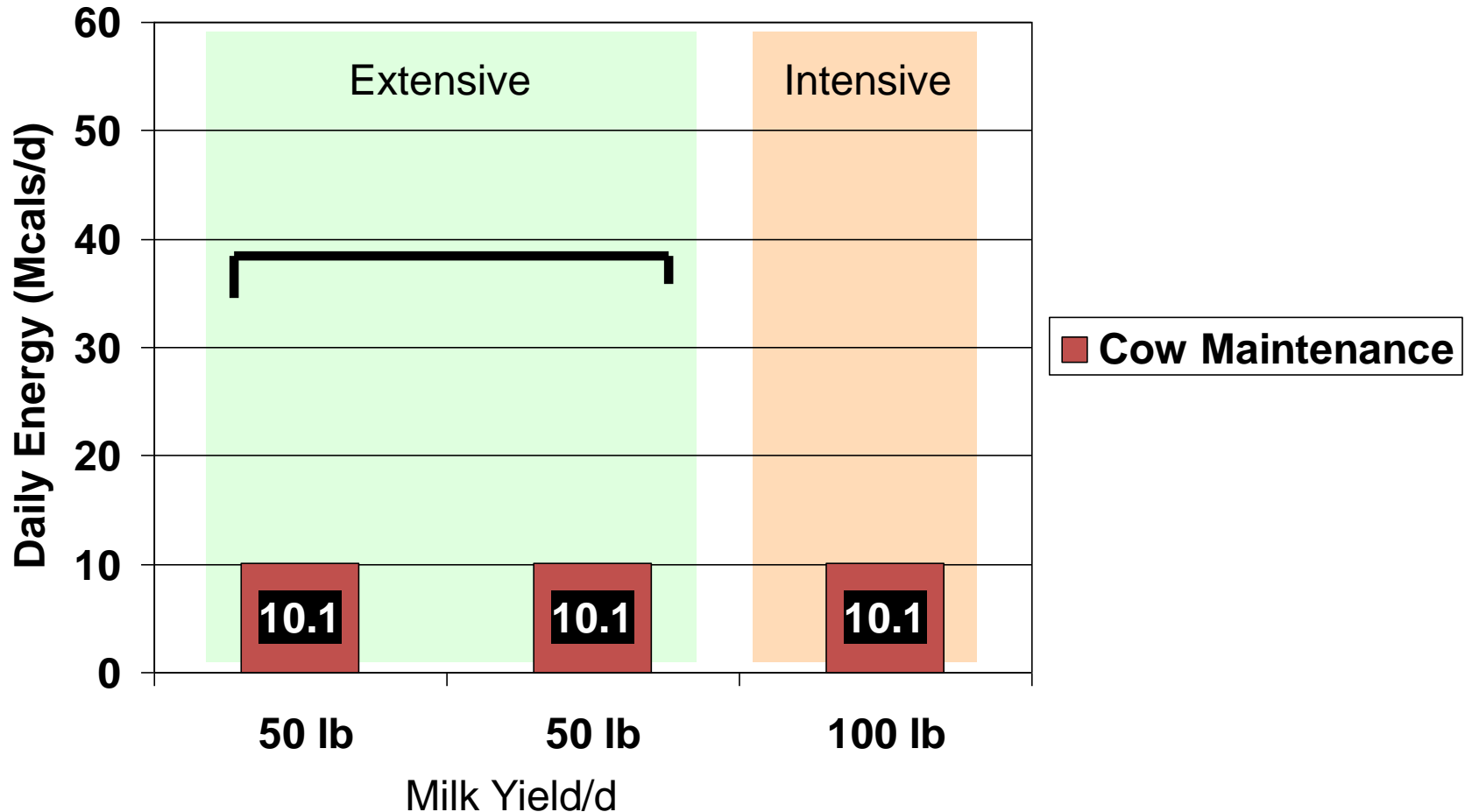
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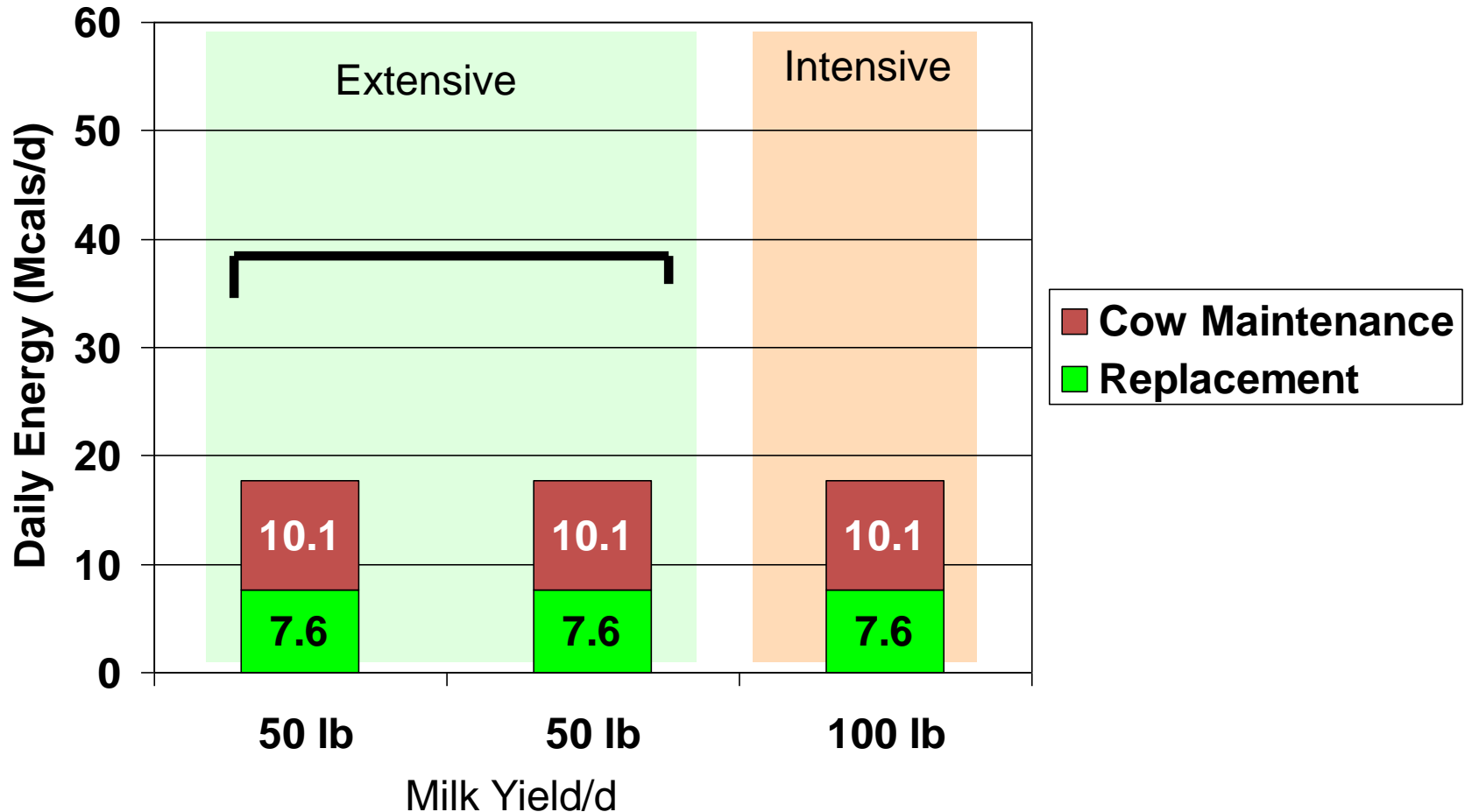
100 lbs of milk/cow



