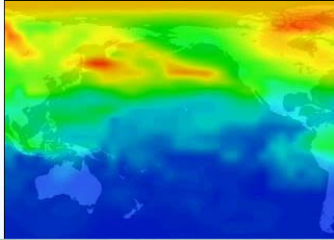




Environmental cattle raising: the scientific basis for measuring impact



Frank Mitloehner, PhD
Assoc Prof & UC CE Specialist
Dept Animal Science, UC Davis





Om Max
Vår Mat
Kampanjer
Reklam & Press
När & Varinger
Arbete
Restauranger
Max & Miljö
Max rekommenderar
Hälsoburgersrestauranter
Max burgare
Max kaffe
Max drink
Max radio
Max tv
Max mobil
Max bil

Din Maxrestaurang

Max - Max & Miljö

UTMÄRKTA BURGARE
Nu redovisar vi kolavslutslapp för alla produkter

Max klimatavslutning Om Max redovisat kolavslutslapp för alla produkter	Koldioxidkompensation Vi kompenserar med kolavslutslapp för alla produkter	Utmärkta burgare Kolavslutslapp för alla produkter
Max ännu godare Max burgare med god kolavslutslapp	Max fisk Max fisk med god kolavslutslapp	Vindkraft Max har ett eget vindkraftverk
Max & Miljö Max & Miljö är en del av Max	Max CO2 Max har ett eget CO2-kontrollsystem	Max miljövänligt Max har ett eget miljövänligt system

Third-Party Initiatives



Rating within Category

Top Milk

Change: Bottom Products View All Products



Straus Fat Free Milk (Organic)
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(4\) >](#)

7.3



Stonyfield Farm, Fat Free Milk (Organic)
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(3\) >](#)

7.3



Organic Valley Pasteurized Fat Free, Skim, Nonfat Milk
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(37\) >](#)

7.0



Clover Stornetta Fat Free Milk (Organic)
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(4\) >](#)

7.0



Knudsen, Fat Free Milk
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(5\) >](#)

6.9



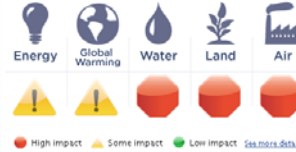
Clover Organic Farms Fat Free Vitamin A&D Milk
[See More Info](#) [Quick Look](#) [Add to Favorites List](#)
[More from this brand \(4\) >](#)

6.9

Detailed Product Review

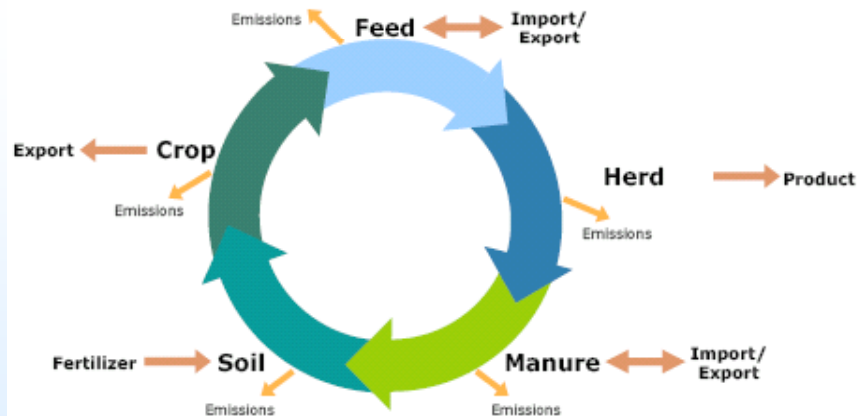
Straus Fat Free Milk (Organic)
 by Straus Family Creamery

GoodGuide Rating: **7.3** User Reviews: Average Price: Best Available: Buy Here



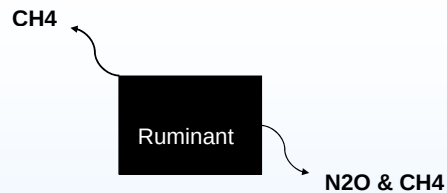
Nutrient	Performance in Milk	
Saturated Fat	Low	Much better than others
Cholesterol	Low	Near the average
Sugars	Medium	Near the average
Sodium	Low	Near the average

Life Cycle Assessments



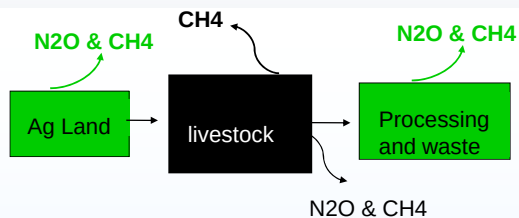
(NRC, 2003)

