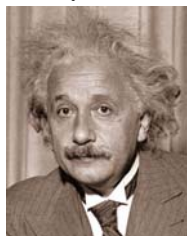
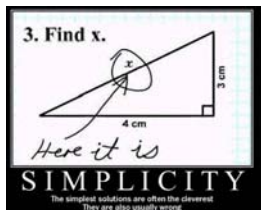


Things should be made as simple as possible -- but no simpler.

Albert Einstein



Maybe simple answers are wrong.

Agriculture is not optional

The dairy industry in 2025 and sustainability

birth to 9th grade
3 cars
3 U.S. Federal Farm Bills
4 Presidential elections
5 cow generations

John Fetrow VMD, MBA
Professor of Dairy Production Medicine
College of Veterinary Medicine
University of Minnesota



This is about food.
And agricultural productivity.
And the planet.

Sustainability goals

- Sufficient wholesome food from milk
 - How much is enough?
 - Positive impact on human nutrition and health
 - The science is well ahead of the public's perception
 - No impact or a positive impact on the environment
 - Realistically: minimize the impact
 - Good animal care and welfare
 - What is good enough?
 - Acceptable life style for those who produce and process dairy products to consumers
 - At minimum, economically sustainable
 - Accepted by the larger society
- **Systems with more than one goal cannot maximize any single goal.**

Social issues and sustainability



Social concerns

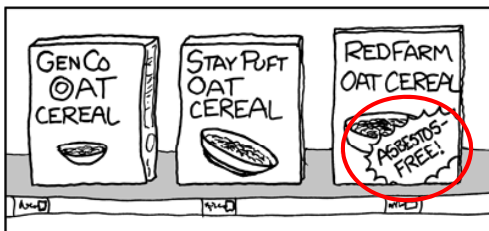
- In the U.S. and across the globe, society at large is shifting in its relationship to animal agriculture
 - In western societies, little concern about adequate supply of food
 - Concern and regulation about animal welfare
 - Concern and regulation relating to food and human safety
 - Concern and regulation of the impact on the environment
 - Concern about possible negative impact of consumption of animal foods on human health

How are issues chosen?

- Issues arise and gain priority by
 - Real need for change: egregious abuse, legitimate food safety issues, preventable environmental impact, etc.
 - Companies trying to profit by altering the structure of the dairy industry or by creating differentiated perceptions in consumer's minds between milk products or dairy production systems
 - Advocacy groups with their own agendas
 - International trade requirements and market opportunities



A new era in food marketing is upon us!



I HATE WHATEVER MARKETER FIRST REALIZED YOU COULD DO THIS.

Who has an interest in opposing increases in productivity in agriculture?

1. The movement against the use of technology to improve production in agriculture is **not** just a bunch of well meaning, passionate and well funded advocates for organic production or animal welfare
 2. It is also backed by large business interests with money to invest and a profit motive
 3. It is led in part by people committed to destroying all of animal agriculture, one bit at a time.
 4. It is also at least tacitly supported by a large sector of traditional producers who understand that limiting production reduces supply and may push up their farm gate prices until they exit from the dairy industry
- Each of these stakeholders understands that successful anti-productivity campaigns are in their best near term personal and financial interests
- more members and donations and political clout, more corporate profit, more farm income

Pesticides, hormones and drugs, oh my!



Get pure. Organic Valley milk.

Pesticides, artificial hormones and drugs are three things you'll never find in Organic Valley milk. The animals on our family farms are never given synthetic hormones or antibiotics. And since organic farming adds no harmful chemicals to our water and soil, the environment is cleaner. So if you're looking for the tastiest milk you can find, click your heels three times and go to your nearest grocery store.

Organic and farmer-owned since 1988.

