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# EFFECT OF SOIL CONTAMINANTS ON SOIL HEALTH AND CROP PERFORMANCE

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**Introduction:** Soil contamination occurs by continuing accumulation of toxic compound, salts, radioactive material or disease-causing agent in soil more than its threshold concentration which causes undesirable changes in the soil environment and has the adverse effect on plant growth. It is mainly as a result of agricultural activities, industrial activities, and urban activities. The agricultural activities include the excess application of pesticides and herbicides. The industrial activities such as mining and smelting of metals, burning of fossil fuels, Toxic fumes, accidental spills of chemicals used for industrial purposes and direct discharge of industrial wastes to the soil. Improper disposal of urban waste, percolation of contaminated surface water to subsurface strata and leaching of wastes from landfills have also been the source of contamination. The commonly found chemical contaminants are petroleum hydrocarbons, polynuclear aromatic hydrocarbons, solvents, pesticides and heavy metals such as lead. External crop production inputs such as mineral fertilizers, organic amendments, microbial inoculants and pesticides are applied with the ultimate goal of maximizing productivity and economic returns, while side effects on soil health are often neglected. This study summarized the current understanding of how crop production inputs affect soil health (soil physical, chemical and biological properties). Mineral fertilizers have limited direct (such as soil physical property) effects but their application can enhance soil biological activity via increases in system productivity, crop residue return and soil organic matter. Another important indirect effect such as N fertilization is soil acidification, with considerable negative effects on soil health such as on amount, activity and diversity of organisms. Organic amendments such as manure, compost, bio solids and humic substances provide a direct source of C for soil organisms as well as an indirect C source via increased plant growth and plant residue returns. Non-target effects of microbial inoculants appear to be small and transient. Among the pesticides, herbicides have few significant effects on soil health, whereas negative effects of insecticides and fungicides are more common and their application warrants strict regulation.

**Common Sources of Soil Contaminants:**

- Accidental Spills
- Industrial accidents
- Nuclear waste
- Landfill and illegal dumping
- Mining and other industries

- Oil and fuel dumping
- Buried waste
- Disposal of coal ash
- Electronic waste
- Disposal of ammunitions and agents of war
- Agricultural practices
- Drainage of contaminated surface water into the soil

**Some of the important sources are discussed below in detailed:**

**Pesticides**: When pesticides are sprayed over the crop, some parts get absorbed by crop, some get solubilises and leach down below root zone, some get degraded by bacterial oxidation and chemical hydrolysis and remaining get to adhere to soil particle which moves through runoff towards lake and river and contaminates it. It remains in the soil for a long time and contaminates the soil because of its persistent in nature such as DDT, Chlordane, BHC, Aldrin having persistent timing 10, 11, 12 and 9 years, respectively

**Fertilizer**: Fertilizer contaminates the soil withimpurities present in their raw material used for their manufacturing such as As, Pd, and Cd present in traces in rock phosphate transfer to superphosphate fertilizer. As metals are nondegradable, Heavy metals get accumulate in soil surface above at toxic level due to their indiscriminate uses.

- **Industrial waste**: Medicine, Metal, Paint, Leather, Oil, Pesticides, Plastics and Textile producing industries produce hazardous wastes mainly heavy metals (Lead, Mercury, Cadmium etc.), Organic chlorine compounds, organic solvents, Cyanides etc. Improper disposal of these hazardous wastes will contaminate the soil.
- **Garbage dumps/ Landfill**: Contribution of municipal waste generation in Bangalore city was higher by residential areas (52%) followed by Hotel and restaurants (19.30%) and by markets (14%). With the improper disposal of municipal waste will contaminate the soil by altering the physicochemical properties and also surrounding areas will get affected.
- **Accidental oil spills**: At most of the fuel station, oil leaks can happen during storage and transportation of chemicals which deteriorates the health of the soil and make it unsuitable for cultivation. These chemicals can enter into groundwater through the soil.
- **Rainwater:** Toxic chemical present in the atmosphere come back through rain and get deposited on the soil where they are held firmly with the soil particles by electrostatic forces.
- **Radioactive pollutants**: Nuclear dust radioactive wastes are being produced from explosions of nuclear testing laboratories and industries, which enters into the soil system and accumulates. Strontium90, Iodine-129, Cesium-137, and isotopes of Iron are the radioactive wastes which are toxic in nature.

**What Happen to Soil Contaminant in Soil?**

Once contaminants are added in soils, where they go and how quickly they travel depends on many factors. Contaminants can be organic or chemical element. Organic contaminants (carbon-based) undergoes chemical changes or degrade into products that may be more or less toxic than the original compound but chemical elements (such as metals) contaminants cannot break down, but their characteristics may change so that they can be more or less easily taken up by plants or animals. As in figure 1, through different sources surface water bodies get contaminated and using this contaminated irrigation water in

agriculture field will deteriorate the soil quality along with produce contaminated food of poor quality. Through subsoil infiltration, contaminate moves and pollute groundwater. So directly or indirectly, human and health is getting affected.

**Effects of soil contamination on soil and crop:**

Soil contaminates which are highly toxic in nature will affect the soil health by declining number of soil organism, lack of essential nutrients and highly toxic element in soil. When we used contaminated soil for crop cultivation, it produces poor quality crop and fruits. As crop uptake toxic metal from contaminated soil and accumulates into it. Human being and livestock are being exposed to contaminated food by their consumption and drinking contaminated drinking water.

