

Unit - I

Food Resources - Agriculture & Environment

By:

Dr. Parveen Kumar

Asst. Professor

Contents

- **Food resources**
- **Global food problem**
- **Modern agriculture**
 - **Fertilizers**
 - **Pesticides**
 - **Water logging**
 - **Salt affectation**
 - **High yielding varieties**
- **Further readings**
- **References**

Food Resources

- **Food** – Materials of plant or animal origin which contain essential body nutrients.
- **“Food resources** - Resources that are used as food, or provide food for organisms”.

1. Plants



2. Animals



Cereals



Pulses



Spices



Beverages



Fruits



Vegetables





Eggs



Honey



Milk



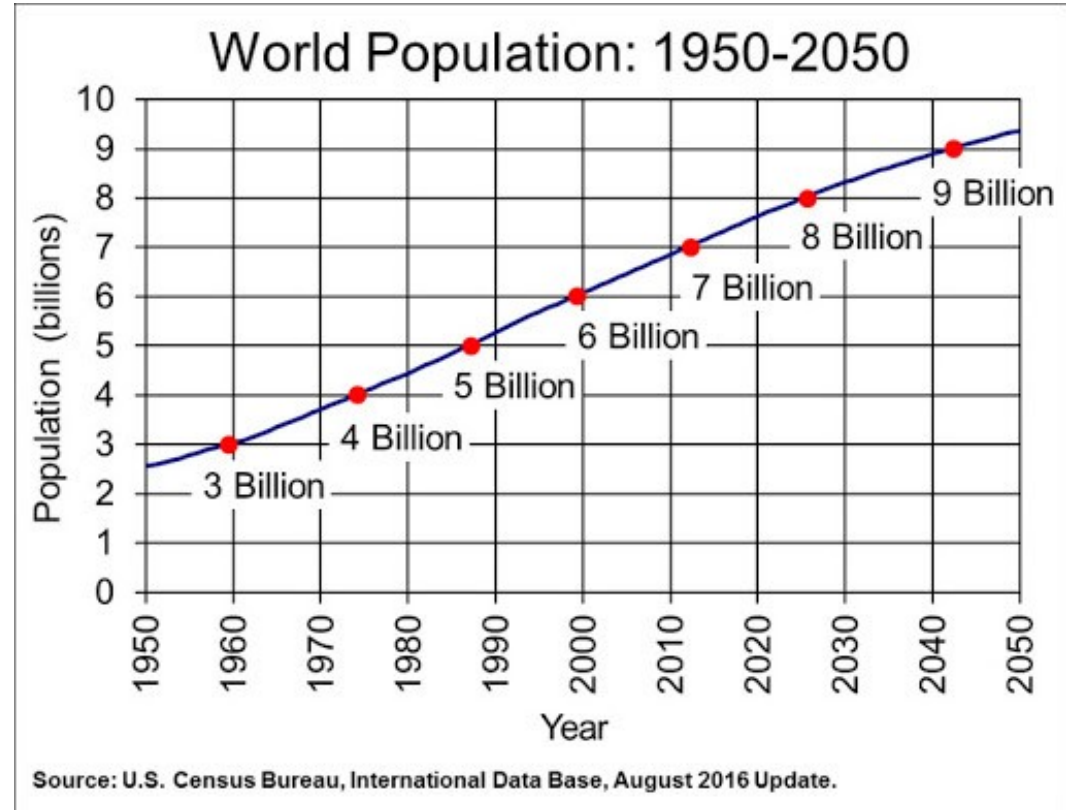
Meat



Fish

Global Food Problem

- **Population explosion**
- **Soil degradation**
- **Loss of crop land**
- **Little growth in irrigation**
- **Contamination of food**
- **Unstable markets**
- **Food wastage**
- **Malnutrition**
- **Climate change**



Modern Agriculture

- **Fertilizers – plant nutrients**
- **Pesticides**
- **Water logging**
- **Salt affectation**
- **High yielding varieties (HVY)**



Salt affectation



Water logging



Fertilizers



Pesticides



HVY

Fertilizers

✓ **Fertilizer** is any organic or inorganic material of natural or synthetic origin that is added to a soil to supply one or more plant nutrients essential to the growth of plants.

