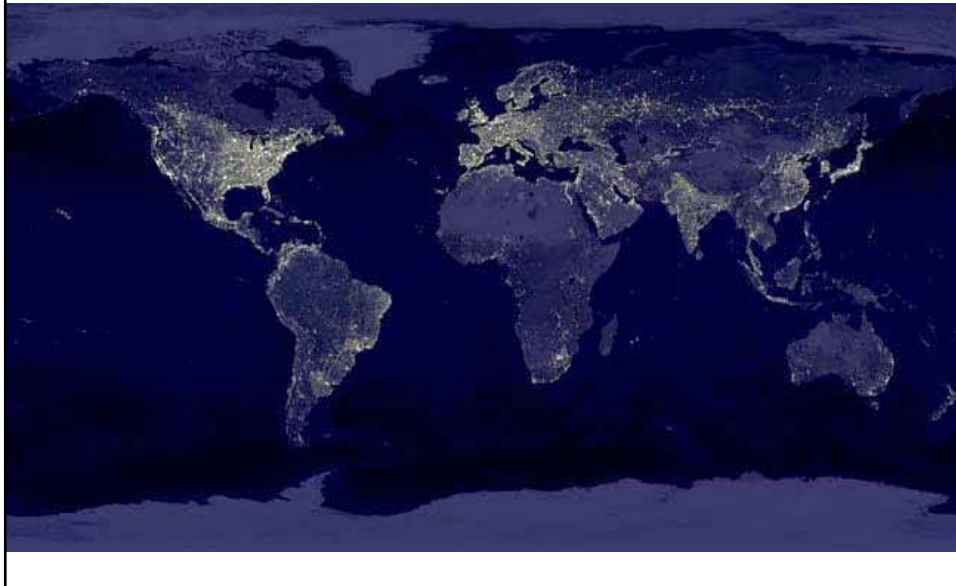


Not to be copied and not for general circulation

**Maximizing Opportunities and Minimizing  
Threats from the Globalization of Agriculture**

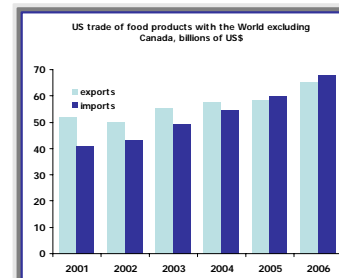
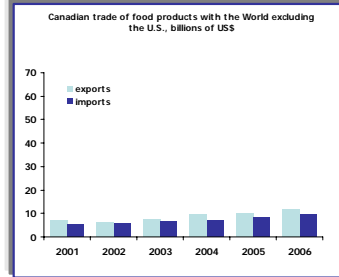
*Nov. 20, 2008*

Globalization and the “flattening world” has resulted in a  
global food system that is completely interdependent



## Canada and US food product trade with the rest of the World

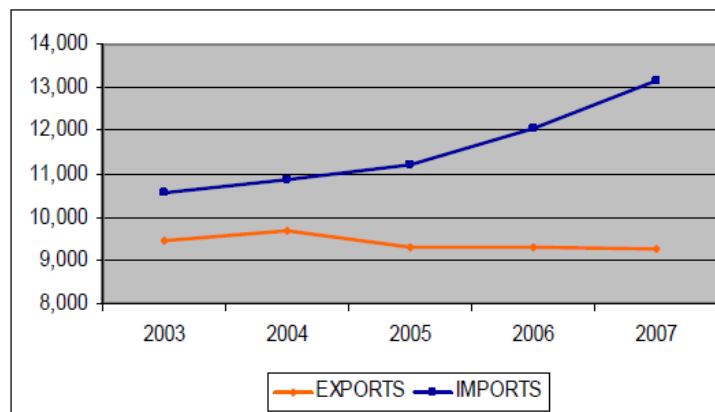
- Trade of food products by Canada and the US (excluding with each other) in 2006
  - Exports: 76.9B (US\$) - increased 30% since 2001
  - Imports: 77.4B (US\$) - increased 68% since 2001
  - As a result a negative trade balance of 0.5B (US\$) in 2006, a dramatic decline from the \$ 13B surplus in 2001



Source: GTA

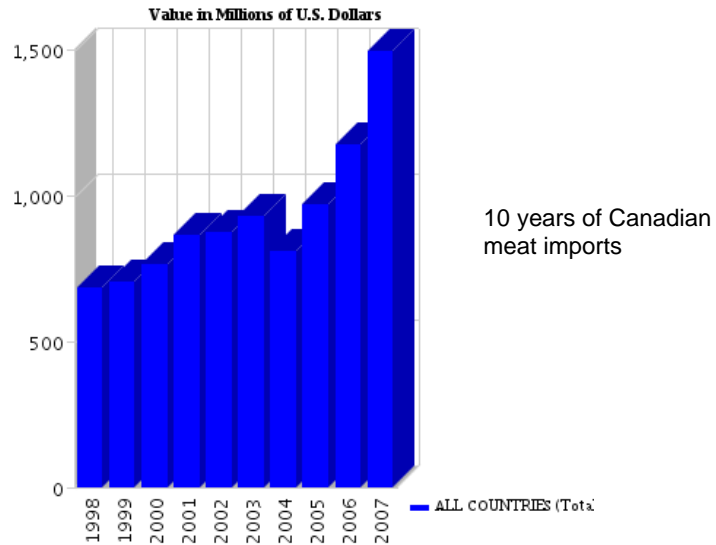
## Increasing global competition at home

Canadian imports and exports of highly processed foods (Canadian millions of dollars) 2003 to 2007



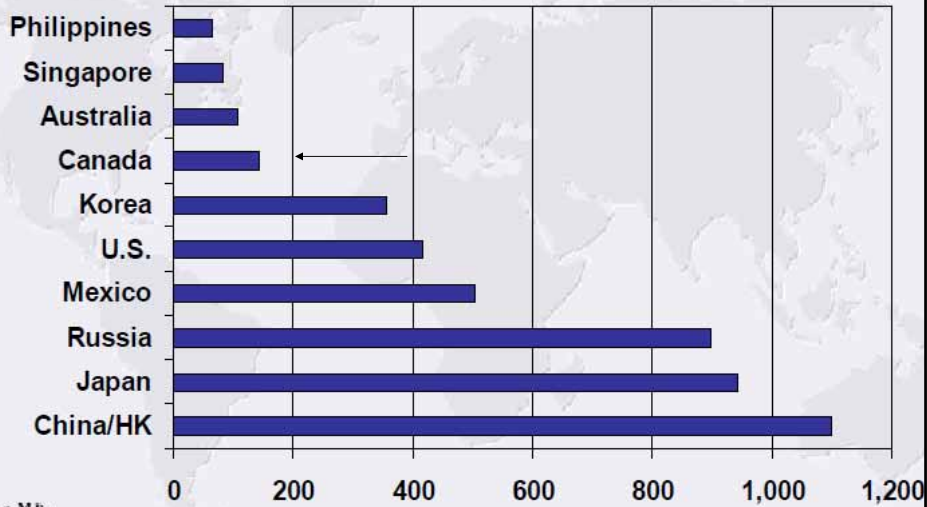
Source: Trade Canada (\*HS 2002 codes 4, 16-23) and Rabobank analysis, 2008

### Canadian meat imports are rising rapidly domestic industry loses ground



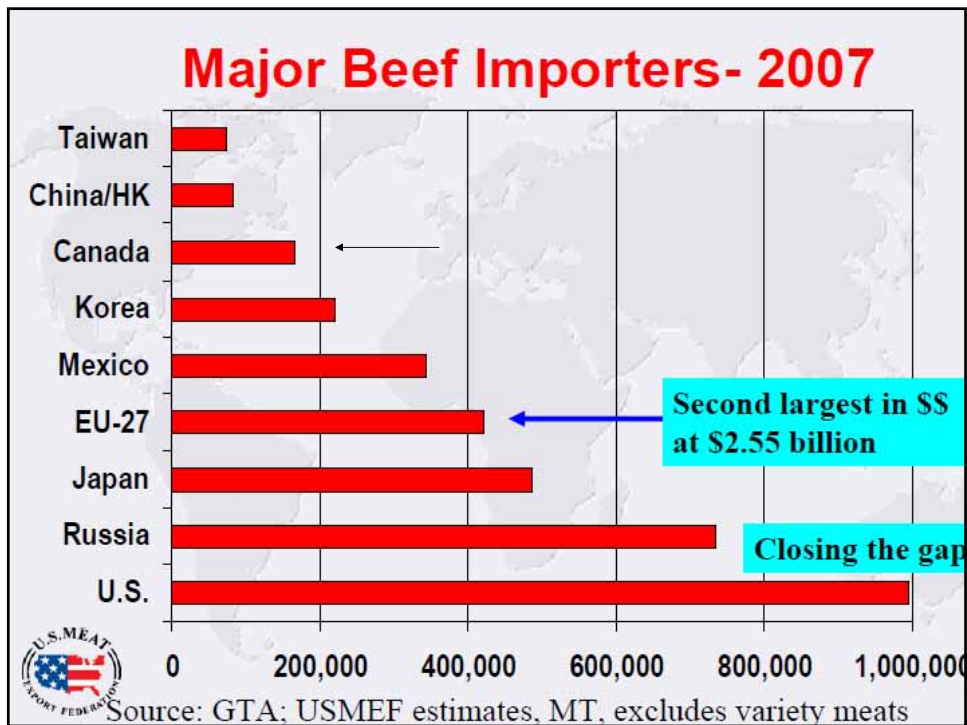
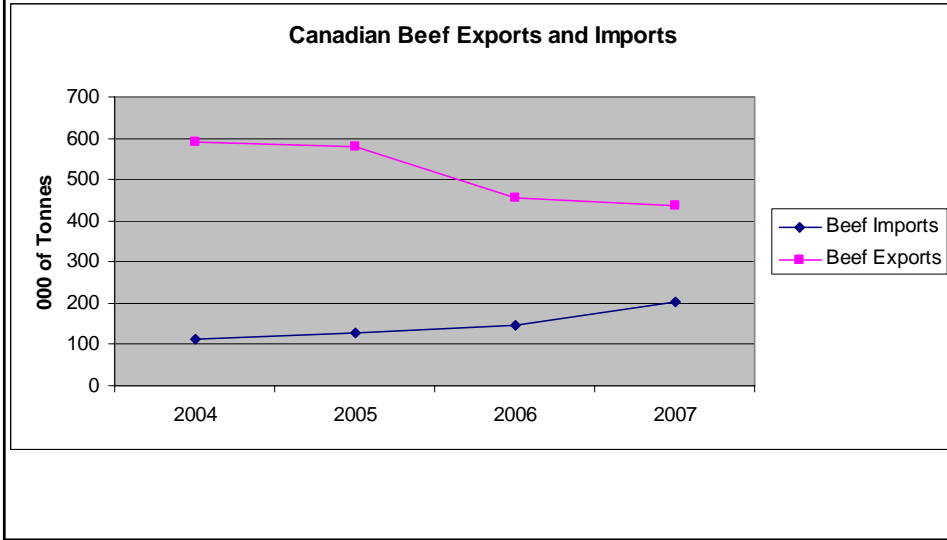
KavaChart images from VE.com

