



Food Resources

Global Hunger



2014 GLOBAL HUNGER INDEX BY SEVERITY

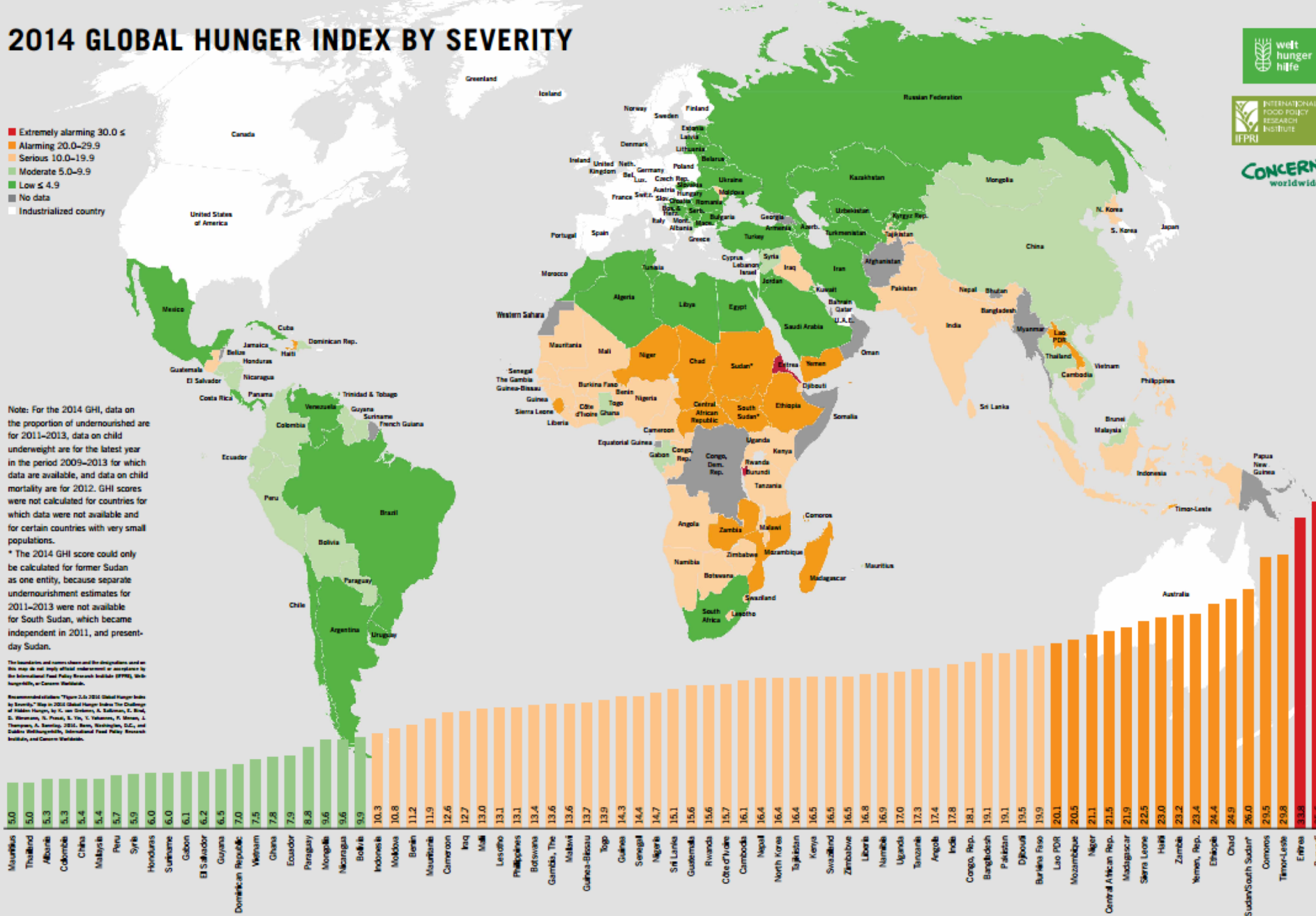
- Extremely alarming 30.0 &
- Alarming 20.0-29.9
- Serious 10.0-19.9
- Moderate 5.0-9.9
- Low < 4.9
- No data
- Industrialized country

Note: For the 2014 GHI, data on the proportion of undernourished are for 2011-2013, data on child underweight are for the latest year in the period 2009-2013 for which data are available, and data on child mortality are for 2012. GHI scores were not calculated for countries for which data were not available and for certain countries with very small populations.

* The 2014 GHI score could only be calculated for former Sudan as one entity, because separate undernourishment estimates for 2011-2013 were not available for South Sudan, which became independent in 2011, and present-day Sudan.

