

Free range chickens: good for them , bad for you?

Dioxins - group of toxic chemicals.

Pollutants that are created when garbage, plastics, metal, wood, and other materials are burned.



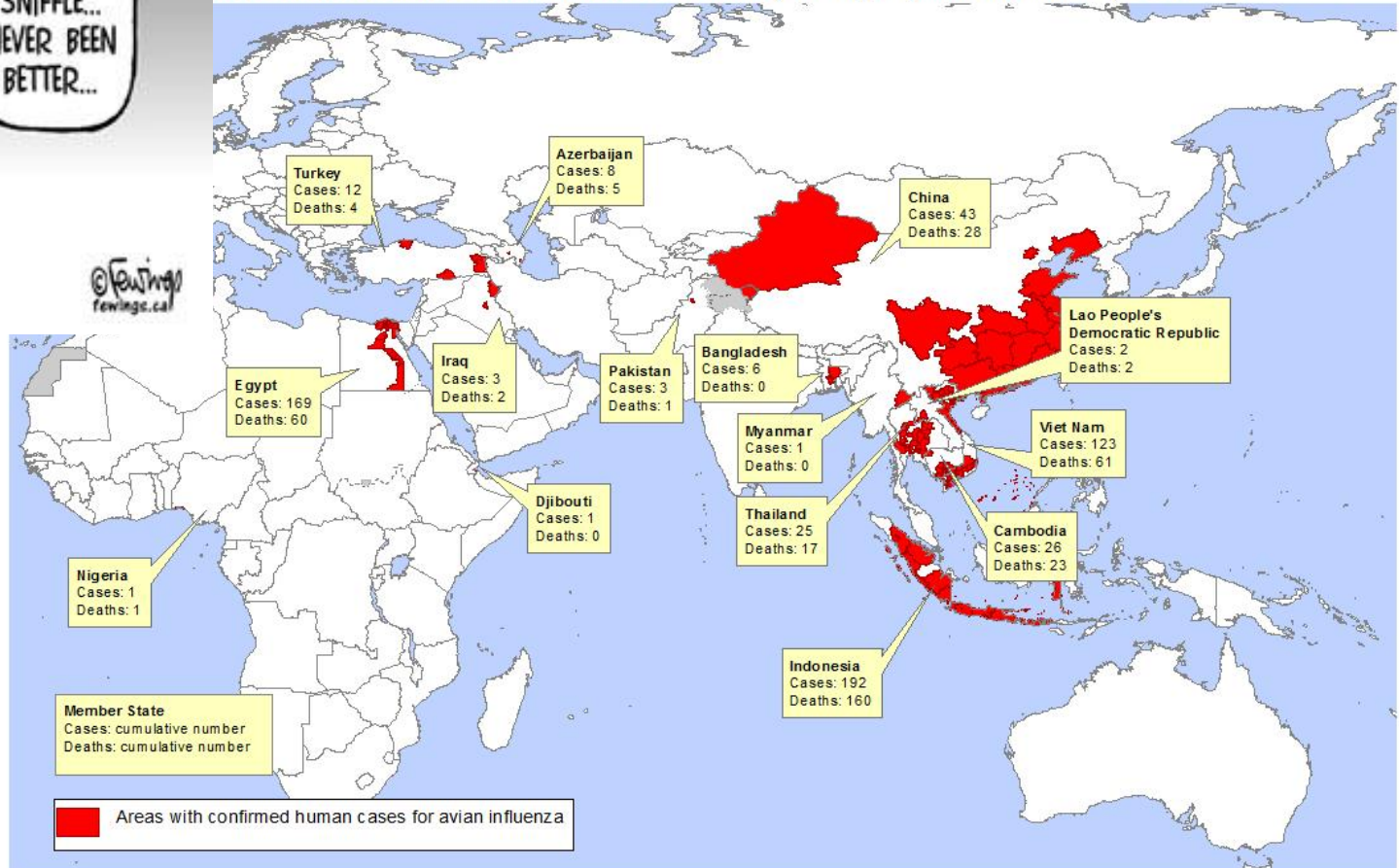
BIRD FLU...



ME??
I FEEL GREAT!
HONESTLY!
JUST FINE.
NOT EVEN A HINT OF A SNIFFLE...
NEVER BEEN BETTER...

AVIAN INFLUENZA

Confirmed human cases for avian influenza A(H5N1) reported to WHO, 2003-2013*



*All dates refer to onset of illness
Data as of 01 February 2013
Source: WHO/HIP

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not be full agreement.
© WHO 2013. All rights reserved.

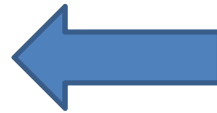


Globalization of food consumption

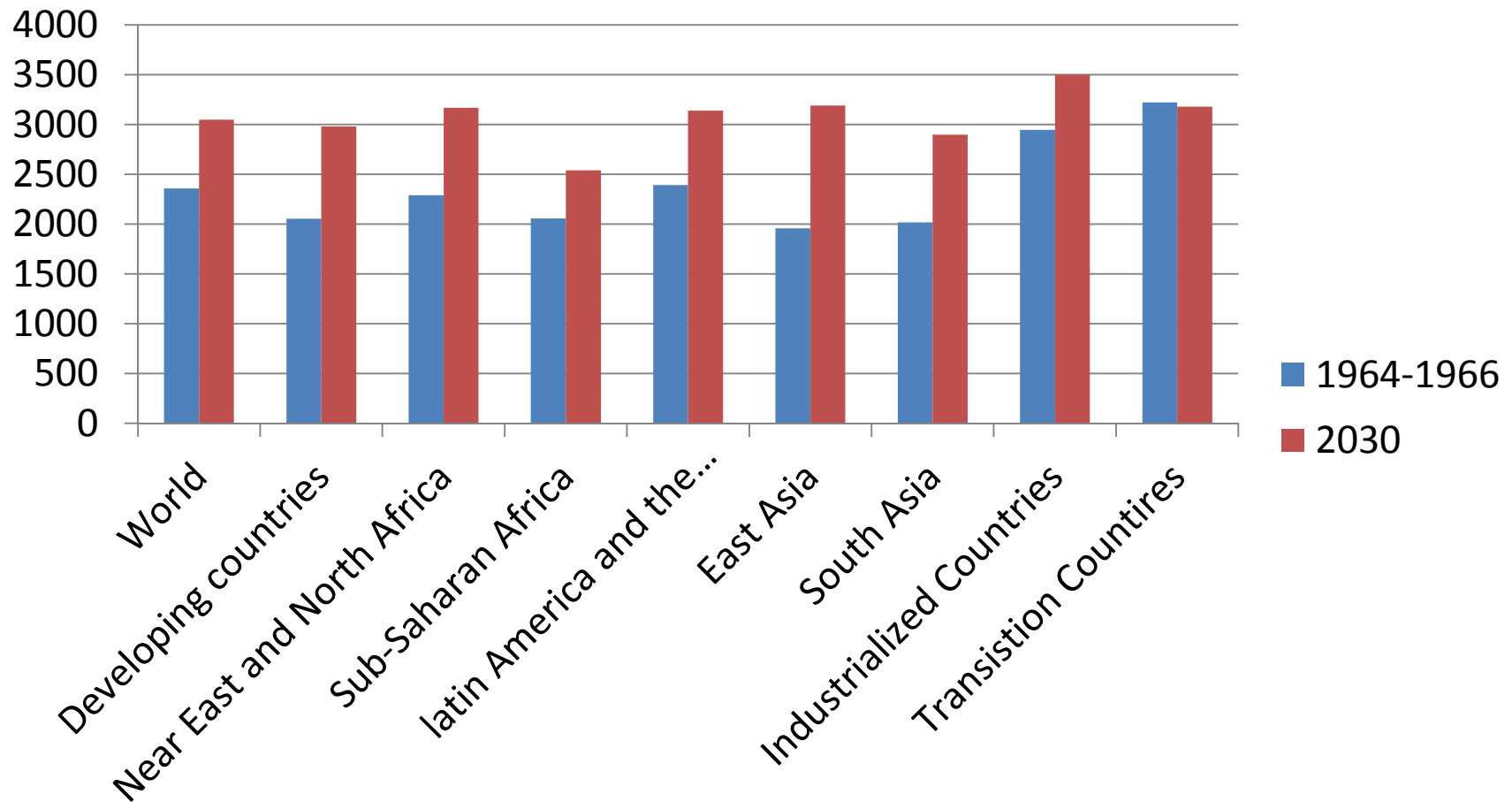


kilocalories (kcal) per capita per day

- Food consumption expressed in kilocalories (kcal) per capita per day is a key variable used for measuring and evaluating the evolution of the global and regional food situation. A more appropriate term for this variable would be “national average apparent food consumption” since the data come from national Food Balance Sheets rather than from food consumption surveys.



Global and Regional Food Consumption



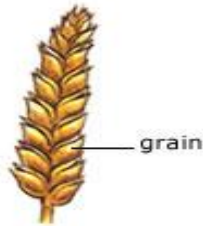
Source: <http://www.fao.org>

Grain Based Energy Sources

Cereals



wheat



ear of wheat



rye



barley



maize (*BrE*) / corn (*NAmE*)



rice



oats



millet

Meat Consumption Per Capita

MEAT CONSUMPTION PER CAPITA

kgs per capita

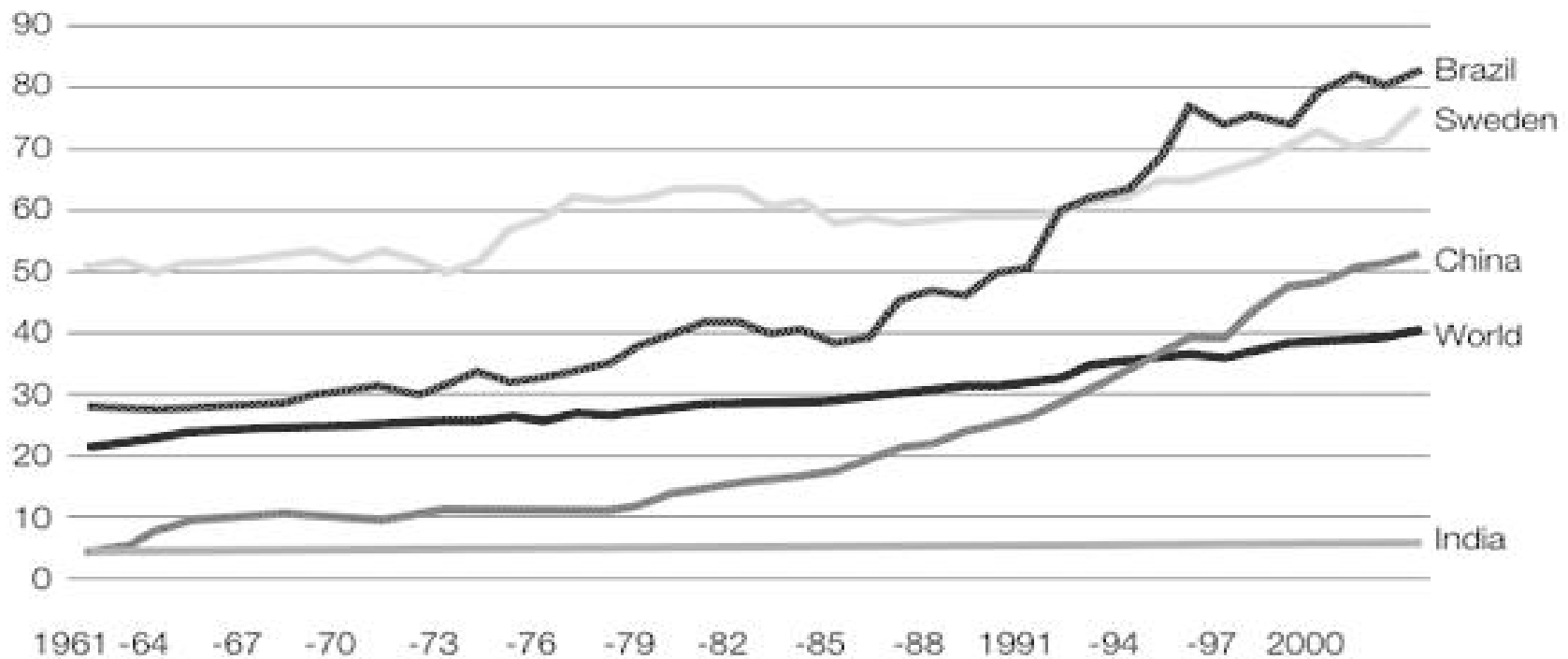
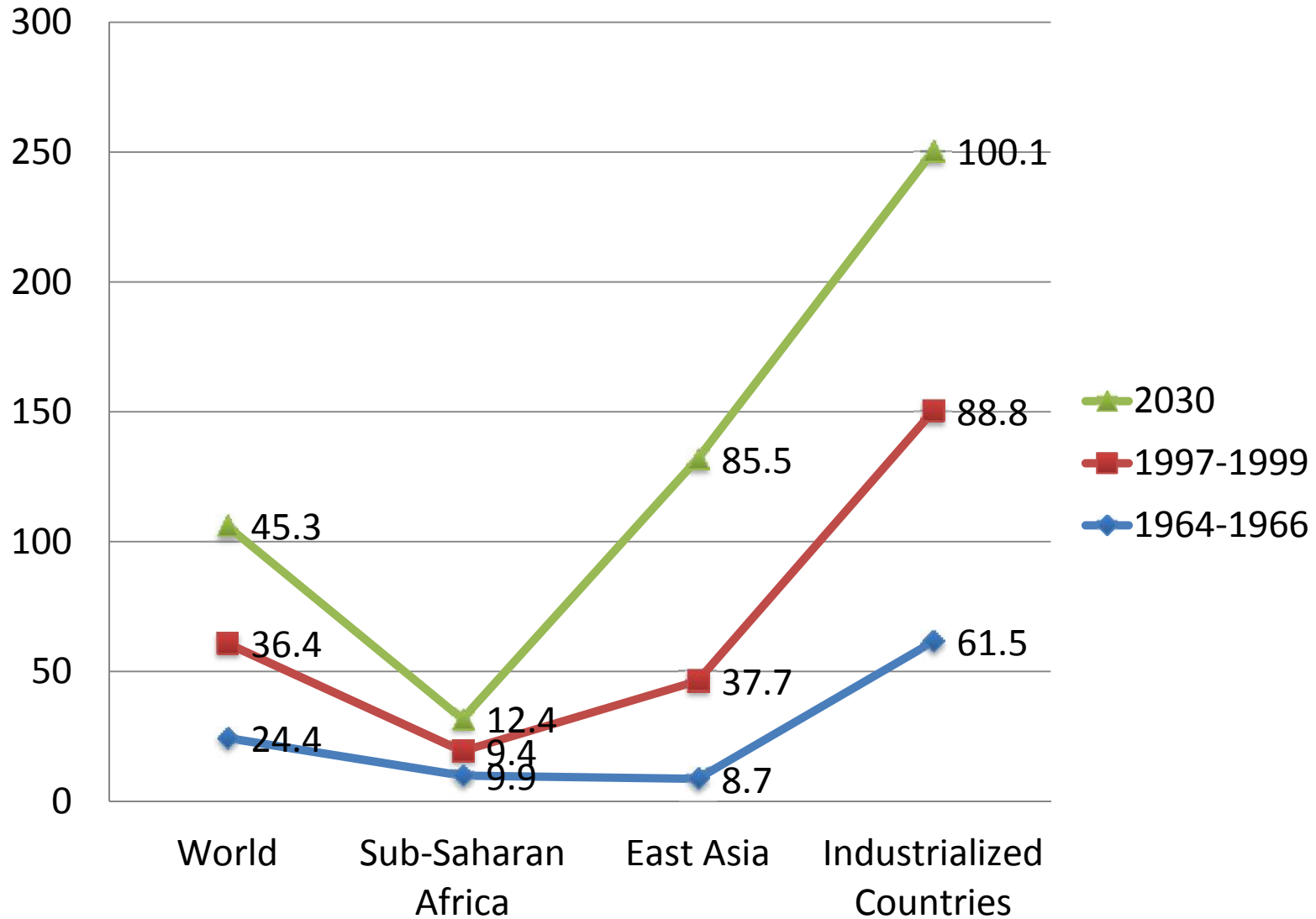
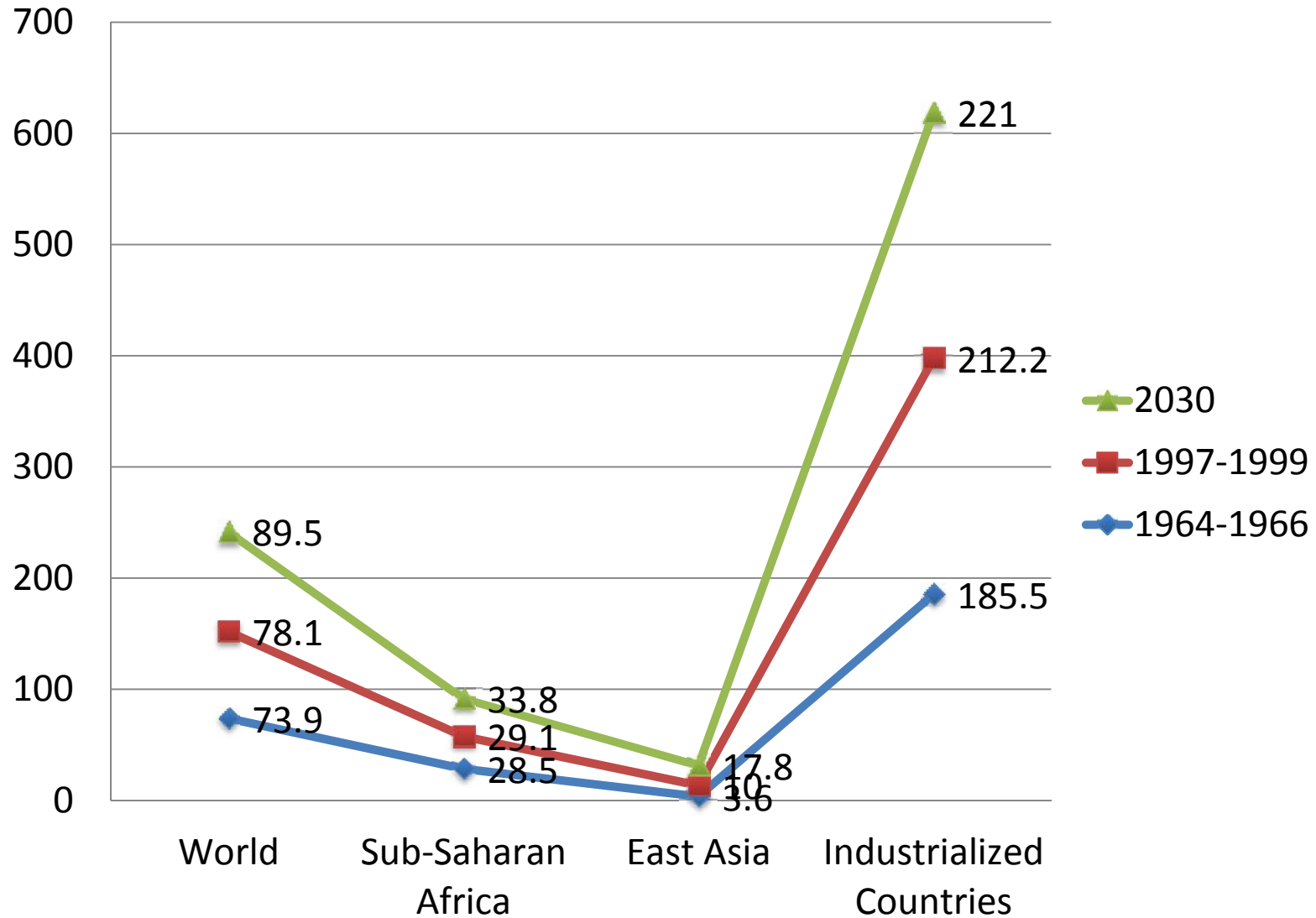


