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Soil Pollution and Its Management Practices

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SUMMARY

Any unfavorable alteration of our surroundings through direct or indirect effects on the physical, chemical and biological characteristics of our land, water and air, influenced primarily by man's actions is known as 'environmental pollution'. Many pollutants reaching the soil can build up to such concentrations which pose serious threats to plants and animal health. Soil pollution is not apparent immediately and shows its effect sometimes only after many years.

INTRODUCTION

Soil is the natural resource it acts as medium for plant growth. Weathering of rocks and minerals consists of mineral nutrients and living organisms. Soil can act as a physical filter by its sieving action, a chemical filter by adsorbing and precipitation of chemical substances, and a biological filter by decomposing organic materials. It does not have infinite capacity to perform these functions. Any addition to soil of substances that may exert adverse effects on its functioning can be defined as soil contamination. Since most soils possess buffering capacity, it usually takes some time for the negative effects to become visible and then the soil can be considered polluted and the process as soil pollution. Pollution refers to contamination of water, land and air by substances that can adversely affect on the environment and human health.

Causes of soil pollution:

- The agricultural activities involve addition of nutrients, pesticides and sediments to soil.
- Industry and urbanization pollute the soil with solid wastes, heavy metals, solvents and several other organic and inorganic substances pollute the soil.
- Application more chemical fertilizers.
- Use of chemicals like pesticides , insecticides
- Soil erosion
- Use of saline water
- Urban wastes
- Industrial wastes
- Radioactive wastes
- Acid rains
- Irrigation Practices(Poor Water management)
- Wastes from mining
- Leakage of toxins
- Dumping of solid waste
- Oil and petroleum spills

Effect on bio accumulation:

Plants: Grown in polluted soils absorbs molecules and accumulate in plants
Animals: By eating plants
Humans: By eating such plants or animals

Soil Pollution problems related to agriculture

Soil pollution can be natural or due to human activity. However, it mostly due to the activities of the human that causes the majority of soil pollution such as heavy industries, or pesticides usage in agriculture.

1. Pesticides:

Pesticides are generally insoluble in water and non-biodegradable. Therefore, these chemicals will not gradually decompose or persists in soil for longer period and keep on accumulating in the soil affecting beneficial soil microflora and these chemicals enters the food chain causes many metabolic and physiological disorders in humans.

2. Chlorinated Organic toxins:

Carbamates and organophosphates chemicals are the harmful toxins for nerves, hence they are more dangerous to humans and animals.

3. Herbicides:

- Herbicides like sodium arsenite (Na3AsO3), sodium chlorate (NaClO3), etc most of the herbicides are toxic. They are known to cause birth defects.
- Majority of the causes is related to manufacturing activities in chemical and industrial processes as their waste is disposed or released into nature or environment which persist in soil for long because are non or very slow degradable.
- These chemical pesticides and herbicides affect the soil health and fertility thereby affecting agricultural productivity or make soil unfit for further cultivation.

4. Fertilizers

- Excessive use of inorganic nitrogen fertilizers leads to deterioration of soil fertility, acidification of soil and contaminate the agricultural soil making them not suitable for agricultural purpose.
- Also known as agrochemical pollution.

5. Industrial Pollution:

The incorrect way of chemical waste disposal from different types of industries can cause contamination of soil, this leads to acidification and contamination of soil due to the disposal of industrial waste, heavy metals, toxic chemicals, dumping of oil and fuel into soil, etc. becomes toxic for the plant growth.

6. Inferior Irrigation Practices:

- Poor irrigation methods increase the soil salinity.
- Excess watering, improper maintenance of canals and irrigation channels, lack of crop rotation and intensive farming gradually decreases the quality of soil over time and cause degradation of land.

7. Solid Waste:

- Disposal of plastics, cans, and other solid waste falls into the category of soil pollution. Disposal of electrical goods such as batteries causes an adverse effect on the soil due to the presence of harmful chemicals such as lead and lithium.
- For instance, lithium present in batteries can cause leaching of soil.

Urban Activities:

Lack of proper waste disposal, regular constructions can cause excessive damage to the soil due to lack of proper drainage and surface run-off. These waste disposed by humans also contain chemical waste from residential areas. Moreover leaking of sewage system can also affect soil quality and cause soil pollution by changing the chemical composition of the soil.

After-Effects of Soil Pollution

Soil pollution is not only the problem in India but it is a global problem. It causes harmful effect on the soil and the environment at large. Contamination of soil will decrease the agricultural output of a land. Major soil pollution after effects are:

Inferior Crop Quality:

- It can decrease the quality of the crop.
- Regular use of chemical fertilizers, pesticides will decrease the fertility of the soil at a rapid rate and alter the structure of the soil. This will lead to decrease in soil quality and poor quality of crops. Over the time the soil will become less productive due to the accumulation of toxic chemicals in large quantity.

Management practices:

Improved fertilizer Nitrogen Use Efficiency

- Apply optimum dose of Nitrogen fertilizer
- Apply timely the fertilizer N applications to coincide with crop needs
- Apply Nitrogen fertilizer in split doses
- Apply balanced doses of Nitrogen, Phosphorus and Potassium
- Incorporate or deep place fertilizer N into soil
- Use slow release nitrogen fertilizers
- Use urea and nitrification inhibitors (N-serve or Nitrapyrin), sulphur coated urea, Urea formaldehyde and Urease inhibitors- Ammonia thiosulphate)
- Practice Integrated Nutrient Management (INM)

Land Management Technique

- Use of crop rotations and catch crops
- Improve irrigation scheduling to encourage plant growth and minimize leaching
- Conservation tillage to control surface runoff
- Crop residue recycling
- Use of animal manures
- Use of terrace, contouring and retention bases to catch sediments
- Genetic manipulation of plant material to be more efficient at N-recovery and N_2-fixation

CONCLUSION

Soil pollution is the contamination of soil with harmful substances that can adversely affect the quality of soil and health of those living on it. Soil contamination or soil pollution can occur either because of human activities or because of natural processes. However, mostly it is due to human activities. The soil contamination can occur due to the presence of chemicals such as pesticides, herbicides, ammonia, petroleum, lead, nitrate, mercury, naphthalene, etc in an excess amount.

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