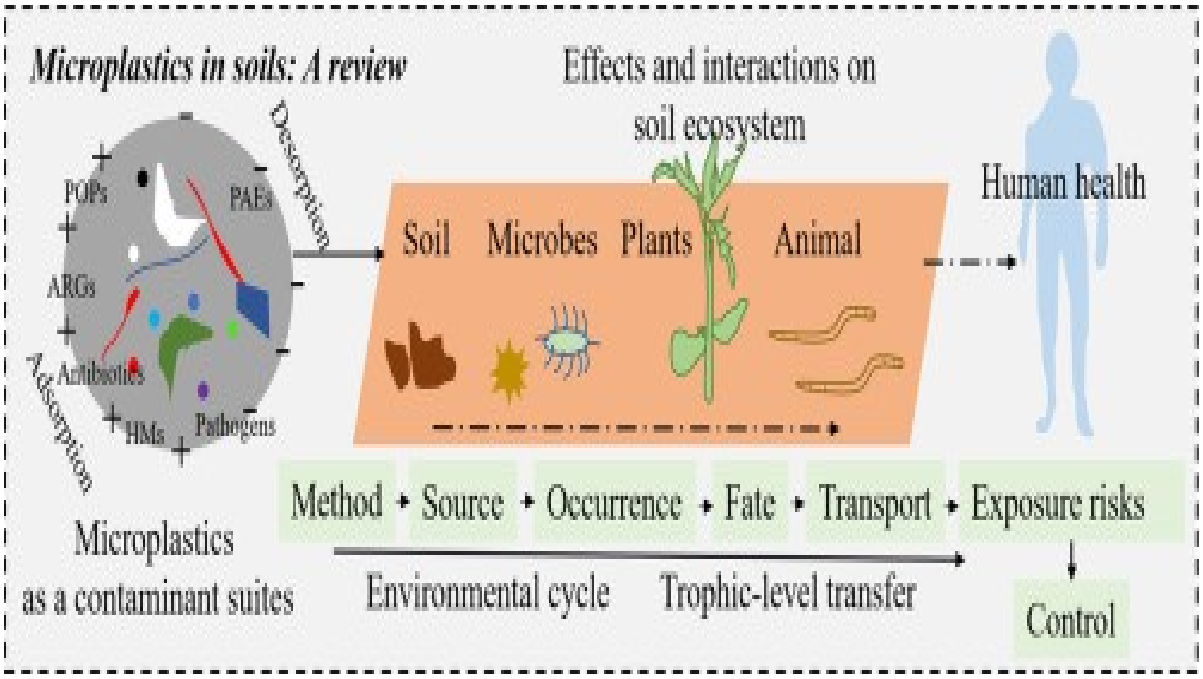


**Figure 1. Fate of contaminants in soil**

Steps to Reduce Soil Contamination

**Proper dumping of unwanted waste:**

Excess waste by man and animal pose a disposal problem. Open dumping is the most commonly practiced technique, which will contaminate soil environments.

• **Production of natural fertilizer**: Biopesticide should be used in place of toxic chemical pesticides. Organic fertilizers should be used in place of synthesized chemical fertilizer. Ex. Organic wastes in animal dung may be used to prepare compost manure instead of throwing them wastefully and polluting the soil.

• **Proper hygienic condition**: people should be trained regarding sanitary habits.

• **Public awareness**: Informal and formal public awareness programme should be imparted to educate people on health hazards through environmental education. Example: Mass media, educational institutions and voluntary agencies can achieve this.

• **Recycling and reuse**

• Ban on toxic chemicals: The chemicals which are more persistent in nature should be banned.

**Reference:**

**Anikwe, M.A.N. and Nwobodo K.C.A.,** 2002, Long term effect of municipal waste disposal on soil properties and productivity of sites used for urban agriculture in Abakaliki, Nigeria. *Bioresource Tech*., **83**: 241–250.

**FAO., 2014.** Ethiopia: El Nino-Southern Oscillation (ENSO) and the main Kiremt rainy season an assessment using FAO's Agricultural Stress Index System (ASIS). http://www.fao.org /es/GIEWS/english/shortnews/enso27062014.htm

**Law-Ogbomo, K.E., 2013**. Nutrient uptake by Abelmoschus esculentus and its effects on changes in soil chemical properties as influenced by residual application of fertilizer. *J. Soil Sci. Environ*. Manage., **4**: 132-138.

**Rattan, R.K., Datta, S.P., Chhonkar, P.K., Suribabu, K. and Singh, A.K., 2005**, Long-term impact of irrigation with sewage effluents on heavy metal content in soils, crops and groundwater. *Agric. Ecosys*. Environ., **109**: 310–322.

**Sharma, R.K., Agrawal, M. and Marshall, F., 2007**, Heavy metal contamination of soil and vegetables in suburban areas of Varanasi, India. *Ecotoxicology Environ*. Safety, **66**:258–266.

**Xie, H., F. Gao, W. Tan and S.G. Wang, 2011**. A short-term study on the interaction of bacteria, fungi and endosulfan in soil microcosm. *Sci. Total Environ*., **412**: 375-379.