Coordinated campaigns



Picking the issue is important

- Resources will be allocated to respond to whatever issues get priority.
 - And will not be available to address other pressing issues of food production.
- Our society's focus on some issues is predicated on the fact that the cost of food is a small part of disposable income
 - Many proposed changes in dairy production systems will increase the cost of protein in the diets of humans
- Decisions made by well-fed people in well-fed societies may have devastating ripple effects on poor people and poor societies

Even in America: food prices matter

- An example: Minnesota is a wealthy state
 - 9th highest household income in the U.S. (\$37,373)
- In 2007 there were about 2 million visits by families to food shelves from 2 million households
 - 1 out of 17 households depends on food shelves to help feed their family
 - more than $\frac{1}{2}$ of those families are working families
 - more than $\frac{1}{2}$ of the people fed are children
 - 62% increase since 2000
- Poor people consume a lower quality diet, with important implications for health and child development

Policy makers and corporate executives are never hungry.

Food prices effect what we eat

"If adult Americans simply increased their intake of dairy foods to the currently recommended 3 to 4 servings per day, using conservative estimates of potential benefit, we project first year {health care} savings of approximately \$26 billion and 5-year cumulative savings in excess of \$200 billion."

Policy makers and corporate executives can afford to eat well.

2004 American Journal of Hypertension 17:88-97

Identifying the solutions

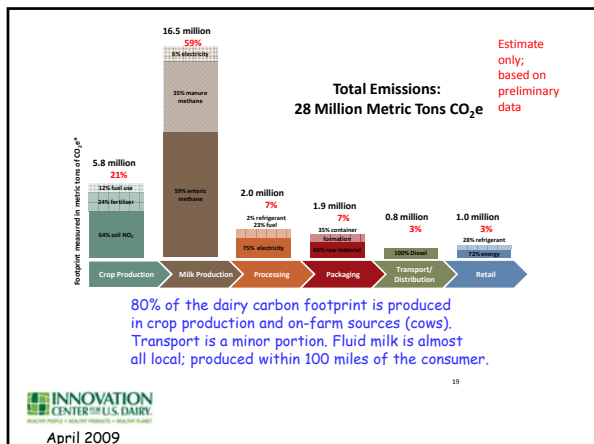
- It seems in our culture that people want simple, quick solutions to these issues
 - "I want it all, and I want it now"
 - "Oh yeah, and I don't want to pay for it..."
- Most people are not tolerant of complexity or interested in considering the tradeoffs necessary
 - They are remarkably easy to manipulate through a growing array of social media
- They do not trust expertise, but they expect experts to be quickly available when real problems require real responses.
- Often, physical reality and this attitude are at odds with each other.
 - As the two meet head on, it will not be pretty.

Environmental concerns and sustainability



FAO Report 2010: Greenhouse Gas Emissions from the Dairy Sector A Life Cycle Assessment

- Life Cycle Analysis: globally, dairy production accounted for 4% of all anthropogenic GHG emissions
 - 2.7 % for dairy products
 - 1.3 % for meat from dairy animals
 - "Industrialized regions such as North America and Europe were found to exhibit the lowest emissions per kg of fat and protein corrected milk."
 - North America: 8 % of global dairy GHG = 0.3% of total global GHG
 - 16% of milk produced
- "On average, grassland systems have higher emissions than mixed farming systems."
- "Along the entire dairy food chain, cradle-to-farm gate emissions contribute the highest proportion of emissions from the sector."
 - "In industrialized countries, the relative contribution ranges between 78 and 83 percent of total life cycle emissions."



10% less feed input needed to produce the same milk from higher producing cows.

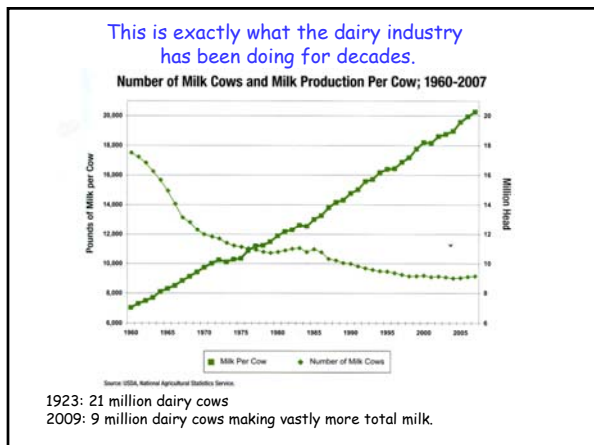
600 pounds of milk in a day

300 pounds of feed to maintain the cows

180 pounds of feed to make 600 pounds of milk.