1. Organic:

- ✓ **Low concentration** of nutrients (5%)
- ✓ **Voluminous** - Collection and Transportation cost more
- ✓ **Slow release fertilizers** – decay to release nutrients.
- ✓ Compost, worm casting, chicken litter, seaweed, guano, bone meal etc.
- ✓ Improve soil **biodiversity** and long-term **productivity** of soil.
- ✓ May contain **pathogens**

2. Inorganic:

- ✓ **High concentration** of nutrients (64%)
- ✓ Nutrients **instantaneously available** to plants
- ✓ NH_3 , NO_3^- , H_3PO_4 , KCl etc.
- ✓ Solid/ powder/ liquid

Inorganic Fertilizers



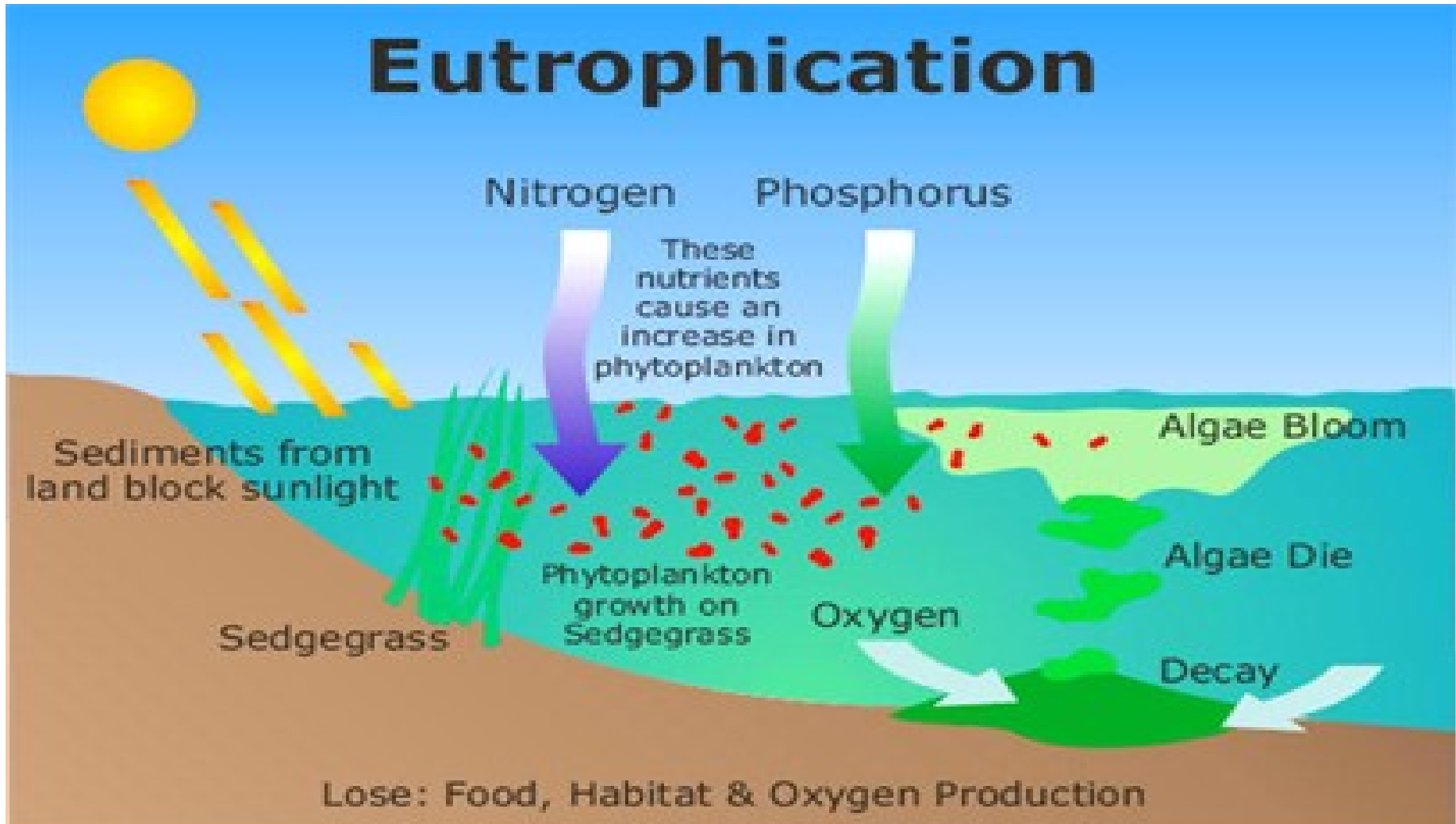
Organic Fertilizers

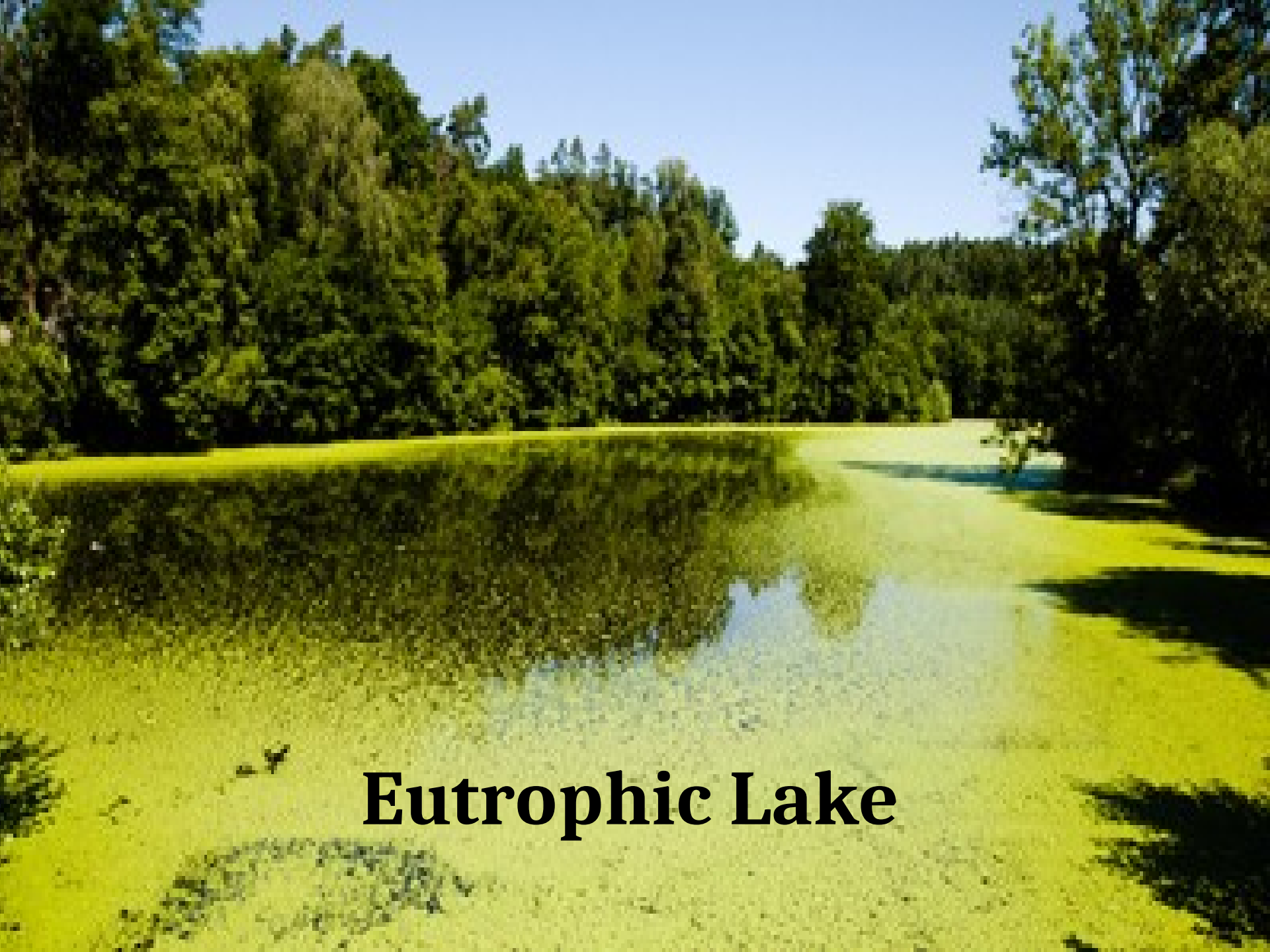
Environmental Impacts of Fertilizers

- **Water pollution** – surface and ground
- **Methaemoglobinaemia** (Blue baby syndrome) – Nitrate
- **Eutrophication** – Nitrates and Phosphates
- **Soil acidification**
- **Soil contamination** – Dioxins, Furans, heavy metals, and radio-nuclides
- **Global warming** – Methane (CH₄) and Nitrous oxide (N₂O) gas emission.
- **Increased pest fitness**

Eutrophication

Excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life.





Eutrophic Lake

Bluebaby Syndrome

- **Babies (under 6 Month)** are characterized by a **blue skin color**.
- Babies who are fed infant **formula mixed with well water** or homemade baby food made with nitrate-rich foods, like **spinach** or **beets**.
- Baby has **underdeveloped gastrointestinal tracts** which **convert nitrate** into **nitrite**.
- **Nitrite** circulates in the body, it produces **methemoglobin** which is oxygen-rich but doesn't release oxygen into the bloodstream.