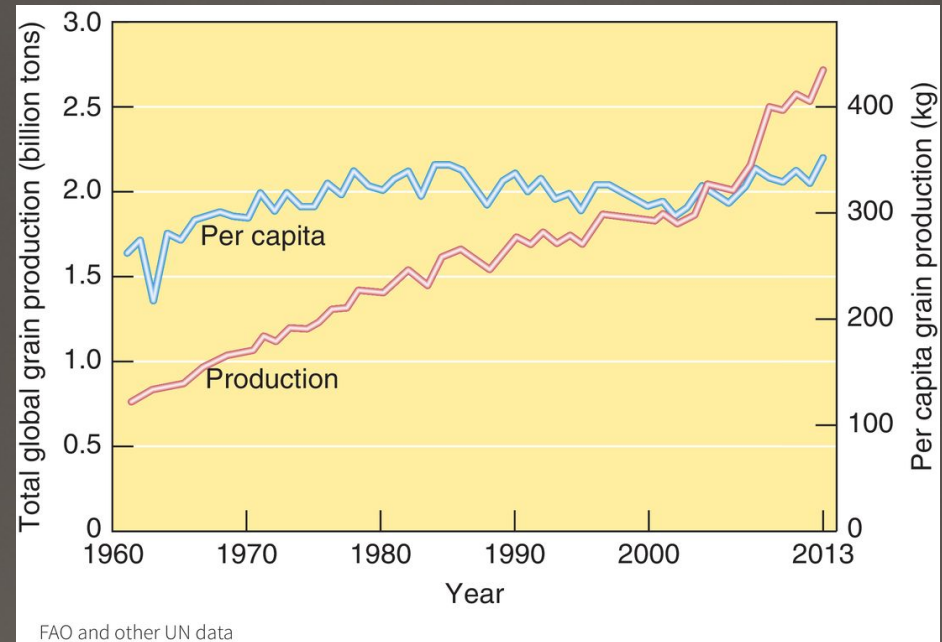
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Food Policy Research Institute (IFPRI), Welt Hungerhilfe, or Concern Worldwide.

Recommended citation: "Figure 2.0: 2014 Global Hunger Index by Severity." *Step in 2014 Global Hunger Index: The Challenge of Hidden Hunger*, by C. von Steiner, A. Ebelhar, E. Bini, S. Wiersma, N. Pineda, K. Yin, Y. Yatsunami, R. Mosen, J. Thomsen, A. Sankar, 2014. Bonn, Washington, D.C., and Dublin: International Food Policy Research Institute, Welt Hungerhilfe, and Concern Worldwide.



World Food Security

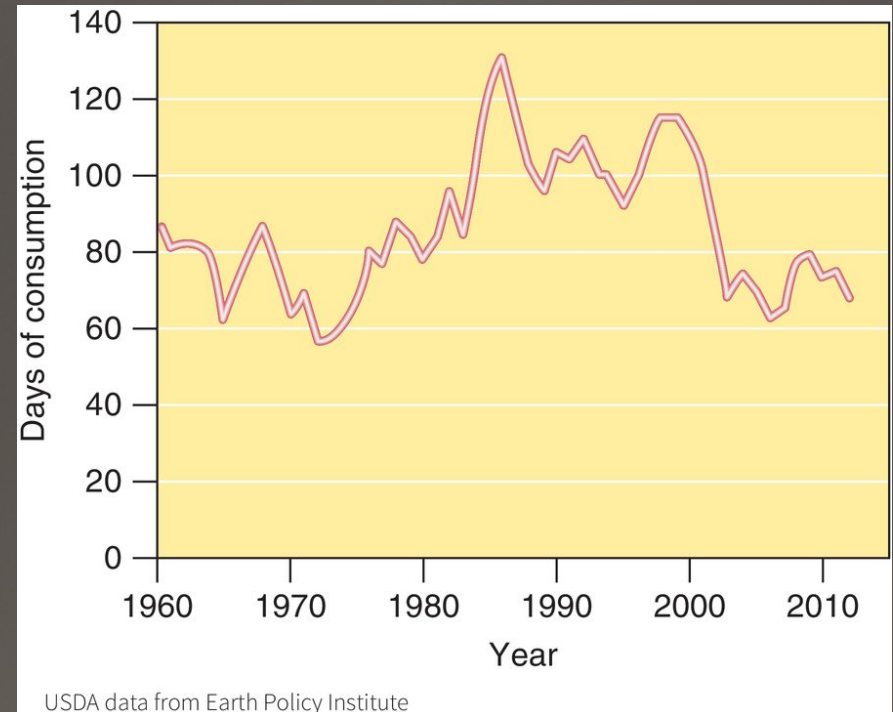
- The goal of all people having access to sufficient, safe, nutritious food at all times.
- Feeding a growing population is difficult
- Annual grain production (below) has increased from 1961–2008
- Due to increase in population, amount of grain per person has not increased



World Food Security

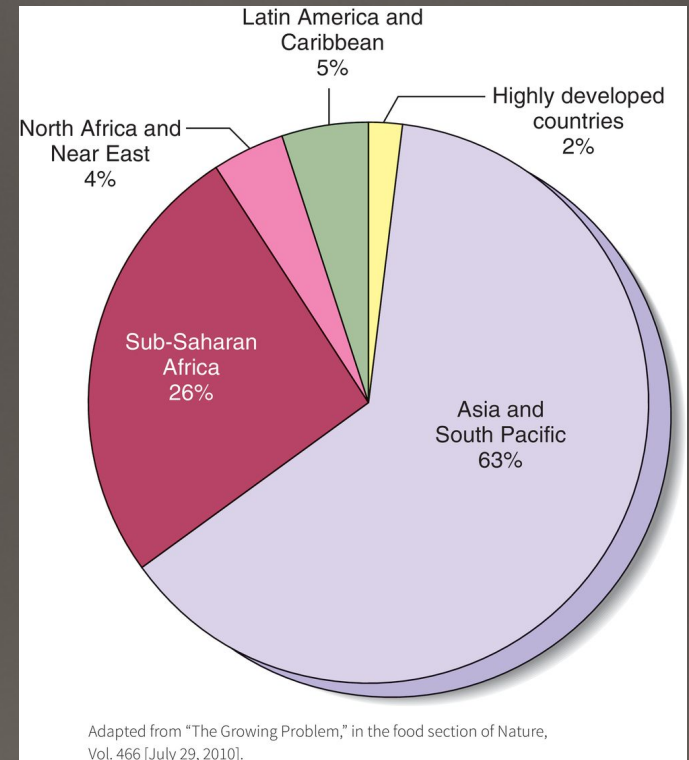
World Grain Stocks

- Amounts of rice, wheat, corn and other grains remaining from previous harvest as cushion against poor harvests and rising prices
- Provides measure of food security
- Decreased each year since mid 1980's