### Major Pork Importers- 2007

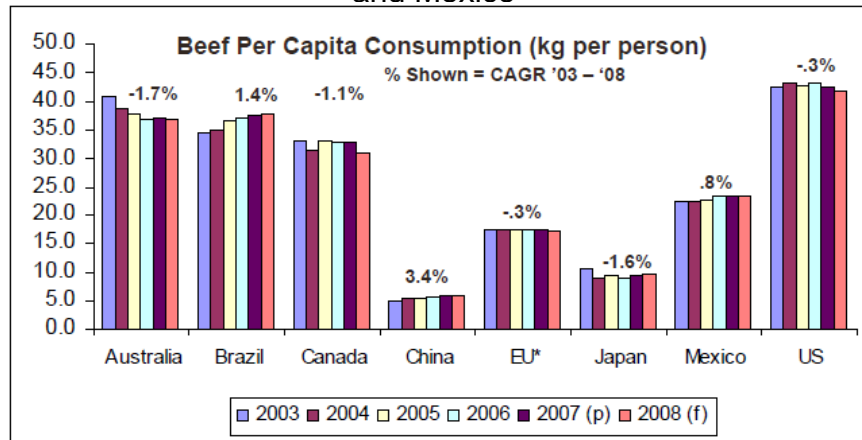


Source: GTA; USMEF estimates, thousand MT; includes variety meats

## Canadian beef exports fall and imports rise

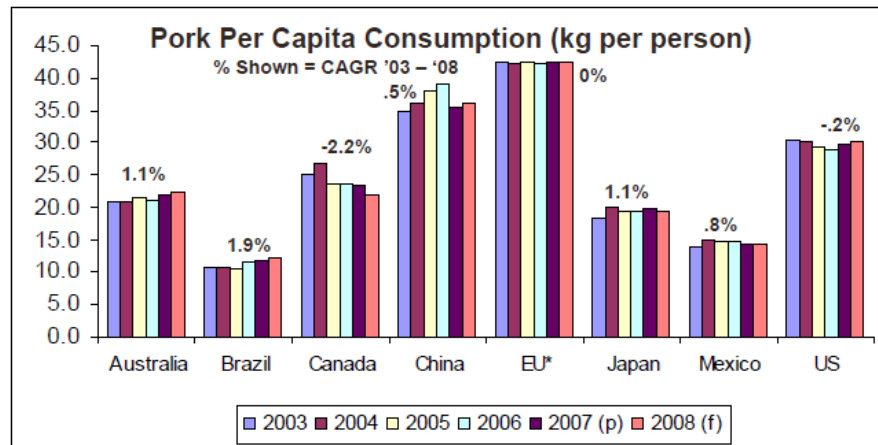


Beef per capita consumption is falling faster in Canada than the U.S. but rising in developing countries e.g. China and Mexico



Data Source: Livestock and Poultry: World Markets and Trade (USDA), November 2007 (p) = projected (f) = forecasted  
 \*EU Data includes 27 member states for all years

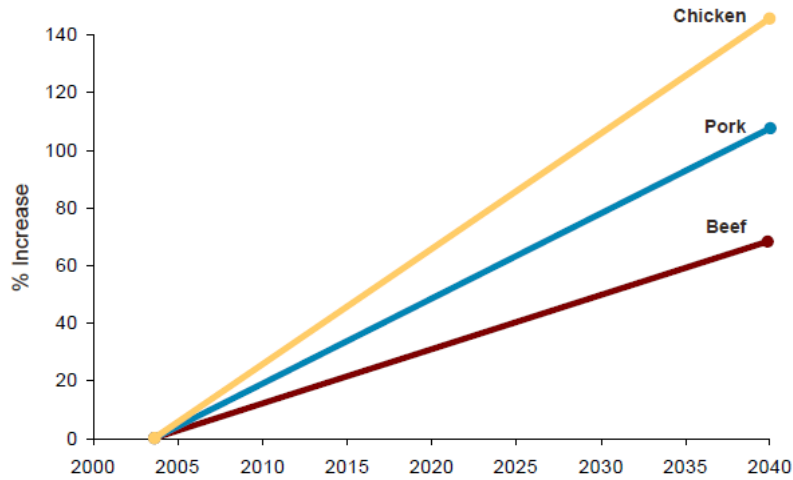
Pork per capita consumption is also falling much faster in Canada than the U.S. but rising in developing countries



Data Source: Livestock and Poultry: World Markets and Trade (USDA), November 2007 (p) = projected (f) = forecasted  
 \*EU Data includes 27 member states for all years

# Increased Meat Consumption

Total World

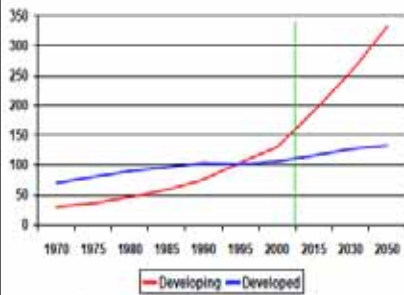


Livestock Information, Sector Analysis and Policy Branch

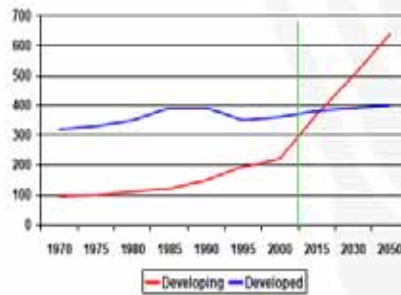
## Livestock sector's trends



Past and projected meat production (million tonnes)



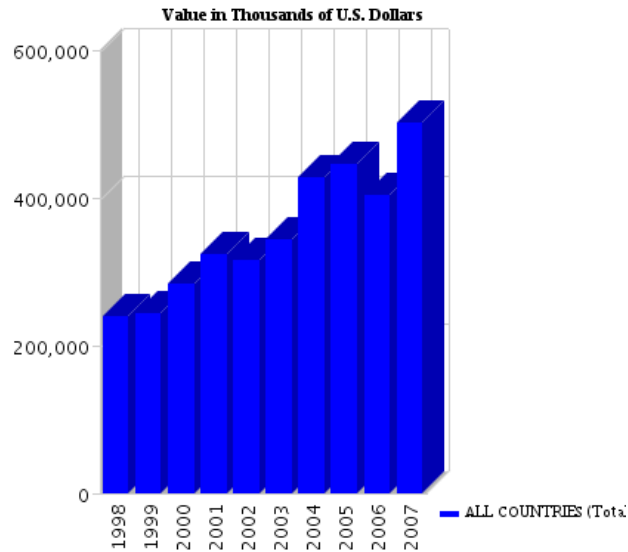
Past and projected milk production (million tonnes)



- Growing **intensities**
- Increasing **scales**
- Vertical **integration**/longer food chains
- Geographic shifts / **geographic concentration**

Agriculture Department  
Animal Production and Health Division

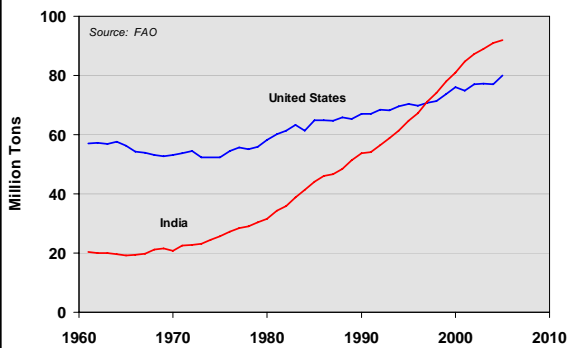
## Canadian Imports of Dairy Produce, Eggs, and Other Similar Edible Products of Animal Origin



KavaChart images from VE.com

Demand for milk products is rising at a rate equal to the output of the New Zealand dairy industry each year due to urbanization and rising disposable incomes

Milk Production in the United States and India, 1961–2005



- In California's Central Valley 891,000 dairy cows in highly concentrated feedlots produce up to 30 million tons of manure
- About 90 percent of India's cattle subsist on natural grasslands that are at risk from both overgrazing and drought.