250 pounds of feed to maintain the cows

10 cows making 60 pounds eat 430 pounds of feed



"And he gave it for his opinion that whoever could make two ears of corn or two blades of grass grow on a spot of ground where only one grew before would deserve better of mankind and do more service to his country than the whole race of politicians put together."

Jonathan Swift: *The Voyage to Brobdingnah in Gulliver's Travels*: 1726

"my principal Design was to Inform, and not to amuse thee" *The Travels* (IV:12)



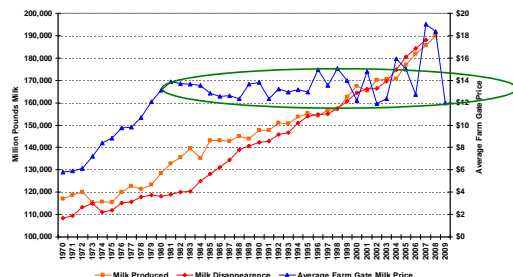
- Dairy industry: issues for the next 15 years**
- "Predicting the future is like driving a car blindfolded, following the instructions of someone looking out the back window."
 - Or: If I can predict the future, why aren't I rich?
 - For the U.S. dairy industry, economics, including market forces, will remain the principle driver.
 - Other issues will be managed as business always responds to regulatory requirements.
 - More regulation favors the larger and better capitalized companies

Economic sustainability

- The American dairy industry has been and will undergo significant structural change, driven largely by economics
 - Financial uncertainty and stress are likely to increase if current operating structures remain
- The net result will be to accelerate the major changes in the demographics and prevailing production systems in the U.S. dairy industry

Supply, Demand & Milk Price

Average U.S. milk price (not adjusting for inflation) for the last 25 years is nearly unchanged

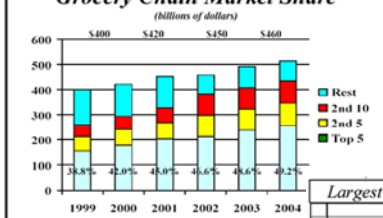


Volatility of milk prices has increased substantially

2009 USDA-NASS, http://www.nass.usda.gov/QuickStats-PullData_US.asp

Consolidation of retail grocery store outlets

Grocery Chain Market Share



Wal-Mart now sells roughly 20% of all groceries in the U.S.

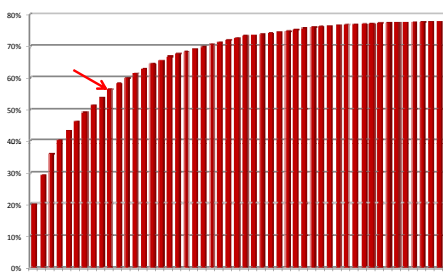
Largest Supermarket Companies

Chain	Stores	2007 Sales*	2007 Share	2006 Sales*	2006 Pct.
1 Wal-Mart Supercenters	1,060	\$67.0	14.64%	\$57.2	17.1%
2 Kroger Co.	2,392	\$50.7	11.08%	\$49.2	15.0%
3 Albertsons	2,541	\$38.3	8.37%	\$36.4	11.2%
4 Safeway	1,759	\$34.4	7.52%	\$31.2	9.6%
5 Whole Foods Market	1,600	\$23.0	5.02%	\$22.0	6.8%

* Billions
Source: Supermarket News

Consolidation of milk marketing channels

Percent of U.S. milk production marketed through top 50 milk U.S. coops.



X axis: number of largest coops aggregated into cumulative sales; e.g. 1 = sales from single largest coop; 6 = total sales from the 6 largest coops, etc.