World Food Insecurity

- State of living in fear of going hungry
 - 49 million in U.S.
 - Malnourished, not receiving specific essential nutrients (1.3 billion poor people)
 - Rural than urban areas
 - Infants, children (182 million underweight) and the elderly

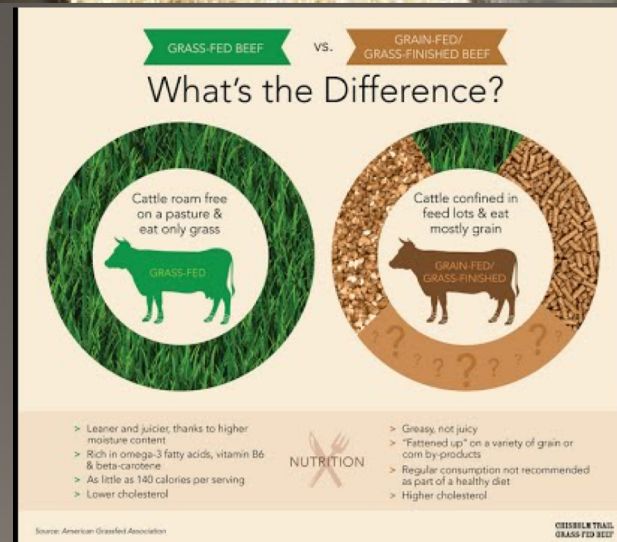


Why is there starvation?

- Not enough food in the world? Governments push for more crop production
- Economics and Politics
 1. Costs of distribution, storage and transportation
 2. Inequality in distribution -Getting food to those who need it is political
 3. Developing countries don't produce for local people consumption
 4. Developing countries Produce high-value crops for export

Decline in Grain Stocks relate to environmental degradation

- Rising temps
- Falling water tables and droughts
- Ethanol production
- More grain is going towards feeding livestock
- Increased meat consumption in developing countries



Challenges of current agriculture:

Sources of food are few

- Only >100 plants make 90% of our foods
- >330,000 plants
- >80 animals provide protein-rich foods: poultry, livestock

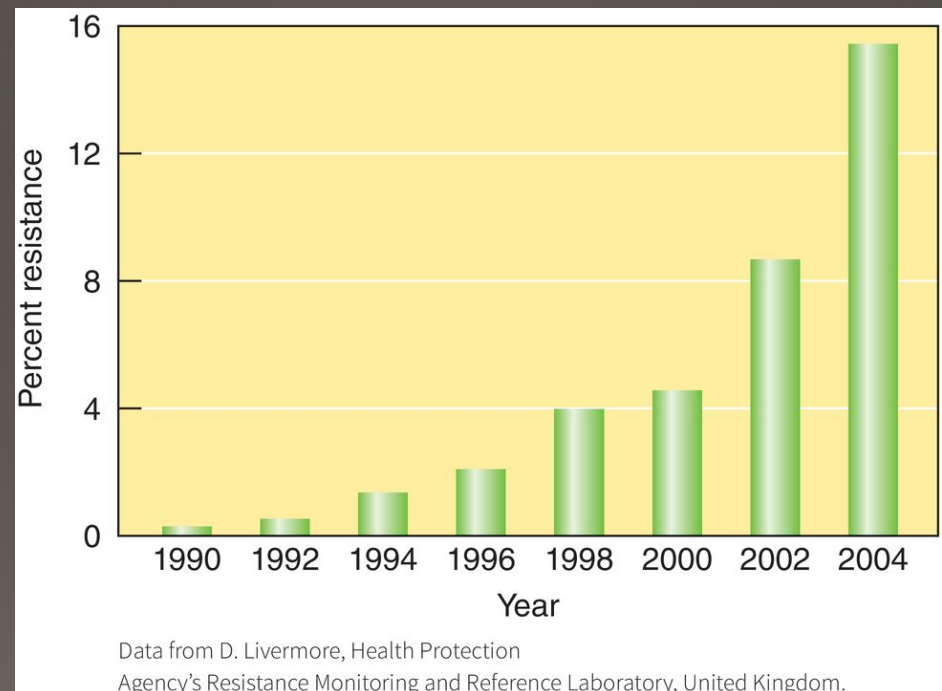
Table 18.1 The 15 Most Important Food Crops in Terms of Production

<i>Plant Crop</i>	<i>Type of Crop</i>	<i>2012 World Production* (1000 tons)</i>
Sugar cane	Sugar plant (stem)	2,020,031
Corn (maize)	Cereal grain	961,289
Rice, paddy	Cereal grain	793,376
Wheat	Cereal grain	739,513
Potatoes	Ground crop (tuber)	402,133
Sugar beet	Sugar plant (root)	297,476
Cassava	Ground crop (root)	289,451
Soybeans	Legume	266,585
Tomatoes	Fruit (annual herb)	178,347
Barley	Cereal grain	146,482
Watermelons	Fruit (vine)	116,153
Sweet potatoes	Ground crop (root)	113,698
Bananas	Fruit (tree)	112,428
Onions, dry	Ground crop (root)	91,328
Apples	Fruit (tree)	84,193

*Based on the 20 highest-producing countries for a specific agricultural commodity.
Source: World production data from FAO.