Production growth has thus far been skewed to the developing world as developing countries seek self sufficiency through agriculture intensification

## Rising Appetites for Dairy

Country	Annual per capita consumption 2002 (in lbs.)	Annual per capita consumption 2007 (in lbs.)	Required milk equivalent to meet new consumption (in millions of lbs.)
Brazil	291.4	310.1	3,551
Mexico	277.3	279.6	244
India	184.1	192.9	9,915
China	32.3	62.3	39,705

Source: USDEC; USDA's Foreign Agricultural Service; Global Trade Information Services; U.S. Census Bureau

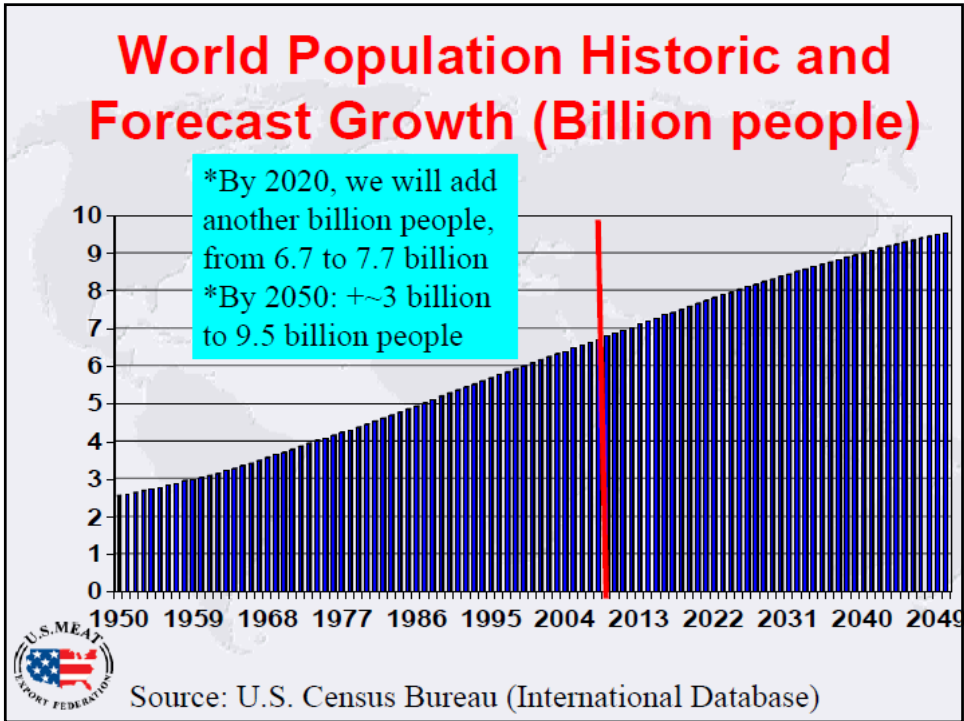
China's cheese imports are projected to quadruple to 40,000 mt. in the short term (Caiani 2008)

The increased consumption in China in only 5 years is roughly equivalent to the production of California

*I was seldom able to see the opportunity until it ceased to be one*

*Mark Twain*





## Huge market growth potential from poverty reduction

Country	Population	% < \$1/day	% < \$2/day
China	1298.8	16.6	46.7 ←
India	1065.1	34.7	79.9 ←
Indonesia	238.5	7.5	52.4
Brazil	184.1	8.2	22.4
Pakistan	159.2	13.4	65.6
Russia	144	6.1	23.8
Bangladesh	141.3	36	82.8
Nigeria	125.8	70.2	90.8
Mexico	105	9.9	26.3

Robert Thompson University of Illinois

## How world food demand doubles by 2050

3 billion (half of the world's population) live on less than \$2

- By \$2 per day, most hunger (calorie) problem is solved
- Between \$2 and \$9 per day people eat more meat and dairy, fruits, vegetables & edible oils, causing rapid growth in raw ag demand
- After \$10 per day, people buy more processed but not more raw ag products

Robert Thompson University of Illinois

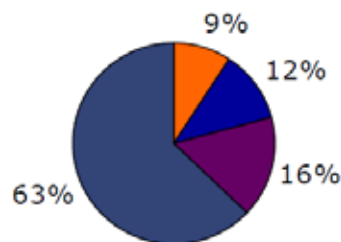
Many large International food processing companies are increasingly dependent on developing markets

	North America	Africa	Eurasia	EU	Lat Am	Pacific	Total
Unit Case Volume	(2%)	13%	16%	7%	8%	7%	6%
Net Revenues	6%	16%	20%	19%	22%	7%	19%
Operating Income	(4%)	1%	31%	25%	19%	3%	11%

Source: The Coca Cola Company

During the first 9 months of 2007, 63% of Anheuser Bush profit growth came from international sales

Source of AB profits growth by division 2007

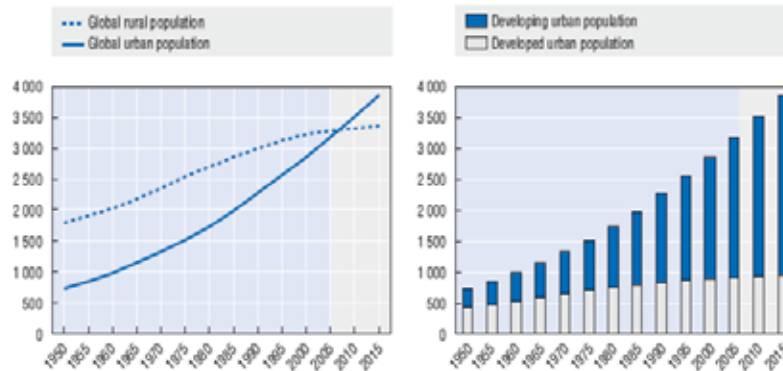


■ Entertainment ■ Packaging ■ Dom beer sales ■ Intl beer sales

Source: Anheuser Busch, Rabobank analysis

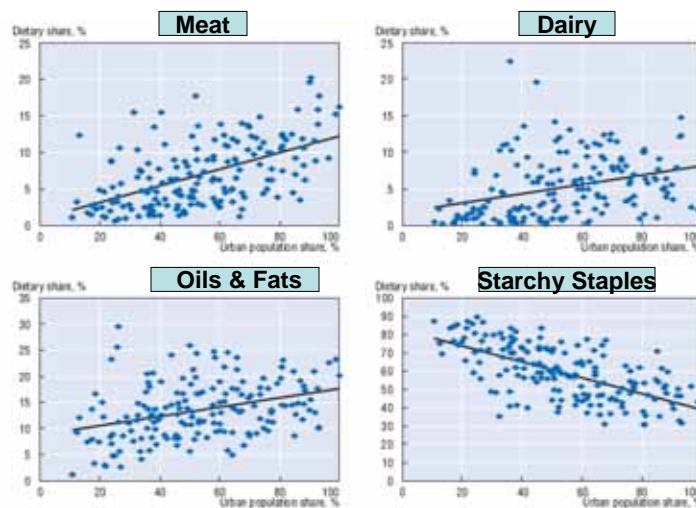
## More than half the world's population will live in large cities and this is driving diet change

Figure 1.4. Rural and urban population structures: 1950-2015



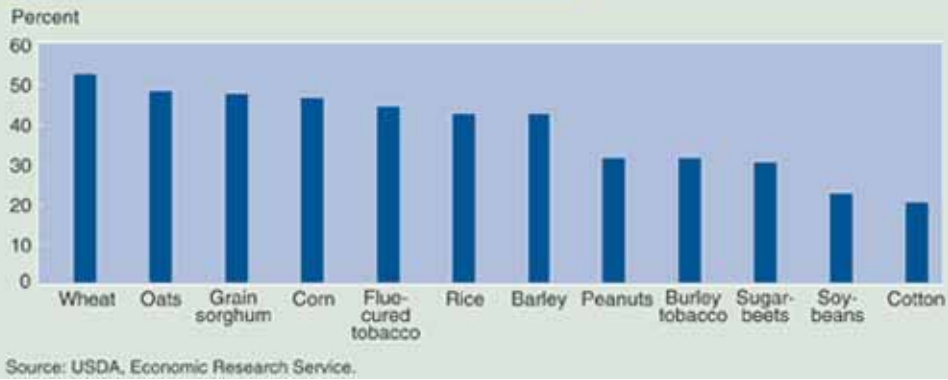
Source: UN Population Division (World Population Prospects: 2004 revision).