The 10 largest milk coops market more than 50% of all U.S. milk.

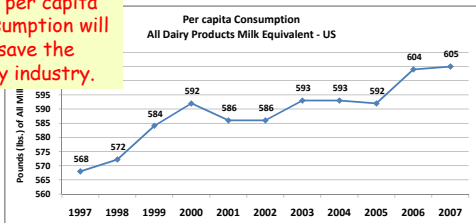
Per capita consumption of all dairy products

600 pounds of milk per person per year is about 70 gallons of milk.

This is 1.5 pints of milk per day per person. USDA "3 a day"

Remember: this includes fluid milk, cheese, yogurt, butter, etc.: all use of dairy.

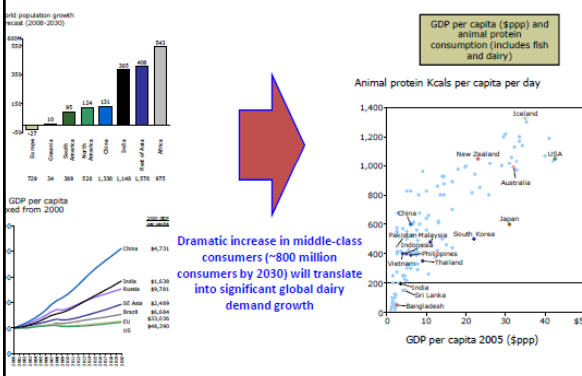
U.S. per capita consumption will not save the dairy industry.



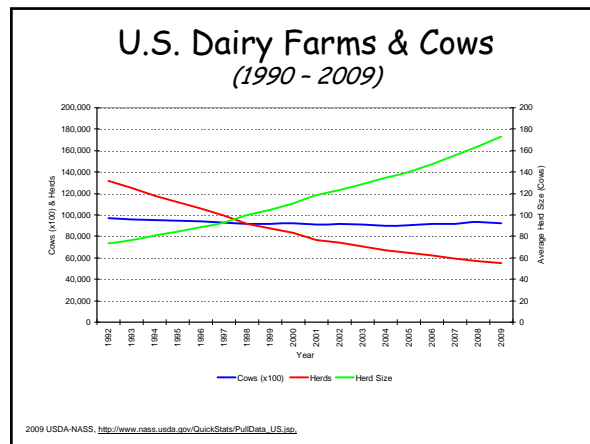
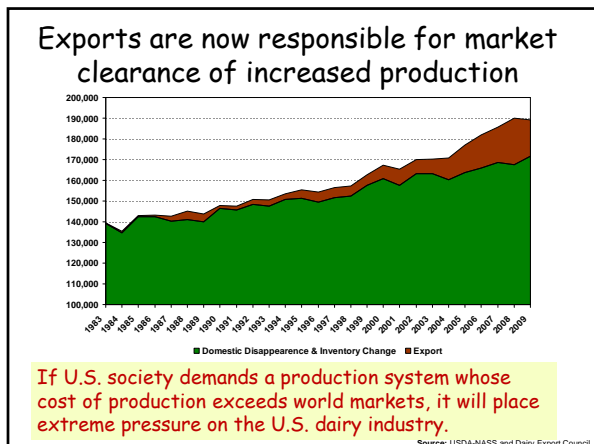
Dairy products contribute 20% of the protein in the American diet. (does not include meat from dairy)

Source: USDA and Agricultural and Applied Economics, UW Madison and Smit et al. J. Amer. Diet. Assoc. : 99: 1999

An Even More Global Market



Dramatic increase in middle-class consumers (~800 million consumers by 2030) will translate into significant global dairy demand growth



Dairy Herds in the U.S. (1,000s)

herd size / year	1-49	50-99	100-199	200-499	>=500	All
1982	204.7	53.3	14.6	approx	5,000 * 200	277.8
1992	93.1	41.8	14.1	approx	8,000 * 200	157.2
2000	52.9 10%	31.4 19%	12.9 17%	5.4 18%	2.8 36%	105.2 100%
2010	18.2 3%	12.8 8%	7.2 10%	4.3 15%	3.3 63%	45.8 100%
2020	2.8 1%	3.5 2%	2.7 4%	2.3 9%	3.4 85%	14.7 100%