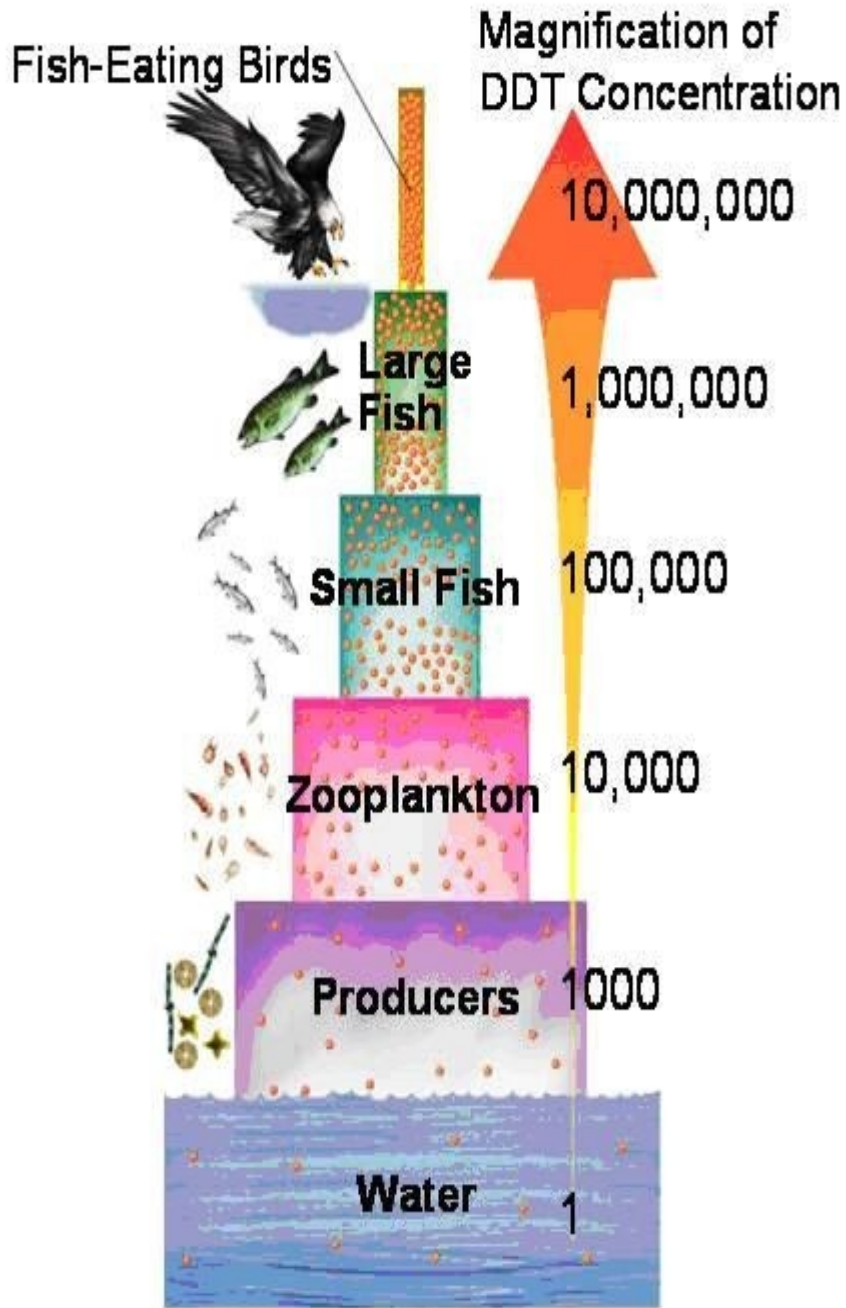


**Nitrates Cause
Blue baby syndrome**

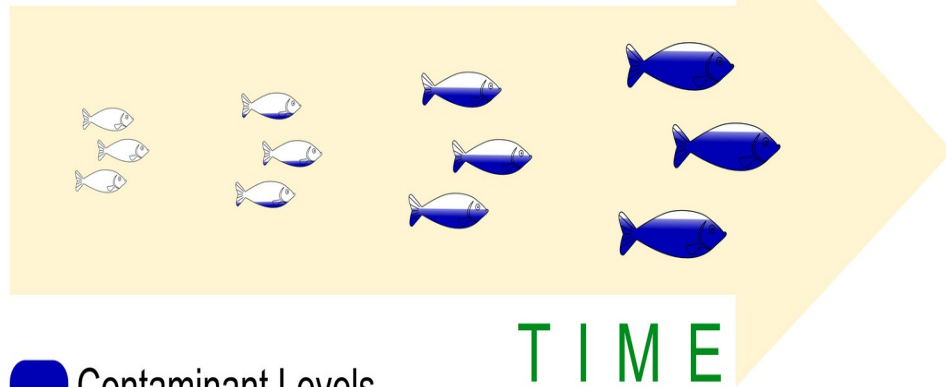


Pesticides – Plant Protection Chemicals

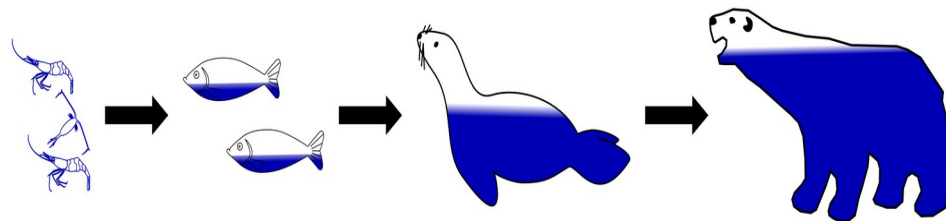
- **Pollution** –air, water, soil, food
- **Plants** – affect nitrogen fixation and root hair development.
- **Kill bees** (pollination decline) and **affect soil biodiversity** – earthworms
- **Birds** – egg shell thinning
- **Humans** – **Inhalation, oral, dermal exposure** – birth defects, tumors, genetic changes, blood and nerve disorders, coma or death.
- **Pest Resistance**
- **POPs**: DDT, Aldrin, and Hexachlorobenzene etc.
 - ✓ **Bio-accumulate** and **Bio-magnify** through food chain
 - ✓ **Volatilize** and Travel long distance
 - ✓ Poison **non-target organisms** - Disrupt ecological balance
 - ✓ **Cause** reproductive, and immune systems, cancer, neurobehavioral disorders, infertility and mutagenic effects