## Urbanization and dietary consumption shares in 180 countries



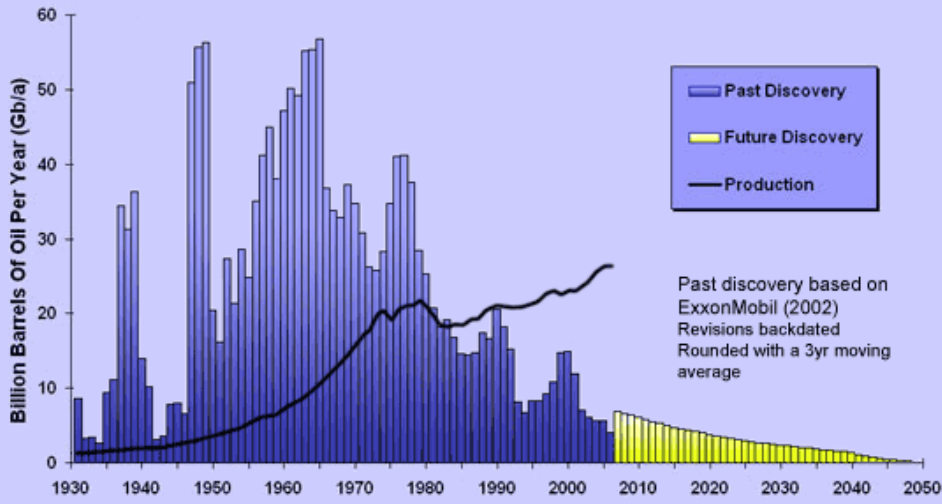
Cheap energy has allowed for the rapid expansion of cheap food to feed cities  
 Energy in many cases is a major cost of food production

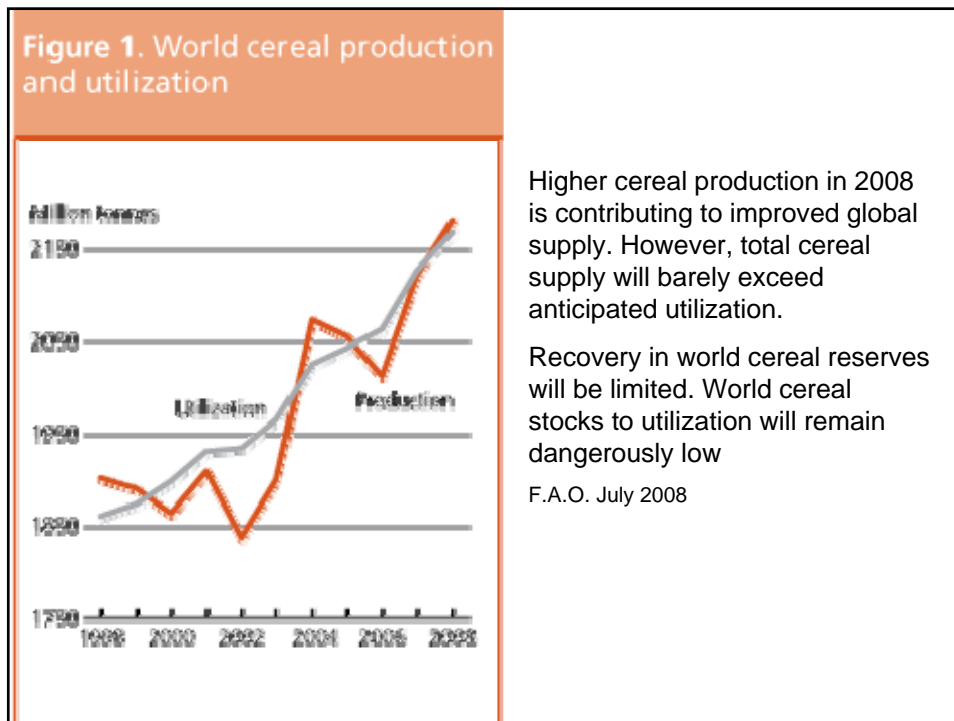
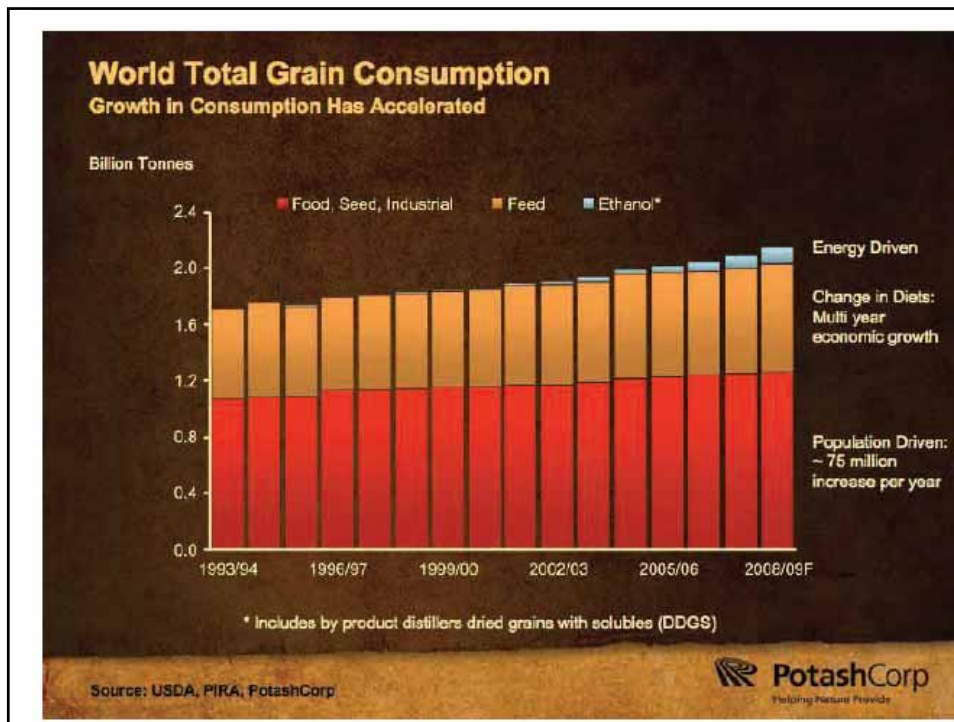
Energy costs as a share of total operating costs, 2004



However we have reached “peak oil” so unless we are entering a long depression food production dependent on fossil fuel is going to eventually cost much more

**THE GROWING GAP**  
**Regular Conventional Oil: Discovery & Production**





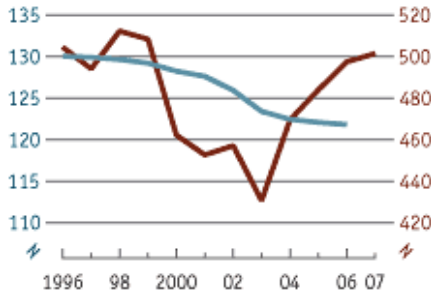
## China's coming major grain deficit will affect it's ability to continue meat and milk expansion

### Seeds of doubt

China's:

*land area under cultivation*  
hectares m

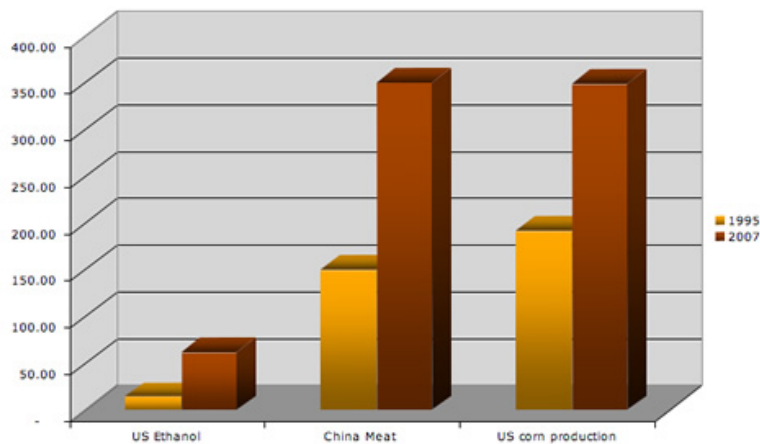
*grain output*  
tonnes m



Sources: China Development Gateway,  
National Bureau of Statistics

- With heavy subsidies China has been able to turn its falling grain production around but it is now challenged by:
- Reduced land under cultivation
- Water shortage
- Diversion of acreage to more profitable labor intensive agriculture. E.g.
  - China's increase in vegetable acreage between 2000 and 2004 (2.3 million hectares) exceeded the entire vegetable acreage in the U.S.

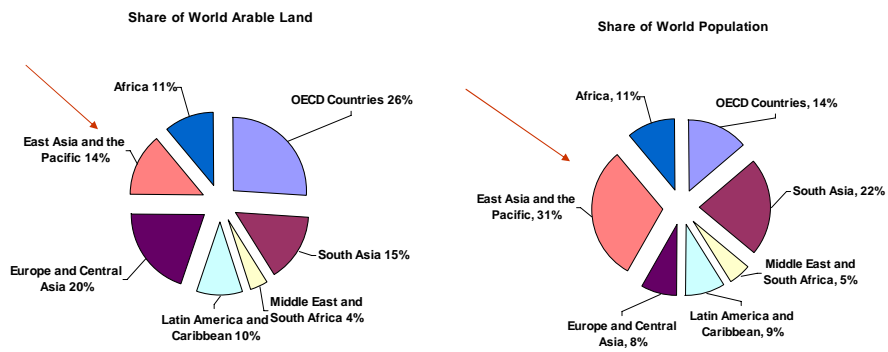
## Usage of U.S. corn for ethanol vs. usage of corn for Chinese meat production



Change in Chinese meat consumption since 1995 is diverting 7.8 billion bushels of grain per year to livestock feed and could empty global grain stocks by 2010.