Taken from "Future Structure of the Dairy Industry": LaDue, Gloy, Cuykendall 2003 <http://agfinance.aem.cornell.edu/research.htm>, historical data from USDA / NASS

Blue #s are % of U.S. milk

Population and milk production in U.S.: 2010 to 2025

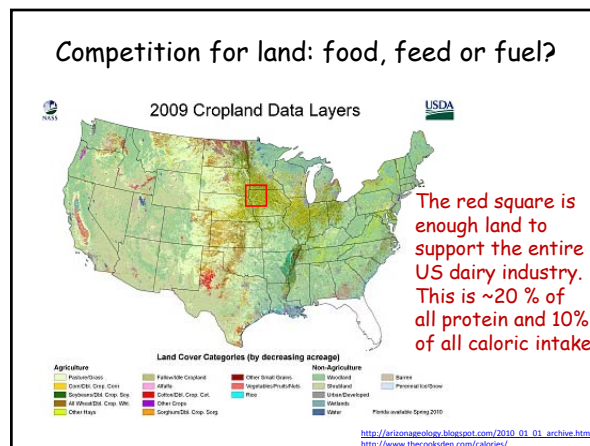
	input numbers	guesses
	2010	2025
people	309,000,000	360,000,000
milk produced	190,000,000,000	221,359,223,301
milk per person	615	615
cows	9,100,000	9,223,301
milk per cow	20,879	24,000
herds	50,000	15,372
cows per herd	182	600
% of cows in herds > 1,000		90%
average herd size if > 1,000		1,500
herds producing 90% of U.S. milk		5,534

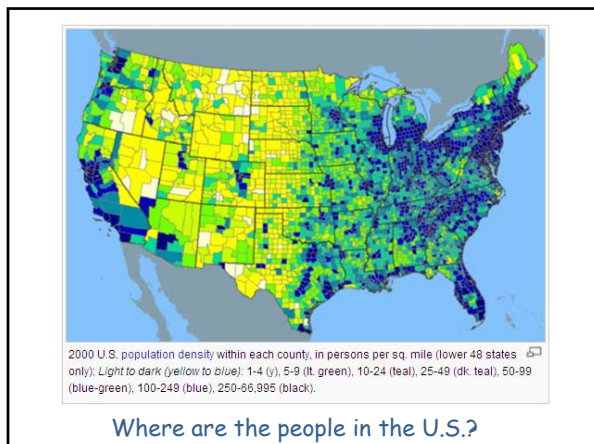
In 2007, more than 1/2 of all U.S. milk came from herds > 500 cows. There were 3,200 such herds.

Animal agriculture and human food

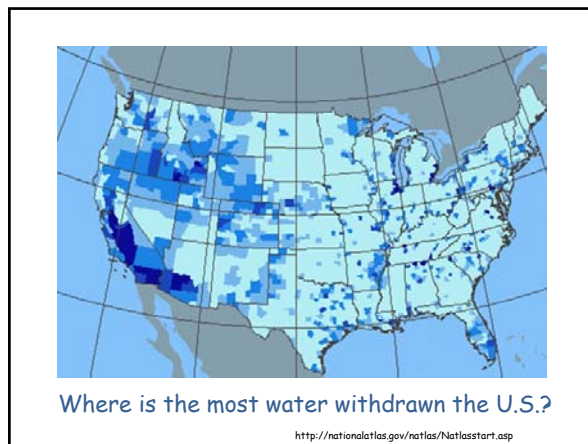
Efficient use of land to produce food

- No significant sustainable human food system exists that does not include animals, particularly ruminants
 - protein quality, consumer preference, biomass utilization
 - more people on the planet include pork in their diet than any other meat
- ruminants are integral to the majority of the planet's food systems (*Why do you think the Hindus made cows holy?*)
- ruminants are effective converters of vegetable biomass (that could not be consumed by humans) into high quality human food (protein, energy, calcium, some vitamins, CLA)
 - range and pasture grasses, crop residue, soy hulls, sweet corn silage, citrus pulp, almond hulls, brewers grains, cannery waste, bakery waste, wheat midds, cannery waste, etc., etc.



