

**Course Code:MCC102A**  
**Course Title:Environmental Studies**

**Lecture No: 6**  
**Title: Food resources**  
**Course Leader : Ms. Priyanka N**



# Topics

**Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.



# Intended Learning Outcomes

**At the end of this lecture, students will be able to**

- Explain different methods of food production
- Describe the problems associated with fishing
- Discuss advantages of Sundance farms



# Food in the World

- 30,000 plant species
- 15 plants and 8 animals supply 90% of our food
- Wheat, rice, and corn are half the calories people eat
- 66% of people eat mainly rice, wheat, and corn (grains)
- The top third of the economic chain eats primarily meat.



# Agriculture

- **Agriculture** is the cultivation of animals, plants, fungi, and other life forms or food, fiber, biofuel, medicinals and other products used to sustain and enhance human life.
- The history of agriculture dates back thousands of years, and its development has been driven and defined by greatly different climates, cultures, and technologies.



# Various agricultural products



Major agricultural products can be broadly grouped into foods, fibers, [fuels](#), and [raw materials](#).

**Specific foods** include [cereals](#) (grains), [vegetables](#), [fruits](#), [oils](#), [meats](#) and [spices](#).

**Fibers** include [cotton](#), [wool](#), [hemp](#), [silk](#) and [flax](#). Raw materials include [lumber](#) and [bamboo](#).



Other useful materials are produced by plants, such as [resins](#), [dyes](#), [drugs](#), [perfumes](#), [biofuels](#) and ornamental products such as [cut flowers](#) and [nursery plants](#).



# Types of Food Production

- Industrialized agriculture
- Traditional agriculture



# Industrialized Agriculture

Industrialized agriculture-Use large amounts of fossil fuel energy, water, commercial fertilizers and pesticides to produce huge quantities of single crops or livestock animals for sale.



## Traditional Agriculture

Practiced by 2.7 million people on earth

Traditional subsistence agriculture-produce enough food to stay alive

Traditional Intensive agriculture- farmers increase inputs of human labour, fertilizer and water to get a higher yield per area of cultivated land to produce enough food for families, and their income







# Green Revolution

- The world's worst recorded food disaster occurred in 1943 in British-ruled India.
- Known as the Bengal Famine, an estimated 4 million people died of hunger that year in eastern India (which included today's Bangladesh).
- Initially, this catastrophe was attributed to an acute shortfall in food production in the area.
- However, Indian economist Amartya Sen (recipient of the Nobel Prize for Economics, 1998) has established that while food shortage was a contributor to the problem, a more potent factor was the result of hysteria related to World War II, which made food supply a low priority for the British rulers.

# Green Revolution

- When the British left India in 1947, India continued to be haunted by memories of the Bengal Famine. It was therefore natural that food security was one of the main items on free India's agenda. This awareness led, on one hand, to the Green Revolution in India.
- The Green Revolution, spreading over the period from 1967/68 to 1977/78, changed India's status from a food-deficient country to one of the world's leading agricultural nations.
- This called for an immediate and drastic action to increase yield. The action came in the form of the Green Revolution. The term 'Green Revolution' is a general one that is applied to successful agricultural experiments in many developing countries. India is one of the countries where it was most successful.



# Green Revolution

There were three basic elements in the method of the Green Revolution

- Continuing expansion of farming areas
- Double-cropping in the existing farmland
- Using seeds with improved genetics.



# Green Revolution

## Involves 3 steps

1. Developing and planting monocultures of selectively bred or genetically engineered high yield varieties of key crops
2. Lavishing fertilizer, pesticides, and water on crops to produce high yields
3. Often increasing the intensity and frequency of cropping



Maize

## Livestock Production

1. Meat products are sources of quality protein.
2. Between 1950 and 1996, world meat production increased fourfold and per capita meat production rose by 29%.
3. 14% of U.S. topsoil is associated with livestock grazing.
4. Cattle belch out 12-15% of all the methane released into the atmosphere



# Livestock Production





# Top food crops of India.....

## The Top 5 Food Crops Produced in India

	Commodity	Production	Value
1	Sugar cane	277,750,000 m/t	\$8,482,043,000
2	Rice, paddy	120,620,000 m/t	\$32,167,493,000
3	Wheat	80,710,000 m/t	\$12,131,465,000
4	Potatoes	36,577,300 m/t	\$5,677,931,000
5	Fresh Vegetables	34,761,000 m/t	\$6,550,398,000