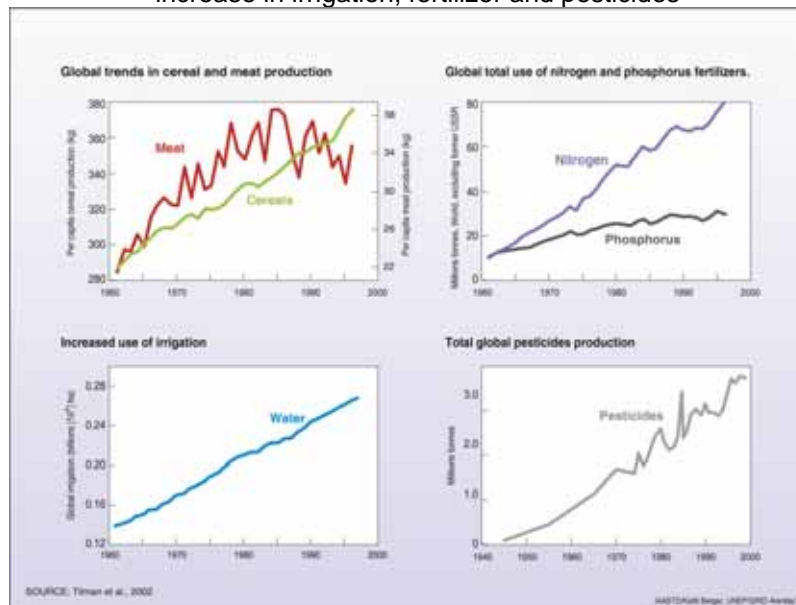
•.- Jim Lane editor of Biofuels Digest April 2008

## Asia has run out of arable land To produce more food Asia must further intensify agriculture



**Asia has 29% of the land but 53% of the people**

## Intensification requires more non renewables Per capita expansion of meat and cereal achieved through huge increase in irrigation, fertilizer and pesticides

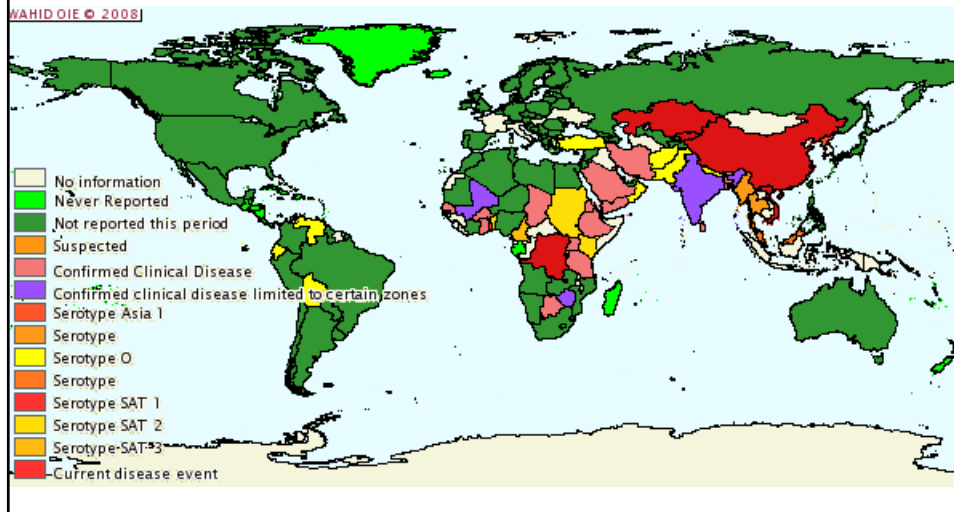




## O.E.C.D. Environmental Indicators

Country	Nitrogen Fertilizer use t/km2 of ag land	Pesticide use t/km2	Water withdrawl % of gross annual availability
Australia	0.2	0.01	5
Canada	2.5	0.06	2
France	7.6	2.7	18
Germany	10.4	0.17	19
Japan	9	1.24	20
Korea	20.1	1.2	36
Netherlands	13.8	0.41	10
United States	2.7	0.08	19

But intensification of agriculture to meet the demands of globalization is also increasing the incidence of animal and plant disease  
e.g. Current Foot and Mouth Situation



## Emerging highly pathogenic zoonoses infections are directly linked to intensification of production

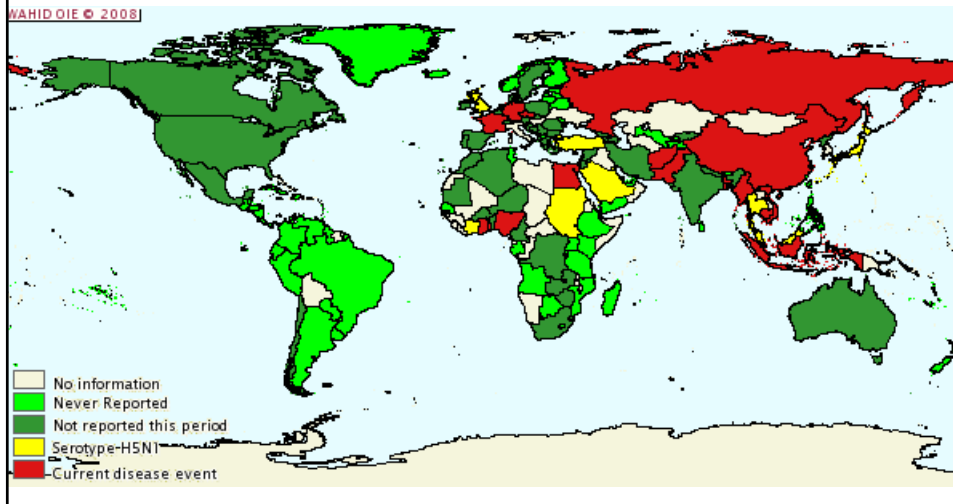
- **Viruses**
  - HIV/AIDS\*
  - SARS\*
  - Avian influenza
  - Dengue Fever
  - Nipah virus
  - West Nile virus
  - Encephalitis
  - Hantavirus pulmonary syndrome
- **Bacteria**
  - E. coli O157:H7
  - Streptococcus suis
- **Prion**
  - VCJD (new variant Creutzfeldt-Jakob)



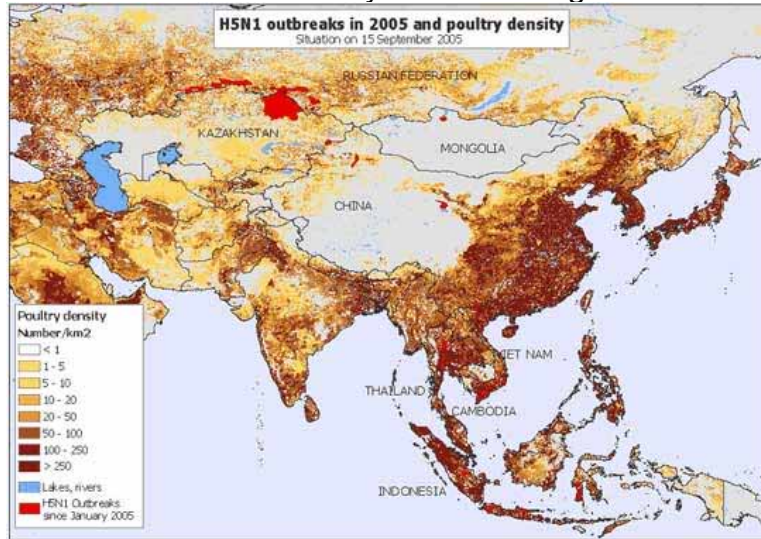
\*progressed to human to human transfer

## Avian Flu has disappeared from the headlines but is still a huge threat

Avian Flu events



A.I. demonstrates intensification of agriculture without biosecurity is not working



© United Nations Food and Agriculture Organization 2005. All rights reserved. Compiled by FAO AGAH, EMPRES Programme. Data sources: A1 outbreaks: OIE, FAO and Government sources. Poultry Density: FAO-AGA; Lakes and Rivers: Global Lakes and Wetlands Database (GLWD-3), UNEP/GRID (Data provider: WWF).