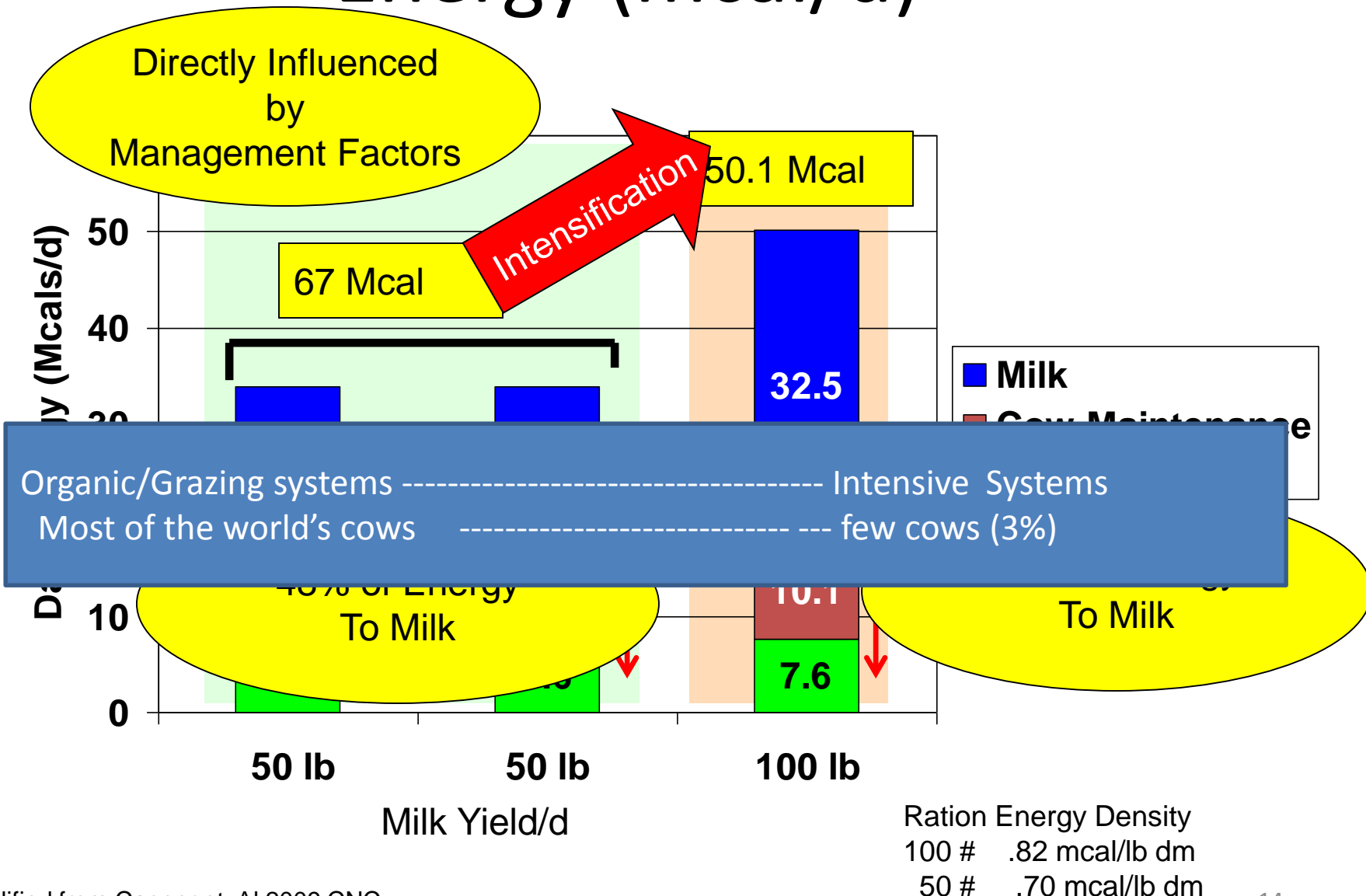
# Feeding - Energy (mcal/d)