Figure 2.4: Source: World Resources Institute 2008

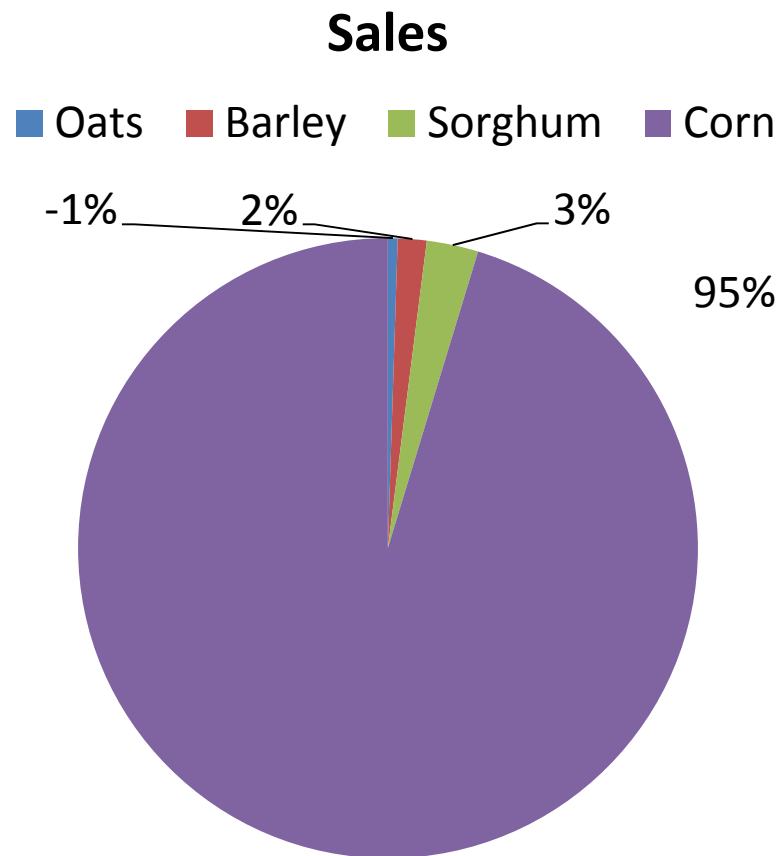
Per Capita Consumption of Meat (kg per year)



Per Capita Consumption of Milk (kg per year)



FEED: What is Feed?

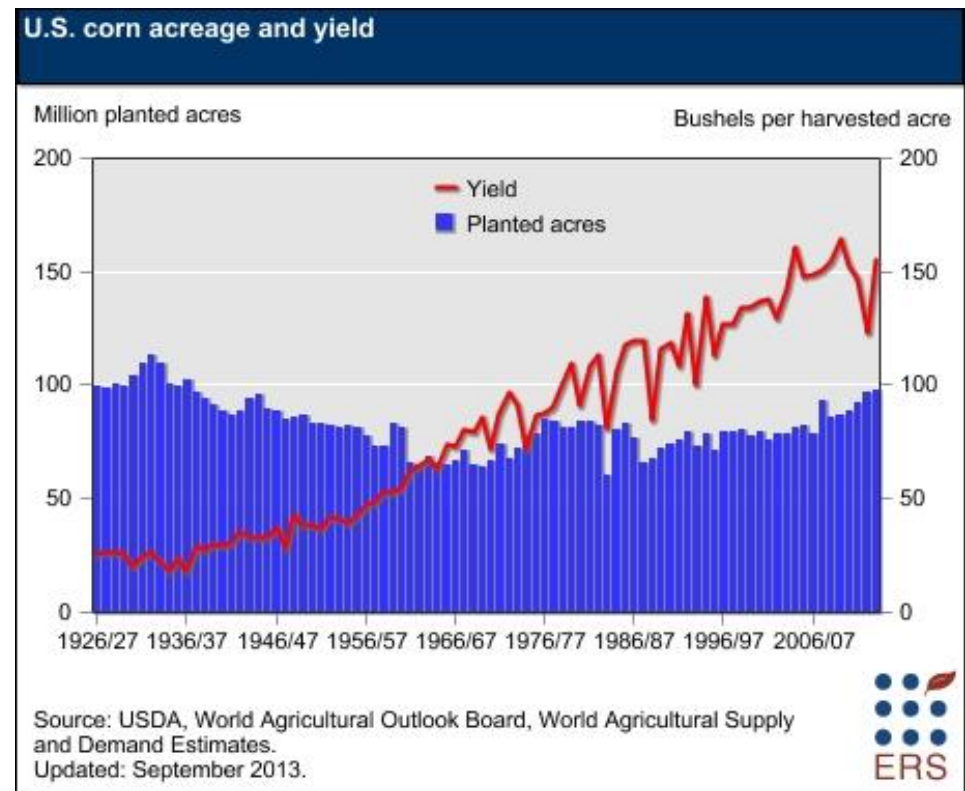


Composition of Feed

- Maize (corn)
- Soybean
- Wheat
- Oats
- Sorghum
- Rice

Corn

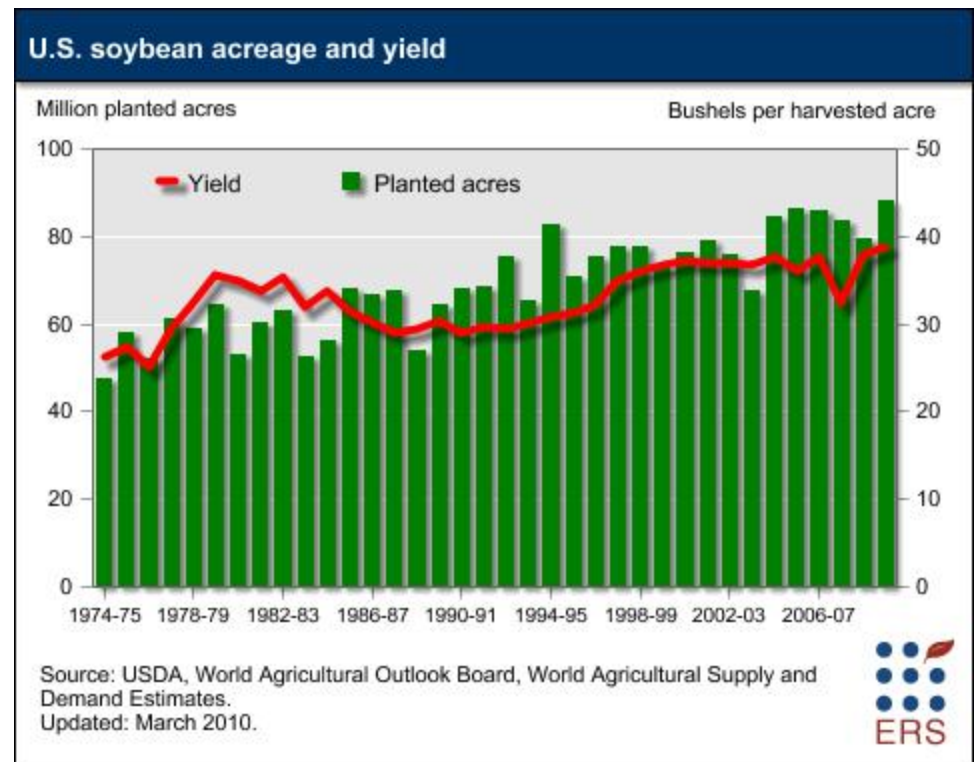
- Widely produced in United States
- Livestock Feeding
- Other Uses
- 80 Million Acres
- U.S. Number 1
- \$63.9 Billion



U.S. USDA. National Agricultural Statistics Service. Crop Production. March 8, 2013.
National Corn Grower's Association 2013 Report. N.p., 11 Feb. 2013.
U.S. USDA. Economic Research Service. Corn: Trade. N.p., March 2013.

Soybeans

- Largest source of protein feed in the world
- Other Uses
- 74 Million Acres
- U.S. Number 1
- \$37.6 Billion



U.S. USDA. National Agricultural Statistics Service. Crop Production. March 8, 2013.

U.S. USDA. ERS. Characteristics and Production Costs of U.S. Soybean Farms. N.p., Mar. 2002.

U.S. USDA. ERS. Soybeans and Oil Crops: Trade. 4 Apr. 2013.

United Soybean Board. New QUALISOY Efforts Reach out to Educate Soybean Value Chain. March 2013.

Mutation Breeding

Changes the structure in normally 1 of 3 places:

- 1) Gene (point) mutation: the only aim is to change 1 gene, and to keep the rest of the genes intact. It's a change in a specific sequence of nucleotides in DNA molecules to hopefully lead to a new type of protein OR to prevent a normal protein (inhibition).
 - molecular or sub-microscopic level

How it works

- 2) Chromosome change: split ends of the chromosome or some other type of change to it. Then the ends can form and fuse again, but will not form looking like their original state. Multiple types of results:
- Deletion or Deficiency
 - Duplication (doubling)
 - inversion (reverse order)
 - rearrangement to lose a segment
 - translocation (change the position of one chromosome or switching of chromosome positions)

How it works

3) Change the Genome: the sets of chromosomes- the ENTIRETY of an organism's DNA

Source: Ridley, M. (2006). *Genome*. New York, NY: Harper Perennial

Food: Positive Environmental Impacts

Production Changes in Insecticide and Herbicide Use

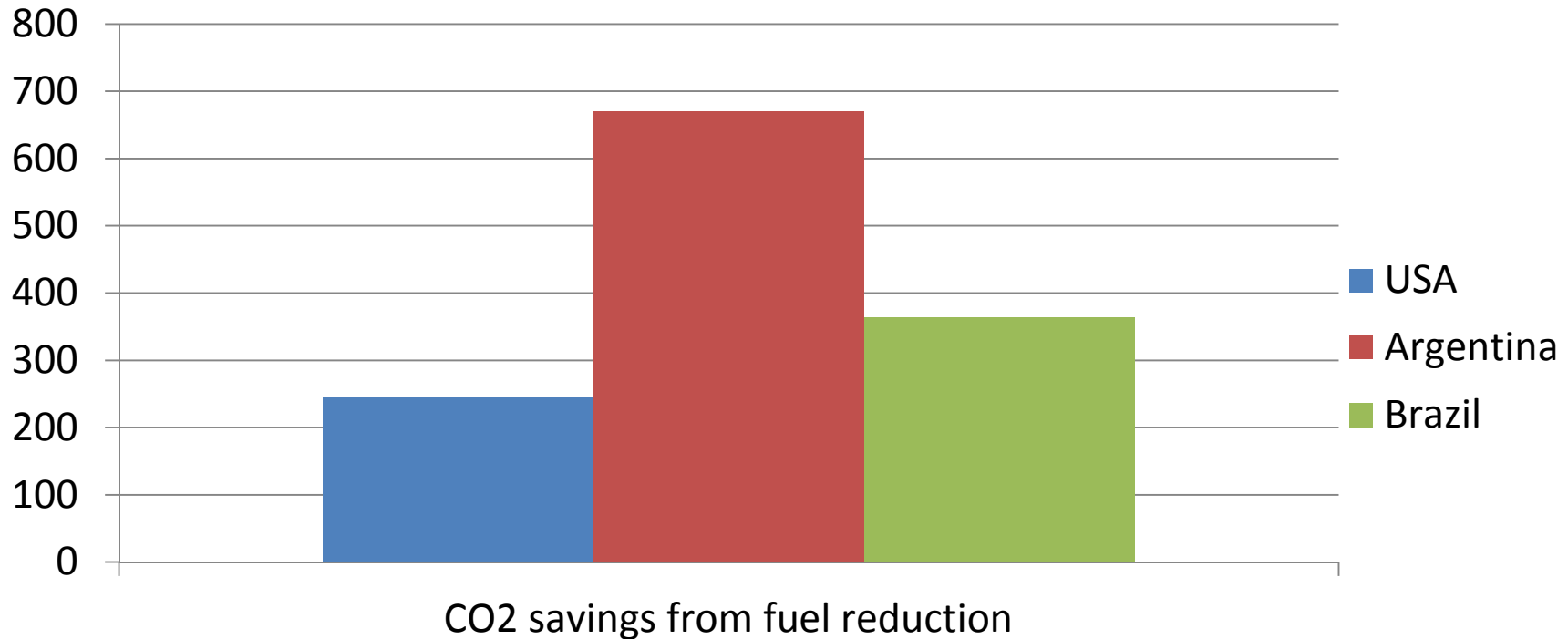
- GM IR Cotton- 23.9% reduction in volume of active ingredient
- 26% reduction in EIQ indicator (GM IR Cotton)
- Volume of herbicides used in Soya Beans down 1.4% and EIQ down 16.2%
- Maize insecticide use down 37.7% due to GM HT/IT maize
- Since 1996 use of pesticides on biotechnology crop area has been reduced by 448 million kg of the harmful active ingredient (9%).
- Total EIQ fell by 17.9%

Positive Environmental Impacts from Food

Biotechnology and Greenhouse gas Emissions

- 1715 million kg reduction in CO2 emissions by saving 642 million liters of fuel
- 4805 million kg of soil carbon sequestered in 2010 (17,634 tons not released into the atmosphere)
- Cumulative (1996-2010) reduction in fuel
 - 12,232 million kg of CO2 (4582 million liters of fuel)
 - The Equivalent of removing .76 million cars from the road
- CO2 emissions reduction as a result of new technology

Impact of Biotech Crops



- Measured in millions of Kg of CO2 reduced
- Based on use of HT soya beans in USA, Argentina, and Brazil

Negative Environmental Impacts from Food Production

Climate Change and Future Food Supply

- Climate change may cause a decrease in food production by 2% per decade for the remainder of the century coupled with a 14% increase in demand per decade
- Although certain GHG like CO₂ increase yields additional research shows that plants are sensitive to heat waves as global temperatures rise

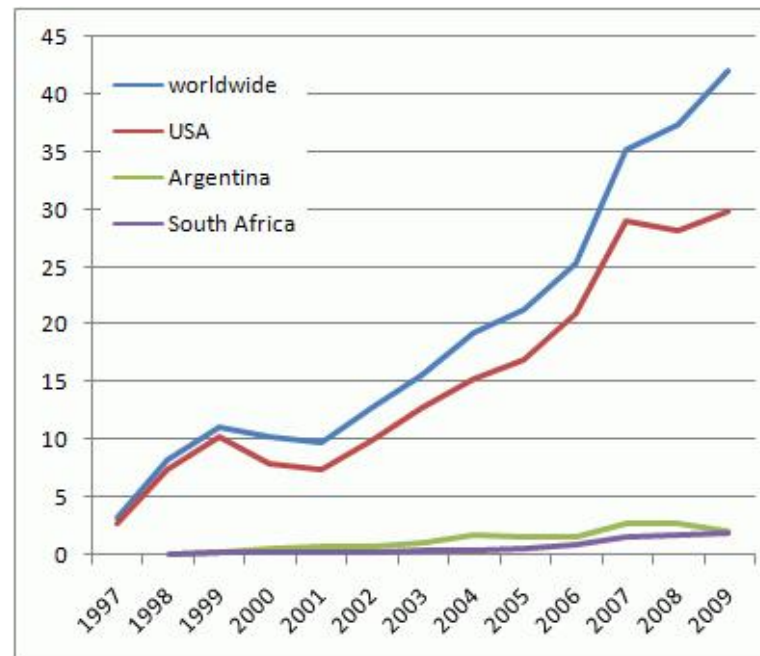


Theory of “Gene Flow” and its effects on the Environment

- Gene Flow- Transfer of alleles or genes from one population to another
 - Identified as a major environmental biosafety issue
 - May increase “weediness” of the wild relatives of the GM crop
 - May cause the extinction of local wild populations
 - May cause harmful affects on non-target organisms in local ecosystems
 - May cause negative impact on biodiversity as a result of possible extinctions from transgene flow
- ** There is not enough negative evidence to support these accusations. Thus far data suggests mostly positive outcomes from adoption of GM crops on the environment as far as a decline in CO2 emissions and other Green House Gases.