Challenges of Producing More Livestock

- Increasing Livestock Yields (growth rates)
 - Hormone supplements
 - US and Canada, not used in Europe
 - Antibiotics
 - 40% of antibiotics produced in US are used in livestock operations
 - Problems with increased bacteria resistance- some bacteria are resistant to every antibiotic known



Agricultural Practices

Principle Types of Agriculture

Industrialized agriculture

- Modern agriculture methods that require large capital and energy input from fossil fuels
- less land and labor
- High yields
- Decreases genetic diversity
- High input of pesticides and fertilizers
- Increasing carbon footprint

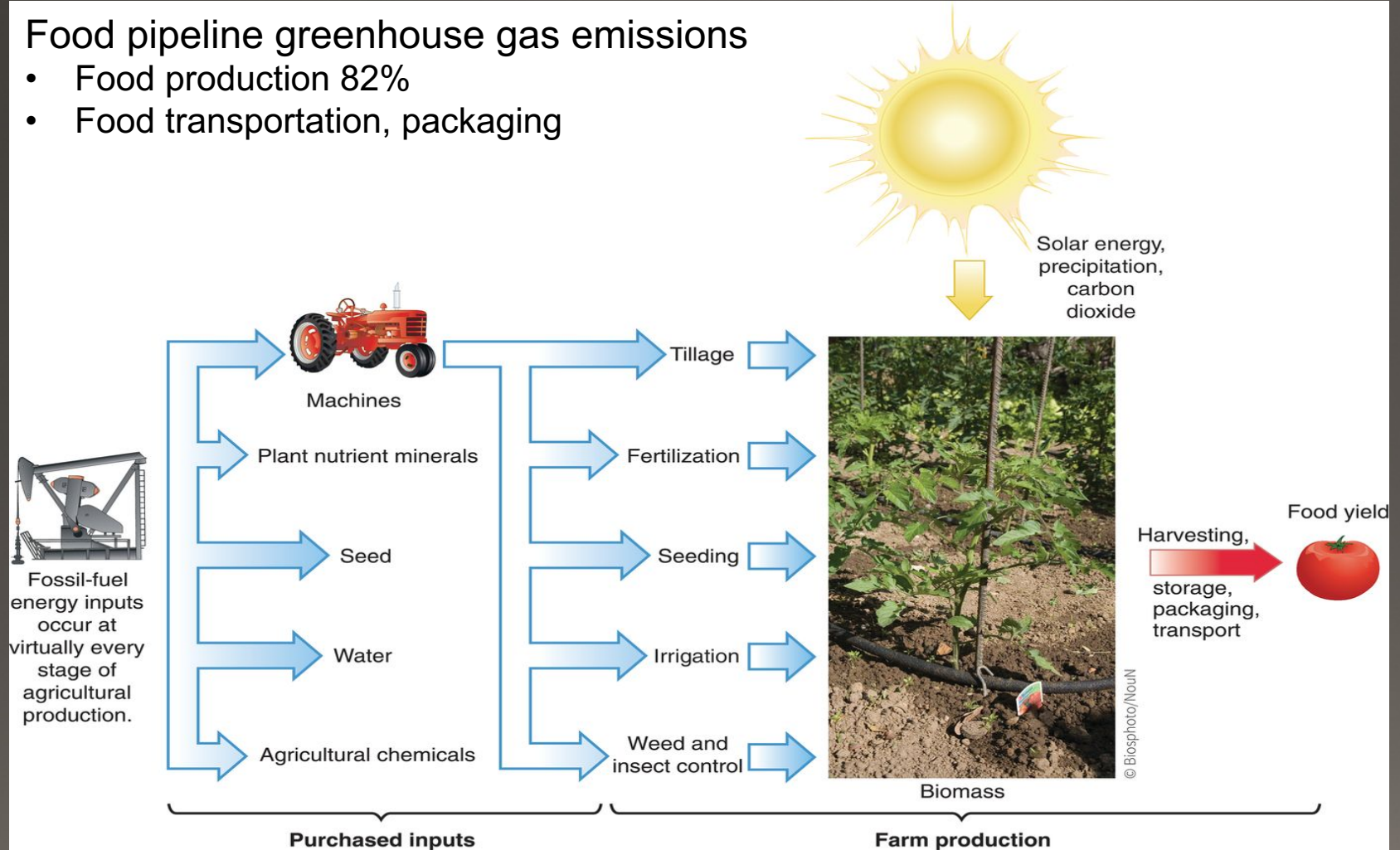
Subsistence Agriculture

- Traditional agricultural methods, which are dependent on labor and large amounts of land
- Human and animal labor
- Low yields
- Genetic diversity is more likely to be maintained
- Shifting cultivation, Slash and burn agriculture, Nomadic herding, Intercropping

Energy Inputs in Industrialized Agriculture

Food pipeline greenhouse gas emissions

- Food production 82%
- Food transportation, packaging



Challenges of Producing More Crops

Pesticides Use

- Pest – any organism that interferes with human welfare or activities
- Pesticide: Chemicals for the control of pest and diseases of crops. Ex. Insecticide, Fungicide

Table 22.1 Percentage of Crops Lost Annually to Pests in the United States

<i>Period</i>	<i>Insects</i>	<i>Diseases</i>	<i>Weeds</i>
2006	13.0	12.5	12.0
1989–1999	13.0	12.0	12.0
1974	13.0	12.0	8.0
1951–1960	12.9	12.2	8.5
1942–1951	7.1	10.5	13.8

Source: USDA Agricultural Research Service

Problems of pesticides

Pesticide Resistance

Genetic Resistance of pest populations to the chemical.
520 pests have developed genetic resistance (17 species are resistant to all pesticides)