# Feeding - Energy (mcal/d)

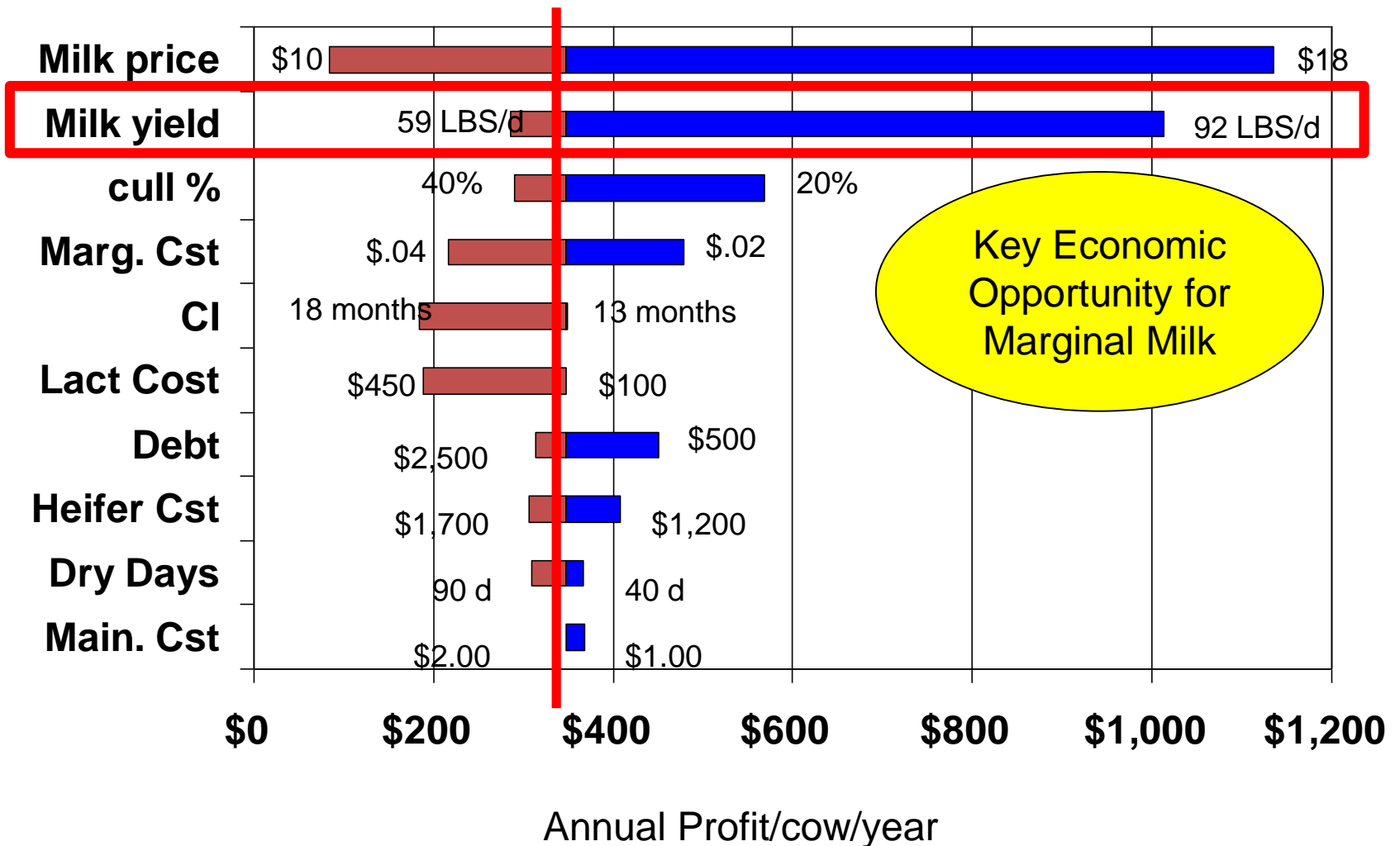


# Energy (mcal/d)



# What influences cow value?

Profit flow/ year  
=347/cow/year

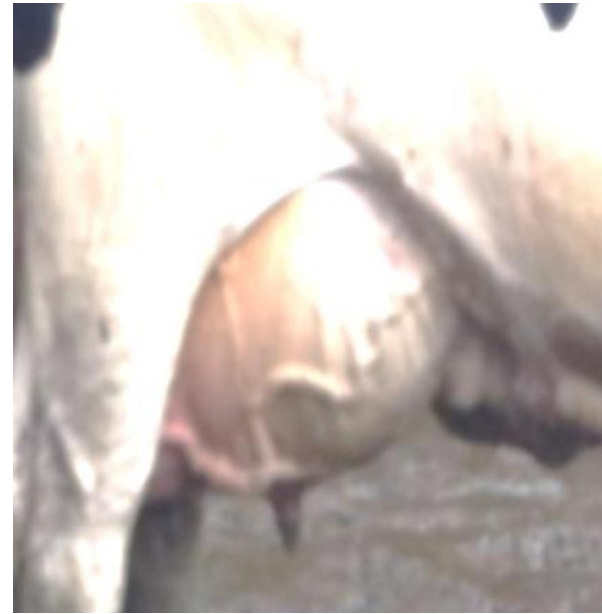


# Rates of Return

More Cows



More Milk/cow



More Cows

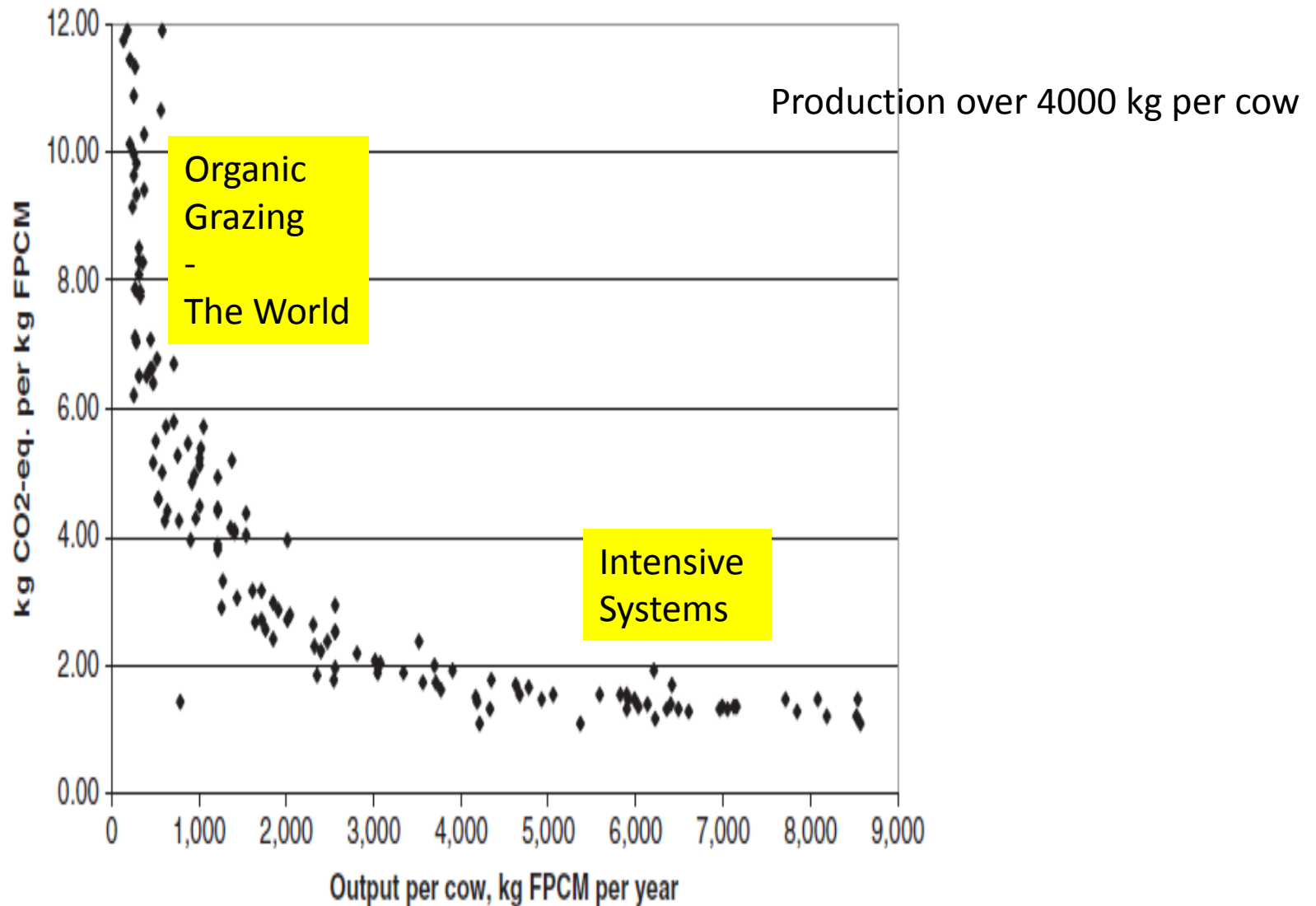
12-30%

More Milk

120%-175%

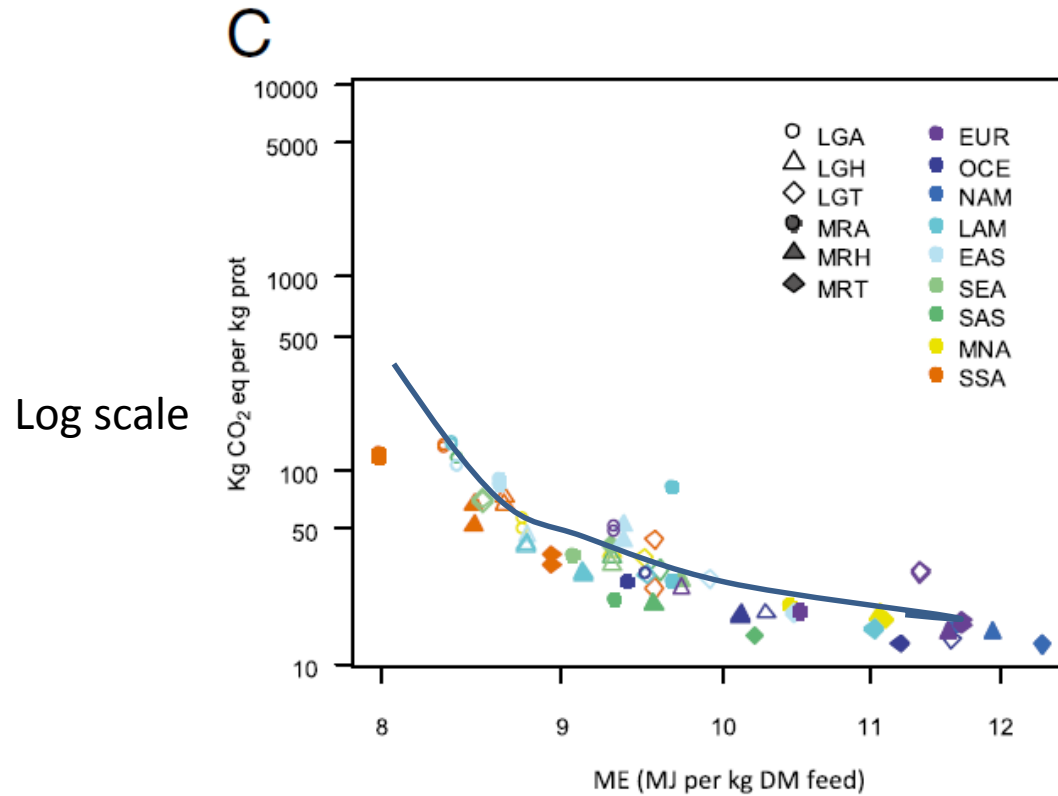
(Milk Price \$.47/kg milk, Feed \$ Cow/d \$6.50, Cow Purchase \$1850)





5. Relationship between total greenhouse gas emissions and output per cow. Each dot represents a country in the database.