LCA-1: Direct Emissions



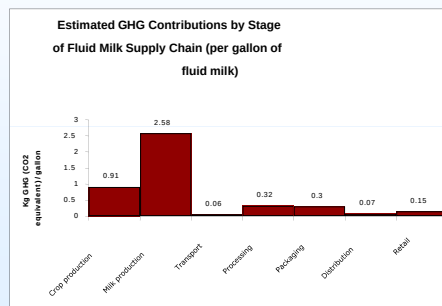
Direct emissions: eructation enteric fermentation, manure and urine excretion

LCA-2: Direct + Indirect Emissions from Livestock



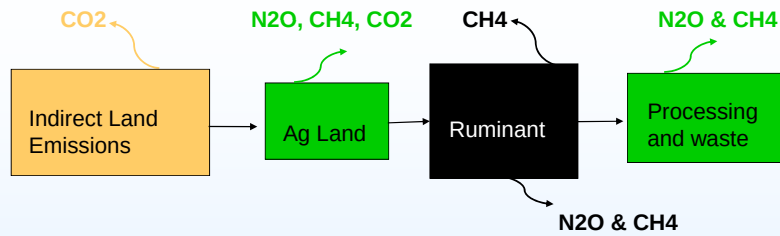
Livestock Indirect emissions include:

- feed crops
- manure application
- Direct mineral fertilizer emissions
- processing
- transportation
- deforestation
- desertification



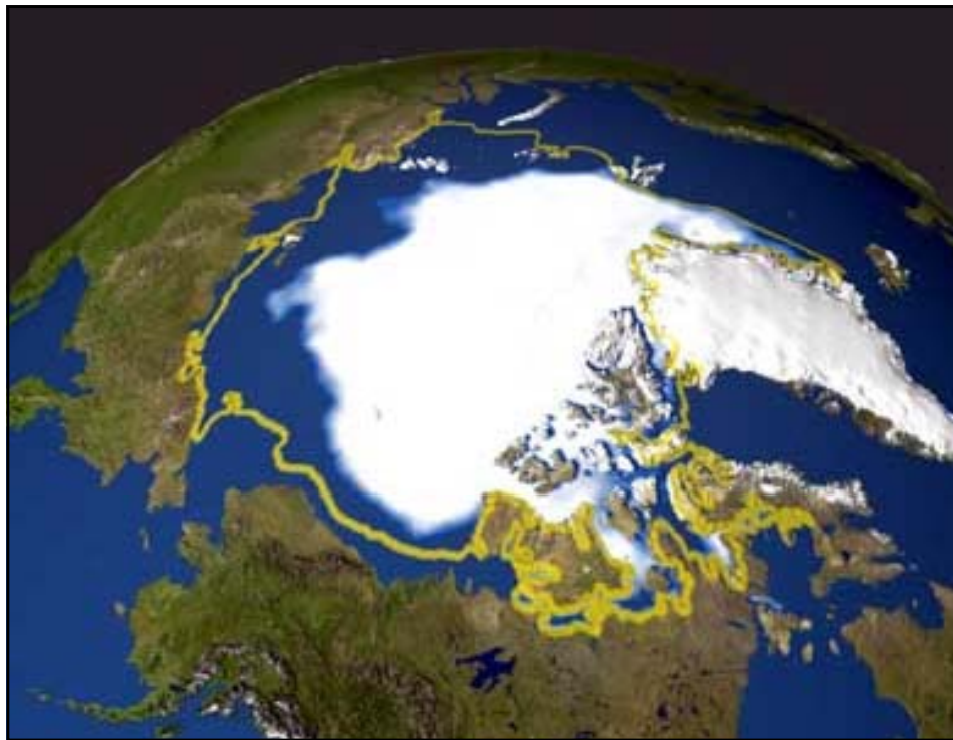
LCA-3: “True” LCA

LCA-3 (direct + indirect emissions from livestock + crop-based indirect emissions)



Crop-based Indirect Emissions include:

