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Soil pollution-A Momentous Crisis.

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Abstract
Soil is nature's wonderful gift and lives of all the living beings are directly or indirectly influenced by the soil in which it resides. Now soil degradation is one of the important issues faced throughout the world due to various pollutants, agrochemicals, trace elements etc. Contamination of soil by urban and industrial pollutants, such as heavy metals, toxic organic chemicals, and radionuclides may lead to toxic accumulation in arable produce and in herbage for grazing animals thus having important implications to human health. The global land degradation rate has been increased dramatically in recent years and likely to increase more in further decades.

Keywords: Soil, nature, toxin, pollutants, degradation, radionuclides.

1. Introduction
Soils play a fundamental role in the regulation of pollutants in the eco system. Soil is the interface for most human activity and is greatly impacted by humans. Soil Pollution like the pollution of water and air can be dangerous. Rural areas are also not freed from soil pollution since they are using various fertilizers and pesticides for agriculture. Plants retain those toxins and when they die, it decompose the toxic material back into the soil and in due course the soil will become unusable. Many bacterial infestations like Actinomycosis, Anthrax, Botulism, E-coli, Leptospirosis spread through contact with polluted soil. Salmonella being a food borne disease, one of the common route of this bacteria in vegetable is through soil. Many helminthes like Ascaris Lumbricoides, Necator Americanus, Ancylostoma duodenale etc. enters man through contaminated soil. Polio virus can survive in soil environment for between 80 to 96 days. Tetanus bacteria and some Hanta virus are transmitted to human through infected rodent excreta which may be in soil. Central and state government has taken many criteria's to access the level of nutrients and control over use of inorganic chemicals and disposal of non-bio degradable waste like plastics. The measures are mainly taken with the prospective of increasing the soil quality for increased productivity of crops. Since soil health may directly affect the human health, more measures are needed regarding health related aspects [1]

2. Soil-classification
There are 5 different soil types that gardeners and growers usually work with. All five is a combination of just three types of weathered rock particles that make up the soil: sand, silt, and clay. How these three particles are combined defines your soil's type

2.1 Sandy
Sandy soil has the largest particles among the different soil types. It's dry and gritty to the touch, and because the particles have huge spaces between them, it can't hold on to water.

2.2 Silty
Silty soil has much smaller particles than sandy soil so it's smooth to the touch. When moistened, it's soapy slick. When you roll it between your fingers, dirt is left on your skin. Silty soil retains water longer, but it can't hold on to as much nutrients as you'd want it to though it's fairly fertile. Due to its moisture-retentive quality, silty soil is cold and drains poorly.

2.3 Clay
Clay soil has the smallest particles among the three so it has good water storage qualities. It's sticky to the touch when wet, but smooth when dry. Due to the tiny size of its particles and

Its tendency to settle together, little air passes through its spaces. Because it's also slower to drain, it has a tighter hold on plant nutrients. Clay soil is thus rich in plant food for better growth.

2.4 Peaty
Peaty soil is dark brown or black in color, soft, easily compressed due to its high water content, and rich in organic matter. Peat soil started forming over 9,000 years ago with the rapid melting of glaciers. This rapid melt drowned plants quickly and died in the process. Their decay was so slow underwater that it led to the accumulation of organic area in a concentrated spot.

2.5 Saline
The soil in extremely dry regions is usually brackish because of its high salt content. Known as saline soil, it can cause damage to and stall plant growth, impede germination, and cause difficulties in irrigation [2]

3. Types of Soil pollution
There are mainly 2 types of soil pollution, Natural and Manmade. Natural is through sea water infiltration in coastal region, acidification of soil, soil erosion etc. Manmade is through deforestation, sewage, use of inorganic pesticide, quarrying and transport of sand etc. Soil degradation incorporates a number of environmental problems, some of which are –erosion, leaching, acidification, salinisation, accumulation of agro chemicals and urban-industrial pollutants The effect of soil degradation is increasing through the world. More worrying features of increasing number of such sites are:

A. The lack of expertise in many countries to remediate contaminated sites
B. The impact that it can have on soil, water and air quality
C. Adverse effect on human and animal health through either ingestion of contaminated soil by children or consumption of crops growing on such soils [3]

4. Agro chemicals in soils
Wide range agro chemicals are currently used by the farmers to sustain food production. These chemicals range from fertilizers that include phosphorus, nitrates, sulphur, calcium, manganese to pesticides to control both weeds and pests. An addition constraint with fertilizer use has been the inadvertent addition of trace metals such as Cd and Hg that implicates to both soil and crop quality [4]

Some commonly used fertilizers in agricultural production

Nutrient	Fertilizers	Chemical formula	Nutrient content (%)
Nitrogen	Ammonium chloride	NH_4Cl	26
	Ammonium sulphate	$(NH_4)_2SO_4$	21
	Ammonium nitrate	NH_4NO3	35
	Urea	$CO(NH_2)_2$	46
Phosphorus	Single super phosphate	$Ca(H_2 PO_4)_2$ $CaSO_4$	8-9.5
	Triple super phosphate	$Ca(H_2 PO_4)_2$	20
Potassium	Muriate of potash	KCl	50
	Sulphate of potash	K_2SO_4	40-42

Some commonly used pesticides in agricultural production

Pesticide group	Common pesticide types
Quaternary N pesticides	Diquat, Paraquat
Basic pesticides	Ametryn, Amitrole, atrazine
Carboxylic acid herbicides	Dicambe, Dichlorprop, Endothal, Picloram
Hydroxyl acid pesticides	Bromacil, Terbacil, Dinoseb

4.1 Adverse impact of agro chemicals in soil
There are many number of ways in which agricultural practices can impact on soil quality. The excessive use of nitrogenous and phosphate fertilizers causes acidifying effect on soil. The effects on soil acidification of various fertilizers used as the sources of major nutrients namely nitrogen, phosphorus, potassium, sulphur. The main process affecting the fate of fertilizers in the soil are : plant and animal uptake, adsorption, exchange in the soil, leaching or infiltration of ground water, gaseous losses to the atmosphere and surface loss in the solid form by runoff and erosion.