- Cost increases
 - Must apply MORE or STRONGER pesticides
 - Effectiveness continues to decrease



Problems with Pesticides

Imbalances the Ecosystem

- Broad spectrum pesticide
 - A pesticide that kills a variety of organisms, not just the targeted organisms
 - Ideal pesticide would be narrow spectrum (species specific)
- Spraying to kill insects can affect birds, rabbits, etc.
 - Ex. River otters exposed to certain chemical pollutants had abnormally small reproductive organs



Problems with Pesticides - Mobility in the Environment

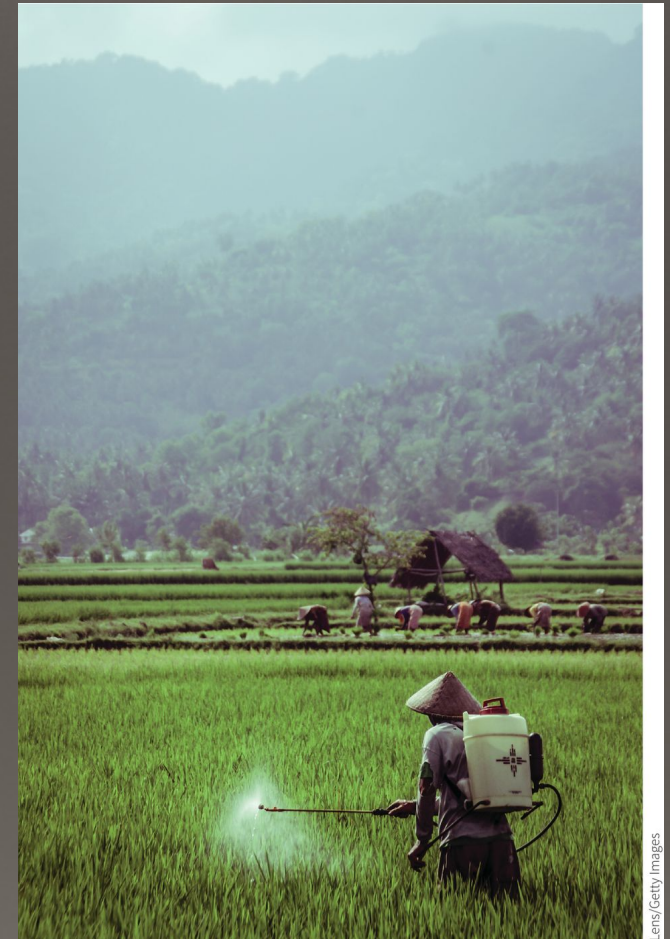
- Do not stay where they are applied
- At least one pesticide found in urban streams above concentration that threatens organisms
- Human health issues (even at home)



Lawrence Migdale/Science Source

Risk of Pesticides to Human Health

- Mild: nausea, vomiting, headaches
- Severe: damage to nervous system, death
- 4 million people poisoned each year; 300,000 die
- Long-term effects (especially for farmworkers and workers in pesticide manufacture companies)
 - Cancer- lymphoma
 - Breast cancer
 - Sterility
 - Miscarriage
 - Birth defects
 - Decreases body's ability to fight infection
 - Potential connection to Parkinson's disease



Alternatives to Pesticides

- Despite 33-fold increase in pesticides since the 1940s, crop loss has not decreased much

1. Cultivation methods

Interplant mixtures of plants (alternating rows), Strip cutting, Proper timing of planting, fertilizing, and irrigating, Crop rotation

2. Biological Control

Use of natural disease organisms, parasites or predators to control pests (ex: *Bacillus thuringiensis* (Bt))



Alternatives to Pesticides

3. Reproductive Controls

- Sterile male technique
- Pheromones and Hormones

4. Irradiating Food (aka cold pasteurization)

- Harvested food is exposed to ionizing radiation, which kills many microorganisms
- Somewhat controversial due to potential for free radicals