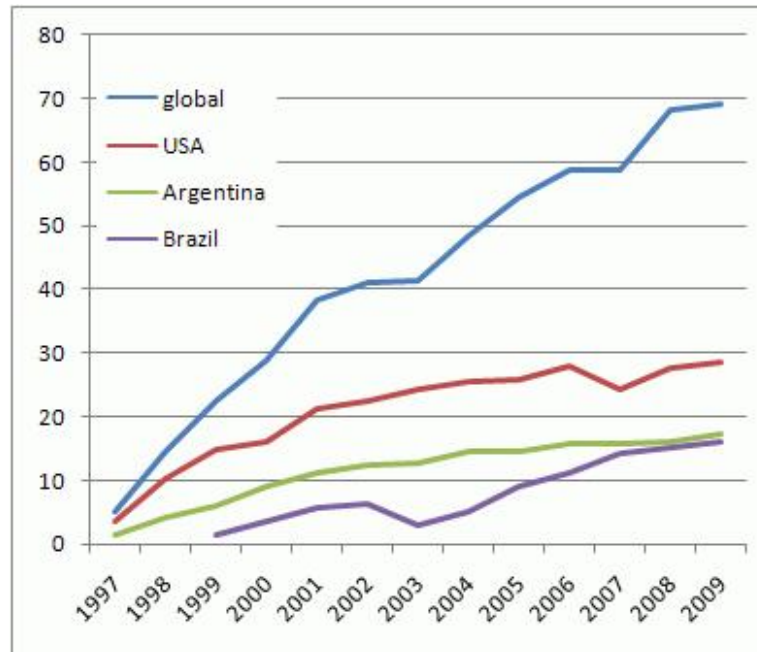
GM Maize

	Year	Cultivation Area in Million Hectares		GMO Ratio
		Total Maize	GM Maize	
Global	1998	140	2	1.4%
	2008	161	37.3	23%
	2009	158	42	26%



GM Soybeans

	Year	Cultivation Area in Million Hectares		GMO Ratio
		Total Soybean	GM Soybean	
Global	1997	67	5.1	7.6%
	2008	91	65.8	72%
	2009	90	69	77%

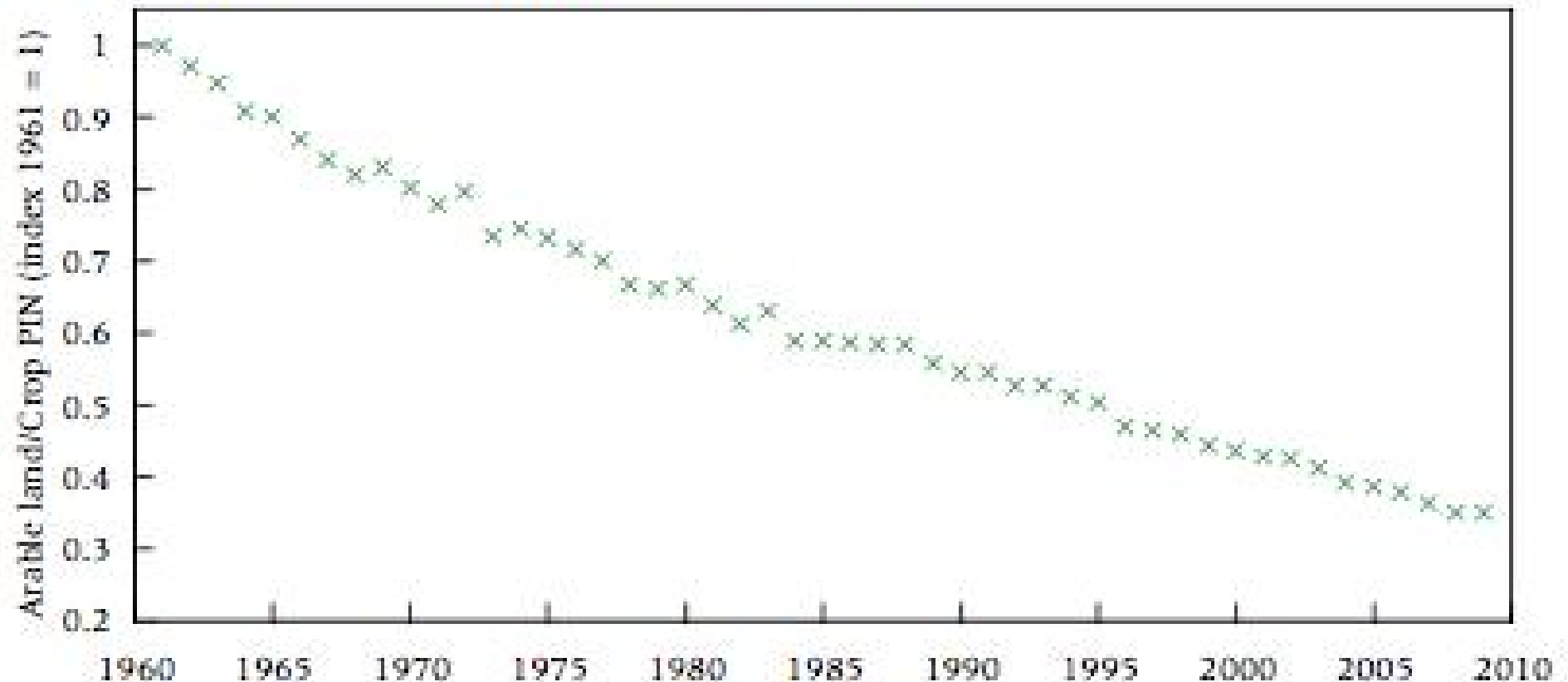


Land Use:

- To produce equivalent aggregate crop production in 2009 required roughly 35 percent of land needed in 1961
- Over last half-century, hectares per unit of production has decreased by 2 percent annually

FIGURE 7 Arable land/Crop PIN, T, for the world, 1961–2009

To produce an equivalent aggregate of crop production (PIN) in 2009 required only about 35 percent of the land needed in 1961.



SOURCE: FAO (2012).

World population (Bn)

Arable land (ha / capita)

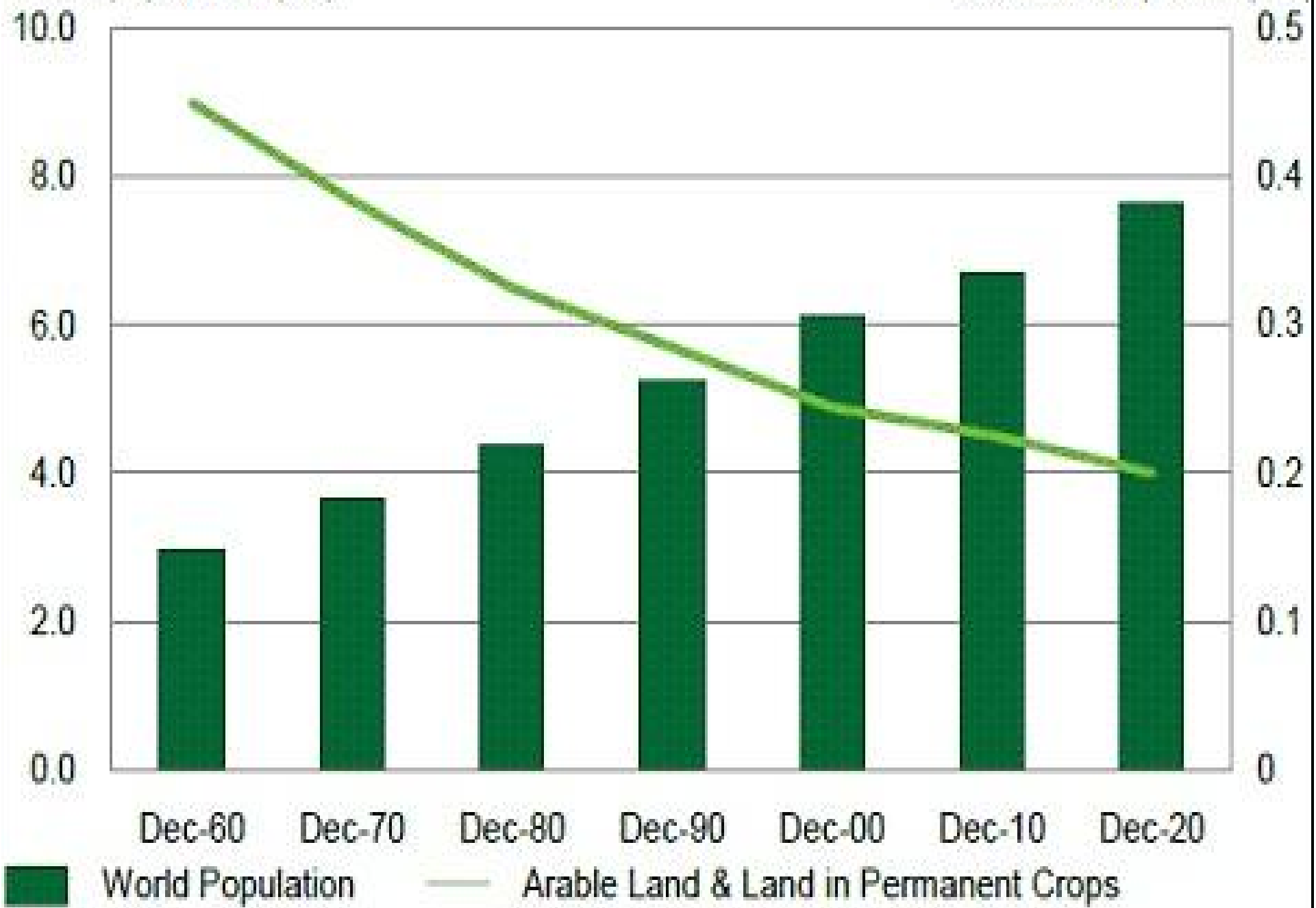


FIGURE 1 Actual and potential land used for wheat production, India 1961–2010

Upper segment shows the hectares farmers would have tilled to produce the actual harvest had yields stayed at the 1960 level.

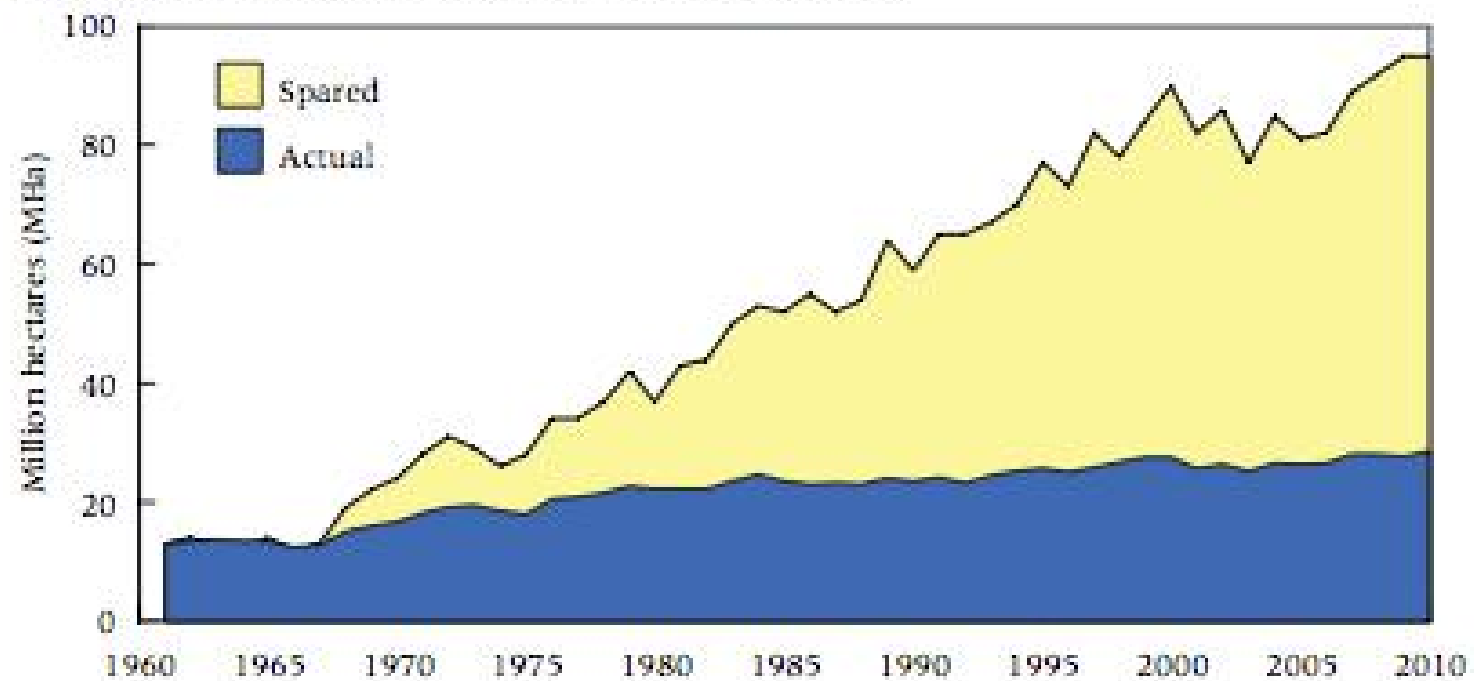


FIGURE 2 Actual and potential land harvested for maize production, China 1961–2010

Upper segment shows the hectares farmers would have tilled to produce the actual harvest had yields stayed at the 1960 level.

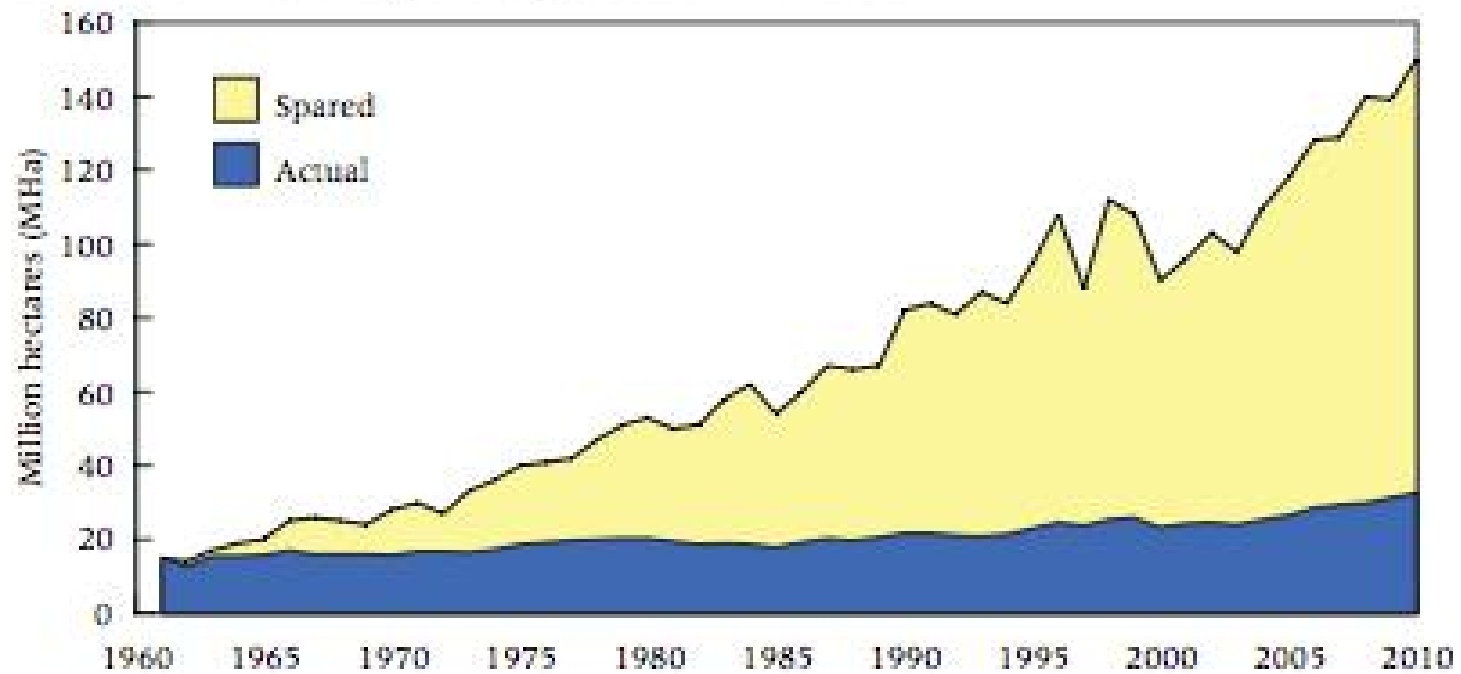
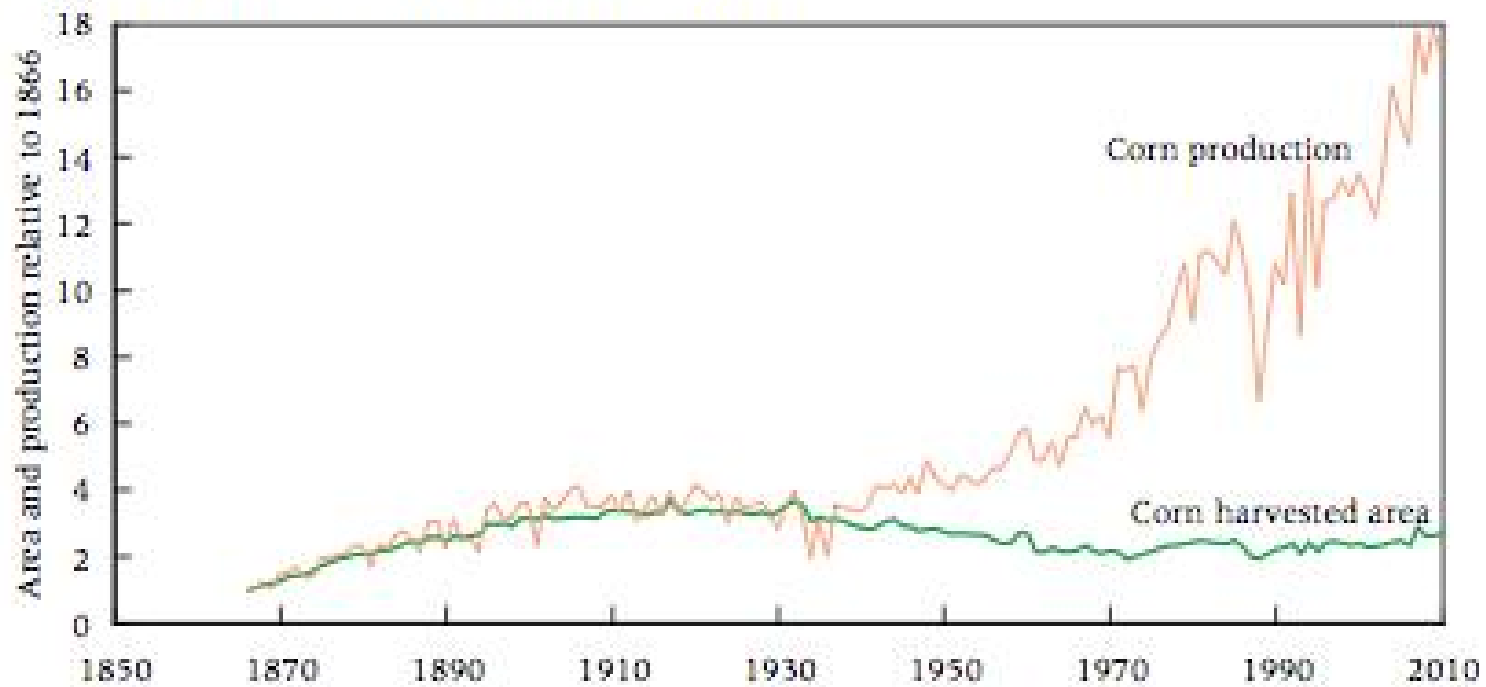
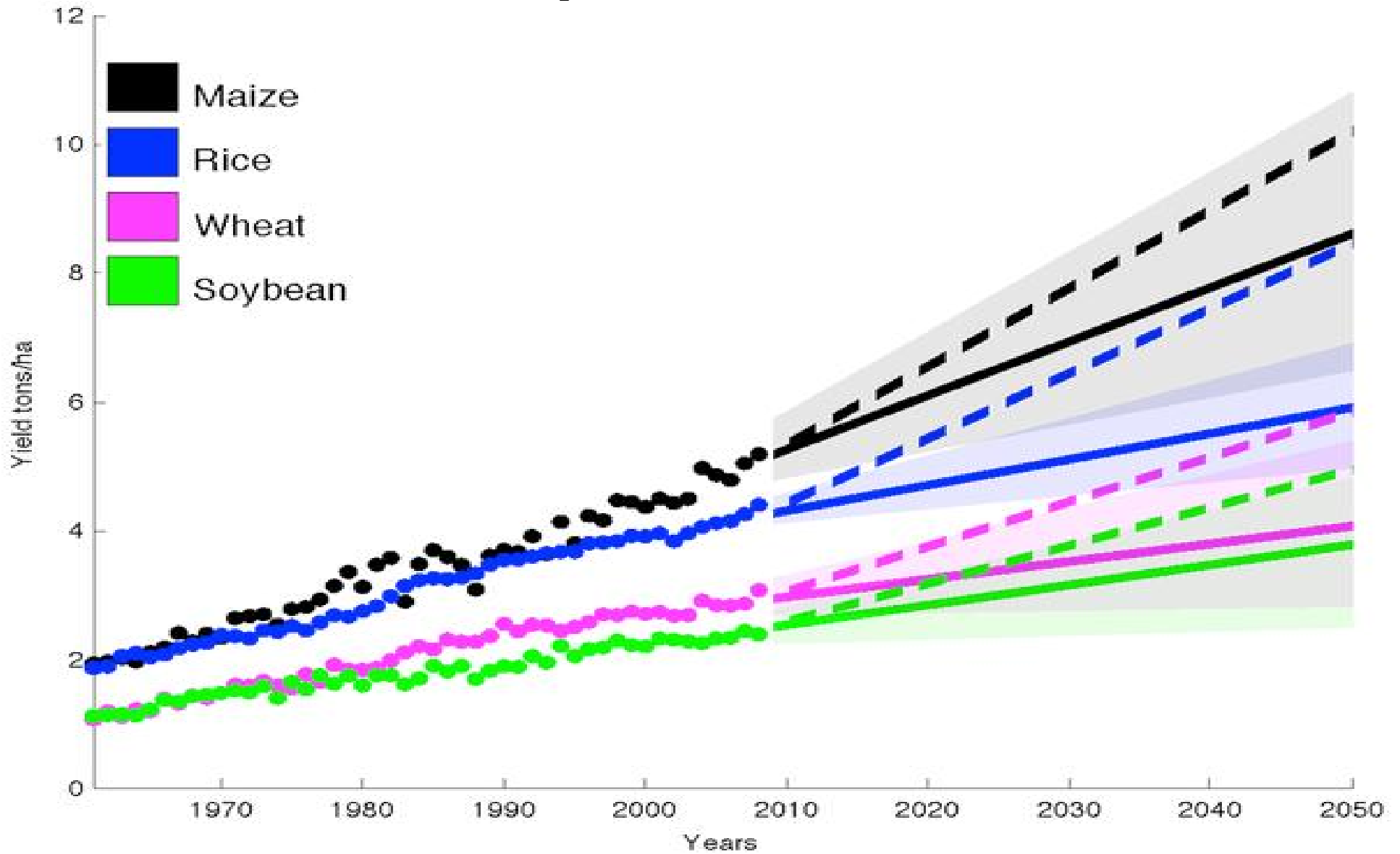


