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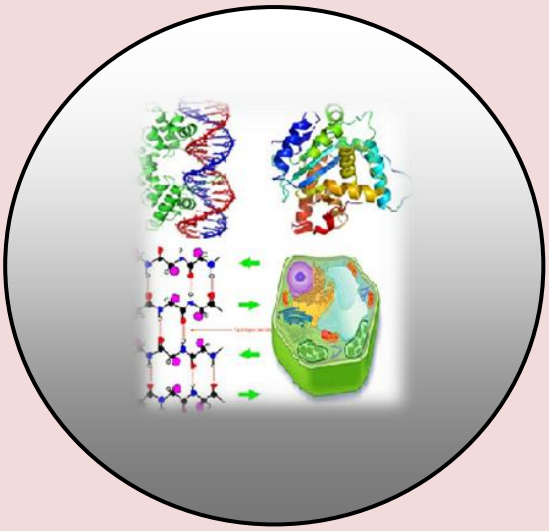

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Effects of Environmental Pollution on Agricultural Productivity

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ABSTRACT

Environmental pollution is a widespread problem that influences both human health and agricultural productivity. Environmental pollution is one of the greatest problems facing the world today which is increasing every year and causing irreparable damage to agricultural production and the earth. These conditions make environmental pollution a major concern to the developing countries of the world, especially Ethiopia. Environmental pollution results from human activities through the use of technology to manipulate the ecosystem or environment to meet its needs. Ethiopia as a developing country has lost much of its habitable environment due to environmental degradation and pollution, which destroys crops. These have negative consequences on crop yield and land productivity, which further impoverish the already poor farmers in these areas. With the decreasing soil fertility as a result of the destruction of soil micro-organisms and low agricultural productivity, farmers have been forced to leave their land to seek non-existent alternative means of livelihood. Therefore, this paper reviews the effects of environmental pollution on agricultural productivity. The paper recommends, among other things, that efforts be made to immediately address the environmental problems of the country if any meaningful development is to be sustained.

Keywords: Environmental Pollution, Environmental Degradation and Productivity.

INTRODUCTION

Environmental pollution is a widespread problem and it is likely to influence the health of humans is great (Progressive Insurance, 2005, Fereidoun et al., 2007, as cited in khan, 2011). Pollution reaches its most serious proportions in the densely settled urban-industrial centers of the more developed countries. Industry, and semi-urban areas surrounded by densely populated, low-income localities, continues to pollute the environment with impunity (Government of Pakistan, 2009). Despite the major efforts that have been made over recent years to clean up the environment, pollution remains a major problem and poses continuing risks to health.

The problems are undoubtedly greatest in the developing world; whereas traditional sources of pollution such as industrial emissions, poor sanitation, inadequate waste management, contaminated water supplies, and exposures to indoor air pollution from biomass fuels affect large numbers of people. (Bull, 2003). According to TANU Agritech Portal (2013), the backbones of man-made pollution are the human population and technology. Naturally human needs contact to the environment, they get resources from nature. A small population with any level of technology wouldn't have to exploit nature overwhelmingly. But a big population with any level of technology will surely exploit nature more, and even overwhelmingly, this is all for the needs of the people. Pollution is a growing pain. Pollution is not a problem that came suddenly from the sky; it's our fault and has been a part of our life for many years. Humans threaten ecosystems by producing waste, damaging habitats, and removing too many species without giving the ecosystem time to naturally regenerate. They have also dumped large amounts of pesticides, such as organophosphates, onto crops that migrate into groundwater and bodies of water, poisoning ecosystems. Plants and animals die from exposure to pollutants such as excess nutrients from chemical fertilizers and other harmful chemicals. Pollution is increasing around the world and results in loss of biodiversity causing severe damage to self-sustaining ecosystems (Alonzo, 2005). Pollution, also called environmental pollution, is the addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form. Impact of Environmental pollution has greatly affected Agricultural productivity irrespective of the developed nation even if it has a big impact as well as in the reduction of Economic loss of one country which has greatly depended on agriculture. The impact of pollution is a widespread problem throughout the world. It has not only affect agricultural productivity it also affects the safety of human health. Environmental pollution has caused many different problems like productivity loss, wilting of green plants, drought, exploitation of natural resources, as well as economic loss of country.