5. Genetic Controls

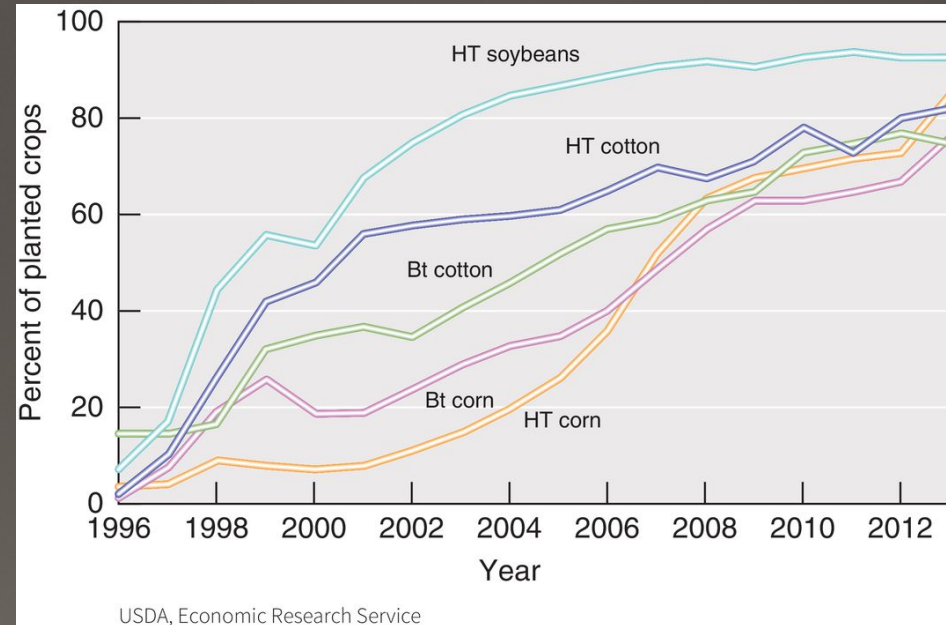
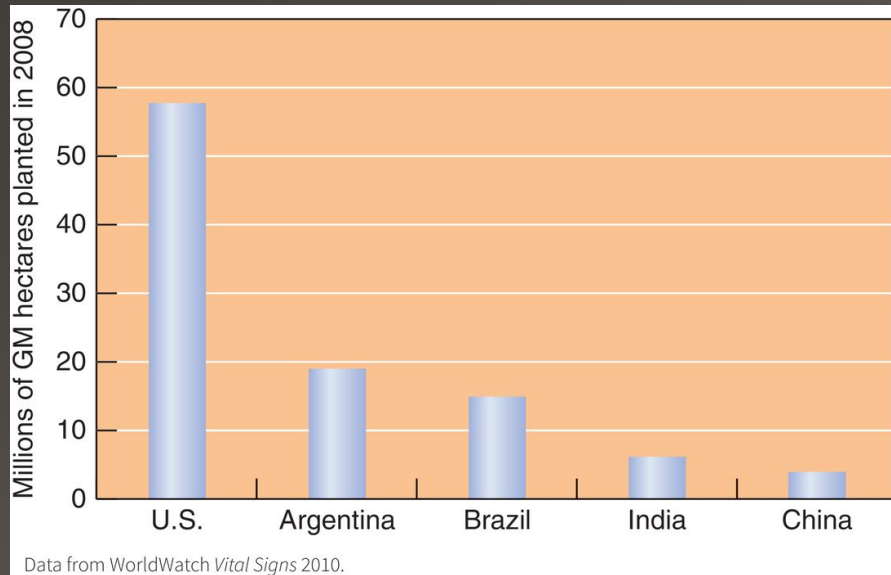
- Genetically Modified plants (GMOs)
 - *Bt* toxin
 - Potential problem: may affect non-target species

Genetic Engineering

- Manipulation of genes by taking specific gene from a cell of one species and placing it into the cell of an unrelated species
- Used to produce Genetically Modified organisms (GMO)
 - Ex: golden rice - rich in beta carotene (prevent Vitamin A deficiency in developing countries)
 - Plants that are tolerant to insect pests, heat, cold, drought, or acidic soils
 - More productive farm animals



GM foods in the U.S.



Safety of GM Foods

- Determined to be safe for human consumption
 - Concerns about GMO seed or pollen spreading in the wild
 - Currently does not appear to be an issue
 - Long term unknown
 - European Union has approved on one GM crop (2014)
-
- GMOs are not currently labeled
 - FDA finds it would be counterproductive and expensive to label
 - Health risks uncertain (food allergies?)



Environmental impacts of current industrialized agriculture



B Brown / Shutterstock



Denton Rumsey / Shutterstock



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naturemania / Shutterstock

Water issues	Air pollution	Land degradation	Loss of biological diversity
• Groundwater depletion from irrigation • Pollution from fertilizer and pesticide runoff • Sediment pollution from eroding soil particles • Pollution from animal wastes (livestock factories) • Enrichment of surface water from fertilizer runoff and livestock wastes	• Pesticide sprays • Soil particles from wind erosion • Odors from livestock factories • Greenhouse gases from combustion of fossil fuels • Other air pollutants from combustion of fossil fuels	• Soil erosion • Loss of soil fertility • Soil salinization • Soil pollution (pesticide residues) • Waterlogged soil from improper irrigation	• Habitat fragmentation (clearing land and draining wetlands) • Monocultures (lack of diversity in croplands) • Stressors from air and water pollution • Stressors from pesticides • Replacement of many traditional crop and livestock varieties with just a few

