Indian Journal of Agriculture and Allied Sciences
A Refereed Research Journal

ISSN 2395-1109
Volume: 1, No.: 4, Year: 2015

Received: 06.11.2015, Accepted: 02.12.2015

EFFECT OF ENVIRONMENTAL AND AGRICULTURAL POLLUTION ON SOIL HEALTH

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Abstract: *Human activities directly or indirectly affect the environment adversely. A stone crusher adds a lot of uspended particulate matter and noise into the atmosphere. Automobiles emit from their tail pipes oxides of nitrogen, sulphur dioxide, carbon dioxide, carbon monoxide and a complex mixture of unburnt hydrocarbons and black soot which pollute the atmosphere. Domestic sewage and run off from agricultural fields, laden with pesticides and fertilizers, pollute water bodies. Effluents from tanneries contain many harmful chemicals and emit foul smell. These are only a few examples which show how human activities pollute the environment. Pollution may be defined as addition of undesirable material into the environment as a result of human activities. The agents which cause environmental pollution are called pollutants. A pollutant may be defined as a physical, chemical or biological substance unintentionally released into the environment which is directly or indirectly harmful to humans and other living organisms. Soil pollution results from the buildup of contaminants, toxic compounds, radioactive materials, salts, chemicals and cancer-causing agents. The most common soil pollutants are hydrocarbons, heavy metals(cadmium, lead, chromium, copper, zinc, mercury and arsenic), herbicides, pesticides, oils, tars, PCBs and dioxins. The third way radio nuclides enter the soil is through man- made activities, such as the fallout from atmospheric testing of nuclear weapons and radiological events like the Chernobyl accident. Deposition studies of these activities indicate that radioactive particles travel around the world on streams of air. The weight of the particle and weather determine how soon they fall to the ground. Sometimes a heavy rain will bring the radioactive particles to the ground quickly. Improper disposal of radioactive material also may contribute to radio nuclides in the soil. Radio nuclides in the soil can move into the water, air and even our food supply. Many different agencies are involved in setting standards and monitoring to keep us safe.*
Key word: *Pesticides, Fertilizers, Soil Health, Radioactive.*

Introduction: Soil health has recently captured the attention of farmers as soil degradation from intensive cultivation, mechanization, limited crop rotations, and lack of organic matter additions have reduced yield potential. This has often led to increased soil compaction, erosion, greater pest problems, and reduced crop productivity. A survey conducted in [1] to assess the state of soil quality of vegetable farms in New York State showed that soil degradation is a common problem in many fields. Often-stated problems include increased disease and pest pressure, soil compaction, decreased infiltration, reduced water holding capacity, low organic matter content, drought-prone soils, and excessive runoff and erosion. Though soil degradation was visible on many farms, a systematic approach to characterize soil health, which transcends the conventional soil nutrient analysis, was not yet available.

Environment Pollution: Environment pollution is a wide-reaching problem and it is likely to influence the health of human populations is great. This paper provides the insight view about the affects of environment pollution in the perspective of air pollution, water and land/ soil waste pollution on human by diseases and problems, animals and trees/ plants. Study finds that these kinds of pollutions are not only seriously affecting the human by diseases and problems but also the animals and trees/ plants. According to author, still time left in the hands of global institutions, governments and local bodies to use the advance resources to balance the environment for living and initiates the breathed intellectuals to live friendly with environment.

As effective reply to contamination is largely base on human appraisal of the problem from every age group and contamination control program evolves as a nationwide fixed cost-sharing effort relying upon voluntary participation [2].

Soil contaminated by heavy metals from agricultural and industrial wastes will produce unhealthy food. Heavy metals enter the food chain and are consumed by human beings. Phosphate fertilizer which contains small amounts of cadmium and lead is widely applied in lowland areas of West Java. However, both these heavy metals remain below toxic levels. In contrast, contamination of lowland rice fields by sewage sludge from textile plants and gold mining has increased the heavy metal content of the soil and reduced rice yields. Remediation of polluted soil is being carried out, using plants such as Vetiveria zizanioides and Eichornia crassipes, plus applications of zeolite. These treatments were able to reduce the concentration of lead and cadmium in the soil.

Improper management of solid waste is one of the main causes of environmental pollution [3]. Land pollution is one of the major forms of environmental catastrophe our world is facing today [4]. As Bulgaria and the Slovak Republic, heavy metal industries have produced wastes that are deposited into landfills without special precautions [5] & [6]. [7] Posit that approximately half of the population lives in the vicinity of waste sites that do not conform to contemporary standards in Romania. Czech Republic's coal and uranium mines have produced serious pollution problems, and much of the solid industrial waste containing heavy metals is disposed of, without pretreatment, in open dumps [8]. [9] Concluded as the worst pollution of Hungary comes from open cast mines, lignite-based power plants, chemical factories, and the aluminum industry. The Silesia district in the south of Poland has severe contamination from mining and industry [10]. [11] Conceived soil pollution is critical issues in Ukraine. [12] Found Particulate matter is the most serious pollutant in large cities in South Asia.

