Supplementary Notes: (PJ Shlachtman): Food Resources

How is Food Produced?

What Plants and Animals Feed the World?

- 15 plant and 8 animal species supply 90% of our food
- wheat, rice and corn provide ~50% of the calories people consume; all three are annuals
- 2/3 of the world's people live primarily on grains (rice, wheat and corn)

The Two Major Types of Food Production

- Industrialized agriculture (high-input agriculture)
    - uses large amts. of fuel energy, water, commercial fertilizers & pesticides
- Plantation agriculture (cash crops)
- Traditional subsistence agriculture
- Traditional intensive agriculture

The Green Revolution (1950-1970)

Increased yields per unit of area of cropland
Involves three steps

1. developing and planting monocultures of key crops
2. lavishing fertilizer, pesticides and water on crops to produce high yields
3. increasing the intensity and frequency of cropping

A second green revolution (1967+) began when fast-growing dwarf varieties of rice and wheat were introduced into developing countries

Case Study: Food Production in the U.S.

- Production doubled since 1940
- Agribusiness – replacing smaller family farms w/ large corporate farms.
- Each US farmer feeds about 140 people

How Are Livestock Produced?

- 10% of the world's land is suitable for producing crops
- 20% is used for grazing cattle and sheep
- Developed countries consume >50% of the world's grain
- Poor developing countries eat mostly grain and live low on the food chain

Traditional Agriculture

- Interplanting - simultaneously grow several crops on the same plot of land
- Common interplanting strategies:
    1. Polyvarietal cultivation
    2. Intercropping
    3. Agroforestry (alley cropping)
    4. Polyculture

World Food Problems

1950-1990:

- amount of food traded in the world market quadrupled
- population growth is outstripping food production
- Factors leading to the slowdown in the growth of per capita grain production:
  1. population growth
  2. increasing affluence (incr. demand for food, esp. meat products)
  3. degradation and loss of cropland
  4. little growth in irrigation since 1980
  5. 10% decline in global fertilizer use between 1989-1997

How many people can the world support?

Earth's carrying capacity depend on:

1. quality of life (cultural carrying capacity)
2. whether future food production can be increased
3. the length of the food chain (grain eaters vs. meat eaters)

Undernutrition, Malnutrition and Overnutrition

1. Undernutrition
   - Chronically undernourished – people w/ <90% of mimimum daily calorie intake
   - Seriously undernourished – people w/ <80% min. daily calorie intake.
2. Malnutrition
   - Marasmus – diet low in calories and protein
   - Kwashiorkor – severe protein deficiency in infants and children 1-3
   - The number of chronically undernourished fell from 36% to 14% (1970-1995)
   - The number of chronically malnourished fell from 940 million to 840 million (1970-1995)
   - Vitamin and mineral deficiencies (iron and iodine)
3. Overnutrition
   - obesity, coronary heart disease, cancer, stroke, diabetes
   - Healthy Diet: largely vegetarian, 10% of calories from fat,

Can we produce enough food to feed the world's people?

- goods news – we produce enough, BUT
- bad news – we don't get it to the right places
- The principal cause of hunger and malnutrition is poverty

Environmental Effects of Producing Food:

- soil erosion
- desertification
- salinization
- waterlogging
- water deficits

- droughts
- loss of wild species

Environmental constraints that limit food production:

- Increased UV radiation form ozone-layer depletion
- Projected global warming

Increasing World Food Production

- The gene revolution - bioengineering
- Food production: from exponential growth to logistic growth
- monoculture vs. polyculture

Can we cultivate more land to increase crop production?

- 36% of the world's land is devoted to raising crops.
- Clearing Rain Forests (?)
- Desert areas (?)
- A major economically profitable and environmentally sustainable expansion of cropland is unlikely over the next few decades.

Catching and Raising More Fish

- Fisheries
- Overfishing
- Sustainable Yield
- Commercial Extinction
- Habitat Degradation
- Destruction of wetlands, estuaries, coral reefs, salt marshes and mangroves; pollution of coastal areas

Aquaculture - "The Blue Revolution" - Two basic types:

1. Fish Farming
2. Fish Ranching

- Advantages – efficient and high yields in a small volume of water
- Problems – require large inputs of land, feed, water, energy; large outputs of wastes
- Pesticide runoff

Agricultural Policy, Food Aid and Land Reform

1. Keep food prices artificially low
2. Give farmers subsidies to keep them in business, and encourage food production
3. Eliminate most or all price controls and subsidies

- Sustainable Agriculture (low-input agriculture)
- Guidelines for sustainable agriculture