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FACULTY OF ENGINEERING AND
TECHNOLOGY

Lecture- 8

Food Resources



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World food problems

World food problems

It can be explained as lack of availability of daily food requirement in terms of kilocalories and nutrition by global population.

Over one billion people worldwide suffer from problem of lack of food.

Poor are most affected group of human population.

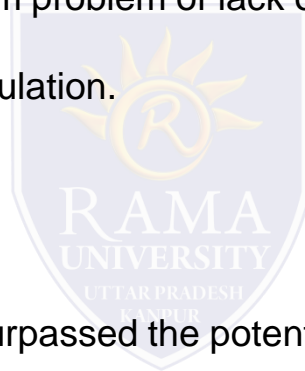
Major reasons related to food problem

The growth rate of human population has surpassed the potential of agricultural fields to produce output.

Food wastage.

Global food production areas are unevenly distributed.

Excessive use of agrochemicals, continuous climate change and over-pressure on agricultural lands are drivers for yielding low quality produce which leads to malnutrition.



Food resources: Changes caused by agriculture and overgrazing

Changes caused by agriculture

- Agriculture practices such as slash and burn, and shifting cultivation carried out generally by poor and tribal people results in forest destruction and degradation of soil quality.
- Intensive agricultural activities and overuse of agro-chemicals has caused land degradation, environment pollution and reduced food quality due to excessive leaching of nutrient, alteration in soil characteristics, depletion of beneficial soil microbes, runoff to water bodies, volatilization of chemicals, and residue accumulation.
- The loss of genetic diversity in crop plants can reduce agricultural produce.

Over-grazing takes place when the grazing activity exceeds the grazing capacity of the area or rangeland.

Over-grazing causes:

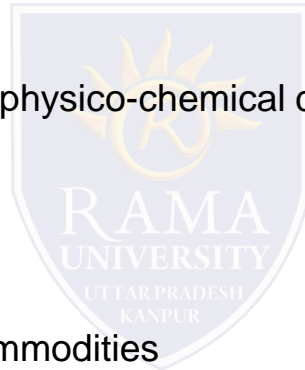
- Reduce vegetation growth and plant cover
- Reduce plant diversity
- Increase soil erosion
- Promote growth of undesirable plant species
- Cattle trampling can destroy other crops and change land structure.

Food resources: Effects of modern agriculture

Modern Irrigation techniques, tilling, monoculture, use of chemical fertilizers and pesticides, and intensive farming are some common practices used in modern agricultural activity.

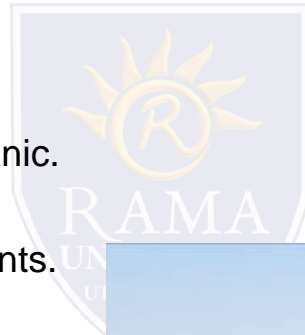
These activities though have enhanced food production but also have raised several grave concerns such as:

- Increase soil erosion
- Decline soil productivity and deteriorates physico-chemical characteristics of soil
- Contaminate surface and ground water
- Decrease water level
- Incorporate chemical residues in food commodities
- Reduce nutritional value to food
- Increase water-logging and salinity
- Develop resistance in pests and pathogens resulting in resurgence of diseases.
- Chemical pesticides kill non-target species and reduce number of beneficial microorganisms in soil.
- Tillage and monoculture reduces soil organic carbon content.



Fertilizers-pesticides problems

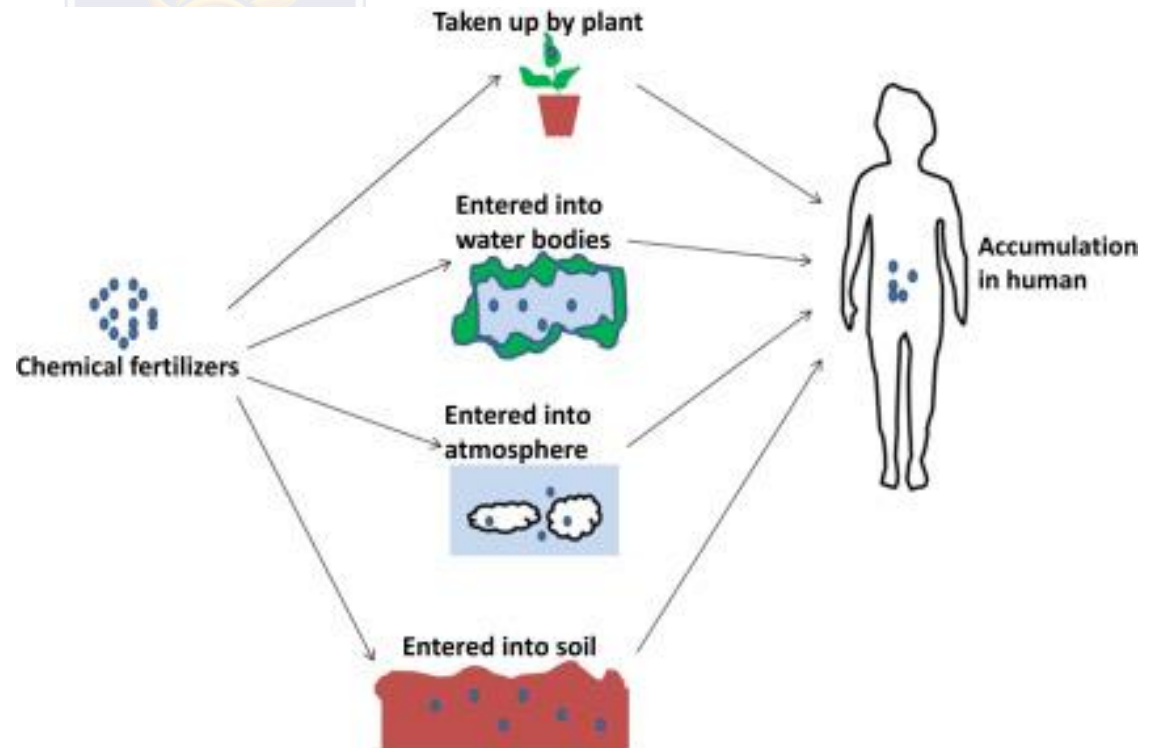
- **Fertilizers** can be natural or synthetic materials which are applied in soil or on plants to promote their growth and productivity.
- Fertilizers supply essential nutrients such as nitrogen, phosphorus, potassium, etc. required for optimum plant growth.
- Fertilizers can be chemical based or organic.
- Fertilizers can contain one or more nutrients.