FIGURE 3 Area of corn harvested and corn production, United States 1866–2010 (indexes, 1866 = 1)



Projected Yields

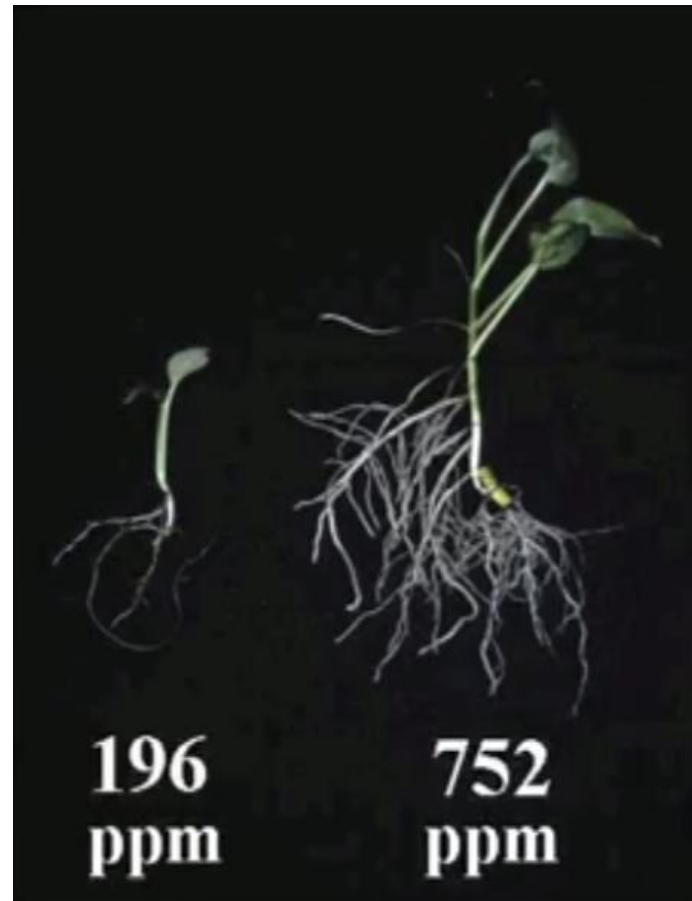


Increased Planetary Greening

- Between 1982 and 2011, 20.5% of the world's vegetated area got greener
- Only 3% got browner
- Increases happen for 2 reasons:
 - 50% comes from increases in rainfall from global warming
 - Other 50% from increased CO₂ in atmosphere
- Greening is happening in farmland somewhat, but mostly in forested areas

Increased Planetary Greening

On average, a 200 ppm (parts per million) increase in CO₂ results in 30% improvement in plant growth



Land Sparing

- Since 1960, we have seen a global increase of 25% more food per capita since 1960 and the population has doubled in that period of time
- We use 65% less land to produce this food
- We farm about 38% of of the land surface of the earth
- With 1960 yields, we would have to use 82%

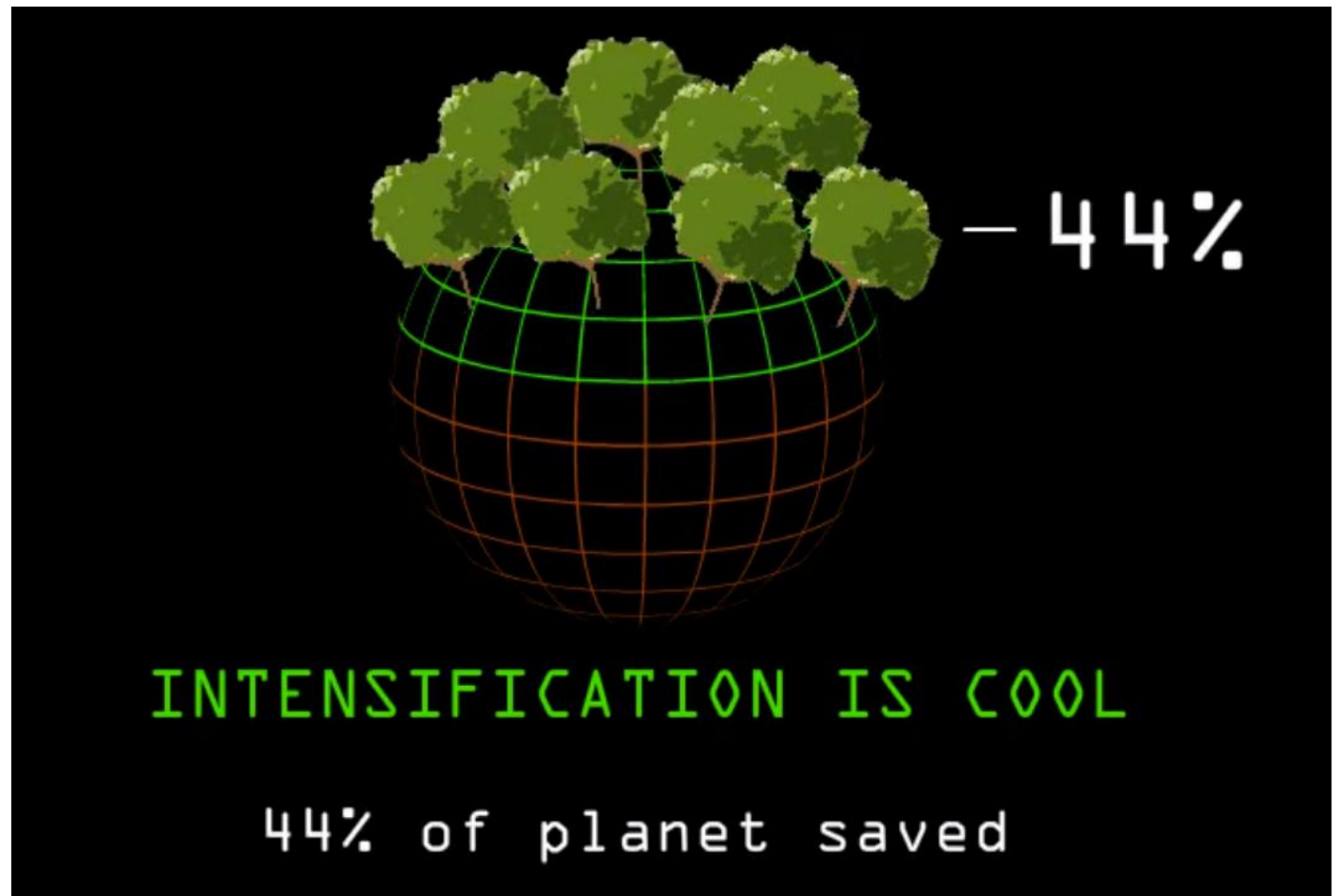
Land Sparing



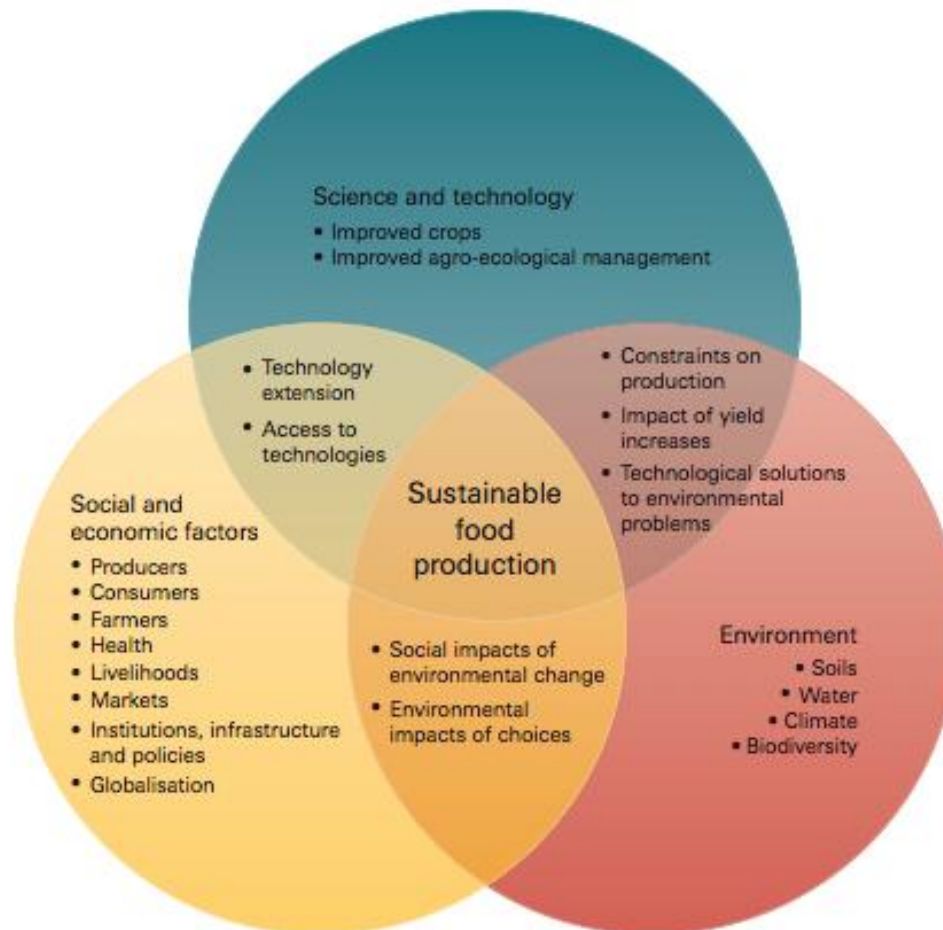
“If the yields of the early 60’s had been the same in 1998, we would have needed to sacrifice an extra area the size of South America minus Chile to feed the world’s population.” -Matt Ridley, The Rational Optimist Online

Land Sparing and Reforestation

The intensification of farming has led to 44% of global land being saved for forestation

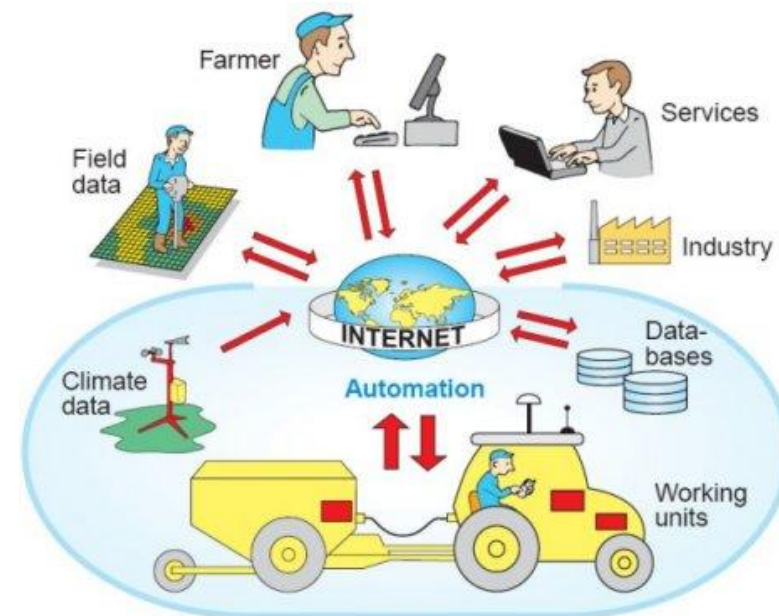


Factors for Sustainable Food Production



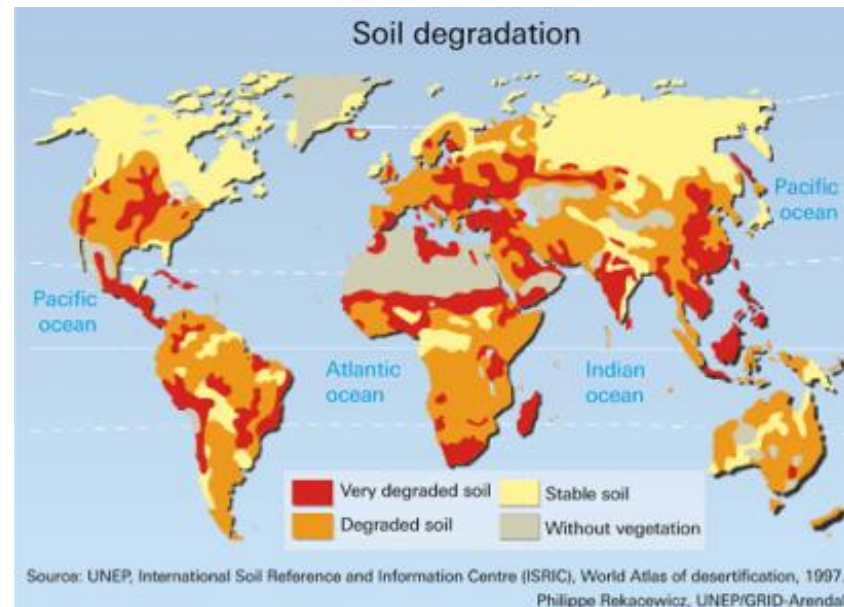
Complexity of Agricultural Systems

- Focus on science and technology
- Relies on interconnectedness of many elements
- Also necessary to factor in social, economic, and environmental concerns



Soil Degradation

- Non-renewable
- Subject to erosion by wind and water
- As soil is lost/degraded and population increases, area of land per person declines