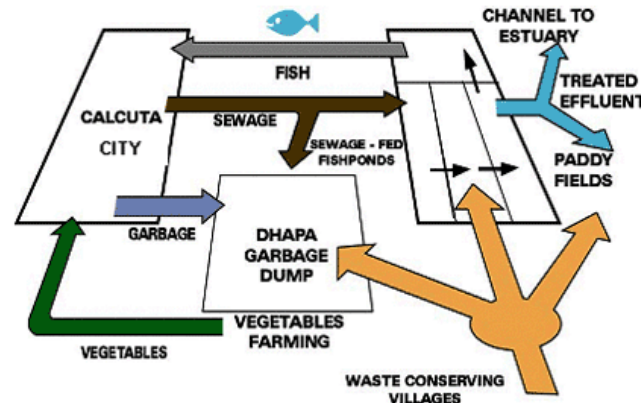
## Case Study.....

- Israel began using drip irrigation systems as it is short of water. With this technique, farmers have been able to improve the efficiency of irrigation by 95%.
- Over a 20-year period, Israel's food production doubled without an increase in the use of water for agriculture.
- In India, some traditional communities in urban and semi urban towns used to grow their own vegetables in backyards on wastewater from their own homes.
- Calcutta releases its waste water into surrounding lagoons in which fish are reared and the water is used for growing vegetables.



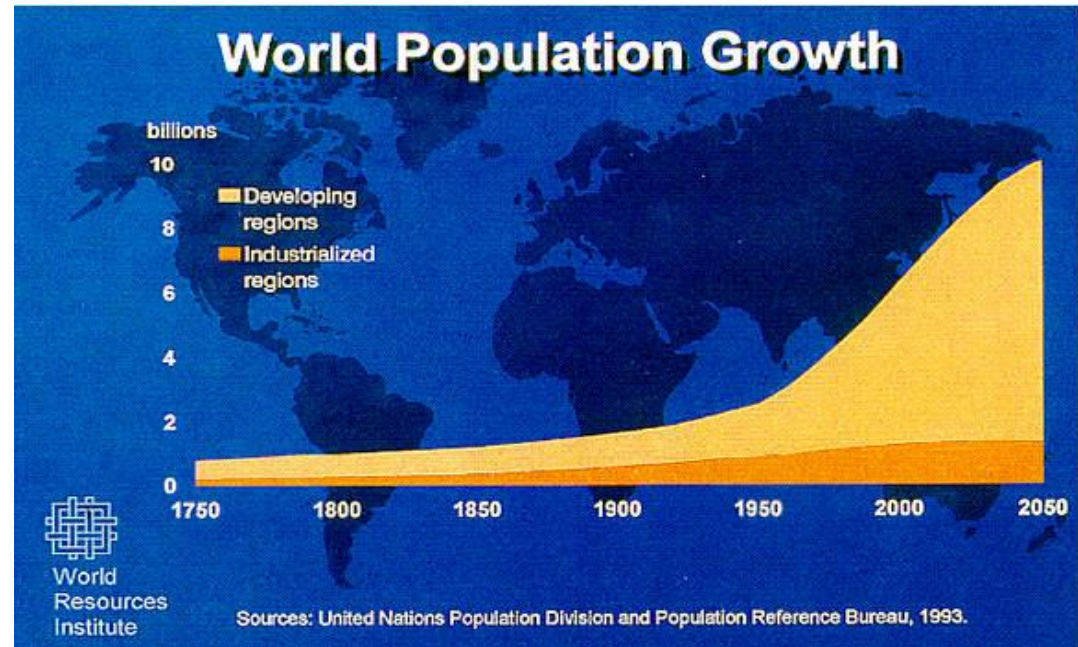
# Calcutta System

The wastewater-fed fish ponds currently occupy an area of about 2,500 ha although they extended over an area of 8,000 ha up to the late 1950s. They are located in a 12,000 ha waste recycling region for Calcutta city which also includes cultivation of vegetables on wastewater and garbage, and paddy fields irrigated with fish pond effluent (Figure 2.53). The wastewater-fed fish ponds have been developed by farmers over the past 60 years who learned by experience how to regulate the intake of raw sewage into ponds to culture fish.



