Agriculture and Society: Part II

PA E & E Standards 4.4
VIII. Farming Methods

1. All agriculture ultimately depends on the soil. **What is soil?**

   - **Soil** is the upper layer of the land surface that contains pieces of rock, water, air, organic matter, and living organisms.

   **Where does it come from?**
2. Soil comes from the weathering of surface rocks.

- Wind, water, organisms and temperature changes break down surface rock.
- This process is very slow. Depending on the location, it may take between 200 to 1,000 yrs to make just one inch of new soil.

- Would you consider soil to be a renewable or nonrenewable resource?
3. Soil is made out of several layers:

a. **Surface Litter** ("O" Horizon) – recently fallen leaves or sticks that are beginning to decompose.

b. **Topsoil** ("A" Horizon) – partially decomposed matter (humus), roots, living organisms, and some minerals.
c. **Subsoil** ("B" Horizon) – fine particles of materials leached from above, some roots.

d. **Parent Material** ("C" Horizon) – weathered bedrock and some leached material from above.

e. **Bedrock** – the underlying solid rock material.
4. One of the major concerns in agriculture is **soil erosion**.

– Some erosion happens naturally due to the influence of wind and running water but...

– Human actions also cause erosion.
  - Logging
  - Livestock grazing
  - Farming
5. Since soil is the farmer’s most valuable resource, farming methods have developed to reduce soil loss.

a. The greatest cause of erosion in farming is plowing or tilling. (breaking up the surface of the soil to prepare for planting)

b. Some farmers have changed to conservation tillage methods.
c. In conservation tillage, the ground is disturbed as little as possible during planting.

- One method just loosens the soil without turning it over.
- **No-till cultivation** involves drilling holes into the topsoil without loosening or turning over the soil.
- Another method uses the leftover stubble from the previous crop as cover between the seeded areas of the field.
d. Advantages and disadvantages of conservation tillage.

**Advantages**

- Prevents or reduce soil erosion.
- Remaining plant stubble breaks down to make humus. *(Humus is a mixture of decomposing organic matter in topsoil that provides nutrients and holds moisture.)*

**Disadvantages**

- Greater use of pesticides to kill weeds that may compete with the crop.
- Require different machinery from typical farming.
- Change from traditional practices.
e. Erosion is sometimes the result of the topography of the land.

- Ideal farmland is flat.
- Real farmland can range from gently sloping to very steep.
- Runoff from sloped or steep areas can result in loss of valuable soil.
Farmers reduce erosion on sloping land by using conservation methods such as: contour farming, strip cropping, and terracing.

- **Contour farming** is when the farming plow and plant their fields across the slope instead of with the slope.
- Reduces runoff of water and reduces erosion from 30 to 50%.
• **Strip cropping** is a method of alternating wide rows or strips of a crop with grasses or legumes.

  – The grasses or legumes help hold the soil and water while protecting the soil from wind erosion.

  – An added benefit of growing two or more crops close to each other is a reduction in pests and plant diseases.
• On very steep hills, farmers use terracing to reduce soil erosion.
  – In terracing, a series of broad, flat ridges are built down the slope similar to stairs.
  – Each ridge holds the water and the soil. It also provides a relatively flat surface for planting.
6. Another important part of soil conservation is maintaining and restoring the nutrients of the soil. 

a. The use of fertilizers and crop rotation help restore nutrients back to the land. 

- **Fertilizers** can either be natural organic or artificial. 
  - **Organic** examples include animal manure, green manure (plant material) or compost. 
  - **Artificial** are typically chemical fertilizers made up of nitrogen, phosphorus, and potassium.
b. **Crop rotation** is the process of changing crops planted in the same field from year to year.

- Each crop adds or removes particular nutrients.
- By varying the crops, the farmer tries to minimize nutrient loss.
- Legume crops are excellent for restoring nitrogen to the soil.
7. We have discussed earlier how the green revolution has increased the crop yields around the globe.

a. However, at the same time, the human population is continuing to increase.

b. The current agriculture of the world produces just enough food to meet the minimal nutritional requirements of everyone on the planet.
c. Millions of people lack access to the necessary food.

d. Many people in developing countries suffer from malnutrition and undernutrition.