Agricultural Pollution (Soil pollutants)

Pesticide Pollution: In modern agriculture the use of various agrochemicals is a common practice. These include pesticides, herbicides, insecticides, fungicides and others. Pesticides applied on seed or foliage ultimately reach the soil. Accumulation of pesticide residues in the biosphere creates ecological stress causing contamination of soil, water, and food. Persisting chemicals may also be hazardous to human health and should be eliminated. Persistent pesticides may accumulate in the bodies of animals and over a period of time increase in concentration if the animal is unable to flush leading to bioaccumulation. When an affected animal is eaten by a carnivore, the pesticide is further concentrated in the carnivore.

This phenomenon i.e. increasing in the concentration of a non degradable substance along the food chain is called Bio magnification. Another problem associated with insecticides is the ability of insects become resistant. Most pesticides kill beneficial predators and parasites. The short term and long term health effects to the persons using the pesticides and public that consumes the food are the major concerns. Exposure to small quantities for longer time causes mutations leads to cancer. Pesticides or their metabolites affect many soil microbes and their activities. Seed treatment with mercuric fungicides is found to be inhibitory to Rhizobium (nodulation and nitrogen fixation), Nitrosomonas and Nitrobacter (nitrification).

Fertilizer Pollution: The agricultural production depends on chemical fertilizer application, as most of our high yielding varieties are fertilizer responsive. Continuous application of chemical fertilizers alone lead to deterioration of soil properties and cultivated soils loose their natural characteristics. Fertilizers like ammonium sulphate, ammonium chloride and urea reduce the soil pH. Many crops, like potato, grapes, citrus, beans are sensitive to chloride toxicity. In integrated nutrient management, to sustain the productivity of our soils, organic manures and bio fertilizers are recommended as supplements to chemical fertilizers.

Nitrate Pollution: Nitrogen occurs in many forms in the environment and takes part in many biochemical reactions. The four forms of nitrogen that are of particular significance in environmental technology are organic nitrogen, ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen. In water contaminated with sewage, most of the nitrogen is originally present in the form of complex organic molecules (protein) and ammonia (NH_3). These substances are eventually broken down by microbes to form nitrites and nitrates. Nitrogen, particularly in the nitrate form, is a basic nutrient that is essential to the growth of plants. Excessive nitrate concentrations in surface waters encourage the rapid growth of microscopic plants called algae and excessive

growth of algae degrades water quality. Nitrates can enter the ground water from chemical fertilizers used in agricultural areas. Excessive nitrate concentrations in drinking water pose an immediate and serious health threat to infants less than 3 months of age. The nitrate ions react with blood hemoglobin, reducing the blood's ability to carry oxygen and this produces a disease called blue baby or methemoglobinemia.

Excess Salts and Water: Irrigation water helps to produce more yield than rain fed land. Irrigation water contains dissolved salts and in dry season, water is in the form of saline solution evaporates leaving its salts such as NaCl in the top soil. This saline soil causes stunted plant growth, lower yield. Flushing out salts reduces the salinity but makes downstream irrigation water, saltier. Another problem is water logging.

Heavy Metal Pollution: Heavy metals include all metals with atomic numbers greater than 23 (with few exceptions) or more than 5 g per ml. (eg. Hg, 70 g ml^{-1}). Heavy metals are hazardous, not acceptable to biological system. They are toxic to man and other life forms. Most of them are slow poisons as they accumulate in the body and cause serious disorders. Mercury, lead, arsenic, chromium and cadmium are the five most common toxic heavy metals and they have serious effects on human health. The unique physical, chemical and toxic properties of heavy metals have promoted their wide use in industrial processes and as biocides (fungicide and herbicide). As a result, higher concentration of these heavy metals accumulates in the environment, causing public health hazards and ecological problems. Removal of these metals is therefore a challenge to environmental management. The metals are generally removed by ion exchange and sorption to resins and precipitation as metal sulphides. Biodegradation of metals is not possible, because unlike organic pollutants, metals as elements cannot be mineralized to non-toxic compounds such as H_2O and CO_2. However, biomobilization is a valid concept in the management of metal pollution. Eukaryotic organisms detoxify heavy metals by binding to polythiols and bacteria have developed different and efficient mechanisms for tolerating heavy metals. They carry the genes controlling metal resistance on chromosome and plasmids, plasmids often contain genes resistance to several metals (Hg, Pb, As, Cr, Cd, Mo, U). As a result of biological action, metals undergo changes in valency and or conversion into organo metallic compounds.

Control of Soil Pollution: Soil may be polluted and converted into acidic soil or alkaline soil. It should be corrected by suitable technology, before cultivation.

Methods of Soil Treatment: Air sparing is an in situ remedial technology that reduces concentrations of volatile constituents in petroleum products that are adsorbed to soils and dissolved in groundwater. This technology, which is also known as "in situ air stripping" and "in situ volatilization," involves the injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase. The air is then vented through the unsaturated zone. Air sparging is most often used together with soil vapor extraction (SVE), but it can also be used with other remedial technologies.