# World Food Problems

- Reasons for problems:
  - Population growth
  - Increasing affluence
  - Degradation and loss of cropland
  - Little growth in irrigation
  - Decline in global fertilizer

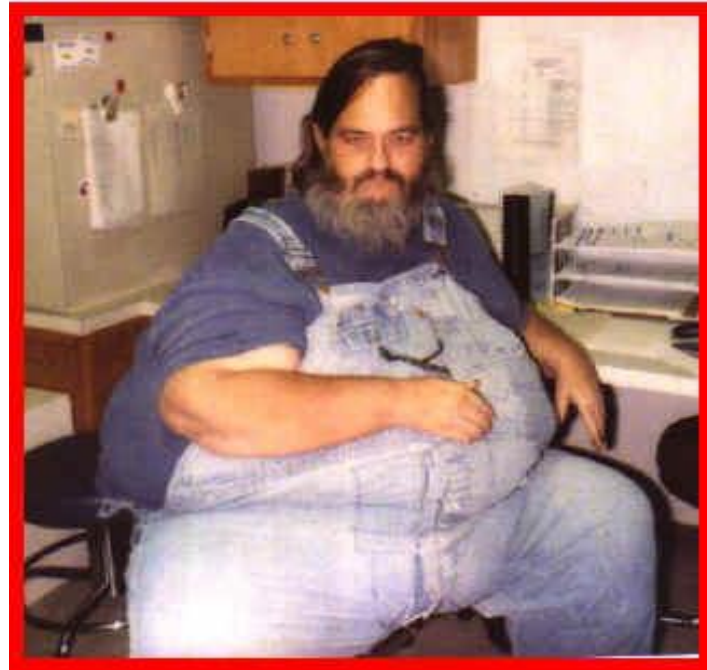


**Under-nutrition:** Consuming insufficient food to meet one's minimum daily energy requirement for a long enough time to cause harmful effects

# World Food Problems

- Malnutrition: Faulty nutrition. Caused by a diet that does not supply a persons with enough protein, essential fats, vitamins, minerals, and other nutrients.

Over-nutrition: an excessive intake of food, especially fats





# World food problems:

- **In many developing** countries where populations are expanding rapidly, the production of food is unable to keep pace with the growing demand. Food production in 64 of the 105 developing countries is lagging behind their population growth levels.
- These countries are unable to produce more food, or do not have the financial means to import it. India is one of the countries that have been able to produce enough food by cultivating a large proportion of its arable land through



# Food security....

- Food Security: It is estimated that 18 million people worldwide, most of whom are children, die each year due to starvation or malnutrition, and many others suffer a variety of dietary deficiencies
- Thus food security is closely linked with population control
- through the family welfare program. It is also linked to the availability of water for farming.
- Food security is only possible if food is equitably distributed to all. Many of us waste a large
- amount of food carelessly. This eventually places great stress on our environmental resources



# Environmental Effects of Producing Food

- Agriculture has a greater harmful impact on air, soil, water, and biodiversity resources than any other human activity.



## Increasing Crop Yields

Agricultural experts expect most future increases in food yields per hectare on existing cropland to result from improved strains of plants and from expansion of green revolution technology

# Cultivation of Land

- 36% of the world's land is devoted to raising crops
- Some think that cultivating more land is a possible solution to the food crisis



## Food Growth in Urban Areas

- Urban gardens provide 15% of world's food
- If people grew more food in their backyards, they could live more sustainable and save money



# Fishing

- 3<sup>rd</sup> major food producing system consists of fisheries
- 99% of fish caught in ocean is from the coastal waters
- Between 1950 and 1996, fish catch increased 4.9 fold
- Fish is an important protein food in many parts of the world. This includes marine and fresh water fish

## Problems With Fishing

- Overfishing-Taking of so many fish that too little breeding stock is left to maintain numbers
- Commercial extinction-reduction of a species to the point at which it's no longer profitable to hunt for them





# Fertilizer

- Lack of nitrogen, potassium, and phosphorus often limits plant growth.
  - Adding nutrients via fertilizer usually stimulates growth and increases crop yields.
    - 1950 - Average of 20 kg/ha fertilizer used.
    - 2000 - Average of 90 kg/ha fertilizer used.
  - Manure and nitrogen-fixing bacteria are
  - alternative methods of replenishing soil nutrients.



## Pest Control

- Biological pests reduce crop yields and spoil as much as half the crops harvested annually. Estimated up to half current crop yields might be lost in the absence of pesticides.
- Crops grown without synthetic fertilizers or pesticides tend to have lower yield, but have lower operating costs and less ecological damage.