Bioaccumulation



● Contaminant Levels



● Contaminant Levels

Biomagnification

Eliminating pesticides

- **Manually** removing weeds and pests from plants.
- **Applying heat**, covering weeds with plastic
- **Placing traps** and lures to catch or move pests
- Pests can be prevented by removing **pest breeding sites**
- Maintaining **healthy soils** which breed healthy plants that are resistant to pests
- Planting **native species** that are naturally more resistant to native pests
- Use **bio-control agents** such as birds and other pest eating organisms

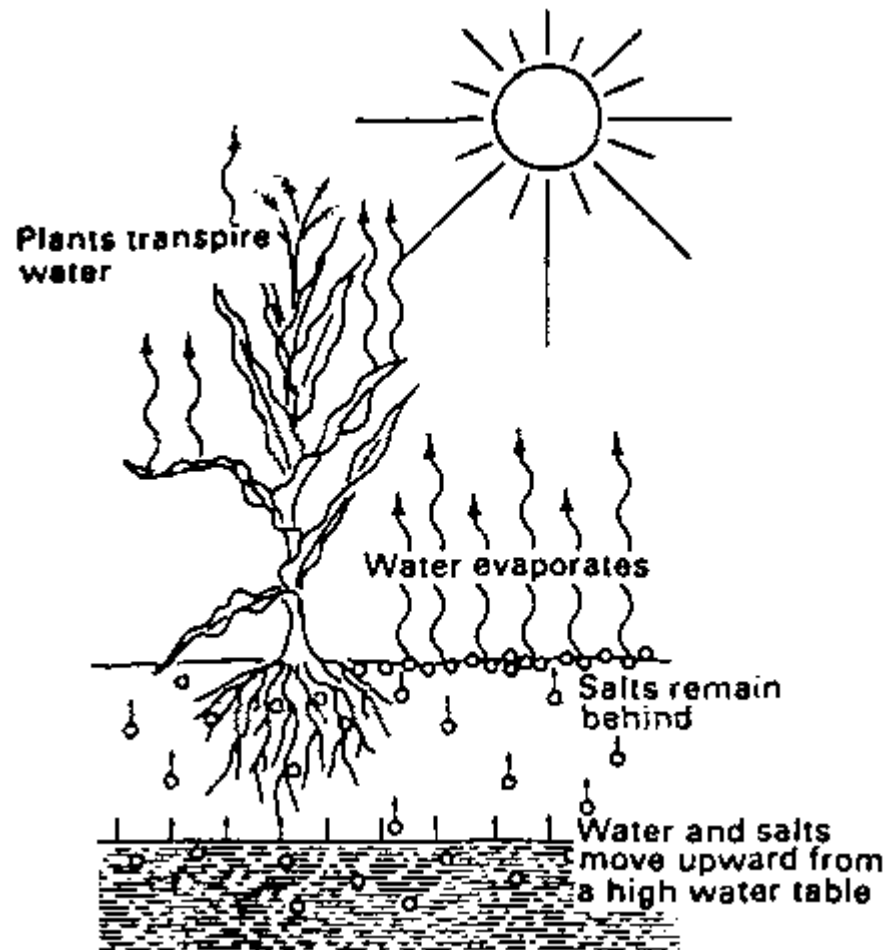
Water Logging

- **Excessive irrigation** without proper drainage – Water table rise
- Soil becomes **saturated** with water
- Saturated soil can not support **plant growth** – congestion of **roots** & poor **mechanical strength**
- **Poor yield**