# Milk

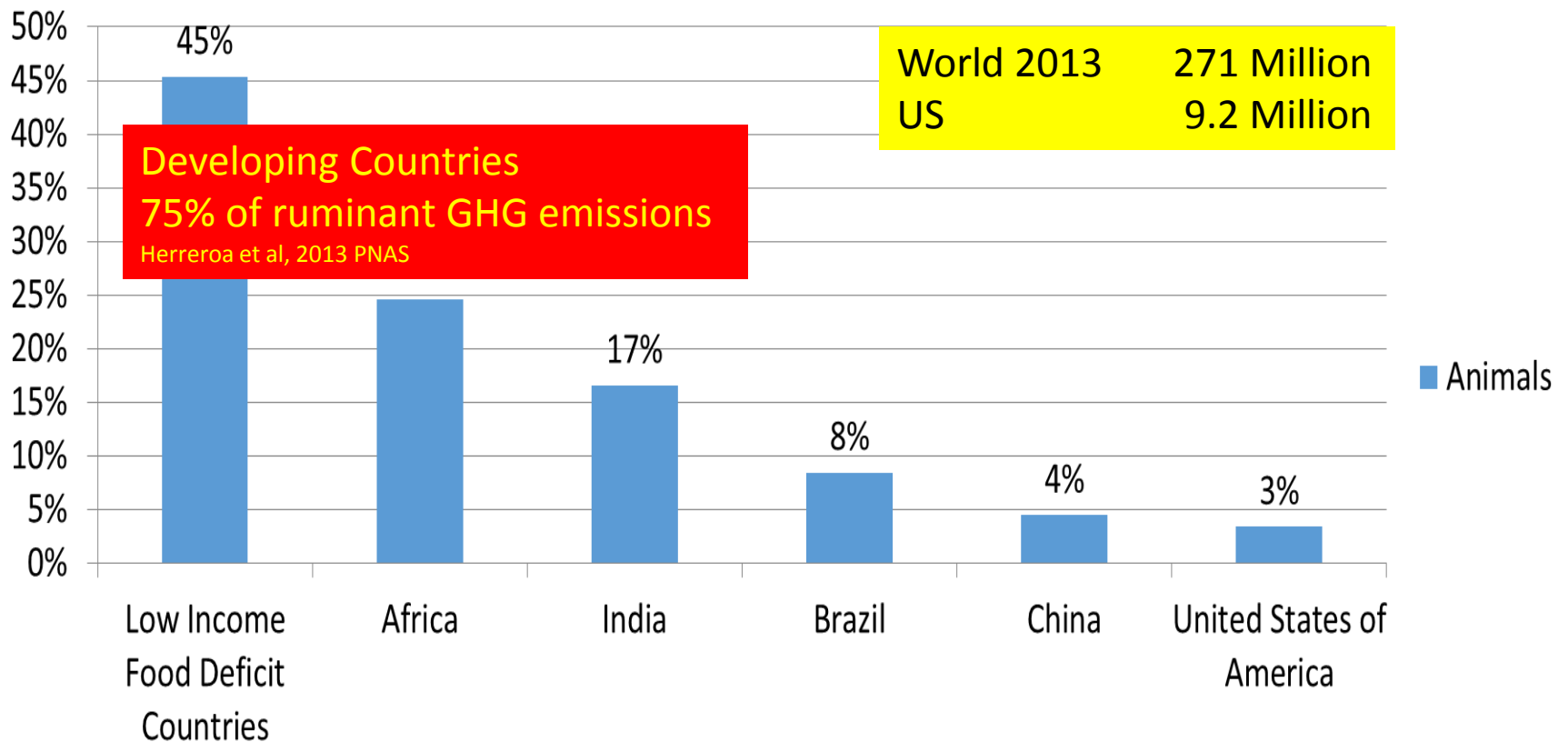


Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems

Mario Herrero et al, 2013 PNAS

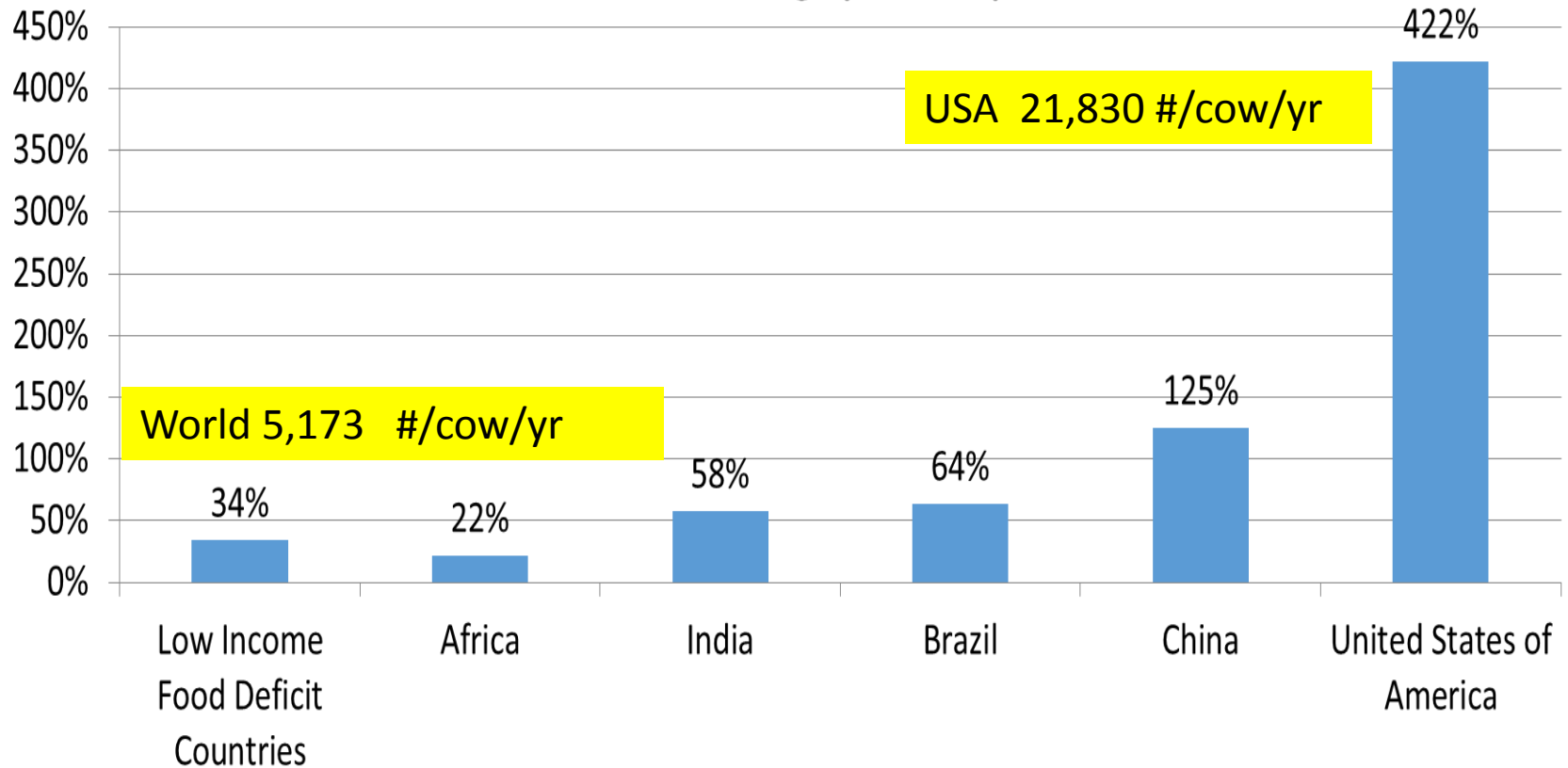
# Percent of the World: Where are the Cows?