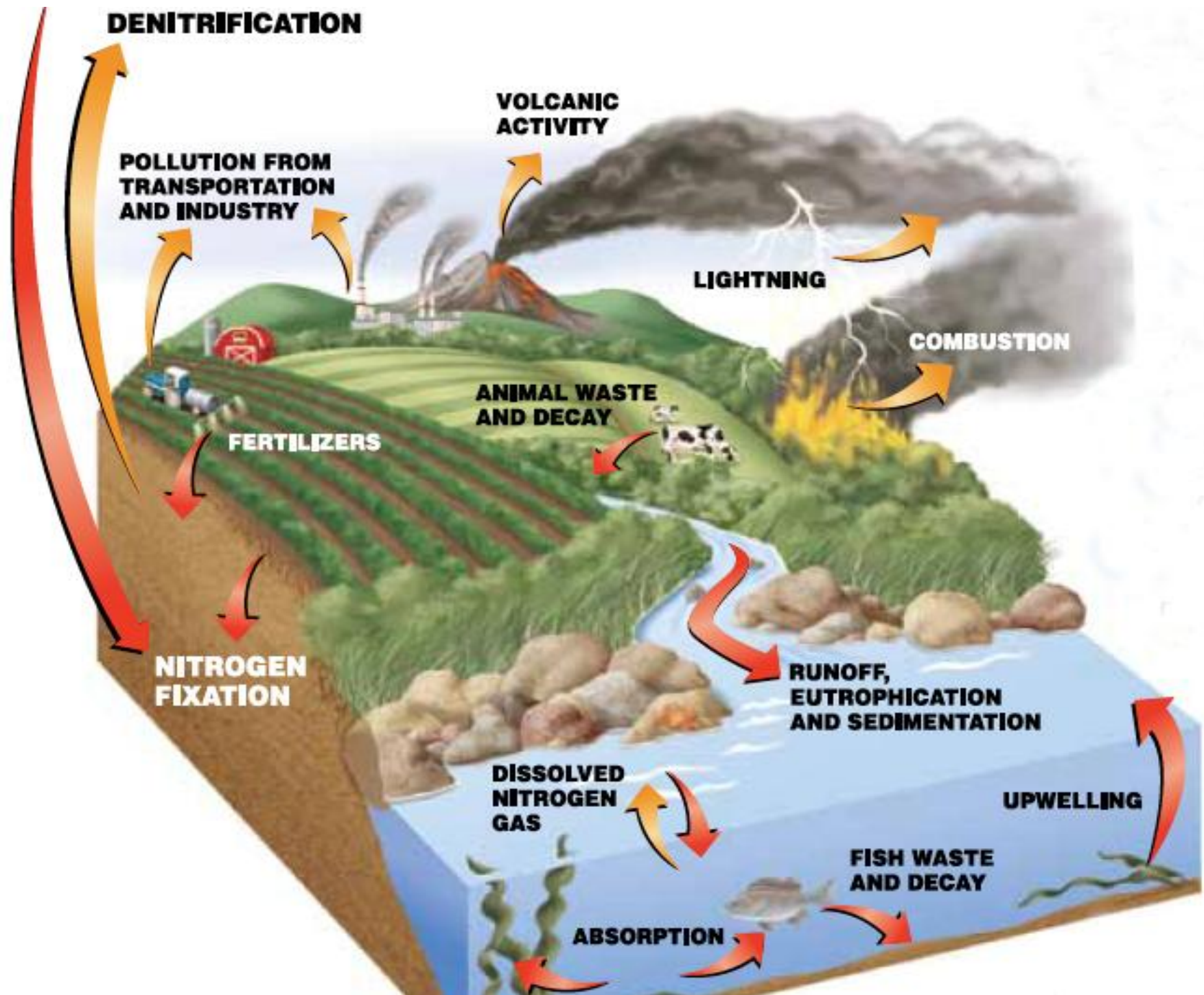


Constraints on Future Food Crop Production

- Climate change
- Water
- Temperature
- Ozone
- Soil factors
- Crop nutrition
- Pests, diseases and weed competition
- Energy and greenhouse gas emissions
- Maintenance of genetic resources and germplasm availability

NITROGEN

- Nitrogen is essential in most of the compounds that allow life to exist.
- Where can it be found?
 - EVERYYYYYYYYYWHEREEE!!
- Earth's atmosphere consists of about 78% Nitrogen gas



THE PROBLEM WITH NITROGEN

- Overuse of fertilizer
- Plants only use about 50%: Results in run off
- Causes algae to grow more rapidly in water
- Hypoxia
 - Solutions:
 - Control Release Fertilizer
 - Nitrogen Efficient Crops
 - No-till Farming

CONTROL RELEASE FERTILIZER

- Due to the insolubility of the fertilizer, nutrients are dispersed more gradually than all at once
- Results in the minimization of run off because the crops only utilize what they need.
- Since there is a consistent release of nutrients with this type of fertilizer an increase in yields can be expected.

NITROGEN EFFICIENT CROPS

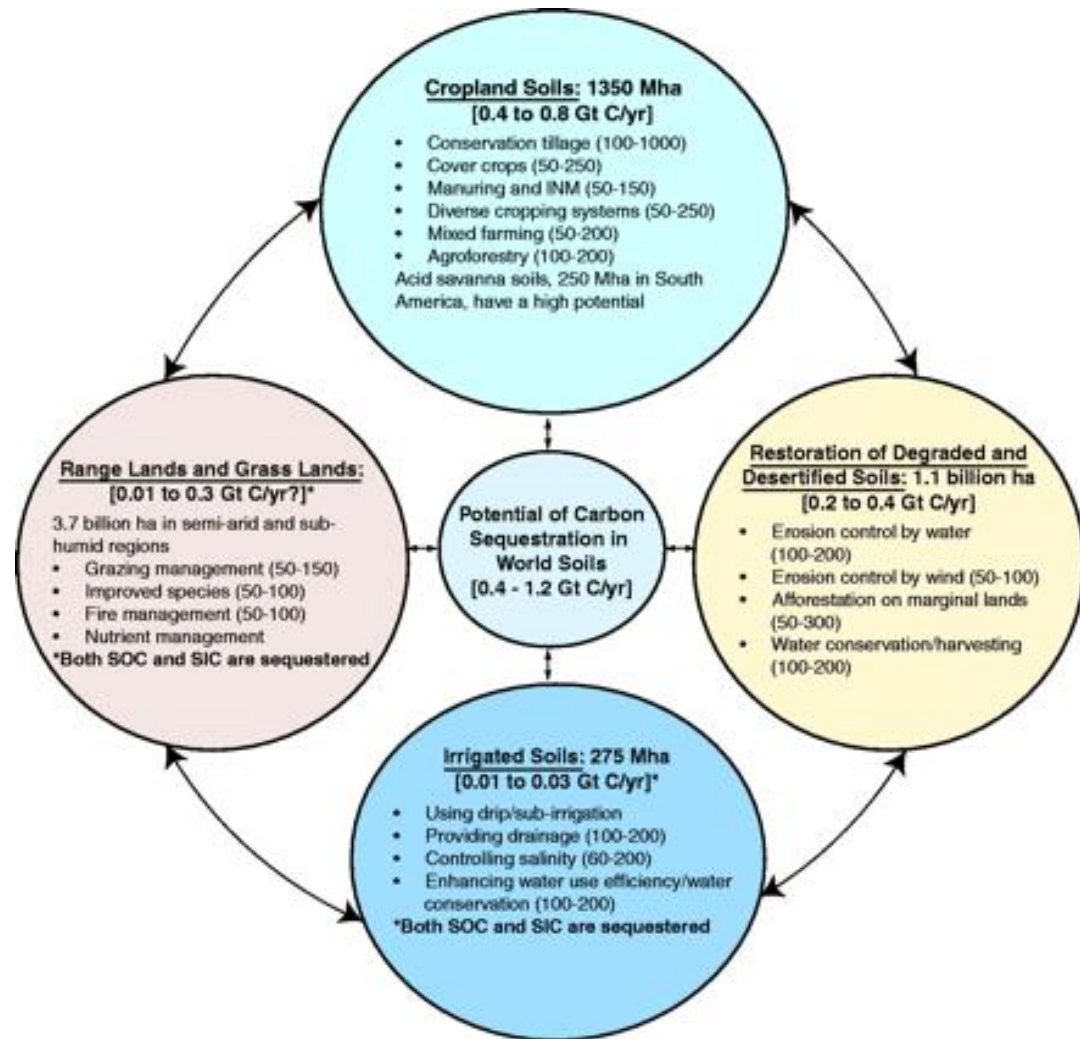
- An agriculture based company, Arcadia Biosciences, were the pioneers for nitrogen efficient crops
- Arcadia has seen crops use up to 50% less nitrogen to produce the same yield.
- Throughout multiple trials they have even seen an increase in yields.

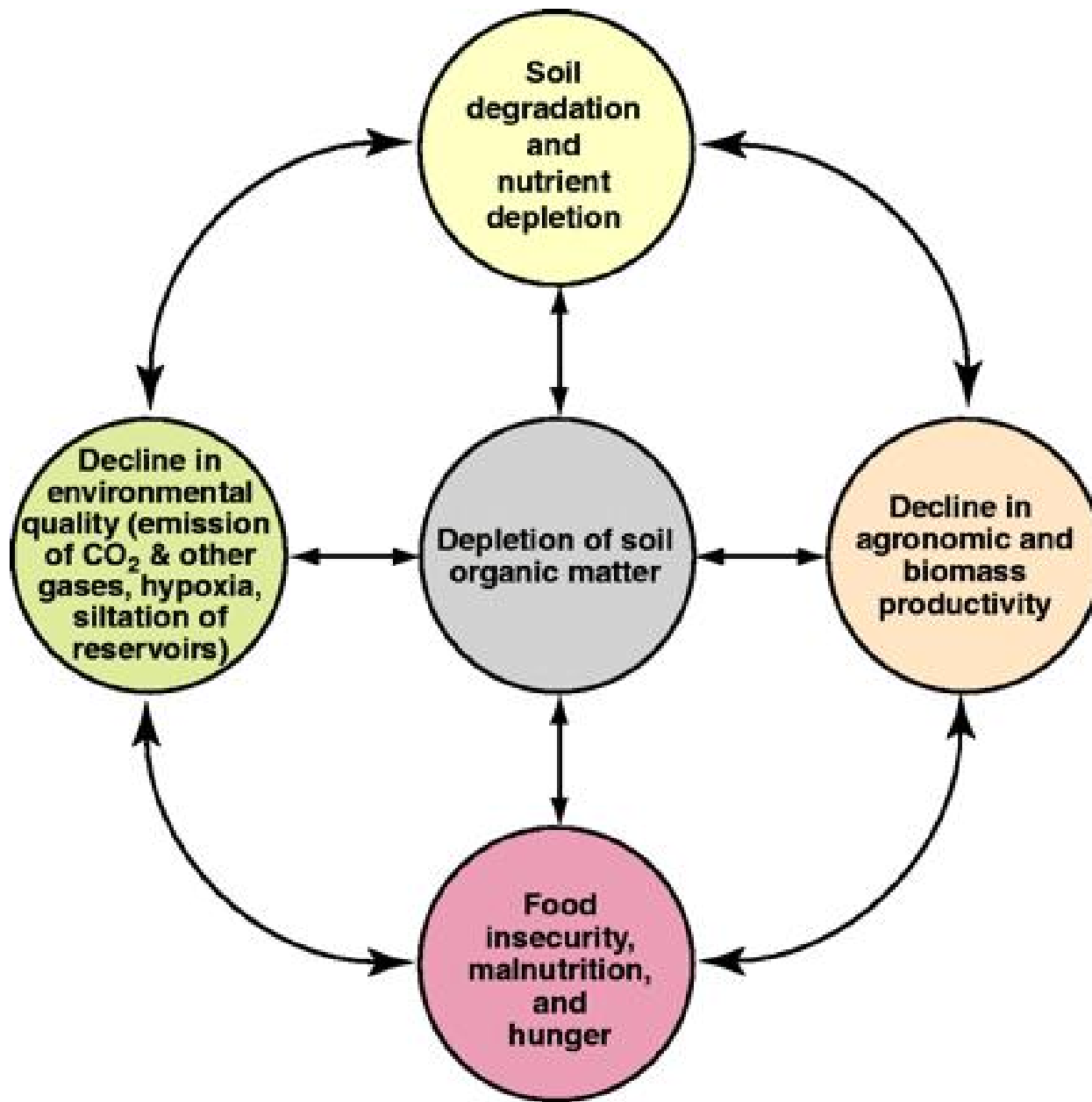
No-Till Farming

- For three years, the USDA measured runoff and sediment loads at the mouth of each drainage channel in specific areas after almost every rainfall.
- It was found that there was 70 percent more runoff and 52 times more eroded material had escaped from the tilled fields than from the no-till fields.
- No-till farming, and the adoption of critical agricultural technology is key to producing food in a clean and efficient way

Soil Carbon Sequestration

- Can help decrease CO₂ emissions from agriculture by...
 - Comparing attainable capacity in soil (only about 55-60% capacity in soil)
 - Incorporating carbon from atmospheric CO₂ into biomass





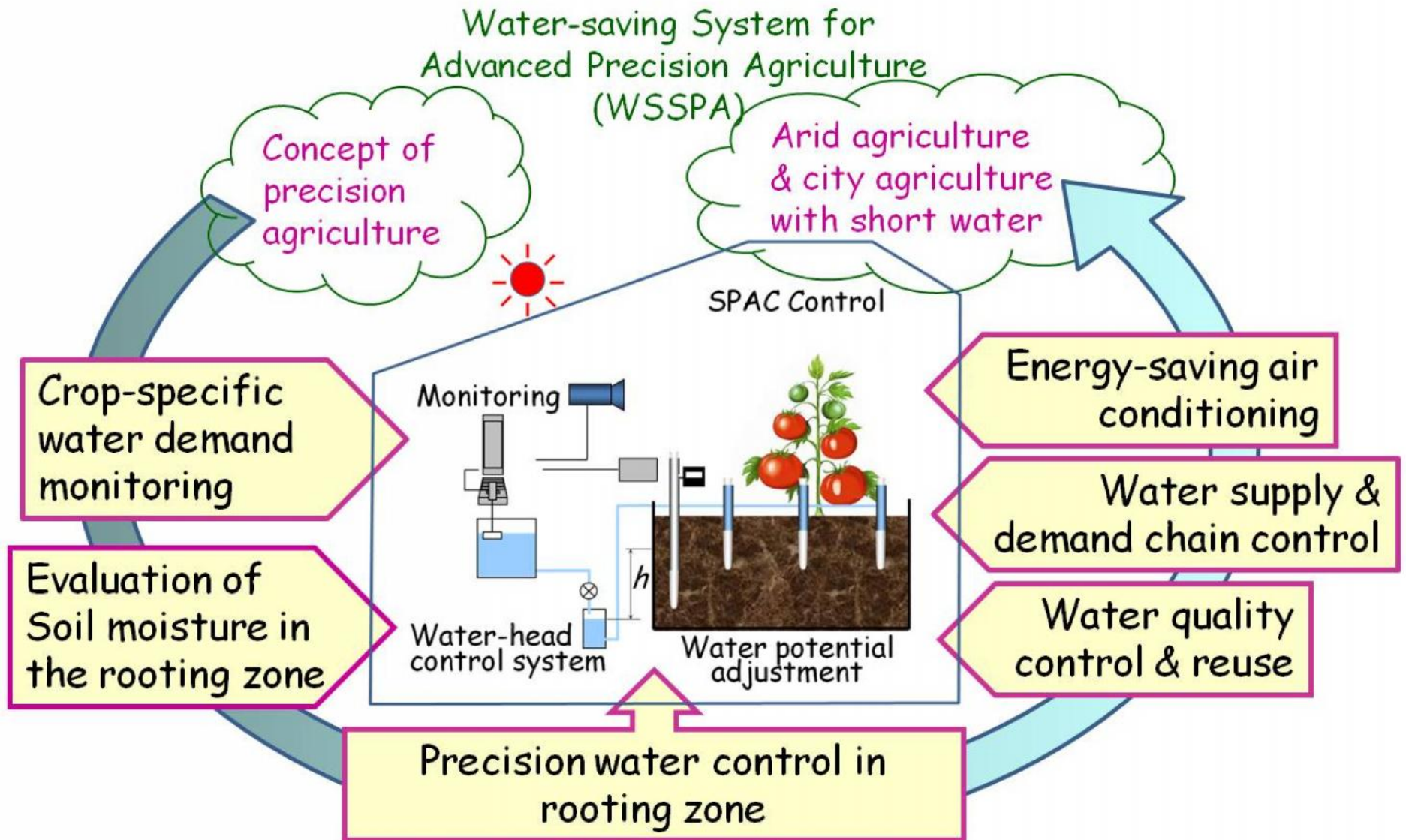
Carbon Sequestration is clean and beneficial for crop yields

Reduces rate of enrichment of atmospheric concentration of CO₂
 Improves and sustains biomass/agronomic productivity
 Potential to offset CO₂ emissions by .4 to 1.2 GT C/year or from 5 to 15% of global emissions