METHOD

The review of this paper was conducted using various new recent evidence accumulated by scientifically credible books, journals and, different article comprehensive scientific explanations regarding effects of environmental pollution on agricultural productivity has been made in the paper. Theories are supported by officially publicized scientific materials. Each resource is well offered in the reference section and the paper further draws on additional material to provide context for the debate reflected in the systematic literature search.

Definition and Concepts of Environmental Pollution

Environmental pollution is the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected. In one word, environmental pollution takes place when the environment cannot process and neutralize harmful by-products of human activities (for example, poisonous gas emissions) in due course without any structural or functional damage to its system (Gray, 2011). The presence of environmental pollution raises the issue of pollution control. Great efforts are made to limit the release of harmful substances into the environment through air pollution control, wastewater treatment, solid-waste management, hazardous-waste management and recycling (Nathanson, 2014).

Source of Environmental Pollution

Fossil Fuel

According to Fossil fuel Encyclopedia (2014), Fossil fuels are fuels formed by natural processes such as the anaerobic decomposition of buried dead organisms. The age of the organisms and their resulting fossil fuels is typically millions of years and sometimes exceeds 650 million years. They contain high percentages of carbon and include coal, petroleum, and natural gas. Combustion of fossil fuels produces extremely high levels of air pollution and is widely recognized as one of the most important "target" areas for the reduction and control of environmental pollution. For example, when oil is transported from the point of its production to further destinations by pipelines, an oil leak from the pipeline may occur and pollute soil and subsequently groundwater. When oil is transported by tankers by the ocean, an oil spill may occur and pollute ocean water. Of course, there are other natural resources whose exploitation is a cause of serious pollution; for example, the use of uranium for nuclear power generation produces extremely dangerous waste that would take thousands of years to neutralize. But there is no reasonable doubt that fossil fuels are among the most serious sources of environmental pollution (Gray, 2011).

Non-Fossil Fuel

Among other pollution sources, livestock farming is worth mentioning as the largest generator of ammonia emissions resulting in air pollution. Chemicals such as pesticides and fertilizers are also widely used in agriculture, which may lead to water pollution and soil contamination as well. Trading activities may be another source of environmental pollution. For example, it's been recently noted that packaging of products sold in supermarkets and other retail outlets is far too excessive and generates large quantities of solid waste that ends up either in landfills or municipal incinerators leading to soil contamination and air pollution. The residential sector is another significant source of pollution generating solid municipal waste that may end up in landfills or incinerators leading to soil contamination and air pollution (Gray, 2011).

Types of Environmental Pollution

Air Pollution

Air pollution may be defined as an atmospheric condition in which certain substances are present in such concentrations that they can produce undesirable effects on man and his environment. These substances include gases (SO_2, NO_2, CO, HCs, etc.) particulate matter (smoke, dust, fumes, aerosols) radioactive materials, and many others. Most of these substances are naturally present in the atmosphere in low concentrations and are usually considered to be harmless (Admass and Wubeshet, 2006). The main pollutants found in the air we breathe include particulate matter, lead, ground-level ozone, heavy metals, sulfur dioxide, benzene, carbon monoxide, and nitrogen dioxide (EPHA, 2009). According to Mishra (2003), rapid growth in urban population, increasing industrialization, and rising demands for energy and motor vehicles are the worsening air pollution levels. He added other factors, such as poor environmental regulation, less efficient technology of production, congested roads, and age and poor maintenance of vehicles, also add to the problem. The natural sources include incinerators and waste disposals, forest and agricultural fires (EPHA, 2009).

Water Pollution

According to the water pollution Encyclopedia (2014), Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers, and groundwater).

Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. Water pollution affects plants and organisms living in these bodies of water. In almost all cases the effect is damaging not only to individual species and populations but also to the natural biological communities. Water pollution also occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water. The sources of water pollution are categorized as being a point source or a non-source point of pollution. Point sources of pollution occur when the polluting substance is emitted directly into the waterway. A pipe spewing toxic chemicals directly into a river is an example. A non-point source occurs when there is the runoff of pollutants into a waterway, for instance when fertilizer from a field is carried into a stream by surface runoff (MBG, 2006).

Solid Waste Pollution

Land pollution is the deposition of solid or liquid waste materials on land or underground in a manner that can contaminate the soil and groundwater, threaten public health, and cause unsightly conditions and nuisances. The waste materials that cause land pollution are broadly classified as municipal solid waste (MSW, also called municipal refuse), construction and demolition (C&D) waste or debris, and hazardous waste. MSW includes nonhazardous garbage, rubbish, and trash from homes, institutions (e.g., schools), commercial establishments, and industrial facilities (Nathan son, 2013). Improper management of solid waste is one of the main causes of environmental pollution (Kaman, 2007; as cited in Khan, 2011). TNAU Agritech Portal, soil pollution can alter the metabolism of plants and reduce crop yields and same process with microorganisms and arthropods in a given soil environment; this may obliterate some layers of the key food chain, and thus harm predator animal class. Small life forms may consume harmful chemicals which may then be passed up the food chain to larger animals; this may lead to increased mortality rates and even animal extinction.

Fundamental Drivers of Environmental Pollution

Industrialization

Industrialization is the first fundamental cause of pollution. Among other things, industrialization set in motion the widespread use of fossil fuels (oil, gas & coal) which are now the main sources of pollution (Gray, 2011). The important role of industrialization in the development process of developing countries cannot be overemphasized. There is a need for structural transformation from small-scale agriculture to industrialization for developing countries to experience inclusive and pro-poor growth. However, industrialization requires massive use of energy resources which could lead to pollution and environmental degradation (Omoju, 2014). Industries such as cement, glass, ceramic, iron, steel, paper, pulp, and refineries, etc, exercise a wide range of environmental impacts. They emit large amounts of nitrogen, sulfur, and carbon oxides into the air. Emissions of lead, arsenic, and chromium, both from glass and iron, and steel industries are extremely toxic. Waste disposal from such industries causes extensive water and soil contamination too. Extraction of raw materials causes large-scale surface disturbance and erosion (SESA, 2001).

Population Growth

Population growth is the second fundamental pollution cause. With population numbers exploding around the world, the demand for food and other goods goes up. This demand is met by expanded production and use of natural resources, which in turn leads to higher levels of pollution (Gray, 2011).

Population impacts on the environment primarily through the use of natural resources and production of wastes and are associated with environmental stresses like loss of biodiversity, air, and water pollution, and increased pressure on arable land. Human population issues are extremely important when it comes to our way of life and our future on this planet. Poverty is said to be both cause and effect of environmental degradation. The circular link between poverty and the environment is an extremely complex phenomenon. Inequality may foster unsustainability because the poor, who rely on natural resources more than the rich, deplete natural resources faster as they have no real prospects of gaining access to other types of resources. Moreover, a degraded environment can accelerate the process of impoverishment, again because the poor depend directly on natural assets (Ray and Ray, 2011).

Globalization

It refers to the homogenization of language and cultural identity that accompanies this flux of material, ideas, and money. Despite its growing strength, the side effects of this pervasive economic strategy remain poorly understood, perhaps because the great majority of them are indirect. The principal environmental costs of global free trade are well known. They include water, air, and soil pollution, exhaustion of non-renewable and slowly renewable resources, and global climatic change-all caused by globalization-related increases in industrial activity, production agriculture and the fossil fuel energy used in the free trade-related transport of raw and finished materials, and by the overriding of local and national protective laws and customs (Ehrenfeld, 2003). According to Gray (2011), writes Globalization is another major cause of pollution. Globalization has become an effective facilitator of environmental degradation. Developing countries usually have much looser laws on environmental protection. With this benefit as well as the population growth and easy availability of cheap labor, the big industry prefers to move its facilities to such pollution havens rather than work in more regulated markets. Air, water, and soil pollution have increased markedly as global trade has increased. For example, in Taiwan, exports have soared as a result of global trade: forests have been cleared for industrial development and tree farms, soil and water have been polluted by pesticides and fertilizer, and 90,000 factories dump their wastes into air and waterways (Bello and Rosenfeld, 1990; as cited in Ehrenfeld, 2003).