## Dairy Cows



# Percent of the World

Yield % of World Average per Cow per Year



# Percent of the World

World 1,401 billion lbs of milk  
US 201 billion lbs of milk

45 % of  
COWS

Production

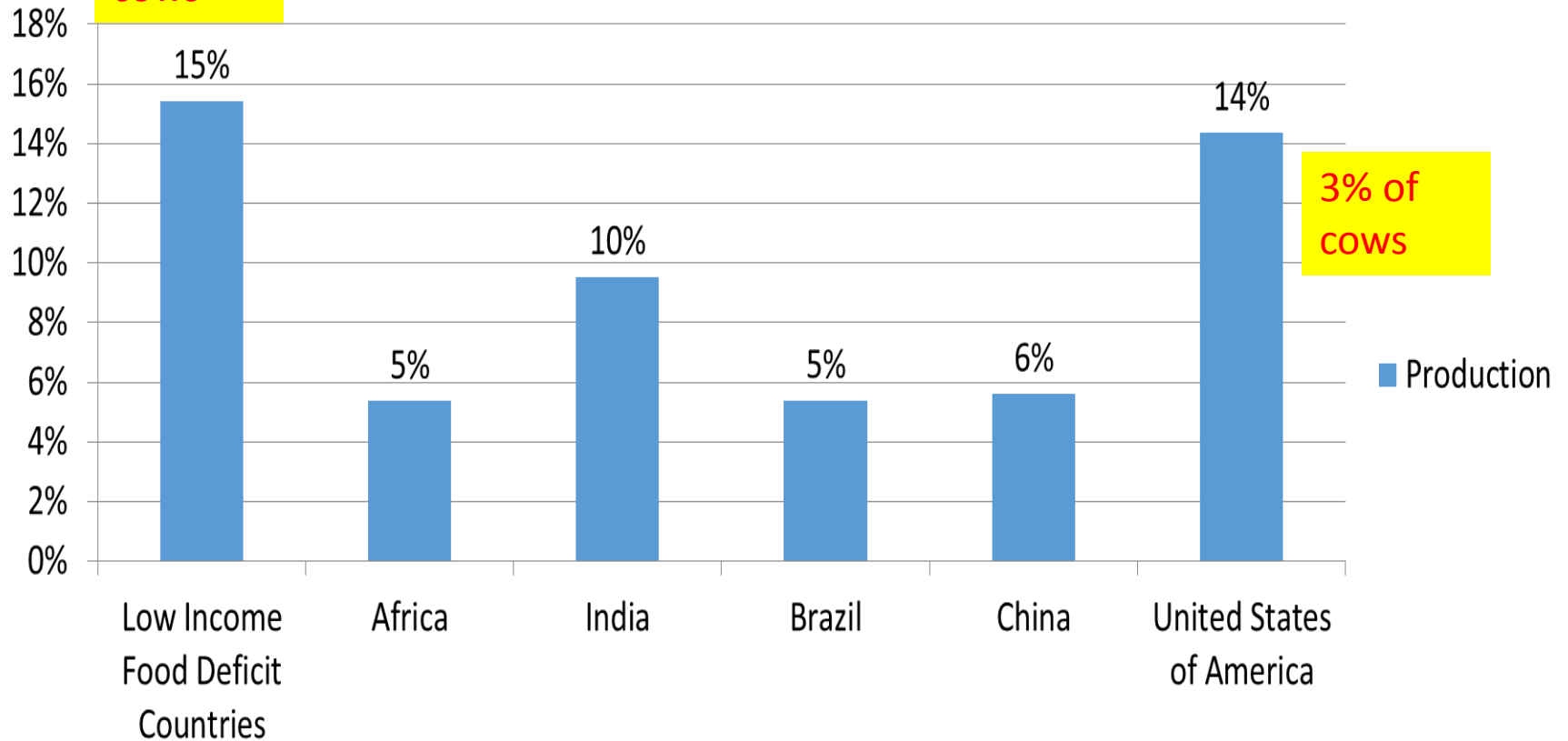


Figure 6. Annual milk yield per cow for four major dairy-producing regions. Adapted from Capper et al. (2009b)