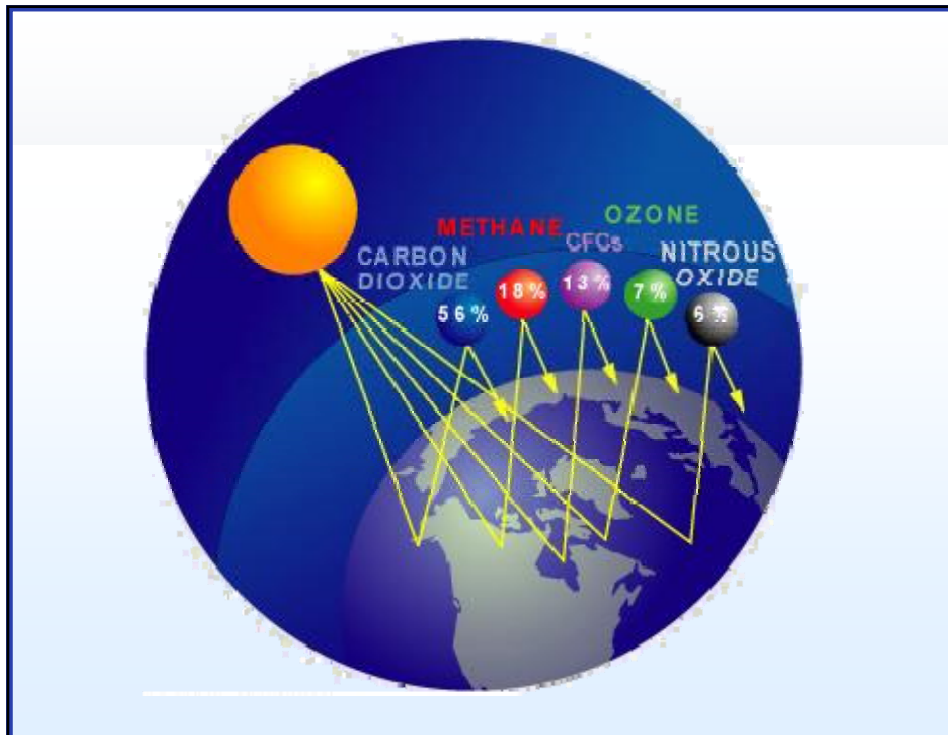
- Fertilizer production
- Herbicide production
- Pesticide production
- E associated with irrigation



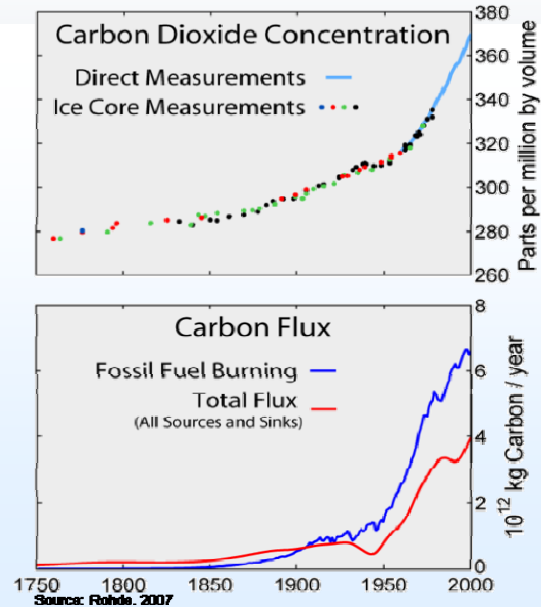
The Five Stages of Climate Grief *Science Fiction or Science Fact?*

1. **Denial** – “the earth isn’t getting warmer, and if it’s not our fault
2. **Anger**
3. **Bargaining** - “It was always too cold in Montana anyway
4. **Depression**
5. **Accepting** climate change as a fact

Steve Running, 2007 Nobel Prize winner



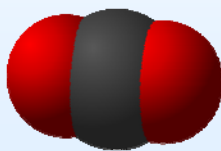
Carbon Dioxide and Carbon Flux



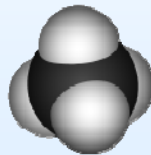
GHG & GWP

Global Warming Potential (GWP) of Main GHG

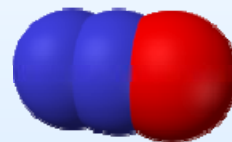
- Carbon Dioxide, CO_2 1
- Methane, CH_4 21
- Nitrous Oxide, N_2O 298