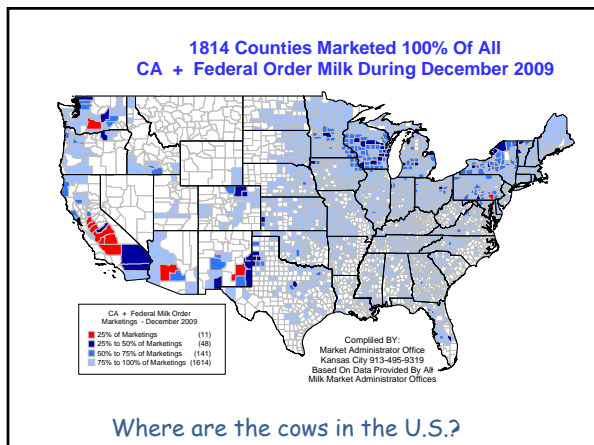


Where are the people in the U.S.?

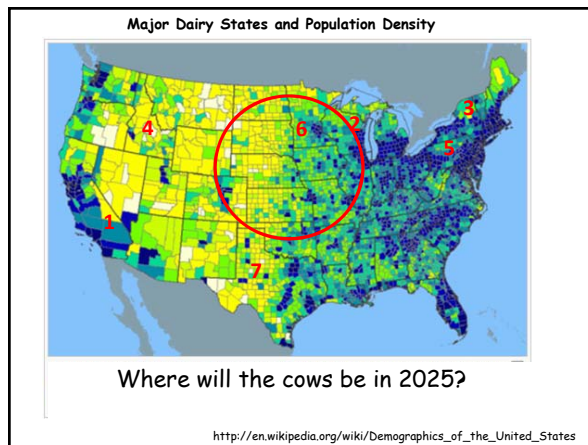


Where is the most water withdrawn the U.S.?

<http://nationalatlas.gov/natlas/Natlasstart.asp>



Where are the cows in the U.S.?






Where will the cows be in 2025?

http://en.wikipedia.org/wiki/Demographics_of_the_United_States

Improved cows for 2025

genetics, genomics, gene expression

- Production, health, fecundity
- More efficient use of inputs
- Reduced genetic variation
- Different "versions" of the ideal cow?
 - Intensive cow
 - high nutrient intake
 - high production
 - Extensive cow
 - deliberately lower intake
 - deliberately lower production
 - Third world cow?
 - 600 pound dairy cow?

COW vs. GOAT

Dairy labor force

More than 50% of all workers on U.S. dairies are now of Hispanic origin.





- Language?
- Worker welfare?
- Social impact?
- Immigration policy?
- Education?
- Unionization?
- Human resource development?

How many dairy science degree programs require Spanish competence?

Food system security

- I can't really talk about it!... ☺
- The world's food systems are vulnerable to a variety of catastrophic events
 - Supply chain disruption
 - Bioterrorism
 - Pathogen transmission / amplification
 - Deliberate contamination / misrepresentation
 - remember melamine?
 - Interruption of trade
 - Inputs and dairy products

Public infrastructure

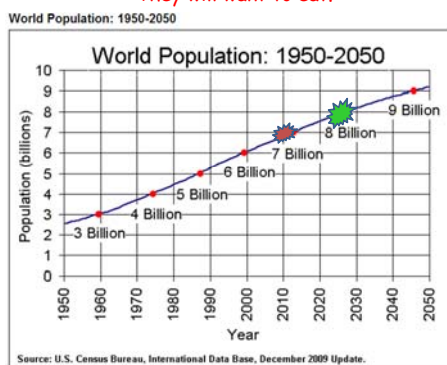
- As the dairy industry consolidates, the public's support for dairy infrastructure will fade
 - University education and research programs
 - Extension will pass to corporate technical services
 - Youth development programs
 - Political policy support
- Large dairies will tend to see their skills and information as proprietary
 - AI bull proofs
 - DHIA testing
- Dairy producers are generally not accustomed to actually paying for these "public" services