Agriculture and Transportation

According to the Free Encyclopedia (2014), Agricultural pollution refers to biotic and biotic byproducts of farming practices that result in contamination or degradation of the environment and surrounding ecosystems, and/or cause injury to humans and their economic interests. The pollution may come from a variety of sources, ranging from point source pollution (from a single discharge point) to more diffuse, landscape-level causes, also known as non-point source pollution. Nitrogen emissions in various forms (nitrogen oxides (NO), nitrous oxide (N2O), ammonia (NH3), and organic nitrogen (Norg) are one of the two main classes of pollutants that are emitted by modern agriculture (Oenema,2005; as cited in Viney *et al.***,** 2008). Although produced naturally in soils through microbial denitrification and nitrification processes, nitrous oxide is a greenhouse gas that is much more effective than carbon dioxide in trapping heat in the atmosphere which arises from animal production in large quantities, depending on the nitrogen input and management of manure.

To increase yields, agricultural operations often directly add reactive nitrogen to soils, either through the application of fertilizer or livestock manure to fields or by growing nitrogen-fixing crops. These measures increase nitrous oxide emissions via microbial reactions, especially enhanced nitrified cation (Crutzen, 2008). Indirect additions of reactive nitrogen exacerbate the problem. For example, nitrogen from fertilizer or manure volatilizes as ammonia, and oxides of nitrogen are redly positing in downwind regions as ammonia, particulate ammonium, nitric acid, and nitrate. A second important pollutant from farming is ambient primary particulate matter, emitted directly from animal housing systems and through practices such as cultivation, harvesting, application of fertilizer and livestock waste to fields, and agricultural field burning. The higher the level of concentration of transport activities, the higher their environmental impacts are being felt by the local community. This is particularly the case for large transport terminals, such as ports, rail yards, and airports. Many air pollutants have been identified as being closely related to transportation. Carbon monoxide is a colorless, odorless gas, the result of the incomplete combustion of hydrocarbons. Transportation accounts for 70 to 90 % of total carbon monoxide emissions. Transportation contributes significantly to the pollution of the hydrosphere in various ways ranging from air pollution fallouts to the construction and maintenance of infrastructures such as roads, railways, and ports. Fallouts occur when a pollutant goes from an airborne state (gas, solid, or liquid) towards a solute or colloidal state (Jean-Paul, 2013).

Effects of Environmental Pollution

Effects on Human Health

Outdoor air pollution is a major environmental health problem affecting everyone in developed and developing countries alike. WHO estimates that some 80% of outdoor air pollution-related premature deaths were due to ischemic heart disease and strokes, while 14% of deaths were due to chronic obstructive pulmonary disease or acute lower respiratory infections and 6% of deaths were due to lung cancer. In addition to outdoor air pollution, indoor smoke is a serious health risk for some 3 billion people who cook and heat their homes with biomass fuels and coal. Some 4.3 million premature deaths were attributable to household air pollution. Almost that entire burden was in low-middle-income countries as well (WHO, 2014). Scientific evidence indicates that ground-level ozone not only affects people with impaired respiratory systems (such as asthmatics) but healthy adults and children as well. Exposure to ozone for 6 to 7 hours, even at relatively low concentrations, significantly reduces lung function and induces respiratory inflammation in normal, healthy people during periods of moderate exercise. It can be accompanied by symptoms such as chest pain, coughing, nausea, and pulmonary congestion (USEPA, 2014). Damage to people may be caused by fish foods coming from polluted water (a well-known example is high mercury levels in fish). Damage to people may be caused by vegetable crops grown/washed with polluted water (Gray, 2008).