You Tube break

Grown Shade Coffee

<https://www.youtube.com/watch?v=b9fZRPgl0tE>



Solutions to Agricultural Problems

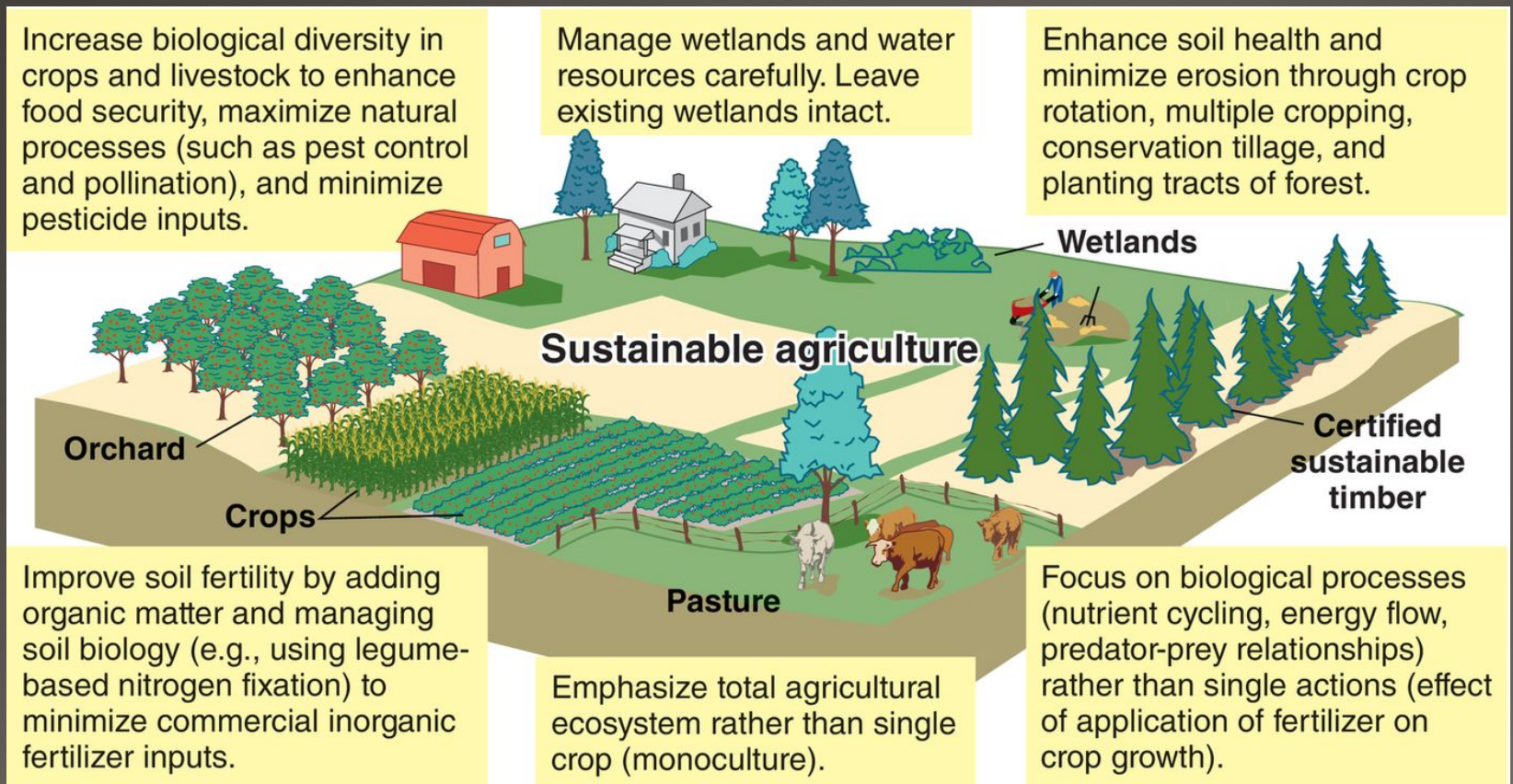
- **Sustainable Agriculture**

Methods that maintain soil productivity and a healthy ecological balance while having minimal long-term impacts

- ✓ Satisfy human food and fiber needs.
- ✓ Enhance environmental quality and the natural resource base upon which the agricultural economy depends.
- ✓ Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls.
- ✓ Sustain the economic viability of farm operations.
- ✓ Enhance the quality of life for farmers and society as a whole

Solutions to Agricultural Problems

- **Sustainable Agriculture:** modeled after ecosystems



Ecolabels

method of environmental performance certification and labelling that is practiced around the world.