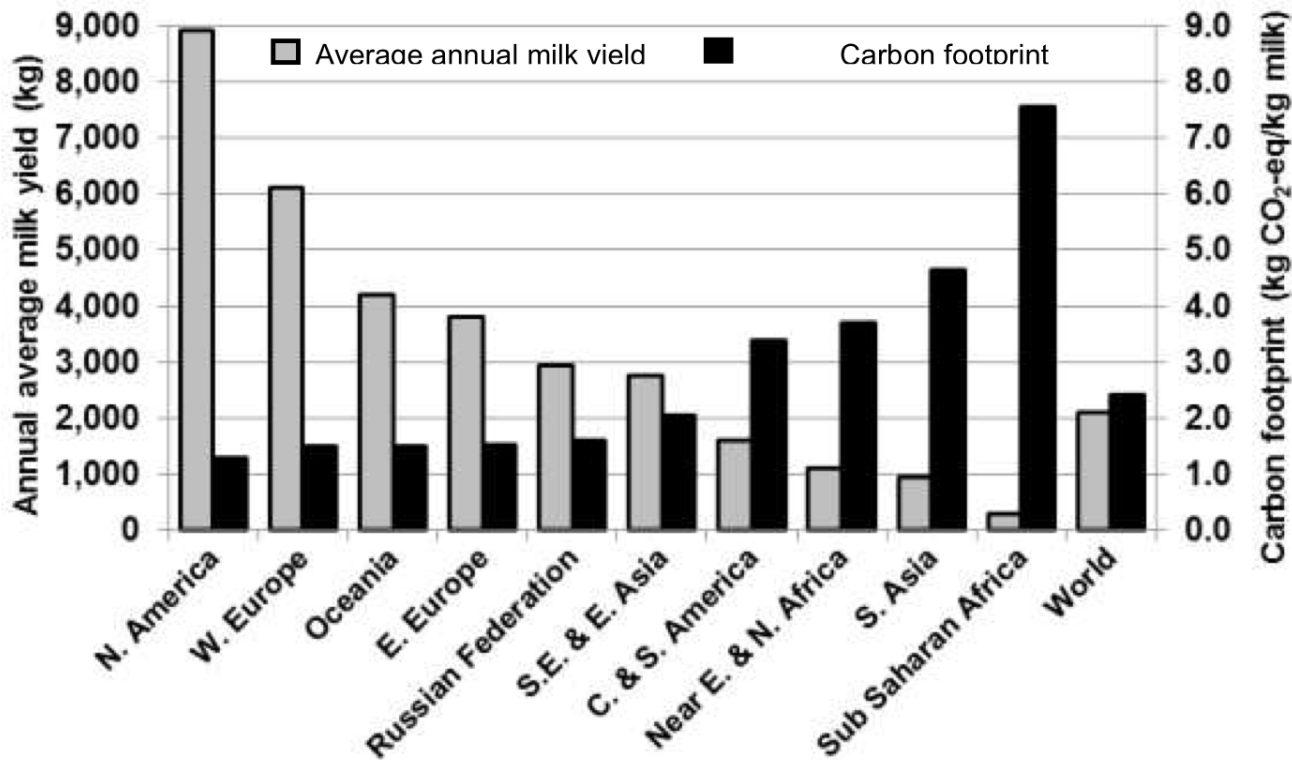
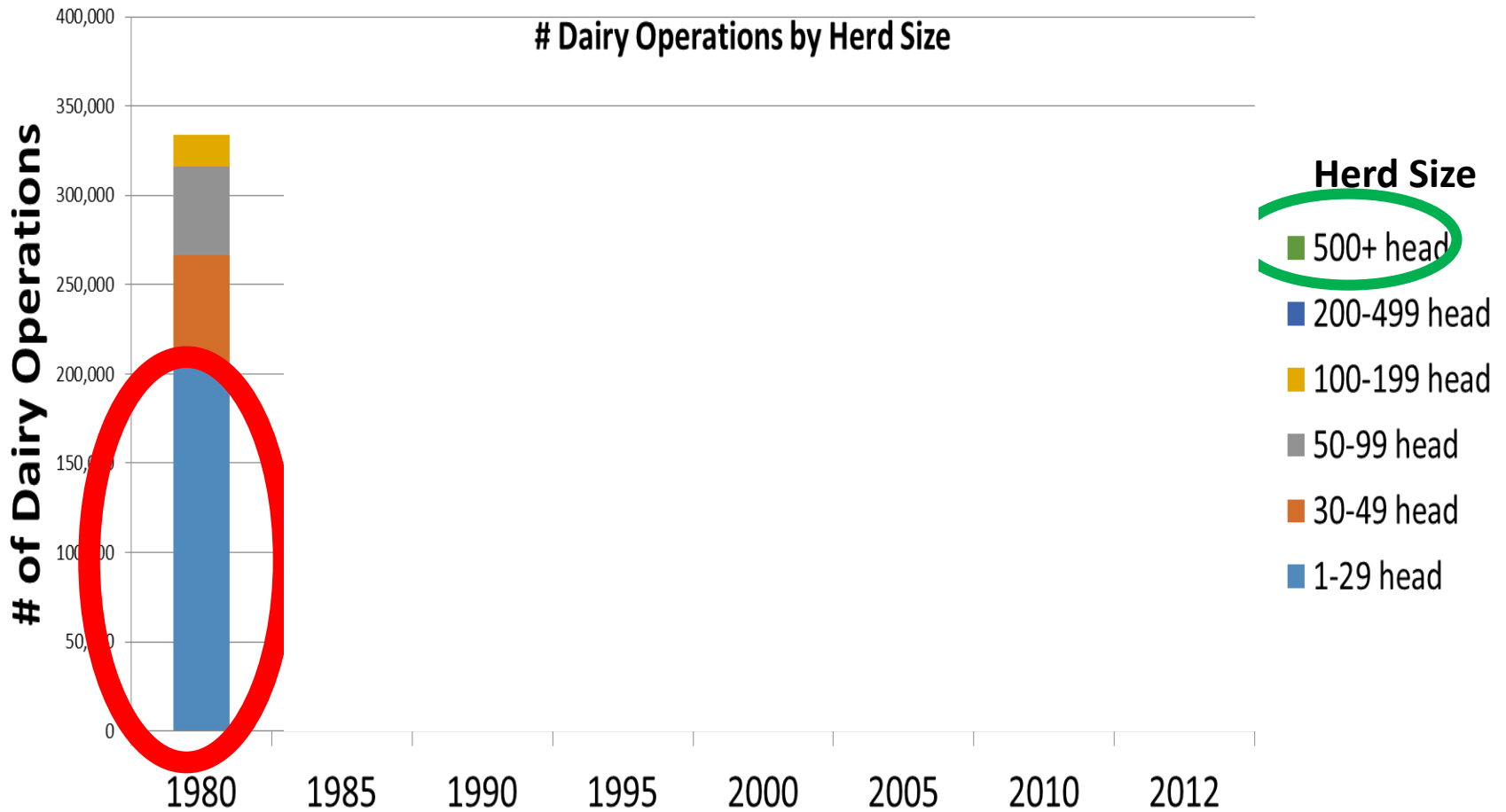
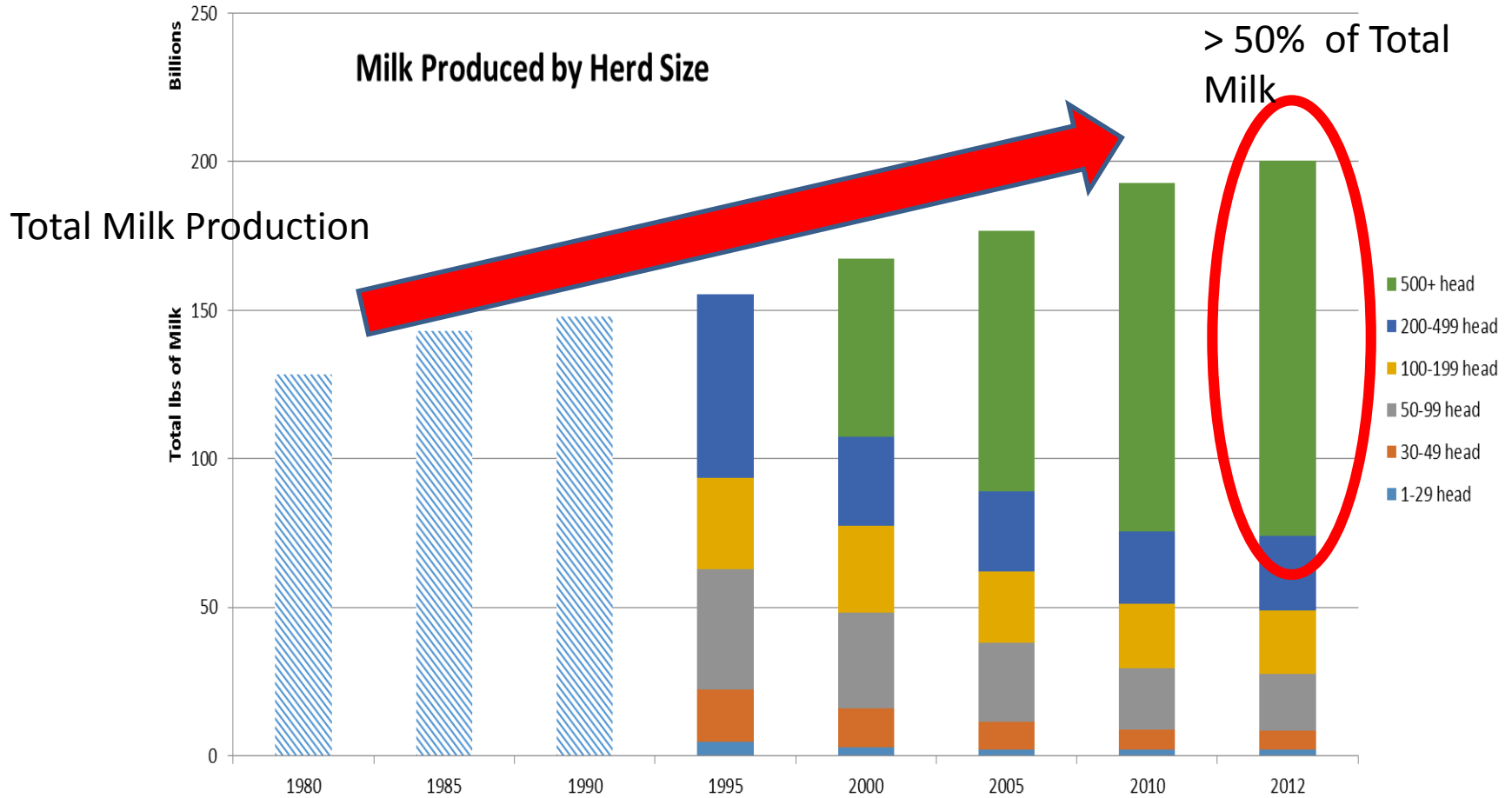


Figure 7. Contribution of dairy products to the daily requirement of key essential nutrients in the U.S.. Figure constructed from NHANES data for 2003-2006 (> 2 yr age) and is available at: <http://tinyurl.com/DairyResearchInstitute>