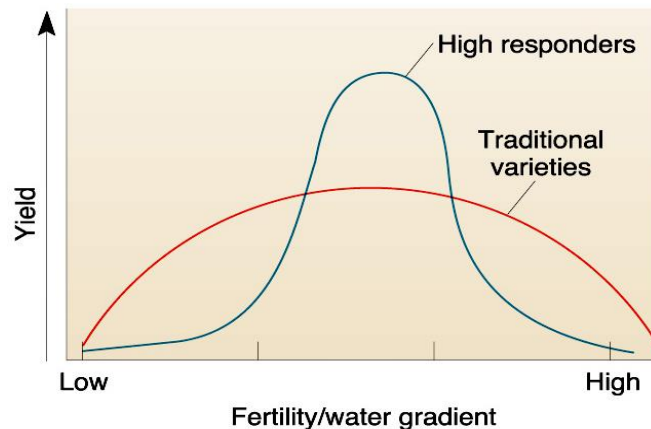
# Genetic Engineering



Up to 90% of all pesticides never reach target organisms.



- At least 3,000 species of plants have been used for food at some point in time, but most world food comes from 16 crops..
- The green revolution refers to the global spread of new, high-yield varieties of plants. These varieties are "High responders" to optimum levels of fertilizer, water, pesticides, light, etc.



# Genetic Engineering

- **Genetic engineering** is the splicing a gene from one organism into the chromosome of another.
- These **Transgenic** organisms are called Genetically Modified Organisms (GMOs) produced
- These new genes result in plants with pest resistance, built in weed control and wider tolerances
- Opponents fear traits could spread to wild varieties, and increased expense would largely hurt smaller farmers.

## Govt. assistance to farmers and consumers

- Keep food prices low
- Give farmers subsidies to keep them in business and to encourage them to increase food production
- Eliminate most or all price controls and subsidies
- Continue Agricultural research



# Sundance Farms

- Agriculture is commonly discussed as a major cause of many serious environmental problems including soil erosion, overuse of water resources, deterioration of water quality in rivers and creeks, loss of biodiversity and in many parts of the world, salinity.
- Sundance Farms in Arizona is an 830 hectare irrigated farm which grows crops including cotton, wheat, barley, milo, maize, seed watermelons, rockmelons and sweet corn
- The arid conditions in Arizona are similar to those experienced in many areas of Australia. Even in well-managed irrigated farms, only 40-60% of water applied to a field will be taken up by crops (for many farms this figure is closer to 20%), with the rest lost to surface runoff, deep percolation or sprinkler wind spray



# Sundance Farms

- Sundance Farms changed from furrow and flood irrigation to subsurface drip irrigation in 1980.
- The drip lines, buried 20-25 cm deep, emit small amounts of water right in the plant root zone.
- The soil surface usually stays dry, reducing surface evaporation, and the root zone is never saturated, reducing runoff and deep percolation.
- The few per cent of water lost is mostly accounted for by the occasional backflushing of the drip lines
- The drip lines, made to last and buried below the depth disturbed by any agricultural equipment, were dear to install, but the cumulative reductions in inputs and increases in productivity made the investment very cost-effective





# Benefits

- Water-use efficiencies increased from roughly 60% to over 95%, a factor of 1.6 improvement
- Reduced tillage operations, replacing ploughing, floating, land planing and listing with simple shallow surface tillage also reduced tillage energy use by 50%
- Simplified tillage allowed quicker postharvest turnaround of fields, permitting two crops to be harvested in some years.
- Because the drip lines cut water losses, less of the applied herbicides and fertilisers left the fields. Herbicide applications were reduced by 50% and nitrogen fertiliser use by 25-50%
- Less water had to be pumped from deep well turbines, thereby reducing pumping energy use by 50%
- Crop yields increased by 15-50%



## Loss of Genetic diversity

- **There are 50,000** known edible plants documented worldwide. Of these only 15 varieties produce 90% of the world's food. Modern agricultural practices have resulted in a serious loss of genetic variability of crops.
- India's distinctive traditional varieties of rice alone are said to have numbered between 30 and 50 thousand. Most of these have been lost to the farmer during the last few decades as multinational seed companies push a few commercial types.



# Summary

- There are two types of agriculture :-
  - Industrialized Agriculture
  - Traditional Agriculture
- In many developing countries where populations are expanding rapidly, the production of food is unable to keep pace with the growing demand. Food production in 64 of the 105 developing countries is lagging behind their population growth levels.
- A few environmental effects of producing food are :-
  - Increasing Crop Yields
  - Cultivation of Land
  - Food Growth in Urban Areas etc.