5. Trace elements in soil
Trace elements are naturally occurring, and abundance in soil reflects the trace element composition of the parent rocks. In general the enrichment ratio(ER) of trace elements in soil relative to parent rocks is near one, suggesting that these elements are not enriched in soil by weathering and SOM accumulation. The trace element content of surface soil can vary naturally by several orders of magnitude, and levels in some soil exceed regulatory limits for contaminated soils. As important as the total contents of the trace elements in soil are, their chemicals form determine their fate and bioavailability. [5]

Some trace elements in soil

Element	Average elemental soil content (mg kg-1)	Effect on plant and animal health
Silver	0.05	Animal toxicity
Arsenic	6	Toxic to plants and animals
Boron	20	Plant nutrient; phytotoxic
Beryllium	0.3	Toxic to plants and animals
Bismuth	0.2	Toxic to plants and animals
Cadmium	0.35	Animal toxicity
Chlorine	100	Plant nutrient; phytotoxic

5.1 Major impact of trace elements in soil.
The trace nutrients may be extensively deficient in soils of the world, and trace element fertilizers are often used in modern yield production agriculture, but the major environmental concerns with these elements have been their potential toxicity to soil biota and the food chain. Anthropogenic trace element sources have caused most of the extensive high level soil contamination. These sources include mining, ore smelting, waste disposal, and indiscriminate use of trace element pesticides and fertilizers. Trace elements can be deficient in plants, deficient in animals grazing forage, phytotoxic, toxic in forage grazed by livestock, toxic to grazing livestock from direct soil ingestion, and toxic to soil biota, particularly bacteria. Mobile trace elements like As, Se, and B can contaminate surface and ground water.

5.2 Changes in soil PH due to fertilizer addition
When plants are grown in UN buffered nutrient medium supplied with different forms of N, the release of hydrogen and hydroxyl ions alter the PH of the medium. In soils, however the acidification is measured either by a decrease in soil PH or

by decrease in anion neutralizing capacity. The extent of soil acidification, as measured by a decrease in soil PH depends mainly on the PH buffering capacity of the soil. Various soil constituents like organic matter, Fe, and Al oxides and calcium carbonate contribute to the PH buffering of soils at different PH values.

6. Other Cemicals in Soil

Miscellaneous chemical compounds may be present at levels that impact soil processes, plant growth and food chain contamination. These include;

I. Soluble salts from saline waters sources (irrigation, seeps, flooding) from waste disposal (food processing brines) from mines(brine associated with oil and gas drilling).
II. Acids from spills, chemical production facilities and from waste disposal
III. Alkalis from spills, chemical production facilities and waste disposal.
IV. Radionuclides from mine tailings, nuclear production facilities atmospheric nuclear bomb.

7. Remediation of chemically degraded soil

Depending on the nature and chemical form of the contaminant and the action level, a remediation strategy can be proposed and then tested at the bench of field scales. The action level may be given in terms of a total or mobile soil concentration or by a biologically available fraction as determined by bioassay [6]

Contaminant type	Mobility	Volatility	Contaminant level	Remediation approach
Nitrate	High	Low	High	Pump and treat phytoremediation
Phosphate	Low	Low	Moderate high	Phytoremediation, removal, immobilization
Trace elements	Low	Low	Moderate high	Immobilization, washing, immobilization

8. Discussion

Soil is the natural medium for the growth of land plants. Soils are all unconsolidated material of the earth crust in which land plants can grow, if water and temperature are adequate, at least the minimum nutrients are available, and toxic substances are in low concentration. Soils play a fundamental role in the regulation of pollutants in ecosystems. Increased demand for food to sustain the ever increasing world population has led to massive increase in both agricultural and industrial activities throughout the world. Such activities have resulted in extensive degradation of soil environment. Soil degradation causes decline in soil productivity through adverse changes in nutrient status, organic matter and concentrations of solutes and agrochemical. The effect of soil degradation is not restricted to soil alone, but have a number of implications. The most serious issue facing scientists and the community is the disproportionately of research activities and regulatory measures to protect soil environment. The agrochemicals like pesticides and fertilizers and industrial, domestic and electronic waste do harmful impact on the soil resource. This will directly affect the crop and then reaches human beings. Measurements of changes in contaminant bioavailability are a necessary test of efficacy for reclamation methods that immobilize rather than remove soil contaminants.

9. Conclusion

Soil is natures gift so it's our responsibility to nature it. The history of a country is written in the way it treats the soil. Soil is the interface for most human activity and is greatly impacted by humans. Soil acts as an important source of pollution and as a carrier or pollutants. Soil is an important sink for pollutants through precipitation, sorption and immobilization reaction and these pollutants are directly ingested by soil biota, grazing animals, and humans. The extend of soil degradation is increasing throughout the world. It is high time to do remedial measures to protect this nature's wonderful gift.

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