Precision Agriculture



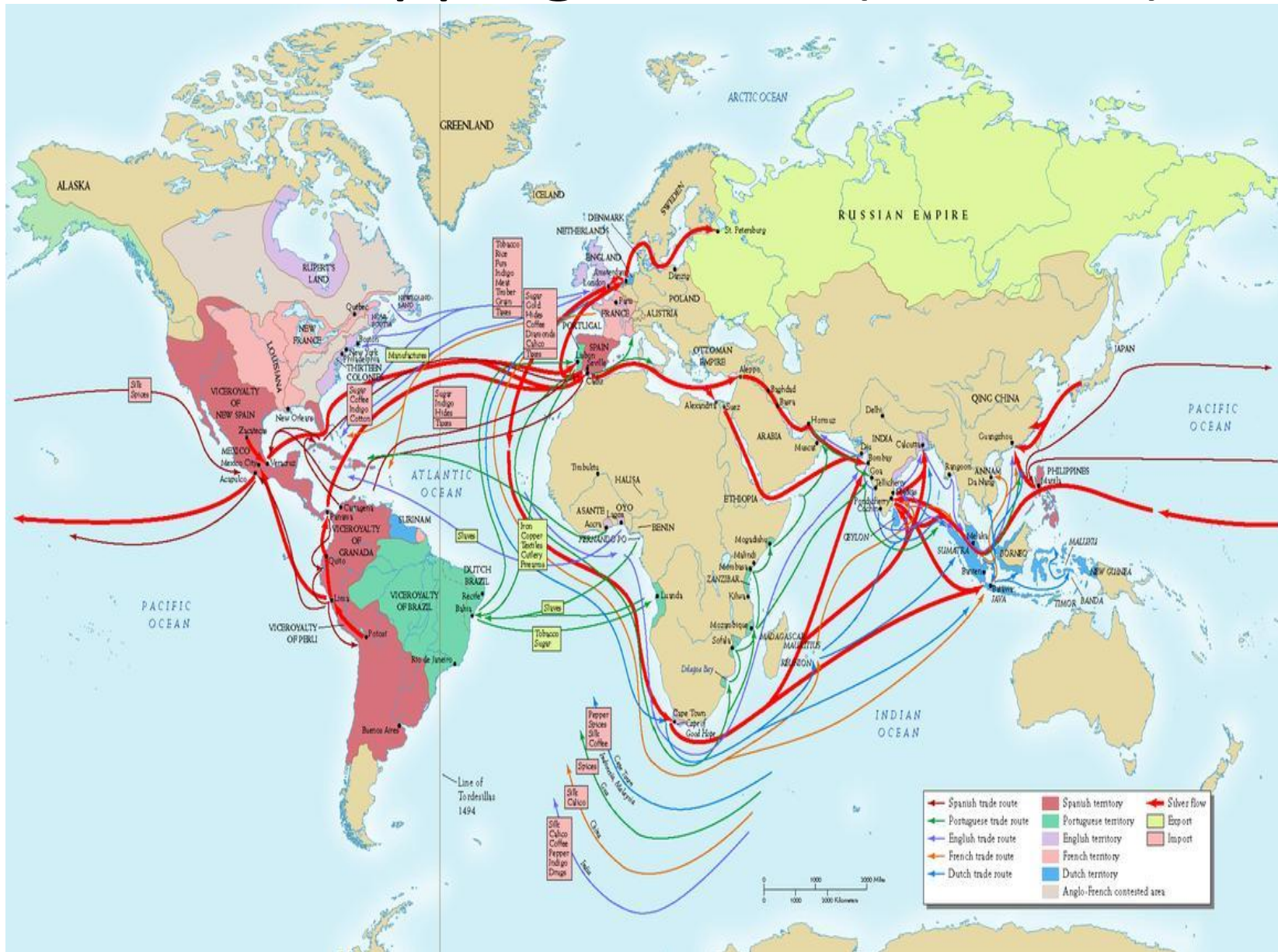
Example



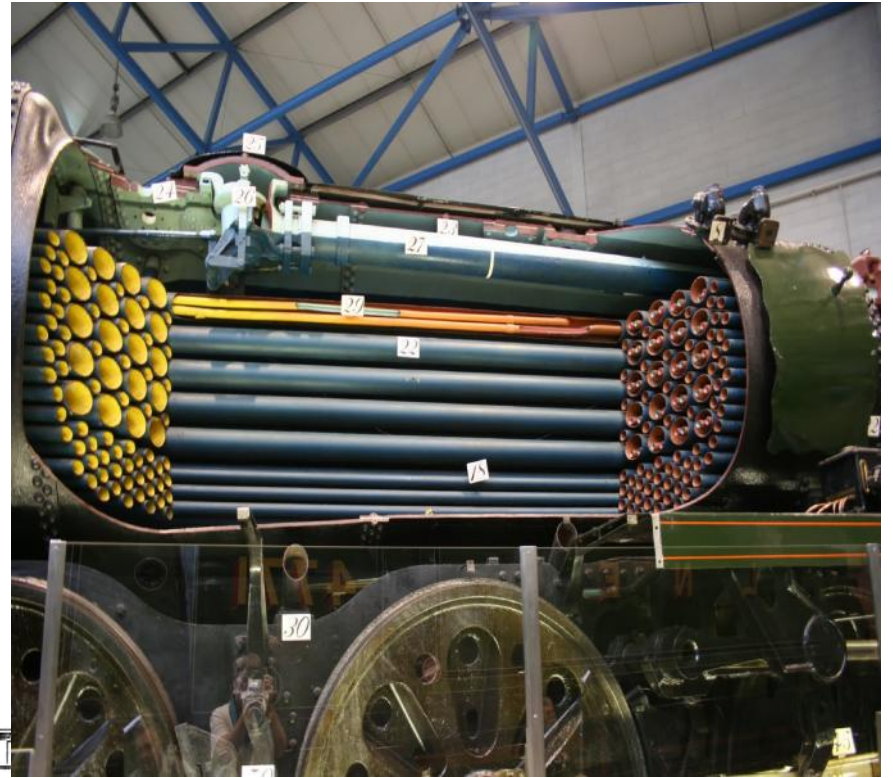
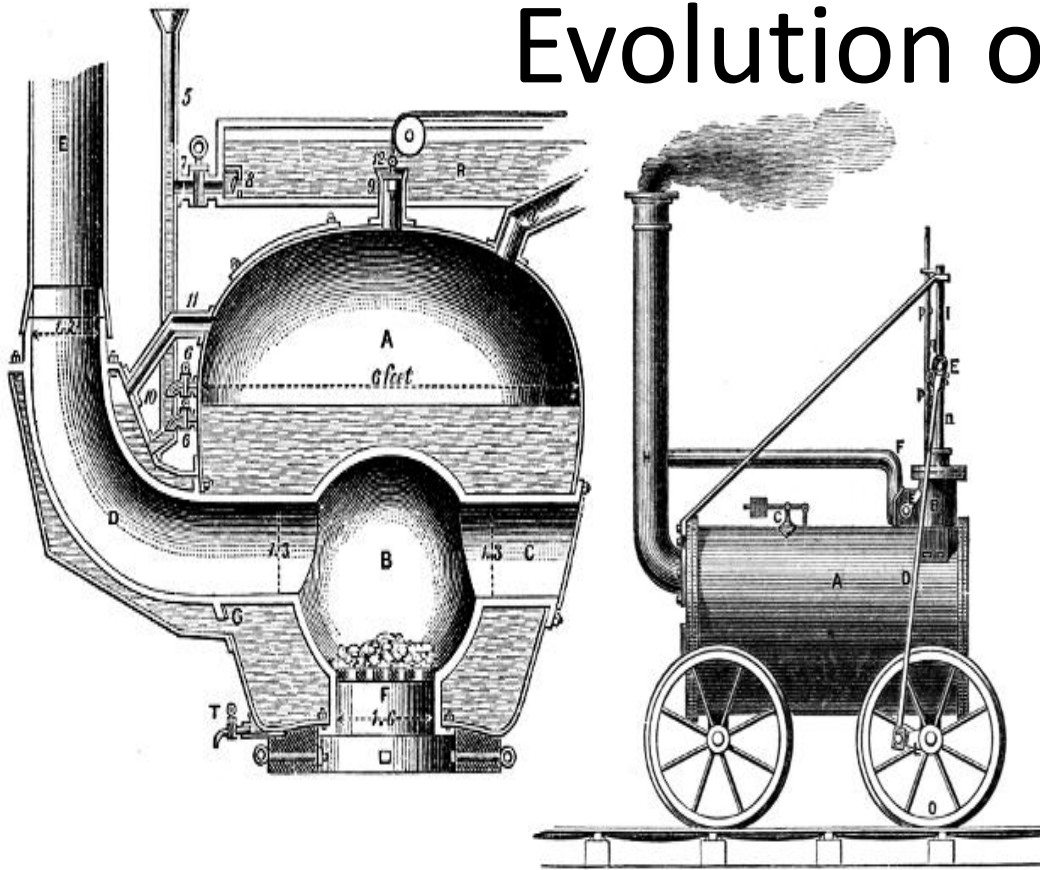
Technology, Transportation, and Communications

<http://www.gapminder.org/videos/hans-rosling-and-the-magic-washing-machine/>

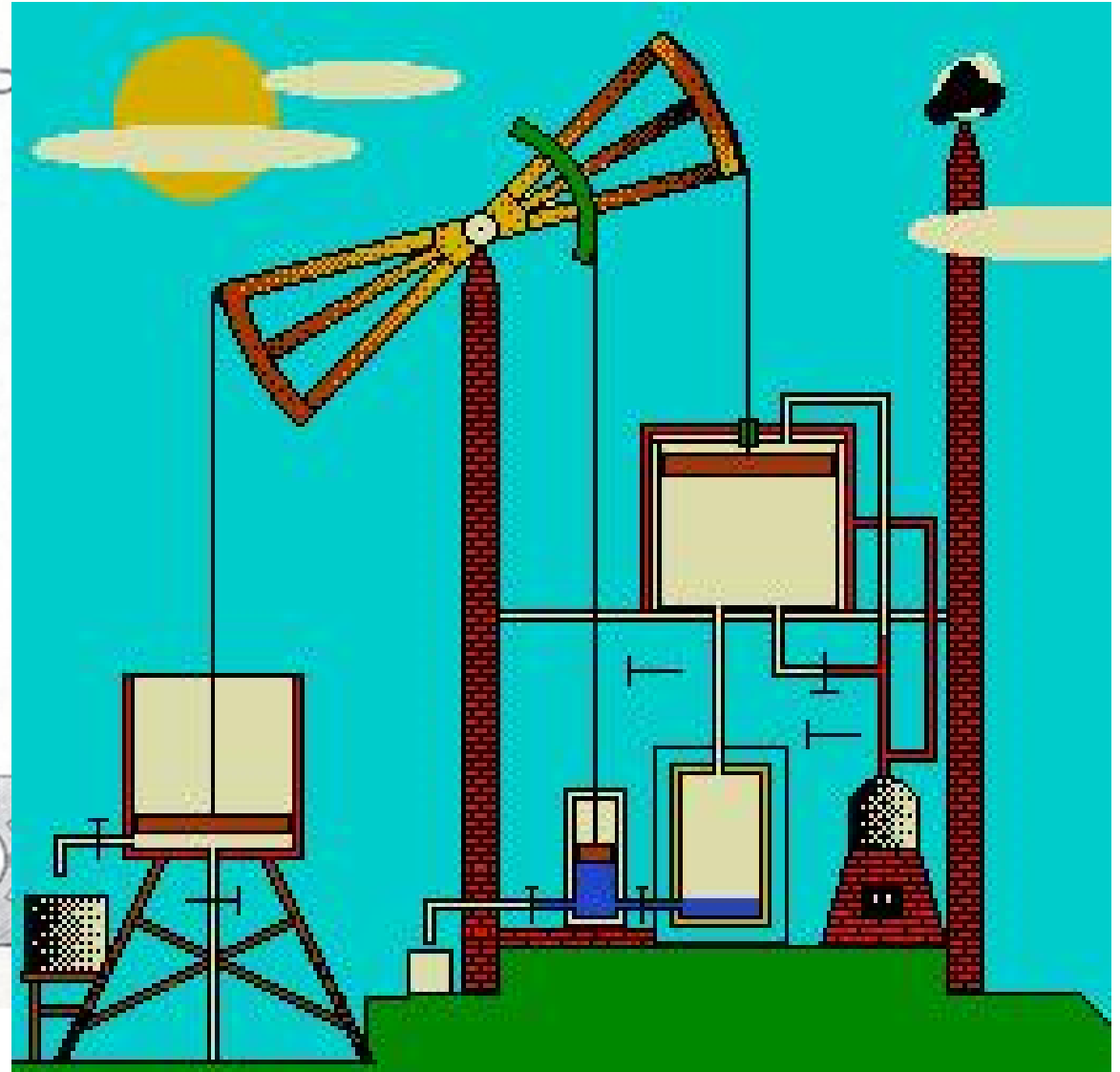
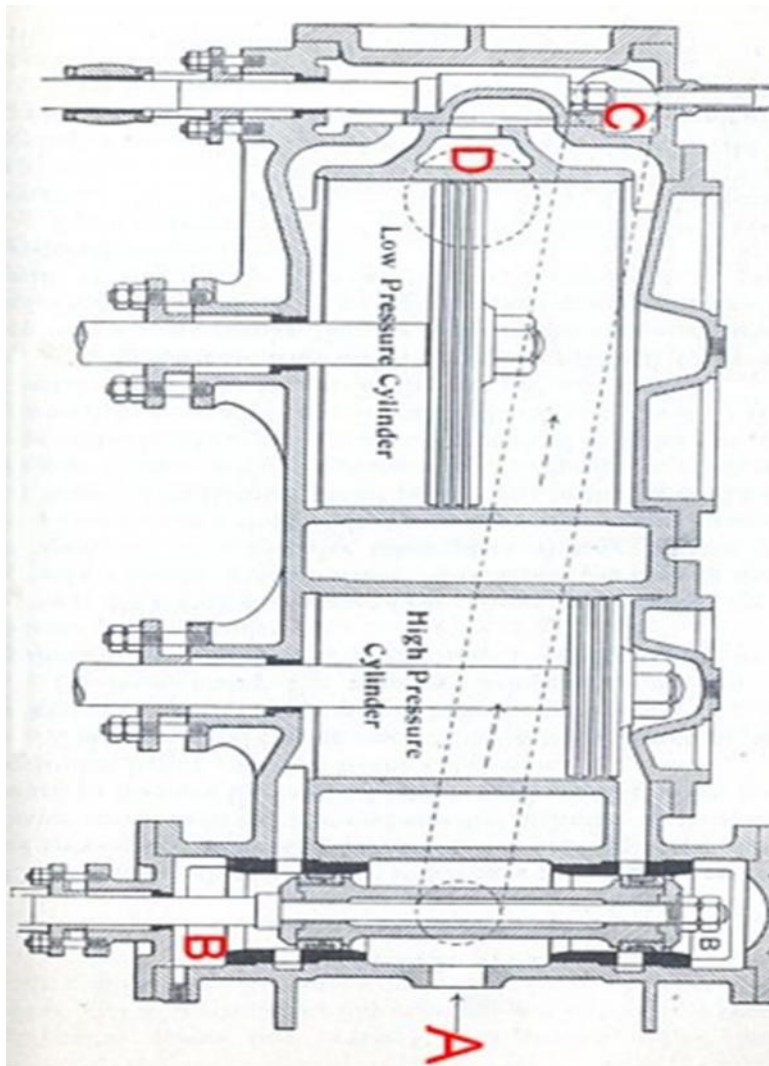
Global shipping Routes (Colonial)



Evolution of Steam



How a Mobile Steam engine works



Modern Shipping

Primarily Diesel Powered

Much quicker and getting quicker

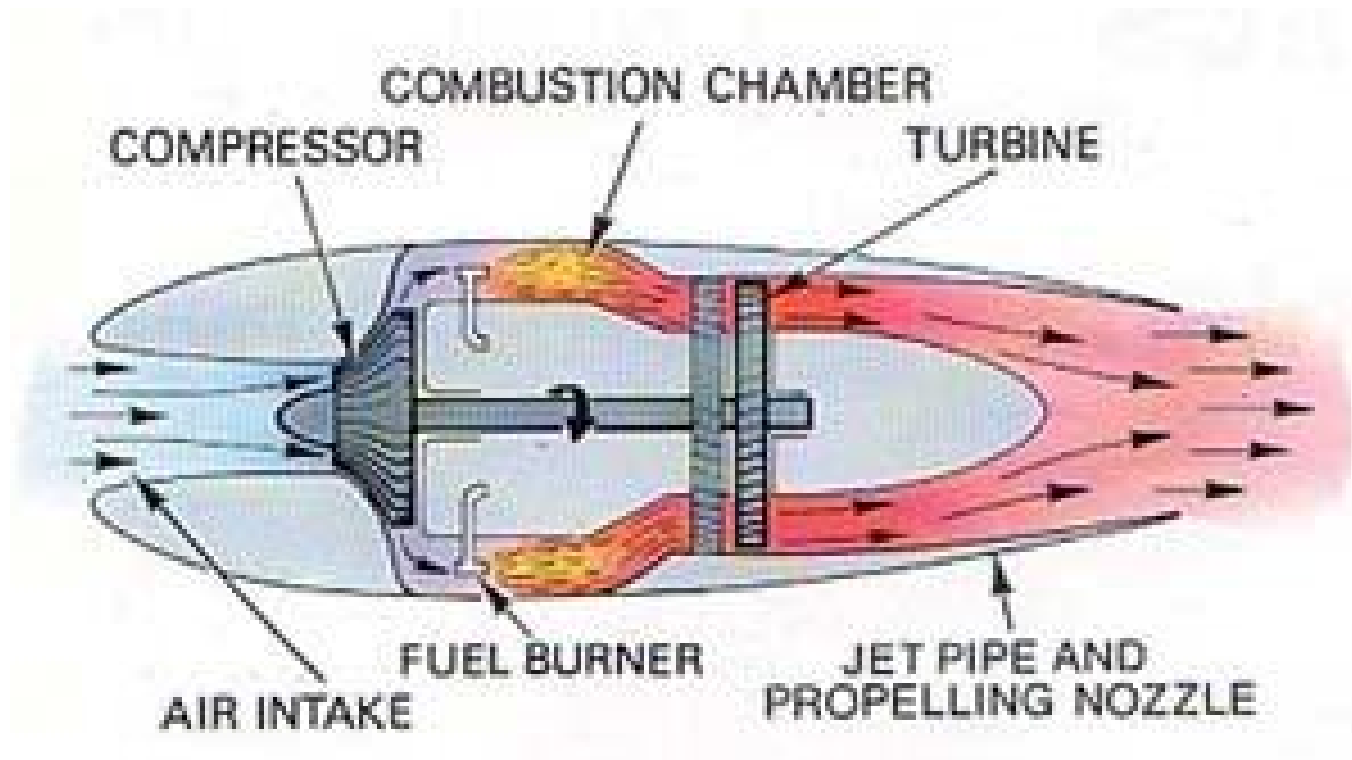
- Corn
- Wheat
- Beans
- Oils

As well as any thing that isn't in the chilled or frozen section of the grocery store.

