Food and Agriculture

I. Nutrition and Food Supplies
   a. Chronic Hunger and Food Security
      i. U.N.’s Food and Agriculture Organization (FAO) estimates that the world grows enough food to provide everyone on earth with well more than 2,770 calories/day needed, on average
      ii. However, 815 million people are chronically undernourished, meaning they routinely get <90% of the minimum caloric intake needed to live
         1. In developing countries, 20% of population
            a. 55% of the 12 million child deaths/year are from malnutrition
         2. Asia, with 61% of the world’s population, has the highest total number of undernourished people
            a. Malnourishment has fallen in Asia from 30% in 1980 to 10% in 2000.
         3. Subsaharan Africa has the greatest increase in hunger, and the highest percentage of hungry people.
            a. One third of the residents are undernourished
         4. Food security is the ability to obtain sufficient food on a day-to-day basis.
            a. 1.4 Billion people in the world live on <$1/day can’t buy the food they need and don’t have access to resources to grow it for themselves.
   iii. Famines and Acute Food Shortages
      1. Famines are large-scale food shortages, massive starvation, social disruption and economic chaos.
         a. Often trigger mass migrations, moving from refugee camp to refugee camp.
      2. Usually caused by environmental conditions, but politics and economics are often equally important
         a. People have lived for a long time with drought, flood, insects and other problems without experiencing famine
         b. National politics, commodity hoarding, price gouging, wars, etc, often conspire so that the poor can neither grow food, or find jobs to buy it.
         c. Armed conflict and political oppression almost always are at the root of famine.
      3. Aid policies of rich countries often serve more to get rid of surplus commodities and make us feel good, than to eliminate the root causes of starvation.
   iv. Malnutrition and Obesity
      1. We also need specific nutrients in our diet, such as proteins, vitamins and certain trace metals.
a. **Malnutrition** is a nutritional imbalance caused by a lack of specific dietary components or an inability to absorb or utilize essential nutrients.

b. In rich countries, we tend to eat too much meat, salt, fat and sugar, and too little fiber, vitamins, trace minerals and other components.

c. On average we consume 1/3 too many calories and get too little exercise.
   i. 61% of Americans are overweight, up from 40% a decade ago.
   ii. 1/3 of Americans are **obese** or seriously overweight.
   iii. Being overweight substantially raises your risk of hypertension, diabetes, heart attack, etc.
      1. 300,000 people/year in U.S. die from obesity related illnesses.

d. Poverty can also lead to obesity.
   i. Lack of time for cooking and shopping, along with cheap fast food leads to dietary imbalances.
   ii. In the poorest countries, people eat the wrong food because they can’t afford meat, fruits and vegetables.
      1. FAO: 30% of the world’s population suffers from some form of malnutrition.

e. Nutritional problems.
   i. **Anemia**, low hemoglobin in blood, is caused by a lack of iron, most common nutritional problem in the world.
      1. India: 80% of pregnant women are anemic, causing maternal deaths.
   ii. **Diabetes**—Diet too rich in starches
      1. Leads to heart disease, blindness and death
      2. Folic acid found in dark green leafy vegetables is essential for early fetal development
   iii. **Protein deficiencies**
      1. **Kwashiorkor**, West African word meaning ‘displaced child’ refers to a child deprived of breast milk
         a. Leads to discolored skin, bloated bellies
2. **Marasmus**, to waste away, caused by lack of calories and protein
   a. Children are generally thin and shriveled.

Case Study: British Columbia Salmon Farming

I. **Salmon Farming in the Pacific Northwest**
   a. Salmon farming is a form of **aquaculture**
      i. **Aquaculture** is the raising of aquatic organisms for food in controlled environments
      ii. **Aquaculture** is the fastest-growing form of food production
         1. 6.9 million tons in 1984
         2. 33.3 million tons in 1999
      iii. **Aquaculture** provides **one-third** of the world’s fish for human consumption.
      iv. Over 220 species are ‘farmed’
         1. Shellfish
            a. Crabs, oysters and mussels
         2. Fin fish
            a. Carp, tilapia, and salmon
   v. Forms of Aquaculture
      1. Inland ponds
         a. **Pro:** Easy to manage
            i. Can contain waste
            ii. Escaped fish not a real problem
         b. **Con:** Require substantial habitat “alteration”
            i. Ex: Thousands of acres of mangroves are destroyed every year in order to build shrimp ponds.
      2. Net cages
         a. **Pro:** Require little habitat “alteration”
         b. **Con:** Difficult to manage
            i. Waste passes through cages into ocean
            ii. Fish can escape into environment
   b. **History of B.C. Salmon Farming**
      i. Salmon farming began in the 1970’s with small, locally owned farms mostly on the Sunshine Coast, north of Vancouver, BC
         1. These farms used Atlantic salmon, which had been greatly depleted in the North Atlantic, and were easier to farm.
         2. Many of these first farmers went out of business or were bought by larger companies.
            a. Currently >80% of the farms in B.C. are owned by 5 multinational corporations, only one of which is Canadian owned.
      ii. In the 1980’s, First Nations (Native Americans), local communities, fishermen and environmentalists were expressing
concern over the impact of these farms on the local environment and communities.