CO_2 – Carbon Dioxide



CH_4 – Methane

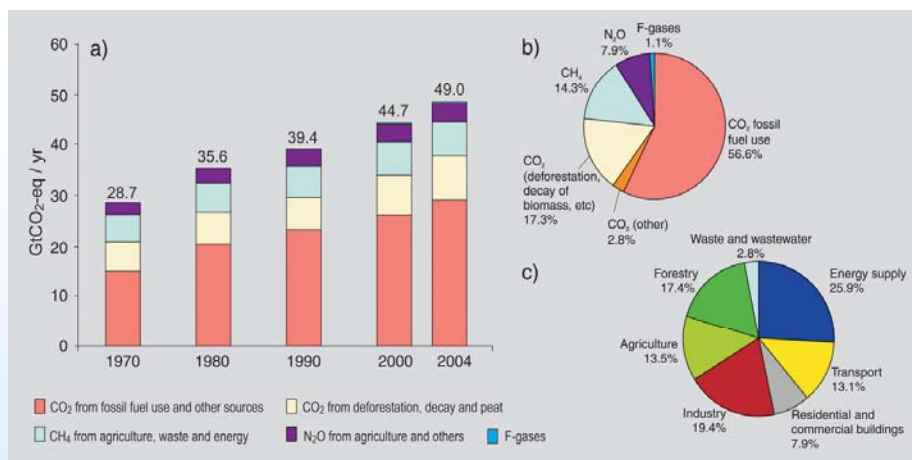


N_2O – Nitrous Oxide

Sources of GHG from Ag

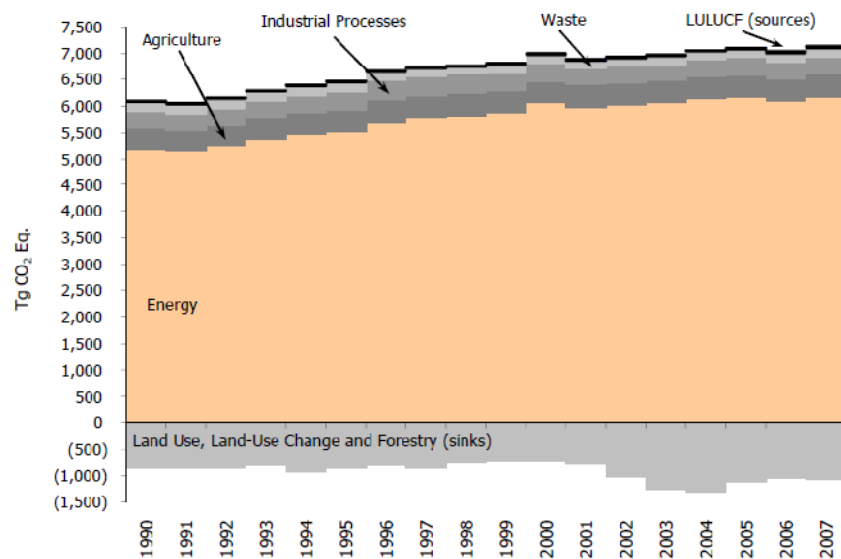
- Enteric fermentation (CH_4)
- Land application of manure (N_2O)
- Manure storage and treatment (CH_4 and N_2O)
- Leading CH_4 source is enteric fermentation from ruminants and manure decomposition
- Leading N_2O source is land incorporated manure and fertilizer

Global big picture



Source: IPCC 4AR, 2004

U.S. – the big GHG picture



Source: EPA (2009)

California GHG inventory

- All GHG sources in California = 500 MMT CO₂e
- Transport = 190 MMT CO₂e
- Energy industry = 170 MMT CO₂e
- Agriculture (all sectors) = 27 MMT CO₂e
- Dairy (enteric and waste) = 11.2 MMT CO₂e

Livestock's Long Shadow (FAO, 2006)

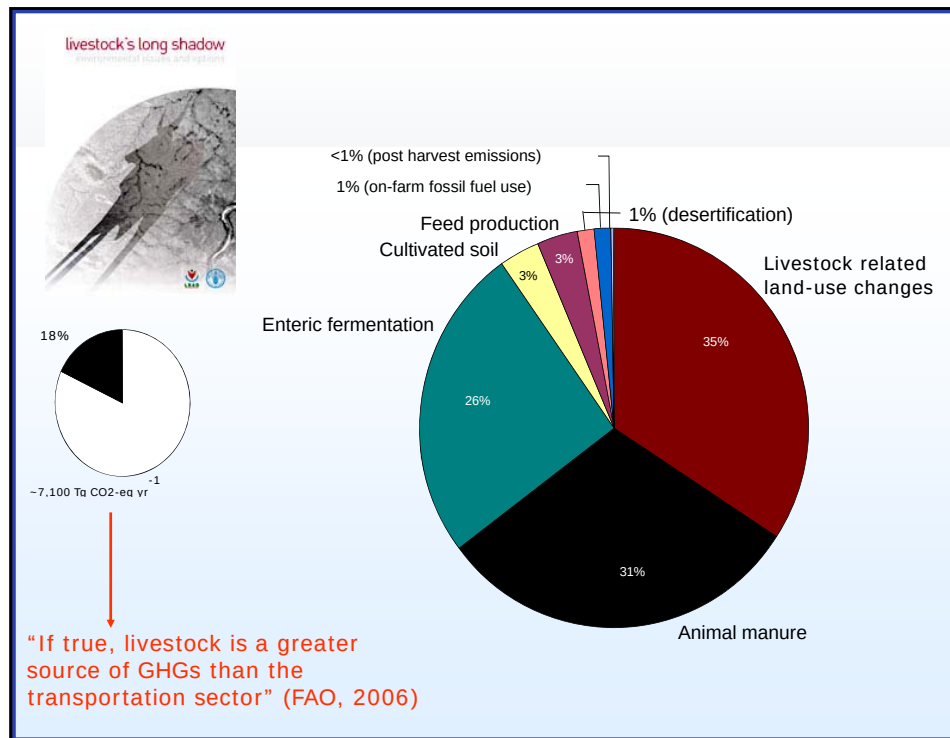
LLS predictions are global not regional

- 18% of all anthropogenic GHG from livestock
- 9% of all carbon dioxide (CO₂)
- 40% of all methane (CH₄)
- 65% of all nitrous oxide (N₂O)