U.S. Dairy Industry: 2025

- Different cows
- Fewer, larger dairies, more in Midwest and Plains states
 - A few more cows, more milk per cow
- Greater price variation? Tighter profit margins?
 - Depends on public policy and exports
 - Vertical integration from crop through retail outlet?
- Fewer milk wholesale purchasers
- Fewer retail outlets
- More exports, more international competition
- Greater product differentiation
 - Real and purported differences
- Greater reliance on immigrant labor
- Risks to food system security
- Less public sector support for dairy farming
 - Research, extension, and political support



In 15 years there will be another 1 billion people on the earth.
They will want to eat.



World population: 1900; each dot is a million people



from the DVD: "World Population" from www.popconnect.org

World population: 1950; each dot is a million people



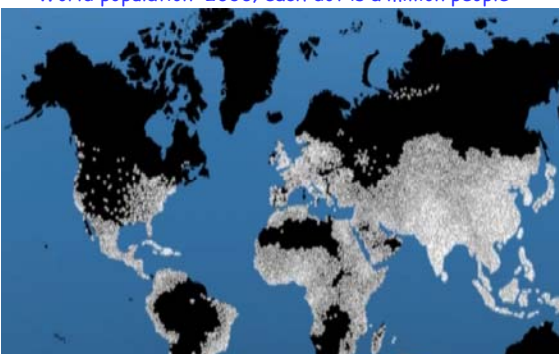
from the DVD: "World Population" from www.popconnect.org

World population: 2000; each dot is a million people



from the DVD: "World Population" from www.popconnect.org

World population: 2030; each dot is a million people

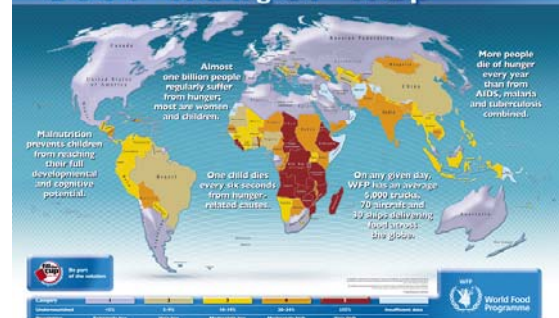


from the DVD: "World Population" from www.popconnect.org

FAO calls for "anger" about hungry people: May 11, 2010

- The Food and Agricultural Organization (FAO) today unveiled a major online petition calling on people to get angry at the fact that approximately one billion people globally suffer from hunger.
- 642 million live in Asia and the Pacific
- 265 million in Sub-Saharan Africa
- 53 million in Caribbean and Latin America
- 42 in the Near East and North Africa
- 15 million people in developed countries.
- FAO estimates that global agricultural production needs to grow by 70 percent if the estimated 9 billion people that will inhabit the planet in 2050 are to be fed.
- Which will pose interesting challenges to the agricultural sector many of whose current production practices cannot meet that demand.

2009 Hunger Map

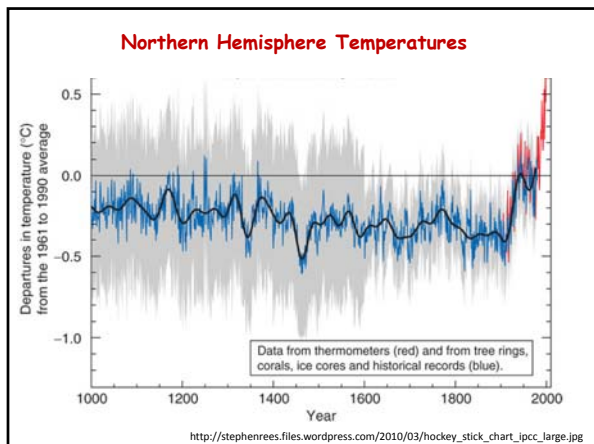


http://documents.wfp.org/stellent/groups/public/documents/liaison_offices/wfp185786.jpg

Hunger creates instability




http://dwfanarchywatch.files.wordpress.com/2010/01/p101_worldmap.jpg



Preserving Civilization

Our society wants to ignore the angry gorilla in the room!