Intensification of agriculture and globalization of the food business is increasing the likeliness of a major food borne illness event

- **Food borne illnesses in U.S. estimate:**
  - 76 million per year
  - 25,000 hospitalizations
  - 5,000 deaths
- **The CDC has identified a significant increase of E.coli O157**
- **Examples of other major recalls world wide include**
  - Residue from antibiotics, metals and pesticides
  - Melamine added to flour, milk, and animal feed

## High profile recalls

### U.S.A.

- Botulism-inducing chili from Castleberry's,.
- Salmonella tainted Peter Pan peanut butter, and ConAgra pot pies
- Listeria tainted Whittier Farms organic milk
- E coli ground meat – multiple huge recalls
- Salmonella tainted tomatoes

### Canada

- Listeria, Maple Leaf Foods processed meats, Quebec Cheeses, and sliced mushrooms
- E.Coli Harvey's restaurant in North Bay, Whole Foods ground beef
- Salmonella, Cantaloupes
- Arsenic, President's Choice & Beech-Nut organic pear Juice

### **U.S.D.A. 2006 pesticide monitoring summary**

- Residue detected in:
  - 64% of fresh fruit and vegetables
  - 59% of processed fruit and vegetables
  - 69% of grains
  - 94% poultry
  - 8 % pork \* 2005
  - 99% of milk \* 2005
  - 19% of bottled water

## U.S. Consumer Confidence in Food Safety Drops in 2007

"Only 66% of shoppers -- down from 82% last year -- are confident that the food they buy at the grocery store is safe," and only 42 % are confident restaurant food is safe according to "U.S. Grocery Store Trends,"

## Response: Japan raises the bar on maximum residue levels in food

retailers provide RFID tags for products allowing consumers to verify origin farm and download information from their cell



Source traceable mark



PHOTO 4. This sign at the meat retail counter at an Ito Yokado supermarket indicates that the beef sold here was raised by a beef group in Japan's Kumamoto Prefecture. Two of the producers are pictured.

## U.K. Waitrose – Traceability for “product provenance” & safety

### Product provenance

- If customers are to have confidence in our products, it's vital that we can trace ingredients or components back to source. To make sure we know where our products come from, how they have been produced and what they contain, we work hard to develop long-term relationships with our suppliers



Vicky Booth, Waitrose Select farmer



## U.K. Response: An expectation of accountability



Sign in the meat counter of Tesco, a major UK retailer

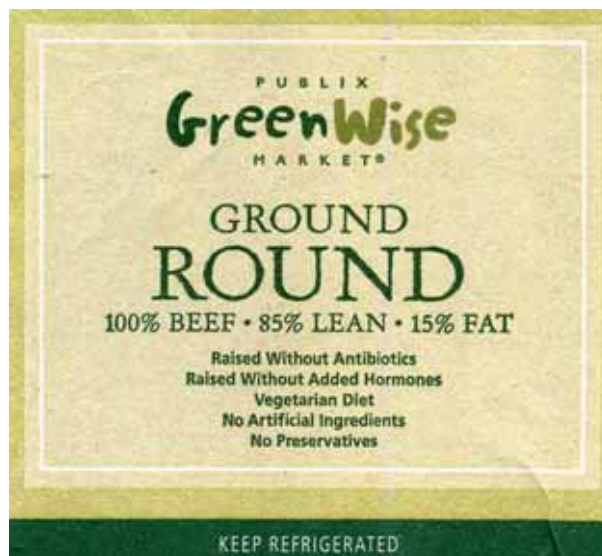
- ✓ Accountability
- ✓ Consumer confidence
- ✓ Reduces risk of animal disease
- ✓ Maintains market access
- ✓ Allows for marketing of value added traits and attributes

U.S. Response: Wal-Mart “democratizes” organics Whole Foods counters with “localization”

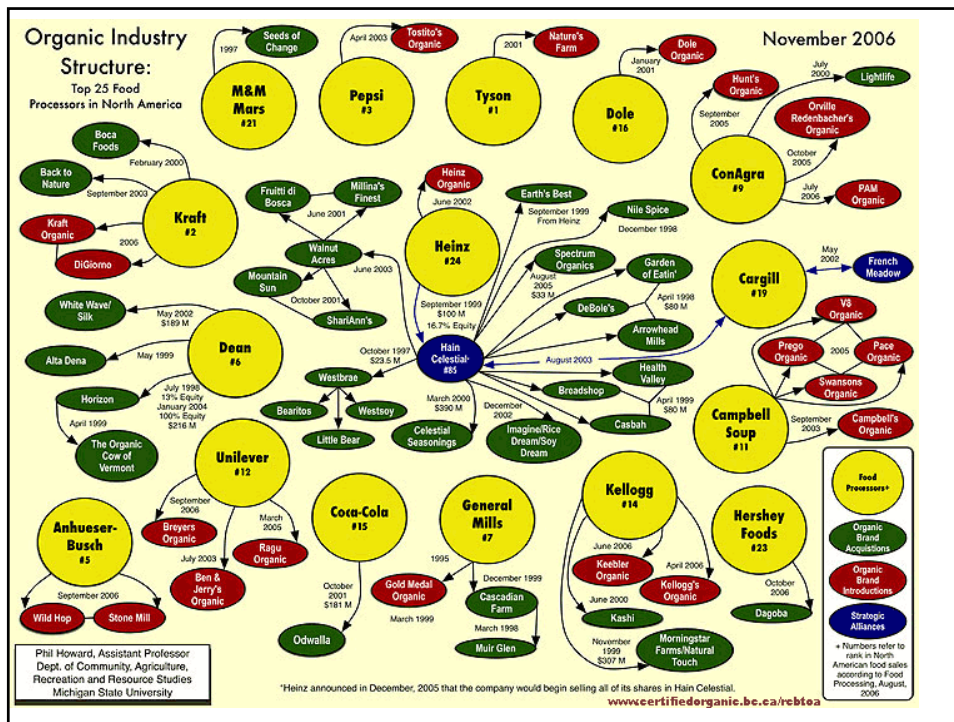


U.S. upscale retailers are moving dramatically to branded meat programs with variations of “natural”

Publix's, the Florida supermarket which has traditionally been a leader in food trends, has positioned its brand, “Green Wise” at the high end of the beef retail trade







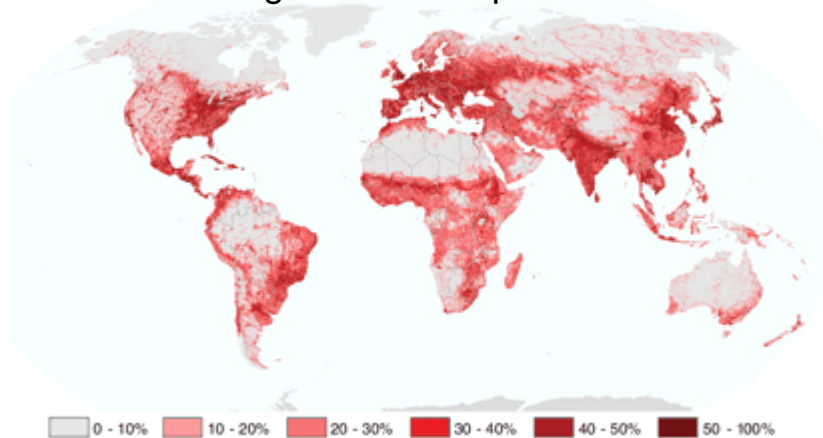


## Canadian Response: Chicken and Pork raised without antibiotics

DuBreton introduced pork raised without antibiotics and now has growing North American customer base



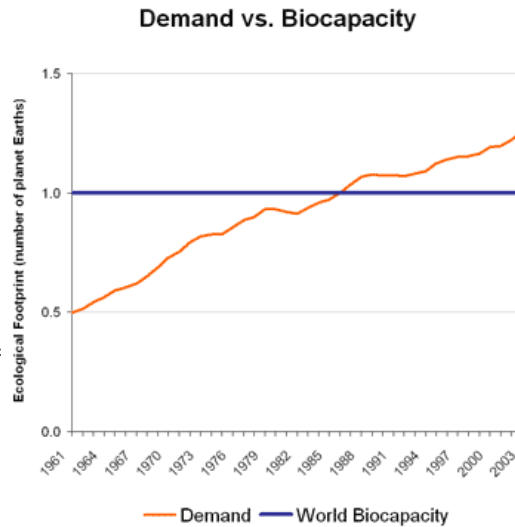
## Agriculture intensification also means an increasing human foot print on the biome



The figure illustrates the human footprint on Earth. Human impact is expressed as the percentage of human influence relative to the maximum influence recorded for each biome. Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare Kareiva et al. Science 29 June 2007

Intensification of Agriculture has allowed humanity to feed itself but only by liquidating the earth's natural capital

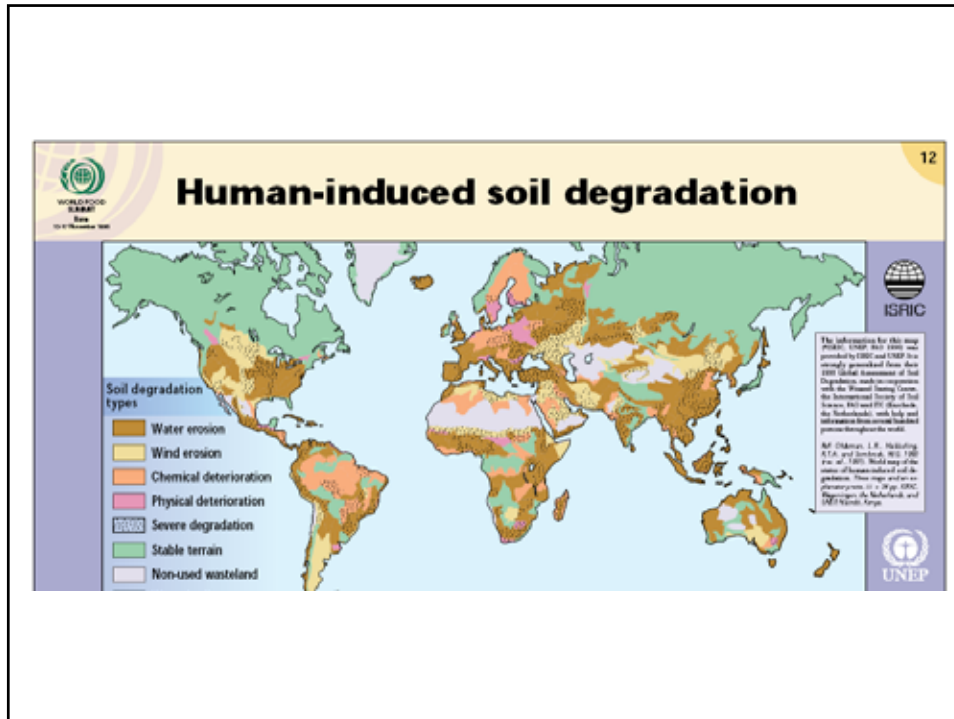
- Agriculture has come to rely on non renewable resources to meet increasing demand.
- Humanity is in ecological overshoot to the extent current practices liquidate environmental capital rather than just living off annual sustainable yields.