“Livestock's Long Shadow” predictions and its misinterpretations

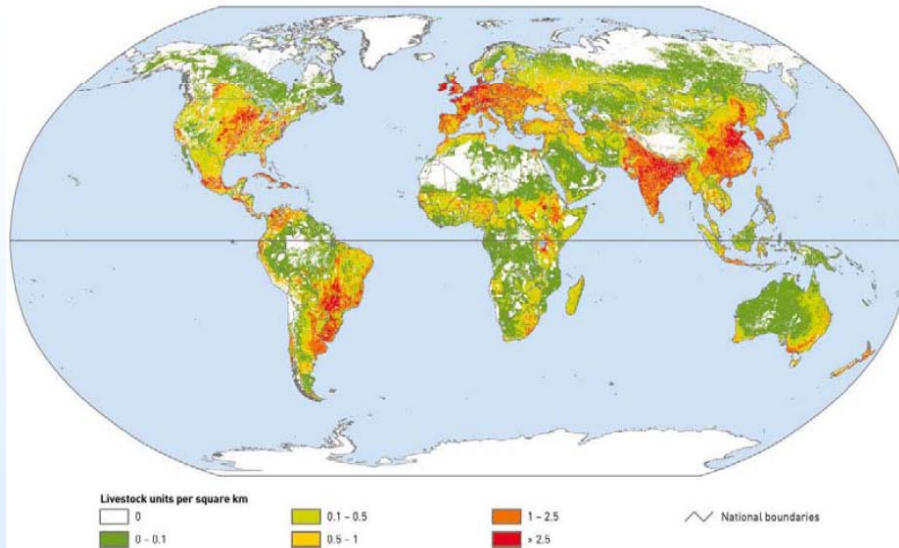
- **“The Livestock sector is a major player, responsible for 18% of GHG emissions measured in CO₂e. This is a higher share than transport” (FAO 2006)**
- “Which is responsible for more global warming: your BMW or your Big Mac? Believe it or not, it's your Big Mac” (Time, 2007)
- “A 16 oz T-bone is like a hummer on a plate. Switching to vegetarianism can shrink your carbon footprint by 1.5 tons of CO₂e per year” (Time, 2007)



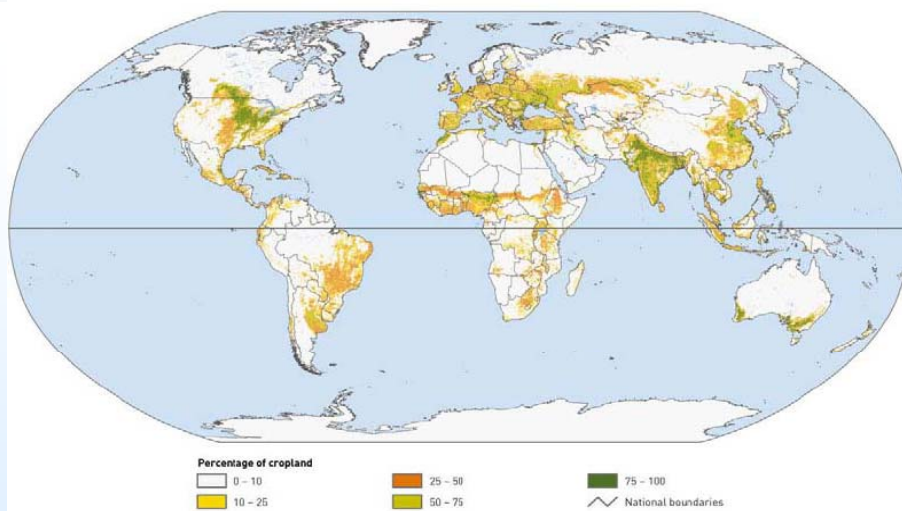
Predictions leading to LLS

- Global meat production will double by 2050
- Growth will occur in areas that are currently forested
- In 2010 6.8 Billion people and in 2040 9.3 Billion