Salt Affection

- **Excessive irrigation** in high temperature zones causes salt affection of soils. Water evaporates very fast, leaving behind the traces of salt on the soil.
- **Salt accumulates** and forms a **grey** or **white layer** of salts on the surface.
- **Alkaline soils** - **insoluble sodium carbonate** and **bicarbonate** - a hard layer of CaCO_3 below the surface - roots cannot penetrate.
- **Saline soils** - **soluble** sodium salts such as NaCl and sodium sulphate.
- Soil with salt exceeding **2000-3000 ppm** - water solution of soil becomes **toxic** for most plants.
- Plants fail to **absorb nutrients** and face **water stress** even amidst plentiful soil moisture.



High Yielding Varieties

“HYVs are manmade varieties of food and fodder plants, forest trees, livestock and fishes developed for more yield”.

- These varieties necessitate use of **fertilizers** and **pesticides**.
- HYVs encourage **monoculture** - same genotype is sown over large land area.
- Whole crop can succumb to the disease leading to eruption of **epidemics**.
- Regeneration of the species and **evolution process is hindered**.
- This results in **depletion of crop diversity** and elimination of chances for development of new varieties.



Monoculture



Mechanized farming

Further Readings

1. Environmental impact of agriculture, https://en.wikipedia.org/wiki/Environmental_impact_of_agriculture
2. V 6.5 ENVIRONMENTAL IMPACT OF AGRICULTURE, <https://humangeography.pressbooks.com/chapter/6-5/>
3. Modern Agriculture Effects Part 1, <https://www.youtube.com/watch?v=c7atjIvE-hk>
4. Modern Agriculture Effects Part 2, <https://www.youtube.com/watch?v=WOH2A17kyIo>

References

- Nirmalajeet Singh, Presentation on food resources,
<https://www.slideshare.net/NirmaljeetGurm/food-resources-30423095>

The image features a blue gradient background that transitions from a lighter blue at the top to a darker blue at the bottom. The text "Thank you for attention!!!" is centered in a white, sans-serif font. The entire image is framed by a thin white border with rounded corners.

Thank you for attention!!!

Q1. How much is Indian population at present?

- a) 1,39.27 Crores
- b) 1,35.26 Crores
- c) 32.72 Crores
- d) 7.7 billion

Q2. What are symptoms of soil degradation?

- a) Decreased fertility
- b) Less production
- c) Poor structure
- d) Less biodiversity
- e) All

Q3. How climate change is affecting food security?

- a) Change in rainfall pattern
- b) More extreme weather events
- c) More natural disasters
- d) All

Q4. Which of the following is a micronutrient?

- a) Nitrogen
- b) Copper
- c) Carbon
- d) Phosphorus

Q5. The nutrient content in organic fertilizer is:

- a) 5%
- b) 0.4%
- c) 1%
- d) 64%

Q6. The characteristics of organic farming soils are:

- a) High water holding capacity
- b) Poor organic matter
- c) Good biodiversity
- d) Good productivity
- e) All
- f) a, c, & d

Q7. Blue baby syndrome is caused by:

- a) Phosphate
- b) Nitrate
- c) Pesticides
- d) Nitrite

Q8. Eutrophication is caused by:

- a) Nitrates
- b) Sewage
- c) Phosphate
- d) Agricultural runoff
- e) a & c
- f) All

Q9. Which is a global warming causing gas?

- a) CO & CH₄
- b) CH₄ & N₂O
- c) N₂O & N₂
- d) b & c

Q10. How modern agriculture is affecting environment?

- a) Pollution
- b) Decreased soil fertility
- c) Contaminated food
- d) Soil erosion
- e) All