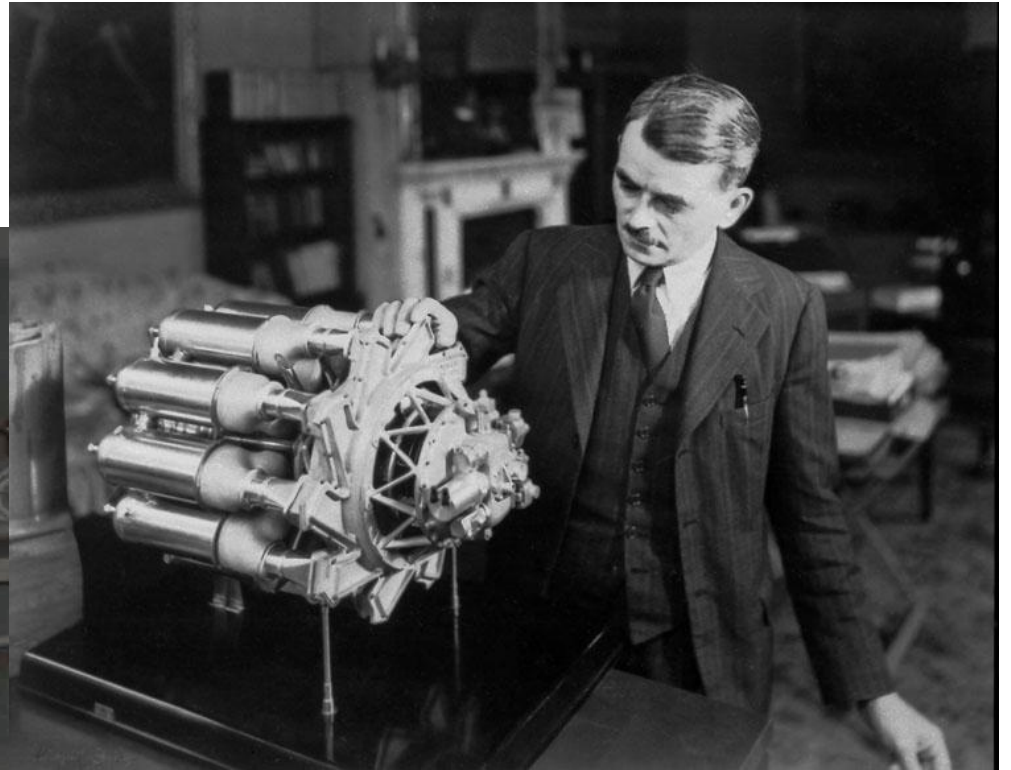


Gas turbines

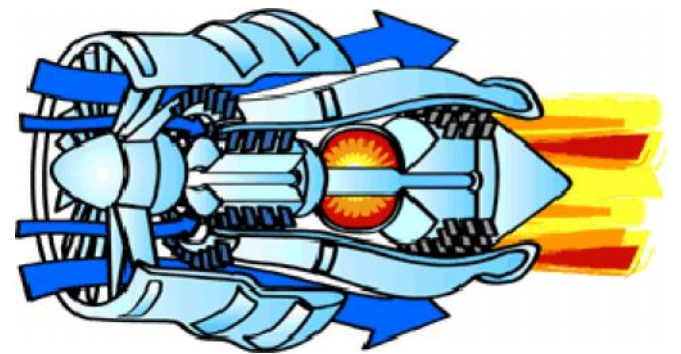
Gas turbines has an upstream rotating compressor with a downstream turbine and a combustion chamber in the middle.



Frank Whittle



- Single handedly invented the turbine engine
- Served as an officer in the British Royal Air Force
- Only 22 when he first thought to use a gas turbine engine to power an airplane
- With private financial support, he began construction of his first engine in 1935.
- Co-inventor of the jet engine along with Dr. Hans von Ohain.



Air Transportation

Air transport are used more perishable items and need a quicker delivery method : Best in transporting foods that wont last long

More popular foods to transport by air

Asparagus from Peru

Bell Peppers from the Netherlands

Blackberries from Chile

Blueberries from New Zealand, Argentina, and Chile

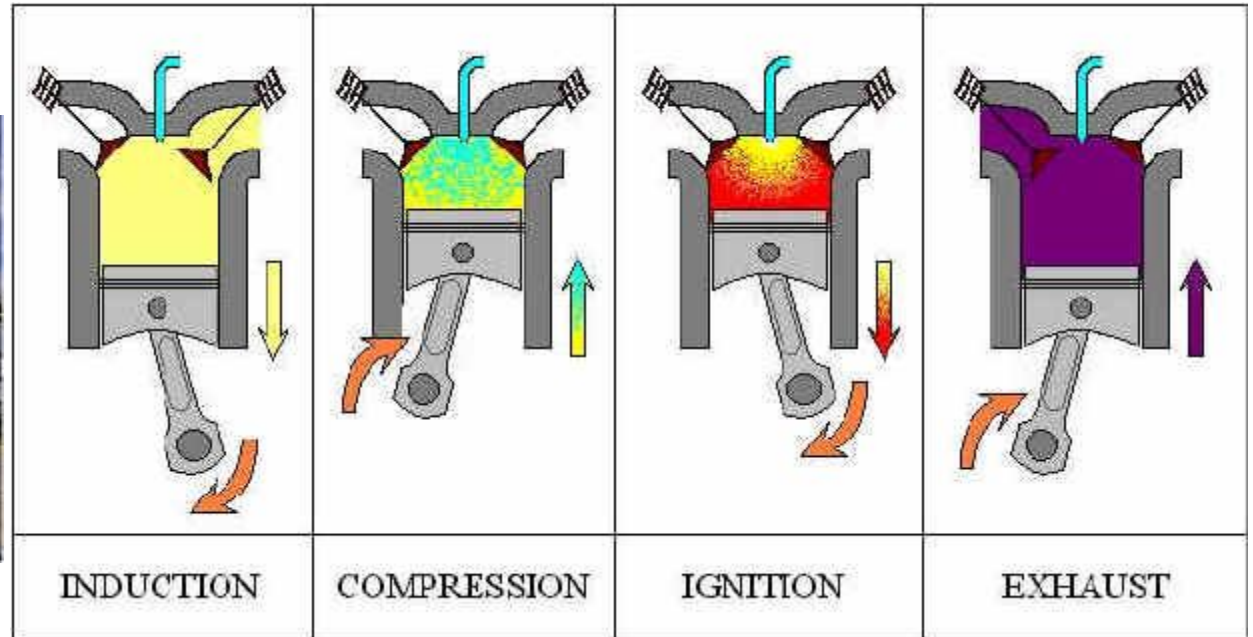
Cherries from Chile

Raspberries from Chile



747-800F

Significance of Diesel Engine



- Fuel Efficient = mass transportation
- Decline in transport costs helped the diffusion of ideas, new goods and machines.
- Transportation and Mass Production allowed for countries to specialize in a certain foods

Trucking



Often times the truck is just a means to get items to more efficient or quicker means of transport

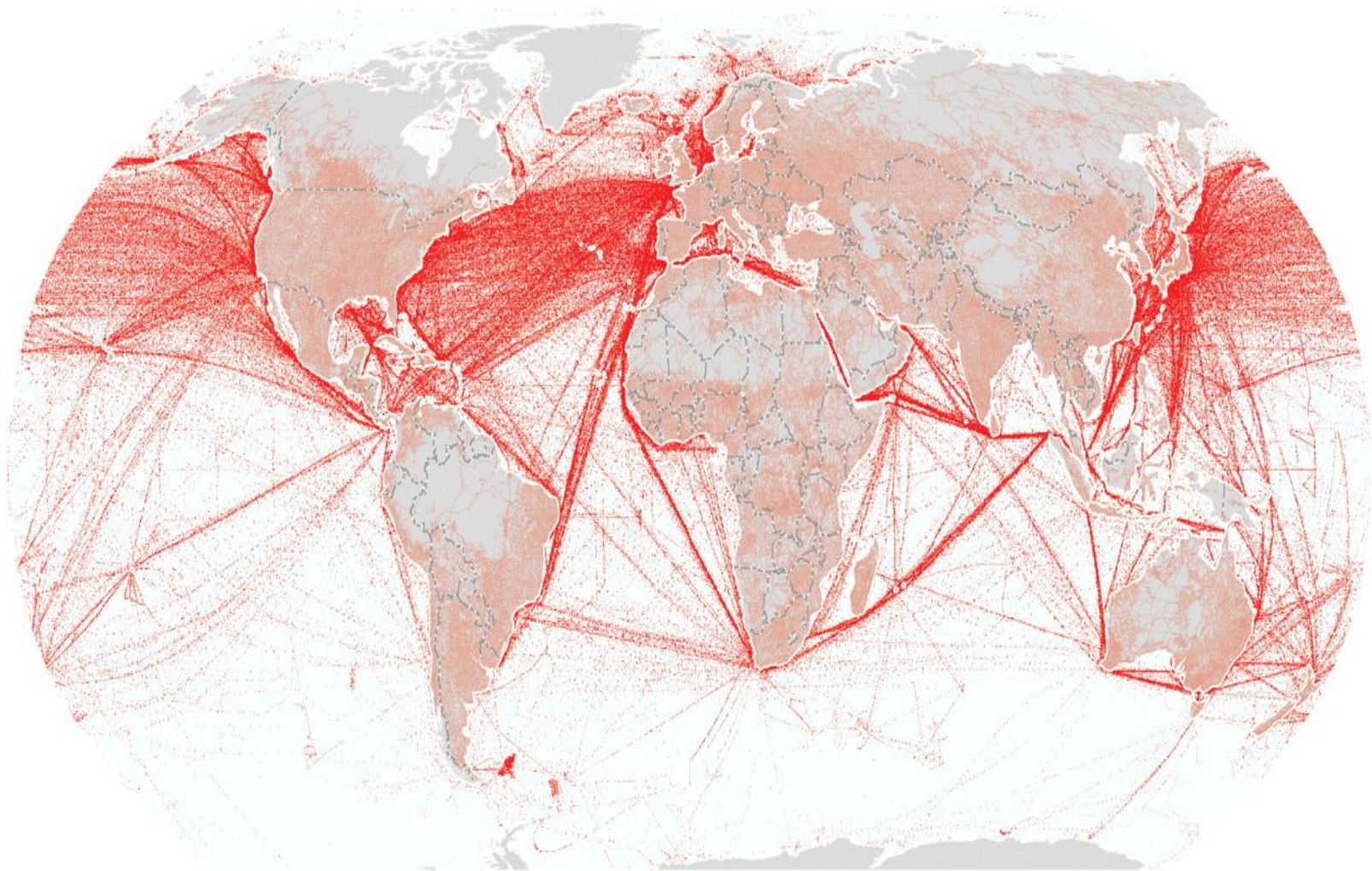
In terms of Globalization this is almost always the case since it is fairly difficult to drive across the Pacific

Items that can be shipped By refrigerated rail cars:

- Apples
- Baby Peeled Carrots
- Cantaloupes
- Celery
- Carrots, whole
- Salad Dressings
- Juices, Fresh
- Lemons
- Onions
- Oranges
- Potatoes



Global Shipping Routes (Present day)



 Shipping Lanes  Road Networks

The Importance of Food Preservation



1. Food preservation increases the shelf-life of foods, preserving our perishable foods increases food supply.
2. Tears down the barriers of seasonality, by making all foods available throughout the year.
3. Adds variety to the diet, therefore improving nutrition & decreasing nutritional inadequacies.
4. Saves time by reducing preparation time and energy because the food is partially processed.
5. Decreasing wastage of food by preventing decay or spoilage of food, caused by bacteria overgrowth.

"What is the importance of food Preservation?." *Preserve Articles* . N.p.. Web. 14 Nov 2013.
<<http://www.preservearticles.com/201105176772/what-is-the-importance-of-food-preservation.html>>.



Methods Used Before Refrigeration

- Stored food in cellars, outdoor window boxes, or underwater in lakes, wells, or streams that were nearby
- Salting, Pickling, Smoking, or Spicing were also used to preserve food
- A more intermediate level of cooling foods were adding chemicals such as: sodium nitrate or potassium nitrate to water, which dropped the temperature of the water
- Cut river & lake ice and sold to consumers through the natural ice industry
- These older methods could not prevent food from spoiling rapidly & without the development of pasteurization bacterial infestations could not be stopped either

Krasner-Khait, Barbara. "The Impact of Refrigeration." *History Magazine* . n.d. n. page. Web. 16 Nov. 2013. <<http://www.history-magazine.com/refrig.html>>.



Ice House (Iran)

- Could store 30,000 tons in a 30 feet by 100 feet by 45 feet high building
- First designed in the early 17th century

The Modern Refrigerator



Refrigeration's Role In Food Preservation

- Bacteria exists everywhere in nature & only sterilized & sealed food contains no bacteria
- Nutrients, moisture, and favorable temperatures (between 40 and 140 ° F) allow bacteria to grow rapidly.
- A refrigerator set at 40 ° F or lower will stop bacteria growth.
- The basic idea of refrigeration is food preservation
- We want to preserve food in order to:
 1. Slow down the growth of disease-causing bacteria (can not kill bacteria w/ refrigeration)
 2. Destroy enzymes that spoil or discolor food rapidly
- Over the past 150 years refrigeration has allowed us to preserve and chill food, along with other substances

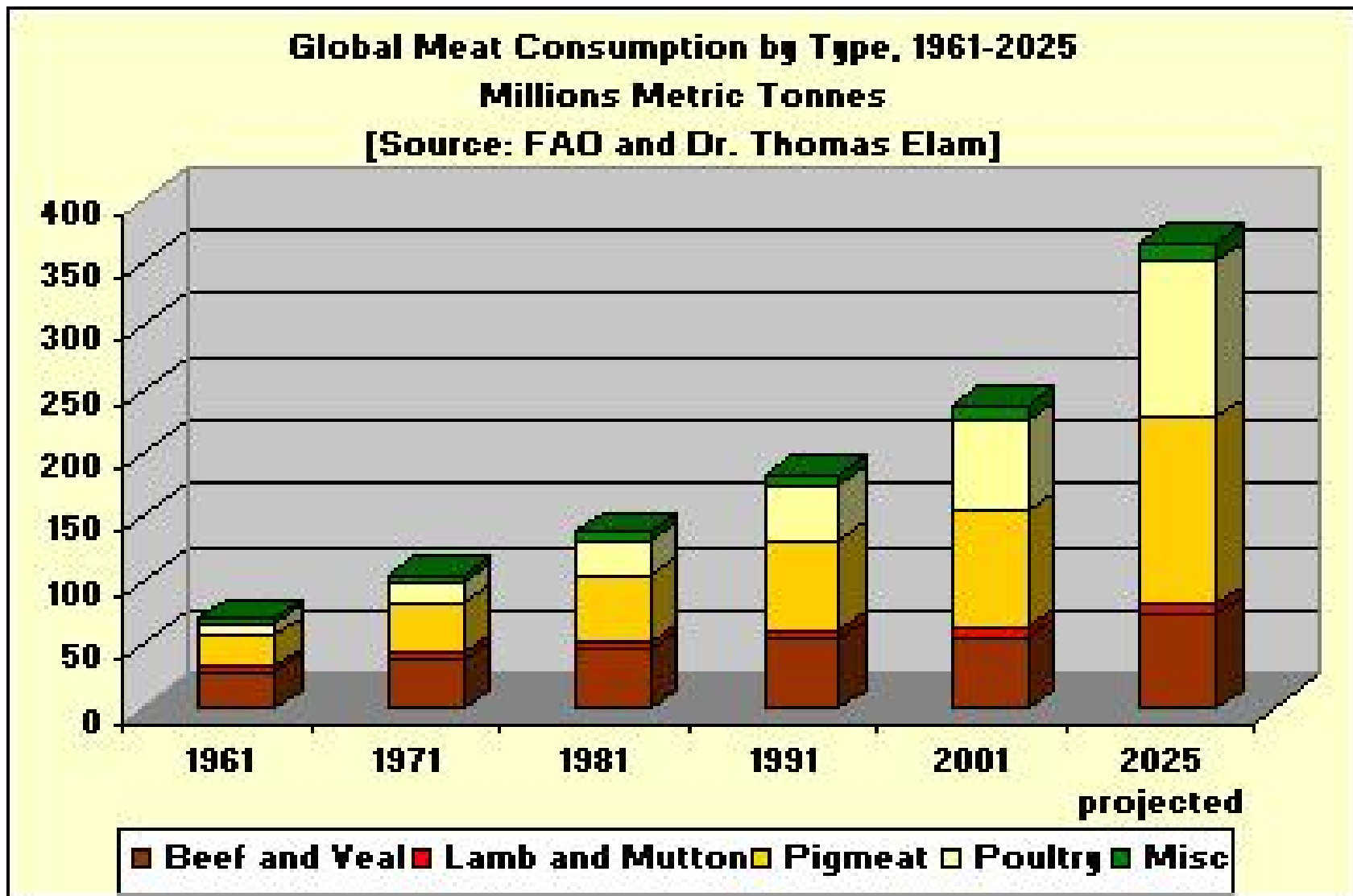
Meat Packing Industry

- Before refrigeration farmers did not slaughter or package meat , instead they sold live cattle which was moved by trains.
- The U.S meat industry was dependent on wild animals for their meat supply
- This method however lowered meat supply & meat quality because cattle often died on the way due to stress:
 - Stresses caused by water or food deprivation, rough handling, exhaustion from long distances, animals would often fight as well, or die
- After refrigeration slaughtering became a key factor in the meat industry, ending the need to drive cattle
- Refrigeration & the refrigerated rail car gave birth to the dressed meat market
- You could now chill meat down to 0°C → shelf-life of up to 3 weeks

"Fao Corporate Document Repository." *Techniques and hygiene practices in slaughtering and meat handling*. Food and Agriculture Organization of the United Nations , n.d. Web. 17 Nov 2013.
<<http://www.fao.org/docrep/004/t0279e/t0279e04.htm>>.