Global livestock distribution

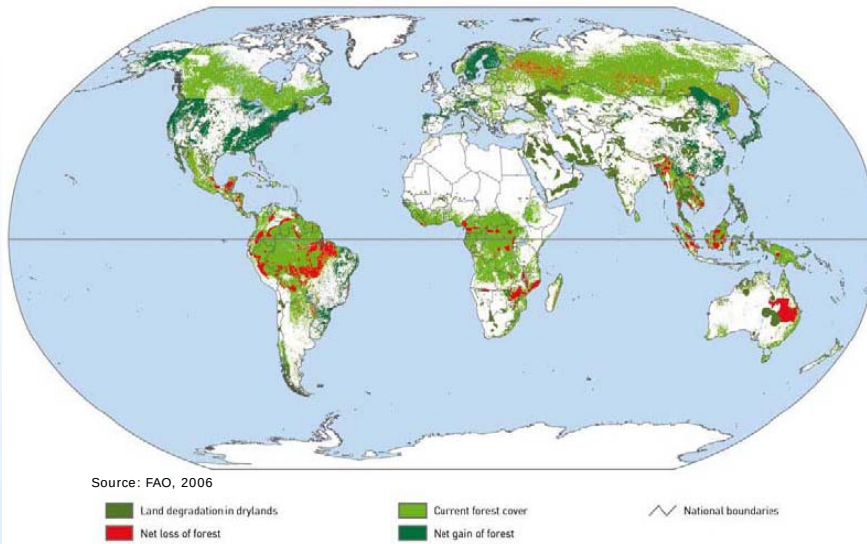


Distribution of cropland



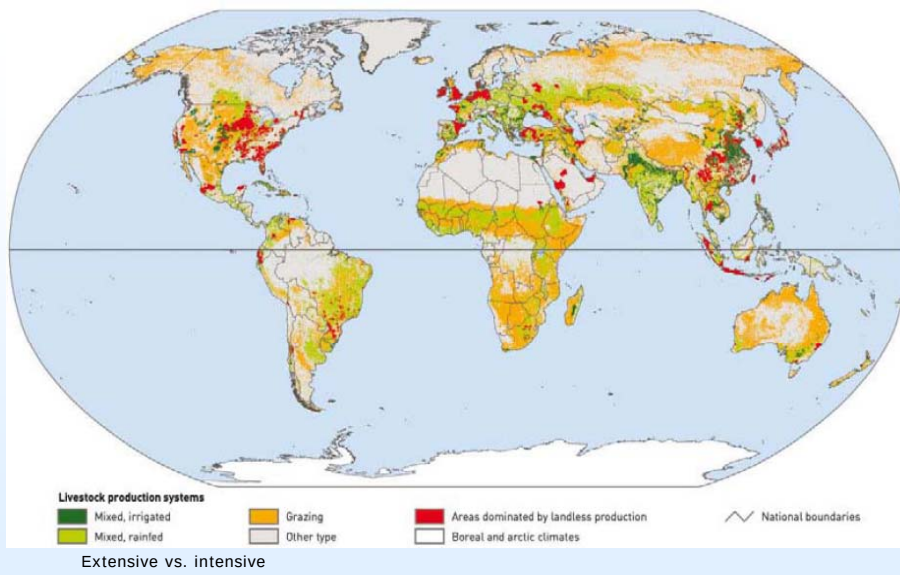
Source: FAO, 2006f.

Forest transition and land degradation in dry lands

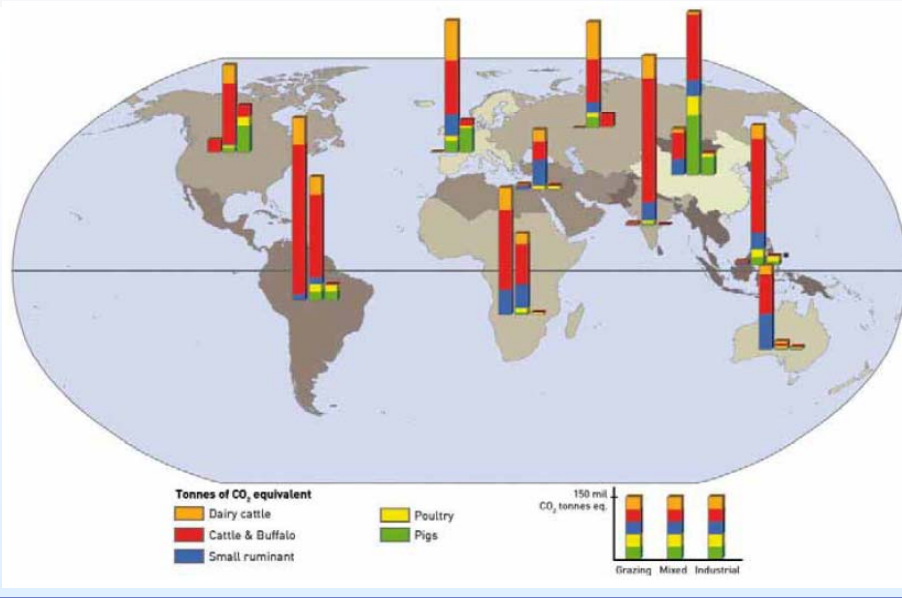


Deforestation in the amazon for livestock production accounts for ~1/3 of the total GHG due to livestock