- Malnutrition is when someone receives enough daily calories but is lacking essential protein, vitamins, and minerals in their diet.
– **Undernutrition** is when someone does not meet their daily caloric amount.

– Both conditions can lead to lack of development, illness, and poverty.

– The good news is that both conditions are reversible with a proper diet.

e. Many individuals in developed countries suffer from overnutrition or eating more than their daily caloric amount.
So how are we going to meet the needs of a continually growing world population? Consider the following:

- Most of the land that is suitable for agriculture is already cultivated.
- Most crop yields have leveled off or declined.
- Wetlands are being drained and forests are being cut down to make room for new farmland.
- Many crops are now being used as energy sources for heating and automobiles.
g. As a result for this need for food, agriculture has caused serious environmental problems.

- Wildlife habitat is destroyed.
- Chemical pesticides and fertilizers pollute soil and water.
- Soil erosion and nutrient loss.
- Heavy reliance on fossil fuels.
- Desertification – when land becomes desert-like due to nutrient loss.
- Salinizaiton – when salts build up in the soils due to over-irrigation and become unusable.
IX. Food Safety

1. There are always stories in the news about food safety recalls or food contamination. What are major sources of contamination?
   - Bacteria
   - Viruses
   - Chemicals

2. Most food borne contamination results in diarrhea and vomiting. However, they can result in serious illnesses or even death.
3. So how do we protect our food...

- There are steps we can take at home
  - Thoroughly cooking raw meats.
  - Washing fruits and vegetables.
  - Proper washing of hands, utensils, serving dishes, and kitchen equipment.

But how do we know the food we are buying is safe?
4. For the most part, food in the U. S. is safe…largely due to the regulations of three agencies.

- USDA (U.S. Department of Agriculture)
- FDA (Food and Drug Administration)
- EPA (Environmental Protection Agency)
5. The USDA ensures food safety by

• Inspecting slaughterhouses and processing plants.
• Grading meat and dairy products to indicate quality.
• Enforce regulations.
• Conducting research.
• Fostering soil conservation.
• Education.
6. The FDA is concerned about:

- Truthfulness in food labels.
- Safety of food packaging.
- Maintenance of sanitary conditions in restaurants and public eating areas.
- Safety of dairy products and shellfish.
- Label listing of nutrition facts.
7. The EPA regulates the use of pesticides on foods.

8. Even with all this protective measures, the CDC (Centers for Disease Control and Prevention) estimate 325,000 people go to the hospital over food illnesses each year. 76 million people suffer from some form of mild food poisoning and about 5,000 people die each year due to food illnesses.
X. Important Agricultural Advances.

1. Farming has come a long way over the past 11,000 years. Farmers now use computers, satellite technology, and genetically modified foods and animals to maintain food production.
2. Here are some the important agricultural advances that made farming easier and more efficient:

- **Cotton Gin (1793)** – Eli Whitney – made cotton easier to clean.
- **Cast-Iron Plow (1797)** - stronger than the wooden plow. Made tilling faster and better.
- **Reaper (1831)** – Cyrus McCormick – cut the time and labor to harvest wheat crops.
• **Steel Plow** (1837) – John Deere – strong enough to plow the thick soils of the Midwest.

• **Chemical Fertilizers** (1849) – allowed farmers to replace nutrients in depleted soil.

• **Transcontinental Railroad** (1869) – opened up new areas for agriculture and trade.
• **Barbed Wire** (1874) – ability to fence off fields from roaming cattle.

• **Pasteurization** (mid-1880s) - **Louis Pasteur** – killing bacteria and other harmful microbes in dairy products and wines.

• **Tractor** (1926) - allowed farmers to work the land faster, leading to increase in farm production.
3. The latest advance in agriculture is biotechnology. Biotechnology is the management or manipulation of living organisms for the benefit of people.

- Most well-know form is genetic engineering which alters the characteristics of plants and animals by transferring genes.
- Scientists are especially interested in genes that code for desirable traits like: greater nutrients, drought tolerance, salt tolerance, etc…
Any Questions ?!?

Let’s review....