Meat Production



Digital Technologies

- Impacts of Mobile Phones on Smallholders
 - Information Hotlines:
 - Kisan Call Centres (KCC) in India
 - M-Kilimo (fka Kenya Farmer's Helpline)
 - Access to agricultural experts
 - » Speak Swahili, English, and other local languages
 - Farmers can obtain information
 - » Climate, weather, land prep advice, pest management, harvesting and marketing information, locations of agro-dealers and capital sources
 - Continued support from organizations such as the Grameen Foundation

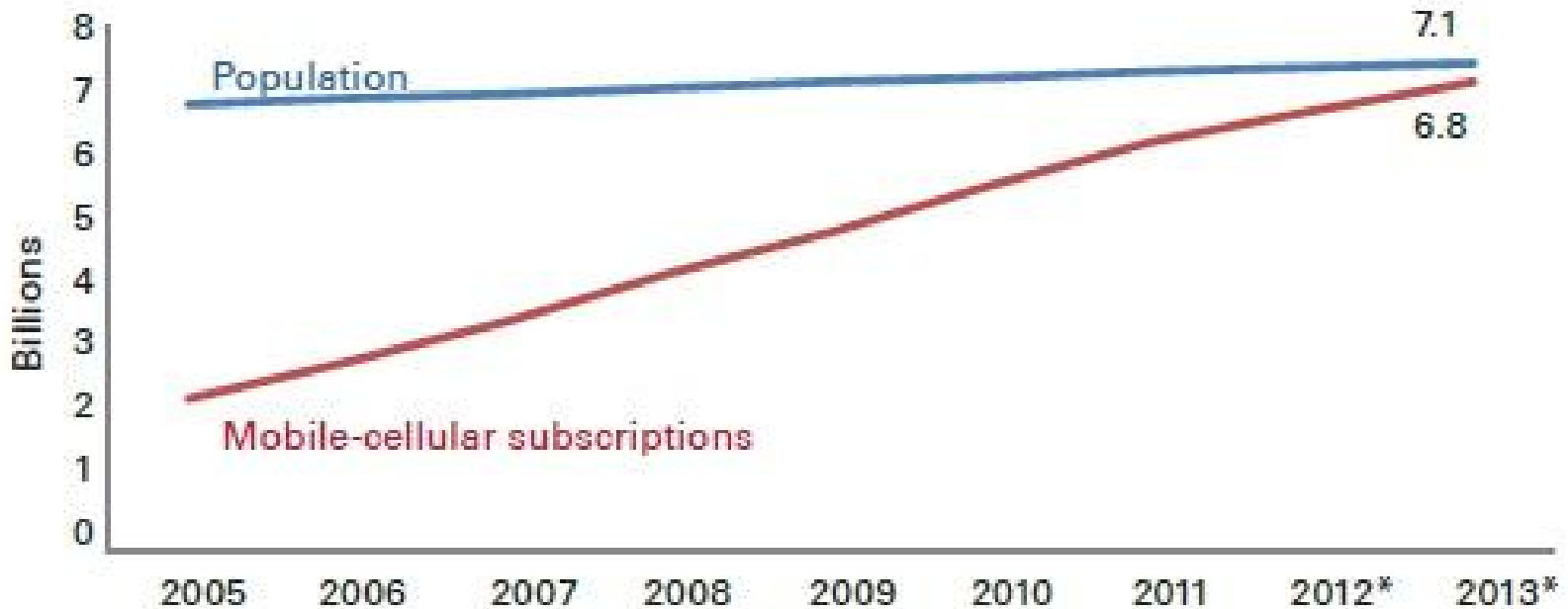
Subsistence Agriculture to Agribusiness

- Impacts of Mobile Phones on Smallholders
 - Emergence of Rural Mobile Banking
 - In Kenya, M-PESA serves as an online banking system
 - M-PESA was created by Safaricom, Kenya's mobile network operator
 - In December, 2011, M-PESA processed \$1.35 billion in transactions (Central Bank of Kenya)



Subsistence Agriculture to Agribusiness

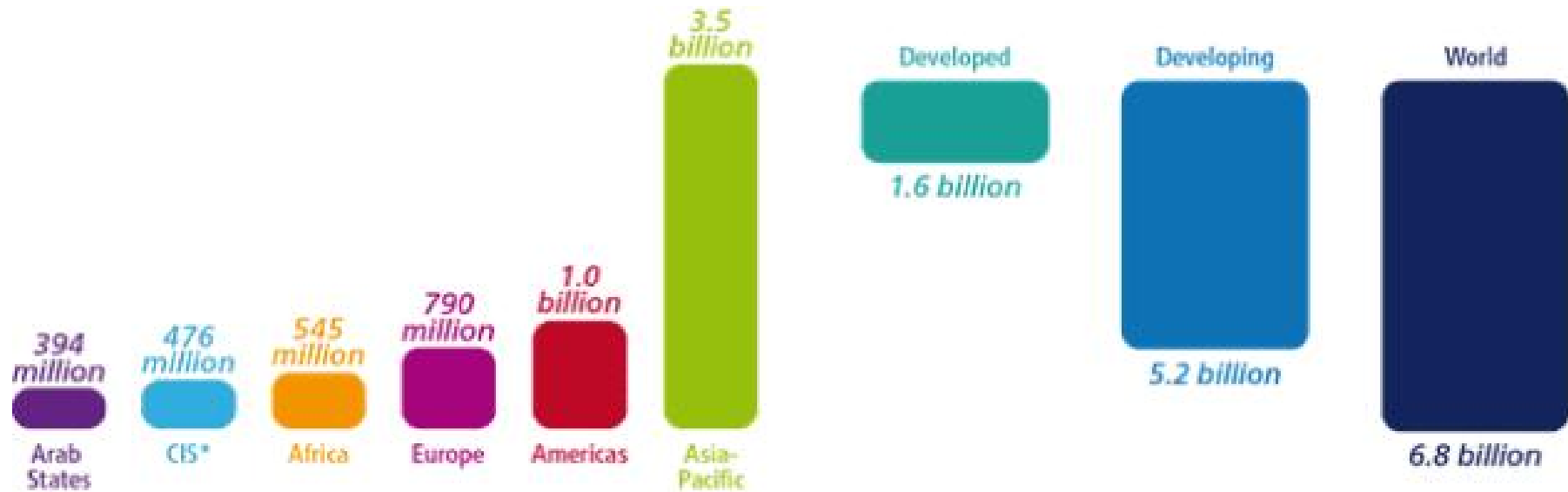
- Who has Mobile Phones?



Source: ITU World Telecommunication /ICT Indicators database

Subsistence Agriculture to Agribusiness

- Who has Mobile Phones?



*Commonwealth of Independent States.

Source: ITU World Telecommunication/ICT Indicators database

Subsistence Agriculture

- Self-sufficient farming (Smallholders)
- Farms contain wide range of crops and animals
- Decisions based on:
 - 1.) Needs of the family
 - 2.) Market Prices



Subsistence Agriculture to Agribusiness

- Large companies dominate international agricultural trade and prefer large suppliers who are generally more reliable as business partners and generate lower transaction costs.



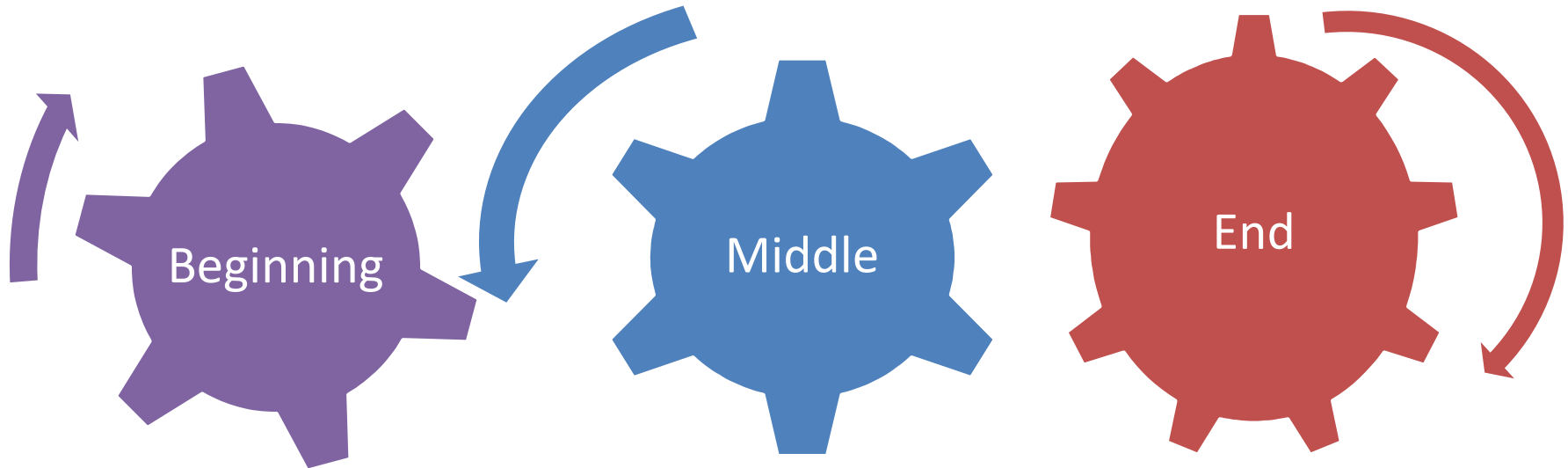
Subsistence Agriculture to Agribusiness

- Agribusiness and Mobile Phones
 - Agribusiness is the business of agriculture production
 - Crop Production (Farming and Contract Farming)
 - Seed Supply
 - Agrichemicals,
 - Farm Machinery
 - Processing
 - Distribution
 - Marketing
 - Retail Sales
 - Impacts are seen in Agribusiness Value Chains

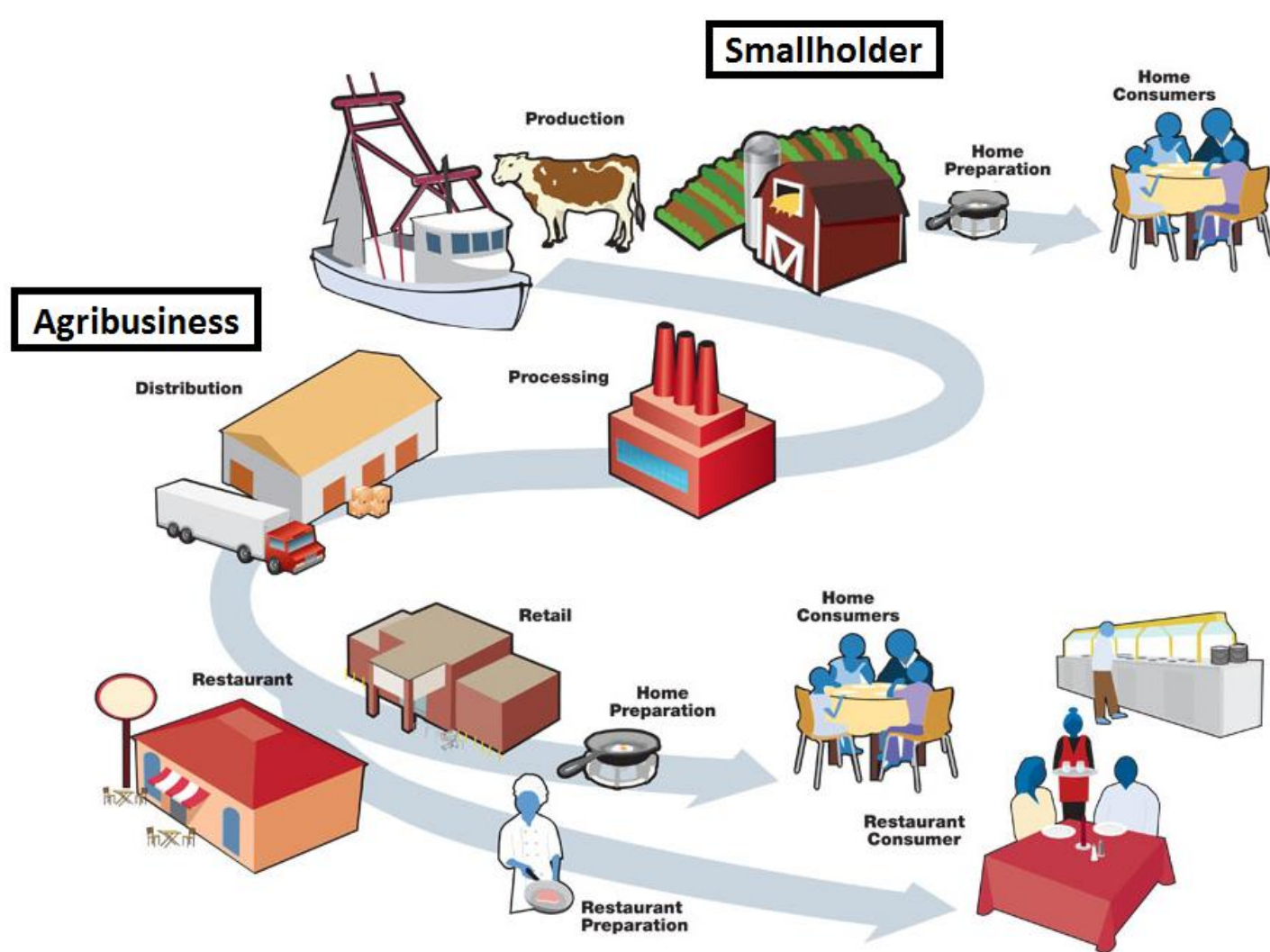


Value Chains

- Value Chains help answer:
 - How the products you produce reach the final consumer.
 - The structure (economic relationships) between players in the chain.
 - How this structure is likely to change over time.
 - The key threats to the entire value chain.
 - The key determinants of your share of the profits created by your chain.



Value Chains



Value Chains

- Key Factors to Agribusiness Value Chains:
 - Differentiation
 - Economies of Scale
 - Economic Relationships that Govern the Transactions
 - Consumer Trends and Key Technological Advances

Mobile phones and mobile finance applications provide value chains with a cheaper, more efficient, traceable and transparent payment method for high-volume, low-value transactions.

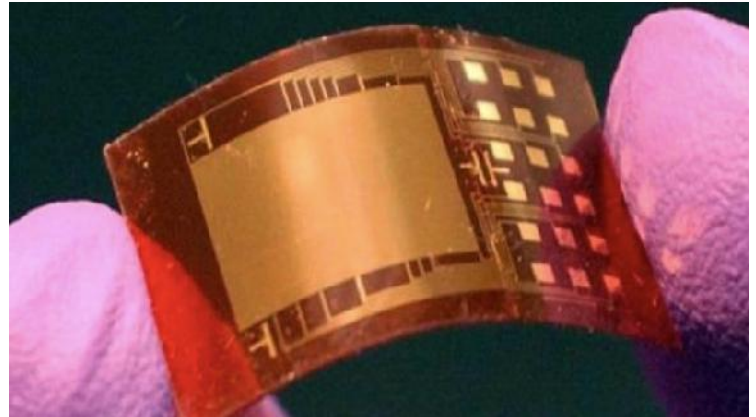
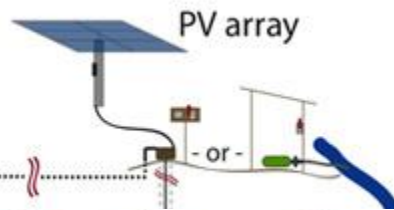
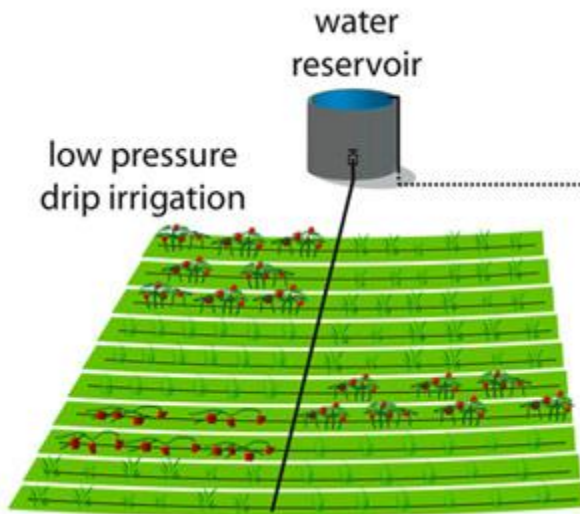
Advantages of Mobile Phones

- Reducing costs of coordination (collection of production, distribution of inputs, etc.)
- Increasing transparency in decision making between partners
- Reducing transaction costs
- Disseminating market demand and price information
- Disseminating weather/pest/and risk-management information
- Disseminating best practices to meet quality and certification standards
- Collecting management data from the field
- Insure traceability

Advantages of Mobile Phones

- Supply-chain management (SCM) software running on networked computers and handheld devices typically performs the following functions:
 - Stores information about suppliers
 - Enables the company to transmit an order to farmers
 - Allows Production to be monitored

Future Tech for Development



Are drones the new iPhones?

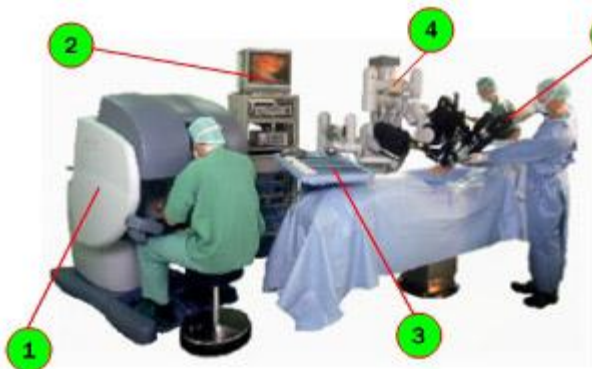
Why Amazon's Jeff Bezos – and your neighbor – love the flying tech

1 Comment

MarketWatch
THE WALL STREET JOURNAL.
December 3, 2013 10:36 AM EST

By Catey Hill 5,304 followers

Amazon AMZN -1.77% CEO Jeff Bezos and the U.S. government aren't the only ones experimenting with drones. Average Joes are buying them too. They're using the flying technology to shoot videos of weddings, Little League games, and for other, less than wholesome, purposes.



- 1 Surgeon Console
- 2 Image Processing Equi
- 3 Endowrist Instruments
- 4 Surgical Arm Cart
- 5 Hi-Resolution 3-D Endo

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Photo courtesy of Intuitive Surgical



Total spending on these unmanned aerial vehicles, or UAVs, reached \$5.2 billion world-wide this year and is projected to more than double in the next decade, according to research firm Teal Group. In the U.S., the government is the main buyer of drones, but a handful of companies—including DJI, 3D Robotics and Parrot—have developed models aimed at the consumer market that are small, affordable and

QUIZ!!!

Are you Smarter than a
Chimpanzee?



<http://www.bbc.co.uk/news/magazine-24836917>