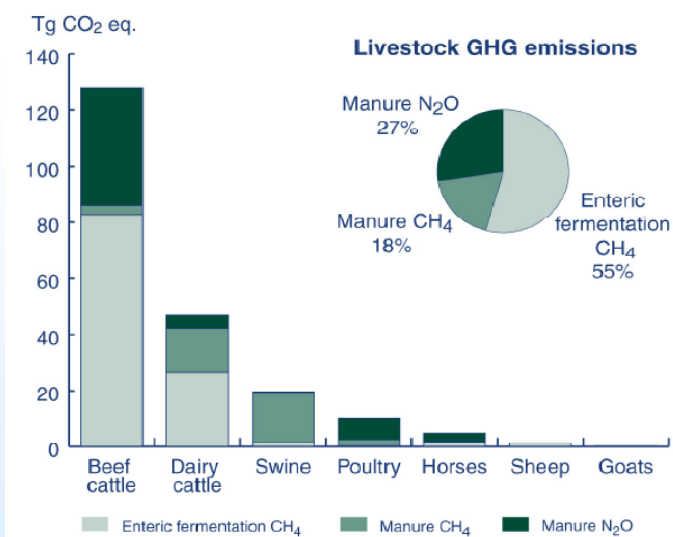
Livestock Production Systems and land-use change



Total GHG emissions from enteric fermentation and manure per species and main production system



US GHG emissions from livestock



USDA, 2004

Clearing the Air: Livestock's Contributions to Climate Change

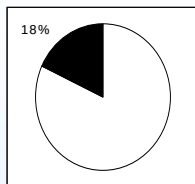
Maurice Pitesky, Kim Stackhouse,
and Frank Mitloehner

Advances in Agronomy, Vol 103

Reports summarized

UN-FAO:

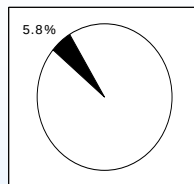
Livestock's Long
Shadow (LLS)



Livestock as portion of emissions
~7,100 Tg CO₂-eq yr⁻¹

US-EPA:

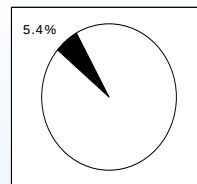
Inventory of U.S. Greenhouse Gas
Emissions and Sinks



Agriculture as portion of emissions
414 Tg CO₂-eq yr⁻¹

CEC:

California GHG Inventory



Agriculture as portion of
emissions
27 Tg CO₂-eq yr⁻¹

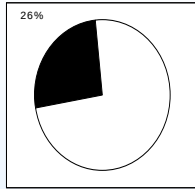


If true, livestock is a greater source of GHGs than the
transportation sector (FAO, 2006)

Livestock emissions - enteric fermentation

UN-FAO:

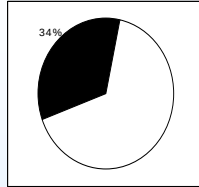
Livestock's Long
Shadow (LLS)



1,800 Tg CO₂-eq yr⁻¹

US-EPA:

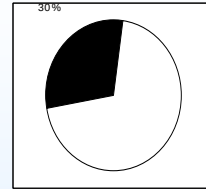
Inventory of U.S.
Greenhouse Gas Emissions
and Sinks



139 Tg CO₂-eq yr⁻¹

CEC:

California GHG
Inventory

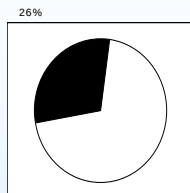


7 Tg CO₂-eq yr⁻¹

Livestock emissions – animal manure

UN-FAO:

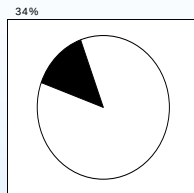
Livestock's Long
Shadow (LLS)



1800 Tg CO₂-eq yr⁻¹

US-EPA:

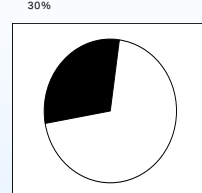
Inventory of U.S.
Greenhouse Gas
Emissions and Sinks



59 Tg CO₂-eq yr⁻¹

CEC:

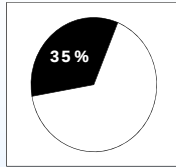
California GHG
Inventory



7 Tg CO₂-eq yr⁻¹

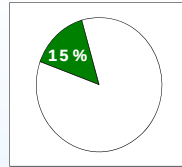
Global Livestock Emissions Land-use Change

UN-FAO:
Livestock's Long
Shadow (LLS)



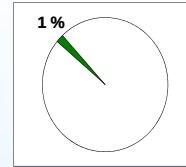
2,400 Tg CO₂-eq yr⁻¹

US-EPA:
Inventory of U.S. Greenhouse
Gas Emissions and Sinks



1,063 Tg CO₂-eq yr⁻¹

CEC:
California GHG
Inventory



5 Tg CO₂-eq yr⁻¹

Net sequestration: via agricultural
land and forest land

Since 1990, 23% increase in sequestration via land-use in U.S.(EPA,, 2009)

In 2007, net sequestration of 1,063 Tg CO₂ Eq/yr represents an offset of 15% of total GHG.(EPA, 2009).