- Feeding the world's population is the challenge of the next 20 - 30 years.
- We must do it while dealing with global climate changes that may significantly alter our current agricultural systems
- You will probably be alive for this entire time.
 - your children / grandchildren almost certainly will be.
- Everything else will hinge on this single challenge:
 - human dignity
 - civil society
 - personal and national security
 - environmental protection
 - quality of life
- There is no place to hide




Maybe people in other industries can ignore this issue. We are in food production. We cannot.

Feeding the world


- Ruminants are essential to finding ways to supply the protein needs of 9 billion humans
 - The majority of a dairy cow's diet, even on U.S. commercial dairies, is made up of things that humans cannot digest.
 - Dairy production is a key element of many human food systems and a source of income for many rural people across the globe
- Milk production is the most efficient because it is a "non-extractive" source of protein
 - We consume the milk, not the cow
 - at least for a while
- The dairy industry has a responsibility to focus its attention to enhancing the productivity and efficiency of milk production and minimizing the environmental impact of production systems.

In my opinion, the intellectual capacity available to the U.S. and European dairy industries is significantly mesmerized by the wrong problems. It is a colossal misallocation of limited resources and is part of a general cultural myopia in western society that denies the magnitude of the challenge and the urgent time frame.

There will be a train wreck. You cannot leave the train.




1934 Minnesota State Fair




Will the prohibition of tail docking really improve animal welfare significantly?

Is this an important problem?

Switzerland: tails may not be docked




U.S.: newly calved heifers with docked tails



Does routine dry cow mastitis therapy lead to the development of resistant bacteria that then results in human infections? If so, why doesn't the resistance pattern in mastitis pathogens change over time? If we stop dry cow therapy, how many fewer antibiotic resistant infections do we expect to see in humans?

?



Is this an important problem?

FAO Dairy Report 2010: a bit of arithmetic

- World dairy industry: 4% of total anthropogenic greenhouse gas emissions
 - North America: ~8% of world GHG total from dairy
 - North America dairy: 0.3% of the world's total GHG production
 - Capture and burn all manure storage methane
 - 1/3 of dairy GHG production (see... LCA is really valuable!)
 - Reduce world GHG emissions by 0.1% (1 part in 1,000)
 - India: ~ 22% of world GHG total from dairy
 - India dairy: ~0.9% of the world's total GHG production
 - Raise milk production from 1,000 to 2,000 kgs/year per "dairy animal"
 - Reduces feed needed per unit of milk by 45%
 - Reduce world GHG emissions by 0.4%
 - Or even better provide double the available dairy food to India's people with essentially no change in greenhouse gas production.

Is this an important problem?
Is it worth our time and effort?

"Are the brightest minds working on the most important problems?"

Bill Gates

speaking to an assembly of scientists at MIT, April 2010

Agriculture and the environment

"Think globally, act locally"

- The natural world's and humanity's fate will be decided in our lifetime.
 - Any proposed solution that advocates reducing productivity per acre or per cow in one place inevitably transfers environmental and social risk somewhere else.
- Our current social mythology about food is making it harder to address the real problems. We cannot afford to waste the time or the resources.

The struggle to preserve and expand productive efficiency in food production is not fundamentally about protecting farmers or their livelihood.

It is about saving the planet: global ecosystems and human civilization.

Anything else is not sustainable.

THANKS!



I think I've dug myself in deep enough...

Thoughts? Questions?



SMILE!
Tomorrow's going to be worse.