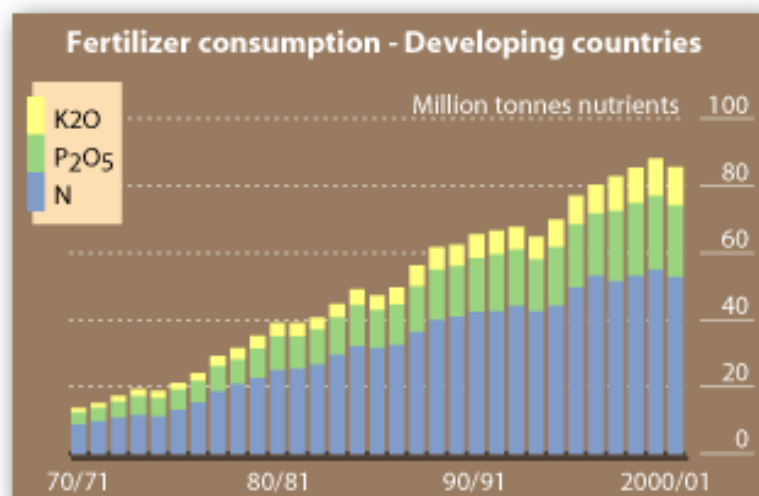
## Environmental Risks

- Expansion of Cropland onto Sensitive Areas
- Overstressed Water Supplies
- Soil Degradation





Intensification of production in the developing world has been dependent on a massive growth in the usage of fertilizer

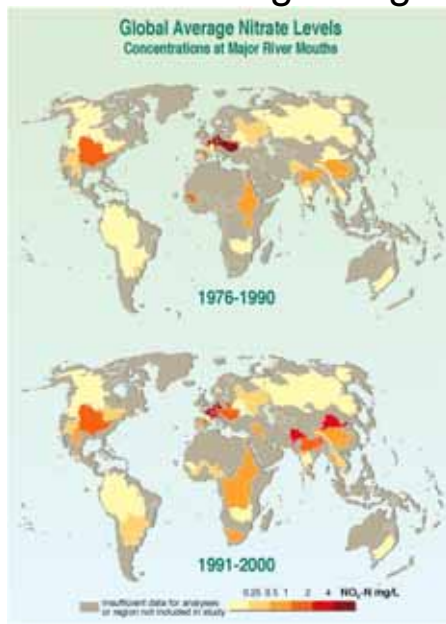


With agricultural intensification has come many forms of disease and pollution



2007 was named China's year of algae because of repeated outbreaks due to pollution

Nitrate is degrading rivers, lakes and oceans



- European rivers showed the highest nitrate loads transported to the marine environment. Comparing data from the two decades, North American and European rivers have remained fairly stable, while major river basins in South Central and Southeast Asia have recorded higher nitrate concentrations.
- Nitrate is a major nutrient, and excess levels can cause eutrophication with symptoms such as decrease in oxygen levels, algal blooms and reduced biodiversity

## Deforestation for soy production in State of Pará prompts world backlash



NOVO PROGRESSO, PARA STATE, AMAZON, BRAZIL September, 2004 Illegal deforestation for soy production in Novo Progresso, State of Pará  
Source: Greenpeace / Alberto Ceisar

More than half the Amazon rainforest will be damaged or destroyed within 20 years if deforestation, forest fires, and climate trends continue warns Daniel Nepstad in *Philosophical Transactions of the Royal Society*. The damage will release 15-26 billion tons of carbon into the atmosphere.

## Greenhouse gas (GHG) emissions by source, 2004

### Greenhouse gas emissions in 2004 by source

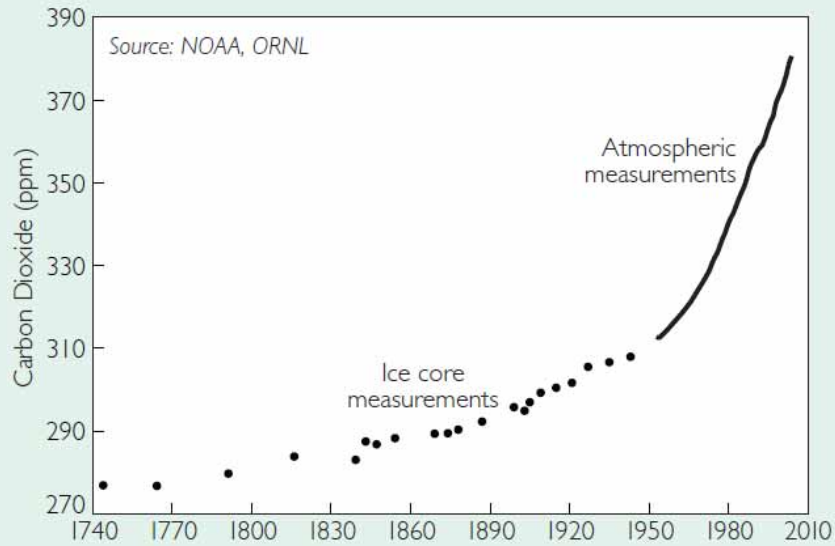


SOURCE: IPCC, Working group 1, 2007

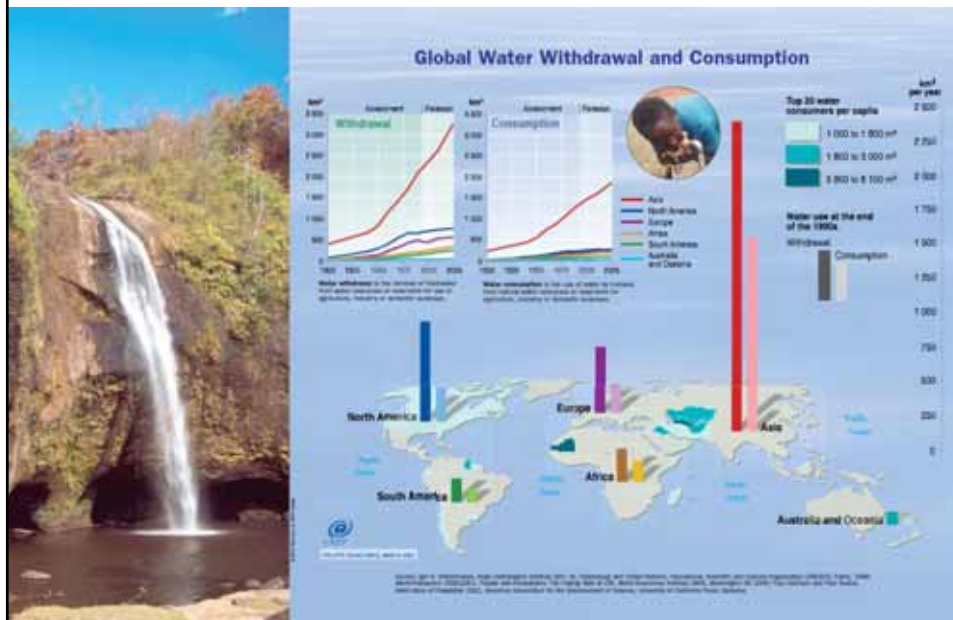
IAASTD/Katell Burger, UNEP/GRID-Arendal

Overall, agriculture (cropping and livestock) contributes 13.5 % of global greenhouse gas emissions mostly through emissions of methane and nitrous oxide (about 47% and 58% of total anthropogenic emissions of CH<sub>4</sub> and N<sub>2</sub>O, respectively).