Soil Conservation: Soil conservation is the protection of soil against excessive loss of fertility by natural, chemical, or artificial means. It encompasses all management and land-use methods protecting soil against degradation, focusing on damage by erosion and chemicals. Soil conservation techniques can be achieved through crop selection and rotation, fertilizer and lime application, tilth, residue management, contouring and strip cropping, and mechanical methods (e.g., terracing).

Soil Amelioration

(a) Soil Amelioration: Amelioration of Acidic Soil: Soil acidity is due to the accumulation of H+ ions over OH- ions. Limiting material – are neutralization of H+ ions such as

- Quicklime- oxide of lime is usually known as burned lime or quicklime.
- Slaked lime-can be obtained by adding water to quick lime.
- Blast furnace slag- a byproduct during the manufacturer of pig iron viz, calcium silicate.
- Electric furnace slag- is produced from the electic furnace reduction of phosphate rock during preparation of phosphorous.
- The product is manly the calcium silicate. The other methods which could result in amelioration of acidic soil are:
- Use of basic fertiizers such as sodium nitrate reduces the soil acidity.
- Proper soil and water management
- Usage of corall shell, chalk, woodash, press mud, byproduct material of paper mills, sugar factories, fly ash and sludge etc.

(b) Amelioration of Saline and Alkali Soil Saline: Soil- they contain an excess of soluble salts. Saline soil reclamation can be achieved by:

- Providing proper drainage
- Using salt free irrigation water
- Use of acidic fertilizers-such as ammonium sulphate
- Use of organic fertilizers
- Use of organic manures. Alkaline soil-they contain appreciable amounts of soluble salts. Alkali soil reclamation may be achieved by the following practices:
- Application of gypsum
- Use of sulphur
- Addition of organic matter
- Addition of molasses.

Conclusions: It appears that polluted environment is global an issue and world community would bear worst results more as they already faced. As effective response to pollution is largely based on human appraisal of the problem [13] and pollution control program evolves as a nationwide fixed cost-sharing effort relying upon voluntary participation. Education, research, and advocacy, are lacking in the region as preventive strategy for pollution [14] especially in Asia. At present the adoption of environmental auditing in any economic sector is voluntary but future legislation could well make it mandatory [15] and still time available to use technology and information for environmental health decision. Policymakers in developing countries need to design programs, set standards, and take action to mitigate adverse health effects of air pollution. Healthy people mean human resources are the main object of any successful business or country. These societal beneficial efforts need to carefully adapt available knowledge from other settings, keeping in mind the differences in pollutant mixtures, concentration levels, exposure patterns, and various underlying population characteristics.

After 30 - 40 years of intensive use of fertilizer in lowland areas of West Java, including rock phosphate, the concentration in the soil of heavy metals such as lead and cadmium still remains below toxic levels. However, these elements are sometimes present naturally in rock phosphate, so that continuous monitoring is needed. Sewage sludge from the textile industry contains high concentrations of elements such as boron, lead, cadmium, copper and chromium. Disposal of these wastes into rivers decreased rice production and was a potential cause of environmental degradation. Air pollution from the exhaust of cars driving through tea plantation areas increased the lead content of the soil. The concentration of the lead was highest in the soil nearest the main road. Traditional gold mining and smelting in Gunung Pongkor was a significant cause of pollution for lowland rice around this area, and increased the mercury content of rice. The remediation of soil contaminated by lead and cadmium by growing water hyacinth or vetiver grass, with an application of zeolite, significantly reduced the level of these two heavy metals in the soil.

Table 1 Effect of heavy metals on human health.

S.No.	Heavy metal (forms)	Source	Effect
1.	Mercury: Hg^{++} (Mercuric) C_6H_5Hg CH_3COO	Methyl mercury fungicides, electrical and electronic industries, PVC, plastics, paints.	Irreversible neurological damage in man, Minamoto disease
2.	Lead(Pb^{2+}, Pb^{4+})	Automobile exhaust of leaded petrol (50%), Batteries, Pipes, Soldiering	Cause mutation in algae and bacteria, blackening in fish, gradual paralysis in man.
3.	Arsenic As^{+++} Arsenic trioxide, Sodium arsenate	Herbicide, fungicide, wood preservative – Agro chemicals (70%), industrial chemicals – paints, bullets (20%), glass and glass wares (5%)	Accumulate in hair, nail, skin lesions, act as oxidative uncoupler, cause damage to kidney, respiratory tract and nervous disorders
4.	Chromium Cr^{+6} CrO_3	Tanneries, electroplating and metal finishing processes, Khaki dyeing in textiles.	Toxic to aquatic organisms, absorbed through intestinal tract in man.
5.	Cadmium (Cd)	Pigment and stabilizer for PVC, plastics, tires, rechargeable cells, electroplating, coal, oil and phosphate rocks.	Bones become brittle – Itai itai disease in Japan, gastro enteric distress and pain.

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