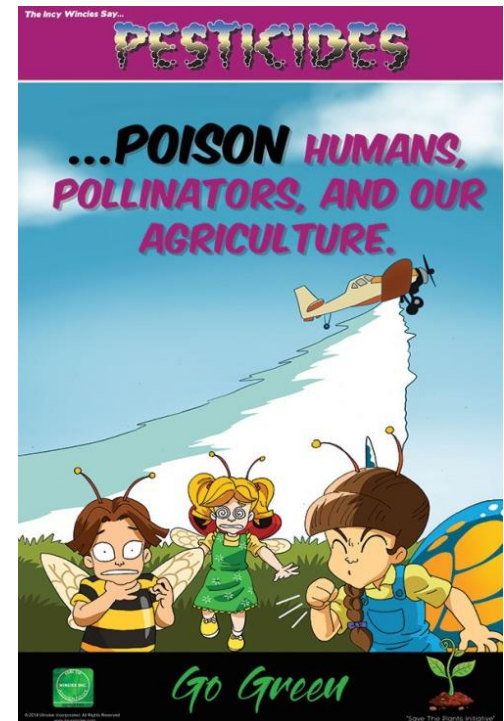
Fertilizers related problems:

- Water pollution- A fraction of the fertilizers applied reach to water bodies through runoff or infiltration and cause eutrophication and deteriorate water quality.
- Soil pollution- Long term use of fertilizers can cause soil pollution. For e.g., use of nitrogen containing fertilizers cause soil acidification. Similarly, use of fertilizers containing metals can significantly cause metal toxicity.

- Air pollution- Use of nitrogenous fertilizers result in production of nitrous oxide and methane gas. These are greenhouse gases and contribute to global warming.



- **Pesticides** are compounds that are used to protect crops from biotic damage by killing pests and pathogens.
- Pesticides are classified depending upon their target organisms.
- Fungicides control fungi that cause diseases in plants such as rust, wilt, damping off, blight, etc.;
- Bactericides or bacteriocides intended to kill bacteria that are responsible for causing diseases such as *Pseudomonas*, *Erwinia*, etc.
- Insecticides control insects like termites, locust, mosquitoes, etc.;
- herbicides control weeds (undesirable plants that grow along with the crops);
- Rodenticides for controlling rodents like rats, mice, squirrels, beavers, etc.



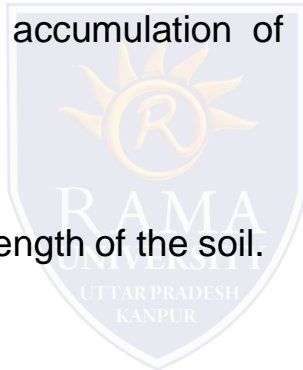
Pesticides related problems:

- Only a small portion of applied pesticides reached to the target organisms, rest affect non-target organisms resulting in loss of beneficial microorganisms and insects.
- Develop resistance in pests and pathogens and induce resurgence of diseases.
- Pesticides show property of bioaccumulation and biomagnification via food chain, hence cause toxicity in organisms present at higher trophic levels.
- Cause water contamination via runoff and air pollution due to volatilization.
- Pesticides residues are often found in food materials that impose risk to consumer.
- Cause pesticide poisoning and other health related problems.