**Figure 6-I. Atmospheric Concentration of Carbon Dioxide, 1744–2004**



## Global water withdrawal and consumption

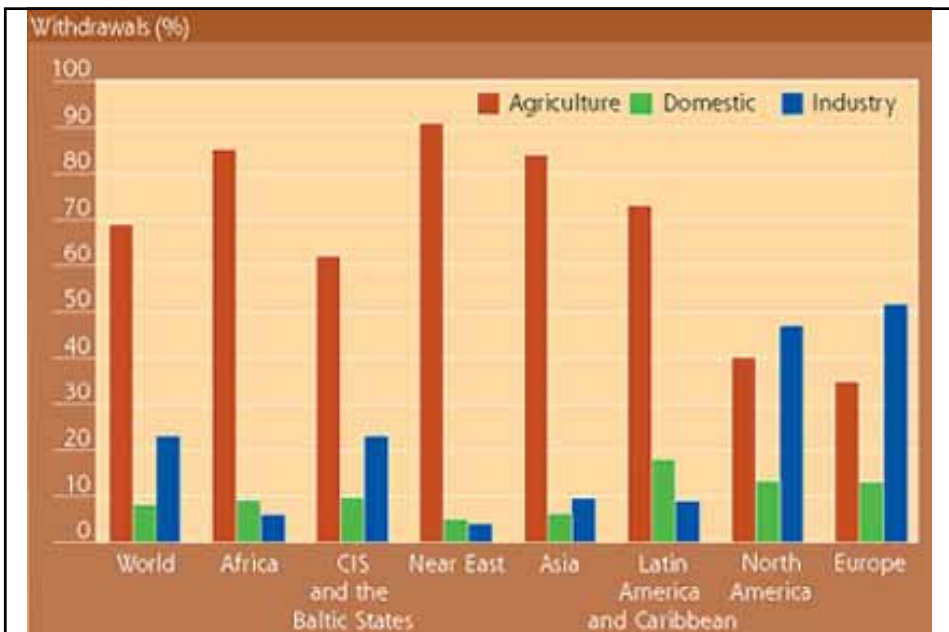




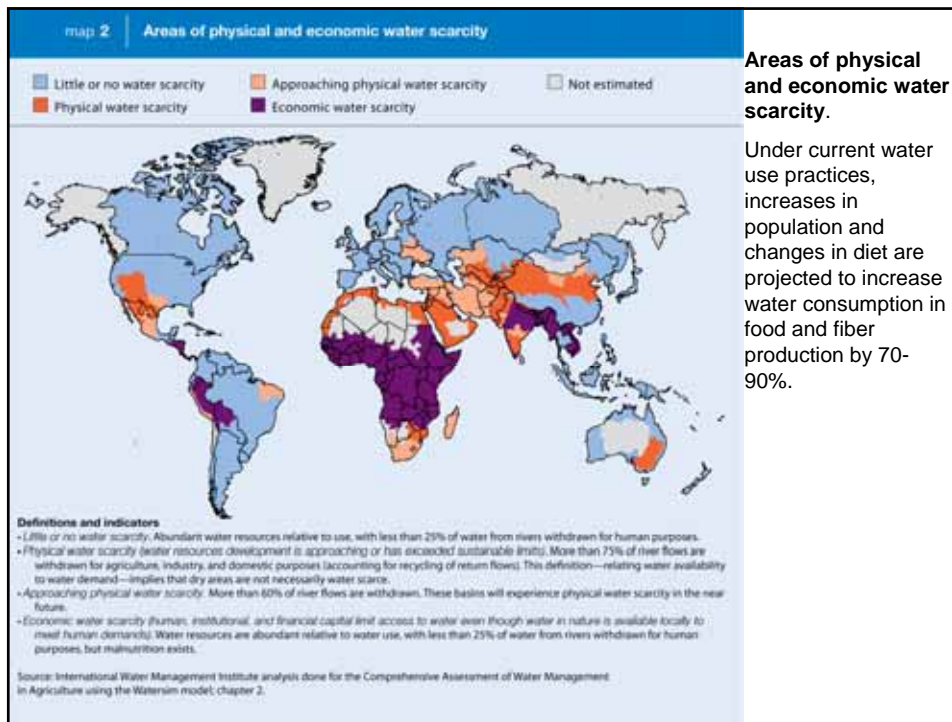
For much of the world water is already used well beyond replenishment rate



It takes a thousand tons of water to grow a ton of grain and 15,000 tons to grow a cow. 1,300 gal of water go into the production of a single hamburger and twice that for a steak



Agriculture already consumes 70% of all global freshwater withdrawn worldwide and has depleted soil nutrients, resulting in N, P and K deficiencies covering 59%, 85%, and 90% of harvested area respectively in the year 2000



## Response: Development of Sustainability Indices

Nestlé Rated in Sustainability Indices 

AAA rating (1st out of 47) from  Innovest  
Strategic Value Advisors

 **Dow Jones Sustainability Indexes**  
Member 2006/07

 **2<sup>nd</sup> of 32**  
Corporate Responsibility  
rated by oekom research

**BEST IN CLASS**  
environmental and social performance  
STOREBRAND SRI 

**CARBON DISCLOSURE PROJECT** Climate Leadership Index : 75

23 | SPRING PRESS CONFERENCE 2007



## Response: Localization and labeling for carbon foot print



**“We are committed to buying from local producers particularly those who farm organically and are dedicated to environmentally friendly, sustainable agriculture”.**



**“we have started the quest for a universally accepted and commonly understood measure of the carbon footprint of every product we sell – looking at its complete life-cycle from production, through distribution to consumption” Sir Terry Leahy Chief Executive**



## Response: GHG emission reduction

### CLIMATE STRATEGY 2020

#### Ambitious target for CO2 emissions

Initiatives include

CO2 mark on products to enable consumers to see the environmental impact

The environmental strategy focuses on areas such as water, energy and waste. The separate climate strategy will contribute to a reduction in CO2 emissions within specific areas such as transport, packaging, food production and cattle farming.

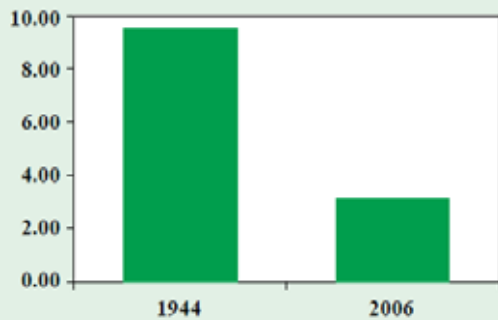
Arla Foods total Carbon Footprint is estimated to 9,000,000 tonnes CO2e, divided into:

Agriculture:	7.500.000 tons
Operations:	CO2e
Transport:	500.000 tons CO2e
Packaging:	500.000 tons CO2e
	500.000 tons CO2e

We intend to achieve a 25 per cent reduction within the areas we are responsible for ourselves, i.e. food production, transport and packaging. As for farming practices, which are outside our direct area of responsibility, we will work with our co-operative members, insurance companies and industry associations to reduce the climate impact from cattle farming as far as possible.

## Dairy leads the way shrinking carbon foot print

Figure 1. Carbon footprint of dairy production, 1944 vs. 2006



- In 1944, the calculated CO<sub>2</sub> production was 10 pounds per 1 pound of milk.

- In 2006 the calculated CO<sub>2</sub> production was 3 pounds per 1 pound of milk.

- 70% decrease in the carbon footprint of milk during this time period.

Mike Van Amburgh is associate professor, Judith Capper a post-doctoral research associate and Dale Bauman is Liberty Hyde Bailey Professor in the Department of Animal Science at Cornell

## Reduction in the discharge of nitrogen

Danske Slagterier

### Nitrogen discharge from slaughter pigs



**39% less nitrogen discharged per kg of pig meat**



## Natural Beef – an appealing concept



- Highly appealing, at a price point slightly above 'regular' beef
- A sense that the product is more 'accessible' than Organic
- Growing consumer interest – hormone free, no antibiotics, raised on pasture



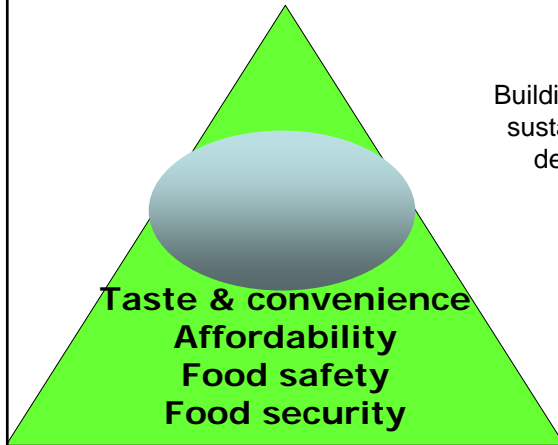
The response we will face if we do not find ways to lower the agricultural footprint by other means



*"Please eat less meat - meat is a very carbon intensive commodity,"*

*Rajendra Pachauri Head Of IPCC*

Agricultural subsidies in the future will support sustainability as that is the only way to have food security, affordability, health and safety



Building markets for products of sustainable systems starts by demanding that at home.

### The transformation of Agriculture from part of the problem to part of the solution

#### Ted Bilyea's Suggestions

##### Issue

- We have reached "peak oil", and now face peak water
- The best arable land is growing cities and we are degrading the world's soils to squeeze out additional production
- Animal disease and crop disease from intensive mono cropping and increased animal densities threatens health and the environment
- Bringing more land into production by the destruction of forests and wet lands is one of the main contributors to global warming and therefore no longer acceptable to consumers.

##### Response

- Invest in agriculture that moves away from fossil fuel dependence.
- National security priority to preserve soils, protect water, guarantee safe food
- Increase surveillance of animal and plant disease, increase auditing of on farm and in factory HACCP, mandate increased testing of domestic and imported products. Monitor foreign production systems
- Turn subsidies to building markets for products of sustainable production systems, develop income streams from carbon sequestration & GHG reduction
- Develop a list of key sustainability indexes. Build international support to curb trade in products from non sustainable systems.