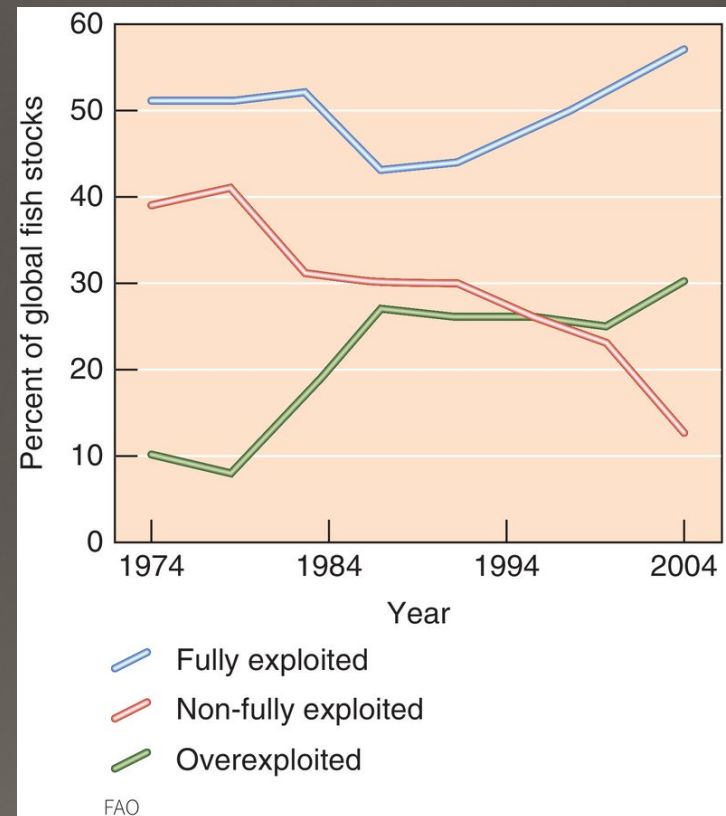
Problems and Solutions

Fisheries of the World

Fisheries of the World - Problems

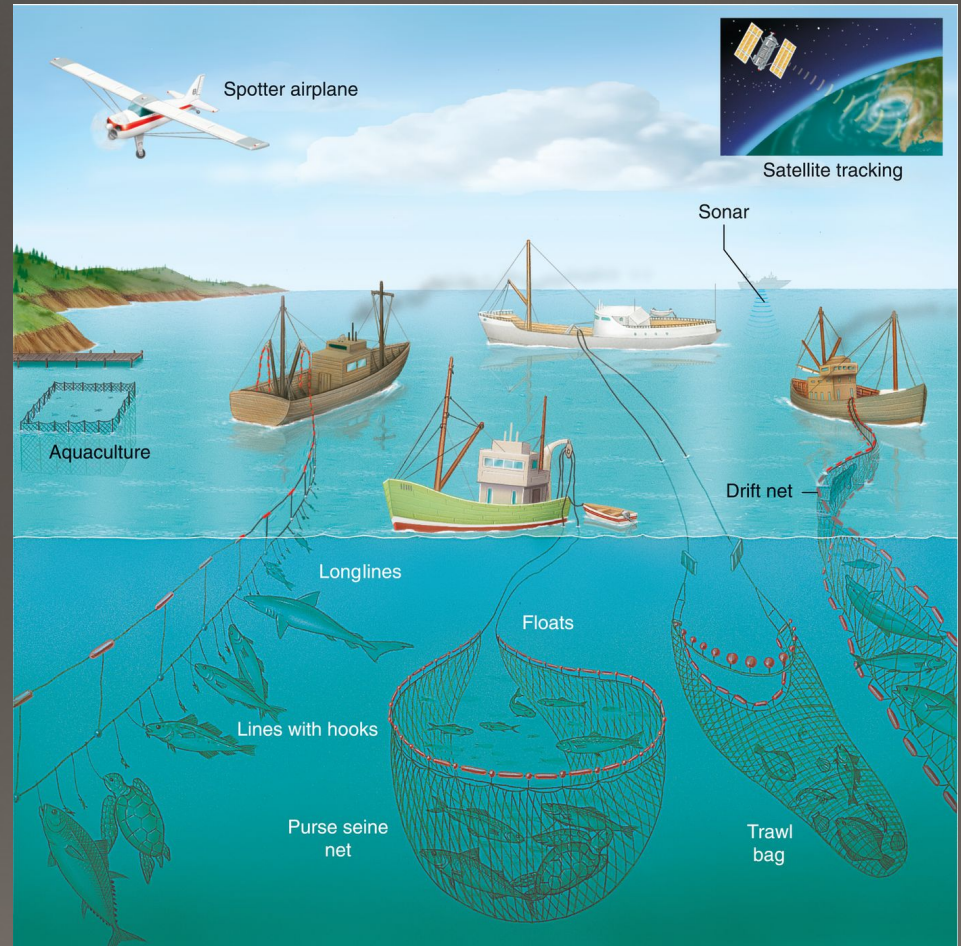
Overharvesting

- No nation lays claim to open ocean
 - Resource susceptible to overuse and degradation (demand and growing populations)
 - Harvest is beyond the MSY (max. sustainable yield)
- Many species are at point of severe depletion (tuna, marlin)
- Declines of 90% of large predatory fish
- ~30% of world's fish stock are overexploited



Fisheries of the World - Problems

- Overharvesting (continued)
 - Sophisticated modern fishing equipment and methods
 - Concentration on high commercial value species
 - Bycatch discarded (dolphins, sea turtles, seabirds, etc.)
- Magnuson Fisheries Conservation Act (1977)
 - Fishing Quotas, season and size restrictions, boat number limits



Fisheries of the World

Aquaculture

- Growing of aquatic organisms for human consumption
- Great potential to supply food, huge industry
- Growing fast specially in developing countries (labor intensive)

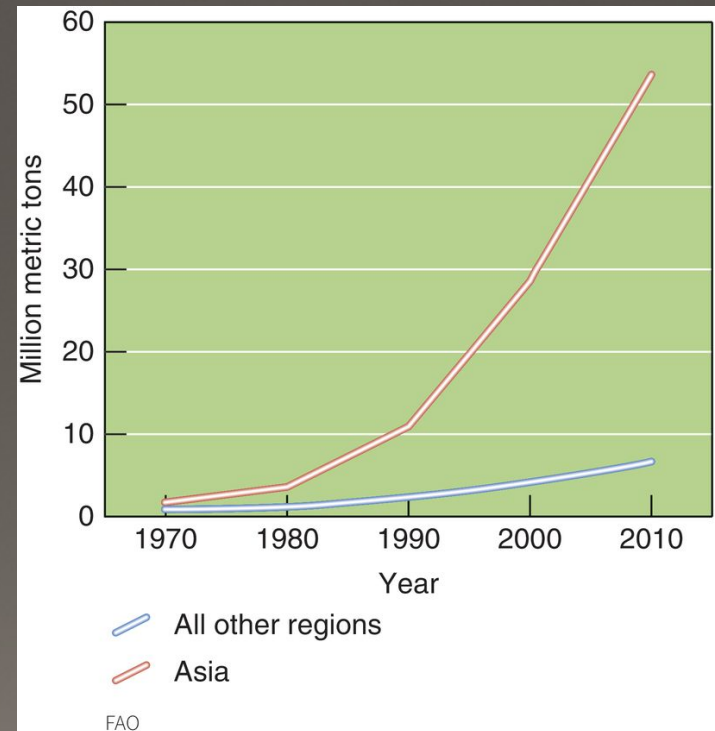


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Fisheries of the World - Problems

Aquaculture (continued)

- Locations of fisheries may hurt natural habitats (mangrove forests)
- Produce waste that pollutes adjacent water
- Fish grown on antibiotics may escape and interbreed with wild populations
- Domestication is difficult
- Prey fish net losses
- Diseases spreading



Fisheries of the World

https://www.ted.com/talks/dan_barber_how_i_fell_in_love_with_a_fish

Discussion questions

- What were the problems of the "sustainable farmed" first fish love?
- Which of the problems fisheries are currently facing were mentioned by the speaker?
- Why did the speaker fall in love with the fish?
- What were the characteristics of the "sustainable farm in southern Spain?
- What was the role of the flamingos in this farming systems? What was the role of the algae?