Water-logging

- Water-logging refers to the saturation of soil with water.
- Over-irrigation of agricultural land, heavy rainfall and inadequate drainage leads to water-logging.
- Under water-logging conditions, level of oxygen decreases in root zone, thereby reduces or inhibit aerobic respiration.
- Water-logging can increase the salinity, accumulation of toxic compounds and reduces soil microbial biomass.
- Water-logging reduces the mechanical strength of the soil.
- Decrease soil temperature.
- These changes in soil reduces plant growth and productivity and under severe conditions leads to plant death.
- Water-logging can be prevented by improving drainage system such as use of bio-drainage with trees like Eucalyptus, and using sprinklers for irrigation.

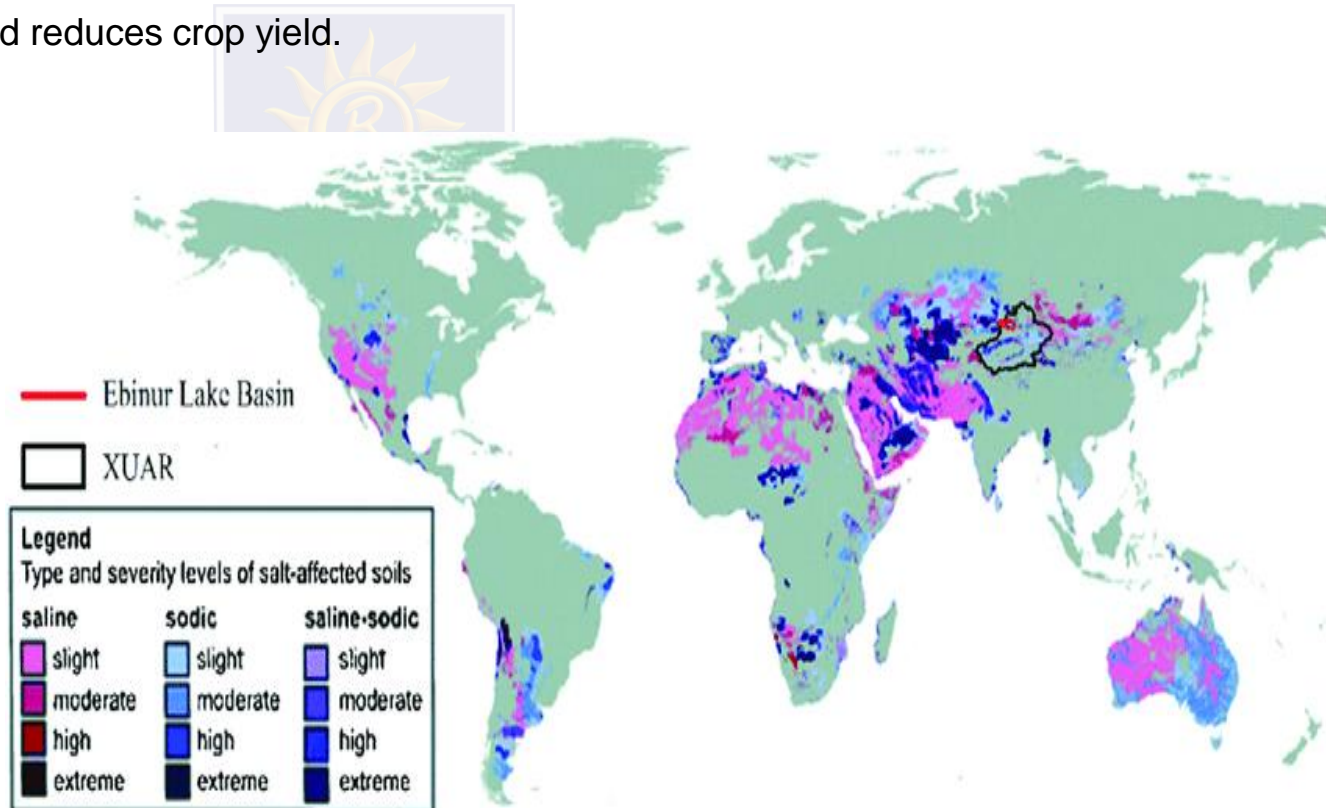


Salinity

- Salinity refers to the condition of high salt concentration in soil.
- Nearly one-third of the total global cultivable land is affected with salinity.
- The major reason for soil salinization is excessive irrigation from canal or ground water that contain dissolved salts like sodium chloride, sodium carbonates, calcium chloride, etc.
- Salinity affect plant growth and reduces crop yield.

Preventive measures:

- Controlled irrigation
- Irrigation of land using water that does not contain salts
- Proper drainage system to flush out excess salt
- Reducing water evaporation



Case study-Water-logging and salinity

▪The first ever report on land salinization due to irrigation activities came into limelight in 1858 from Haryana (then Punjab). It was reported that several villages in Panipat, Rohtak, and Delhi lying in command area of Western Yamuna Canal were suffering with the problem of destructive saline efflorescence.

▪The occurrence of flood in 1947, 1950, 1952, 1954-56 coupled with poor drainage system resulted in water-logging condition in Punjab.

▪Introduction of canal irrigation in 1.2 million hectare of irrigated area in Haryana initially raised the water table which was later followed by water-logging and salinity condition. This incurred huge economic losses due to reduction of crop productivity.