Land-use Change

Amazon



70% of previously forested land in the Amazon is used as pasture

Iowa



Production Efficiency

	Dairy emission factor (kg/head/yr)	Milk production (kg/head/yr)	Non-dairy emission factor (kg/head/yr)
North America	118	6,700	47
EU	100	4,200	48
Latin America	57	800	49
Africa	36	475	32

(IPCC, 1996)

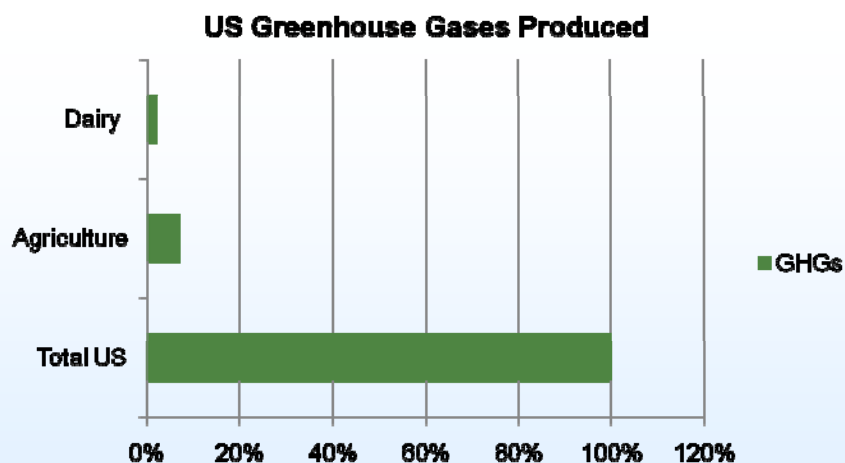
Conclusions

- Livestock in developed countries has relatively small GHG contribution dwarfed by large transportation, energy, and industry
- In developing countries livestock can be a dominant contributor to the GHG portfolio due deforestation and to their relatively smaller transportation and energy sectors

Conclusions

- According to *Livestock's Long Shadow*, intensification provides “large opportunities for climate change mitigation, can reduce greenhouse gas emissions from deforestation,” and is the long-term solution to more sustainable livestock production
- In the United States, transportation accounts for at least 26% of total anthropogenic GHG emissions, electricity for 31%, compared to roughly 6-8% for all of agriculture, which includes less than 3-4% associated with livestock production

US Dairy is A Small Percentage Of Total Emissions



Agricultural Contribution to Greenhouse Gases

- "Livestock's Long Shadow" = livestock emissions 18%
- This is an intern. number and not representative of US livestock.
- This number includes land use issues in developing countries (wetlands reclamation & deforestation), which inflates the number by as much as one third.
- Comparison livestock vs transportation is inappropriate (LCA 3 vs LCA 1)
- Livestock production in US model for the rest of the world due to efficiencies
- Largest issues: digestibility (developing countries) and waste management (developed countries)

Media's Response to Livestock's Long Shadow

MACLEAN'S

Save the planet: Stop eating meat
The UN says so, and so do a growing list of school boards. Meet the new eco enemy



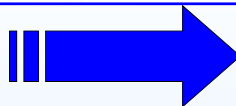
NewScientist

Cows, pigs and sheep: Environment's greatest threats?



CLEARING THE AIR: LIVESTOCK'S CONTRIBUTION TO CLIMATE CHANGE

Maurice E. Pitesky,* Kimberly R. Stackhouse,* and Frank M. Mitloehner*¹



MACLEAN'S

Where's the beef?
Scientist takes a second look at UN numbers that have led many environmentalists to forego meat

I must say honestly that he has a point - we factored in everything for meat emissions, and we didn't do the same thing with transport, we just used the figure from the IPCC."

BBC

Dr Pierre Gerber,
LLS contributing author

The Daily Telegraph

UN admits flaw in report on meat and climate. The UN has admitted a report linking livestock to global warming exaggerated the impact of eating meat on climate change.

ECOLOGIST

Have we got it right on meat and greenhouse gas emissions? If intensive farming has the lowest environmental impact should we promote it?

So how about the 18%?

