Chapter 11
Feeding the World

Global Undernutrition

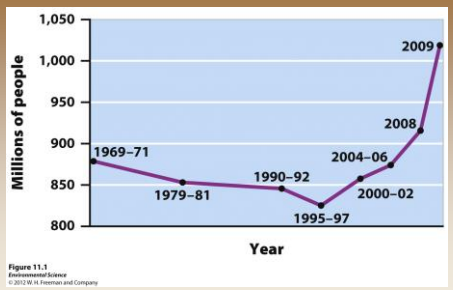

Figure 11.1
Environmental Science
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Nutritional Requirements

- Undernutrition- not consuming enough calories to be healthy.
- Malnourished- a persons diet lacks the correct balance of proteins, carbohydrates, vitamins, and minerals even though they get enough calories.
- Overnutrition- too many calories and improper foods that causes a person to become overweight.

Annual Meat Consumption

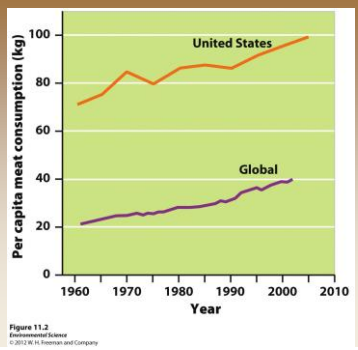

Figure 11.2
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Global Grain Production, 1950-2006

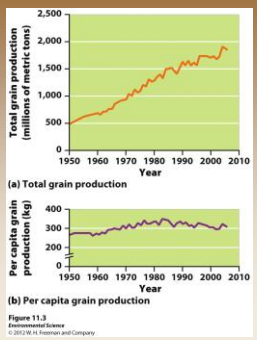

Figure 11.3
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Reasons for Undernutrition and Malnutrition

- Poverty
- Political and economic factors
- Agricultural resources being diverted to feed livestock and poultry rather than people

The Green Revolution

- New management techniques and mechanization as well as the triad of fertilization, irrigation, and improved crop varieties. This has increased food production dramatically.

Irrigation Problems

- Waterlogging- when the soil remains under water for prolonged periods which impairs root growth because the roots cannot get oxygen.
- Salinization- when the small amounts of salts in irrigation water become highly concentrated on the soil surface through evaporation.

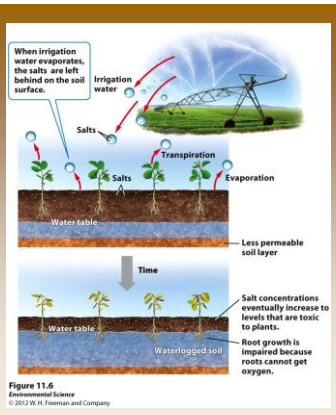

Figure 11.6
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Fertilizers

- Organic fertilizers- organic matter from plants and animals. Typically made from animal manure that has been allowed to decompose.
- Inorganic fertilizers (synthetic)- fertilizers that are produced commercially. This is usually done by combusting natural gas, which allows nitrogen from the atmosphere to be fixed and captured in fertilizer.

Monocropping

- Growing a large amount of a single species of plant.

Pesticides

- Pesticide- a substance that kills or controls organisms that people consider pests.
- Insecticide- target insects
- Herbicides- target plants

Pesticides

- Broad-spectrum pesticides- designed to kill many different types of pests.
- Selective pesticides- designed to kill a narrower range of organisms.

Pesticides

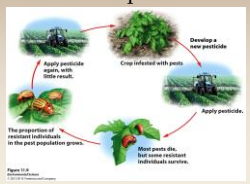
- Persistent- pesticides that remain in the environment a long time.
- Nonpersistent- pesticide that breaks down relatively rapidly, usually in weeks to months.

Pesticides

- Bioaccumulation- some pesticides are found to build up over time in the fatty tissues of predators.
  - An example was DDT.
  - When an organism containing the pesticide is eaten, the chemical is transferred to the consumer.
  - This eventually leads to very high pesticide concentrations at high trophic levels.

Pesticides

- Resistance- pest populations may evolve resistance to a pesticide over time. These are said to be resistant.
- Pesticide treadmill- the cycle of pesticide development followed by pest resistance, followed by development of a new pesticide.