Effects on Plant

The effects of pollution on plants include mottled foliage, burning at leaf tips or margins, twig dieback, stunted growth, premature leaf drop, delayed maturity, abortion, or early drop of blossoms, and reduced yield or quality. In general, the visible injury to plants is of three types: the collapse of leaf tissue with the development of necrotic patterns, yellowing or other color changes, and alterations in growth or premature loss of foliage.

Factors that govern the extent of damage and the region where air pollution is a problem are the type and concentration of pollutants, distance from the source, length of exposure, and meteorological conditions (ACES, 2004). Atmospheric pollutants harm the plants; they can have direct toxic effects, or indirectly by changing soil pH followed by solubilization of toxic salts of metals like aluminum. The particulate matters have a negative mechanical effect. They cover the leaf blade reducing light penetration and blocking the opening of stomata. These impediments influence strongly the process of photosynthesis which rate declines sharply. Also, the leaves of the trees have an important role in the retention of the particulate matter; they are most affected when the wet and dry atmospheric deposition increases (Juliana and Barbu, 2011).

Effects on Climate Change

Air pollution changes our planet's climate, but not all types of air pollution have the same effect. There are many different types of air pollution. Some types cause global warming to speed up. Others cause global warming to slow down by creating a temporary cooling effect for a few days or weeks. Air pollution includes greenhouse gases. One of these is carbon dioxide, a common part of the exhaust from cars and trucks. Greenhouse gases cause global warming by trapping heat from the Sun in the Earth's atmosphere. The increase in greenhouses gases is the cause of most of the global warming that happened over the past century. Cars, trucks, and smokestacks also release tiny particles into the atmosphere. These tiny particles are called aerosols. Aerosols have an impact on climate. While different types of aerosols act differently in the atmosphere, the overall effect of aerosols is cooling (NESTA, 2012). The Earth's atmosphere contains a delicate balance of naturally occurring gases that trap some of the sun's heat near the Earth's surface. This greenhouse effect keeps the Earth's temperature stable. Unfortunately, evidence is mounting that humans have disturbed this natural balance by producing large amounts of some of these greenhouse gases, including carbon dioxide and methane. As a result, the Earth's atmosphere appears to be trapping more of the sun's heat, causing the Earth's average temperature to raise a phenomenon known as global warming. Many scientists believe that global warming could have significant impacts on human health, agriculture, water resources, forests, wildlife and coastal areas (EPA's Global Warming Webpage: http://www.epa.gov/globalwarming/).

Effect of Environmental Pollution on Agricultural Productivity

The environmental impact of agriculture is the effect that different farming practices have on the ecosystems around them, and how those effects can be traced back to those practices. Ozone is considered to be an important pollutant, and its harsh effects on the growth of crops were firstly observed (Roy et al., 2009). It is formed by the complex photochemical reaction occurring in the troposphere involving nitrogen oxides, carbon monoxide, and volatile substances. It can cause damage to many plant species such as cucumber, grape, tomato, onion, potato, radish, and tobacco crops (Griffiths 2003). It interests through stomata, which are small openings in the leaves, as the cuticle is impermeable to it (Del Valle Tascon and Carasco Rodrigo, 2004). Its symptoms usually appear on the upper part of the leaves causing chlorosis and foliar injury in the crops leading to a decrease in crop production. The impact of environmental pollution on agricultural productivity leads to a serious problem in today world's including developed and developing countries.

This problem might harm the economy of one country which results in a variety of problems like drought, desertification, economic loss, the stress of scarce resources, and depletion of resources.

CONCLUSIONS

Environmental pollution is a serious global problem that contributes to affect the loss of biodiversity, atmospheres, and ecosystem. It is caused by anthropogenic and natural events. Anthropogenic threaten an ecosystem by producing waste, damaging habitats, and removing too many species without giving the ecosystem time to naturally regenerate. Natural events occur naturally and won't cause excessive harm to our lives due to their regeneration ability. Natural processes which affect air quality include volcanoes, which produce sulfur, chlorine, and ash particulates which are released into the atmosphere. The other events flooding, volcanic eruption, storms, etc., leads to habitat distraction and environmental pollution

RECOMMENDATION

Among other things, that effort is made to immediately address the environmental problems of the country if any meaningful development is to be sustained.

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