# Changes in Dairy Operations



# Whose making the milk?





# Milk Yield/Cow, Environmental Impact and Societal Demand

English

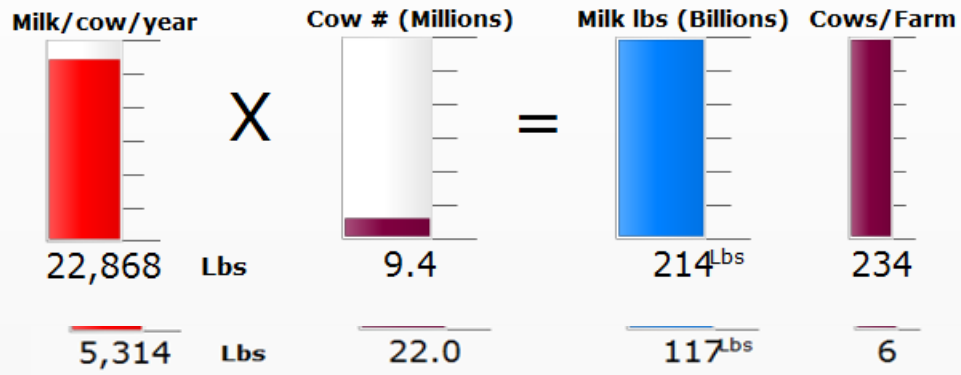


- Externalities
- Per Million lbs
- Balance Eq.**
- Environ/cow
- Environ/lb mil
- Water 1
- Water 2
- Percent