Benefits of Genetic Engineering

- Greater yield
- Greater food quality
- Reductions in pesticide use
- Reduction of world hunger by increased food production
- Increased profits

Concerns about Genetically Modified Organisms

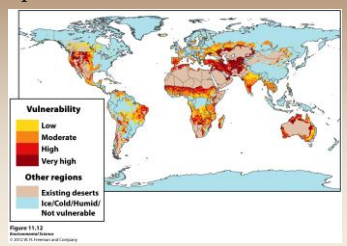
- Safety for human consumption
- Effects on biodiversity
- Regulation of genetically modified organisms

Farming Methods

- Conventional agriculture- industrial agriculture where labor is reduced and machinery is used.
- Traditional farming- still used in the developing world where human labor is used and not machinery.
- Shifting agriculture- used in areas with nutrient poor soils. It involves planting an area for a few years until the land is depleted of nutrients and then moving to another area and repeating the process.
- Nomatic grazing- moving herds of animals to find productive feeding grounds.

Desertification

- Desertification- When soil is degraded by agriculture to the point at which they are not longer productive.

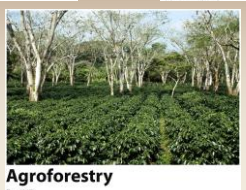


Sustainable Agriculture

- Sustainable agriculture- producing enough food to feed the world's population without destroying the land, polluting the environment, or reducing biodiversity.
  - Intercropping- two or more crop species are planted in the same field at the same time.
  - Crop rotation- rotating crops species from season to season.
  - Agroforestry- intercropping trees with vegetables.
  - Contour plowing- plowing and harvesting parallel to the land to prevent erosion.

Intercropping

Contour plowing



Agroforestry

No-till Agriculture

- No-till agriculture- helps to stop soil degradation by leaving crop residues in the fields and not tilling the land after each harvest.

Integrated Pest Management

- Integrated pest management- using a variety of techniques designed to minimize pesticide inputs.
  - Crop rotation
  - Intercropping
  - Planting pest resistant crop varieties
  - Creating habitats for predators
  - Limited use of pesticides

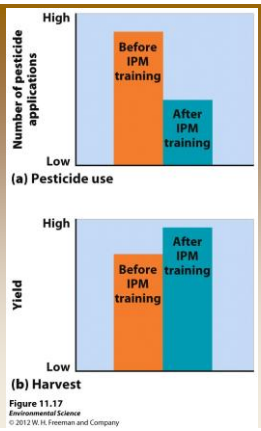


Figure 11.17
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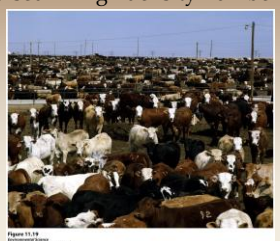
Organic Agriculture

- Organic agriculture- production of crops without the use of synthetic pesticides or fertilizers.

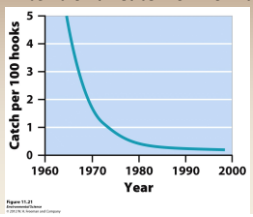
High-Density Animal Farming

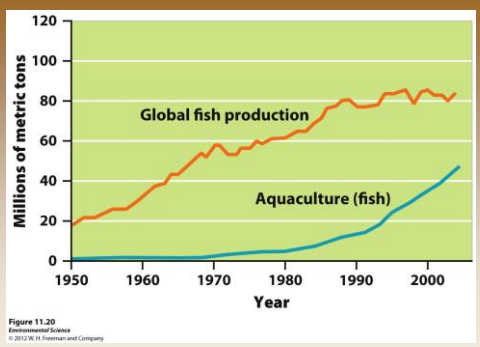
- CAFOs (concentrated animal feeding operations)- large structures where animals are being raised in high density numbers.



Harvesting of Fish and Shellfish

- Fishery- a commercially harvestable population of fish within a particular ecological region.
- Fishery collapse- the decline of a fish population by 90% or more.
- Bycatch- unintentional catch of non-target species.





Aquaculture

- Aquaculture- the farming of aquatic organisms such as fish, shellfish, and seaweeds.