iii. In 1995 the provincial government, in consultation with Fisheries and Oceans Canada, implemented a moratorium on the fish farm industry, setting a cap on the number of farms at 121.

c. **Why farm salmon?**
   i. Wild salmon are endangered
      1. *Thirty-six* separate salmon runs are currently listed under the Endangered Species Act
      2. Columbia River salmon harvest peaked in late 1800’s and declined for the rest of the century
   ii. Causes of the “Salmon Crisis”
      1. Destruction of spawning habitat
         a. Large-scale logging destroys sensitive stream habitat necessary for spawning salmon
      2. Dams
         a. The damming of rivers has cut salmon off from hundreds of kilometers of spawning habitat.
      3. Overfishing
         a. Industrial fishing techniques have greatly reduced the number of salmon returning to the rivers

d. **What are the costs of salmon farming?**
   i. Can be very contaminating to the surrounding environment
      1. The dense concentrations of farmed animals can increase the incidence of disease
         a. A virus outbreak wiped out half a billion dollars worth of Ecuadorian shrimp in 1999
         b. Necessitates antibiotic treatment, which increases the virility of pathogens
      2. Produces lots of waste
         a. Open net cage farming in coastal British Columbia produces as much untreated waste and a sewage system from a city of 500,000 people
            i. Causes coastal eutrophication, or nutrient enrichment, and ecosystem degradation.
   ii. Ecologically inefficient
      1. Farmed salmon are raised on fish meal from wild fish.
         a. It takes 5 kg of wild caught fish for every 1 kg of farmed salmon.
   iii. Escape of farmed fish into the environment can affect wild stocks.
      1. Escaped farmed fish carry disease
      2. They can outcompete wild stocks
      3. They may interbreed with wild stocks, weakening them.
   iv. Human Health Costs
1. January 9, 2004 issue of *Science*, it was reported that farmed salmon have **significantly higher concentrations of PCB’s** than wild-caught salmon
   a. The difference comes from feeding farmed salmon fish meal and fish oil, which has higher concentrations of pollutants than the zooplankton native salmon eat in the wild.
   b. This is also why farmed salmon is a lighter color than wild salmon

e. **Is fish farming bad?**
   i. No.
   ii. If done ecologically aquaculture provides a great source of protein.
      1. It’s a matter of scale
         a. Similar to other forms of agriculture, small-scale operations are much easier to environmentally manage than larger operations.
   2. Herbivores are better than carnivores
      a. Herbivorous species are more efficient
      b. Oysters, filter-feeding herbivores, actually improve water quality.
   3. Can be integrated with other agriculture
      a. Integrated aquaculture has been practiced in China for over 2,000 years
         i. Produces almost *no* net waste.

iii. **What are the benefits of aquaculture?**
   1. Helps ensure people of a reliable protein source
      a. Because of overfishing and deforestation many game species are greatly depleted and therefore much of the developing world is protein starved
   2. Reduces fishing pressure on wild fish stocks
      a. Also reduces the **by-catch**, the unintended catch of non-target organisms
   3. Can be very energy efficient
      a. Aquaculture ponds may produce as much as 10 times more fish per unit area than can be harvested from highly productive oceanic coastal waters.

f. **What you can do?**
   i. If you buy farmed fish or shellfish, buy **herbivores**
      1. Herbivores, such as carp and oysters, can be managed more effectively because they don’t rely on wild-caught protein for their food
   ii. If you want salmon, buy wild-caught salmon from well managed fisheries
      1. Alaska’s Copper River is very well managed and quite sustainable.
   iii. Some salmon farmers are using land-based techniques
1. In land based salmon farming it is much easier to control the escape of non-natives
2. It can be integrated with other forms of agriculture, as has been demonstrated in China for the last 2,000 years
3. It doesn’t destroy environmentally sensitive coastal environments.