Year 2017

United States of America

- Metric
- Milk/Acre
- Country Current Milk

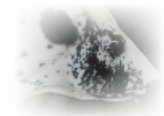


Galligan, Ferguson, Dou, Wu  
2008.,.,2018

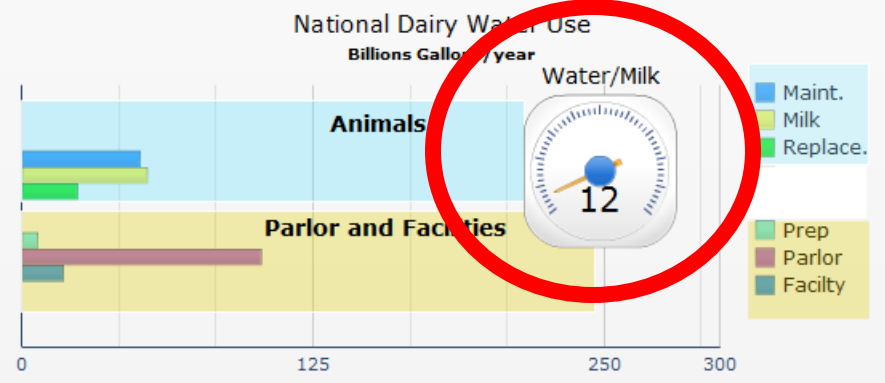
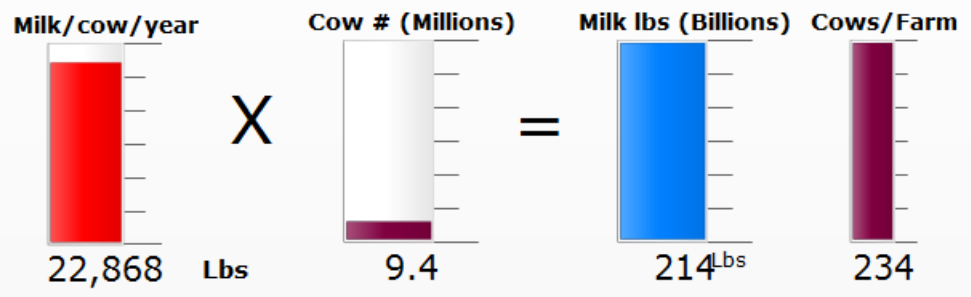
# Milk Yield/Cow, Environmental Impact and Societal Demand

English

- Externalities
- Per Million lbs
- Balance Eq.
- Environ/cow
- Environ/lb mil
- Water 1
- Water 2**
- Percent



- Metric
- Milk/Acre
- Country Current Milk



Fewer Cows  
Fewer Replacements  
Fewer Farm/parlors  
**MORE MILK**

Galligan, Ferguson, Dou, Wu  
2008., 2018

# Milk Yield/Cow, Environmental Impact and Societal Demand

English

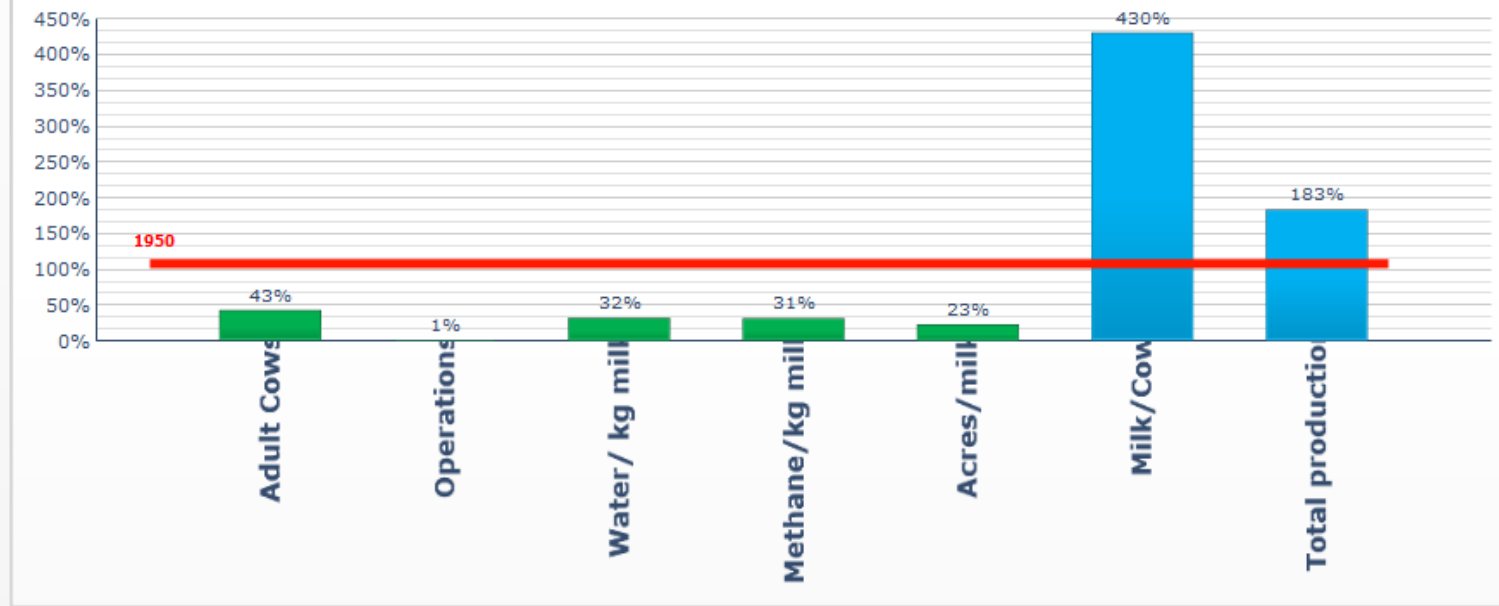


- Externalities
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- Water 1
- Water 2
- Percent**



- Metric
- Milk/Acre
- Country Current Milk

Year 2017 As a Percent of 1950 values



Galligan, Ferguson, Dou, Wu  
2008., 2018

# Summary

- Animal Unit: “maintenance, replacement, production”
- High yield is critical for economic and environmental sustainability “Sustainable intensification”
- GHG are LOWER with higher yield/kg of milk
- US dairy history is a model of efficiency
  
- Please let me talk to you about cows!



# US Dairy, A History of Efficiency

