

Effect of increasing pollution and use of fertilizers and pesticides on the environment and human health

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Abstract—Today pollution is rising at an alarming rate; various human activities are responsible for it. The rise in pollution worldwide has affected the lives of millions of people, biological diversity, natural cycle is disturbed all around. Agricultural practices that play a crucial role throughout the life of every individual and for the economy of the country are devastated due to the extensive use of chemical fertilizers and pesticides in farming. Deadly diseases are rising due to pollution which has badly affected the health status of the population of a country. The use of chemical fertilizers and pesticides in farming increases rapidly after the Green revolution. This article provides a sketch of chemical fertilizers and pesticide effects on the environment and human health. It also provides the current health issues occurring in India and the upcoming scenario which could be the biggest obstacle for the development of the country.

Keywords— Agriculture, Diseases, Fertilizers, Health, Pollution.

I. INTRODUCTION

The population is increasing rapidly to meet the present food demand of the society, agriculture must be practiced on a large scale. Due to the urbanization of villages and increasing factories and industries, an ample amount of land is not available for cultivation. The green revolution helped to meet this ever-increasing demand for food with the use of technologies in the field of agriculture. The use of chemical fertilizers and pesticides in farming has improved the growth of fruits and vegetables. At the same time, it badly affects the environment by polluting air, water, and soil. Studies have shown that more than 98% of the pesticides reach a destination other than their target and 50% of applied fertilizers are used by crops. Thus, remaining fertilizers and pesticides in the environment result in pollution. An increase in pollution gives rise to health issues which in the long term give rise to deadly diseases such as lung cancer, cardio disorder, kidney failure, etc. Studies of different institutes worldwide show that in the last 3 to 4 decades nutrient content of fruits and vegetable decreases; composition elements present in the soil decreases; fertility of soil decreases; groundwater, rivers, lakes are contaminated. Pollution is responsible for the death of millions of people worldwide; this even affects the GDP of a country. According to the World Bank, 8.5% of decrease in the GDP of India is due to expenditure on medical facilities and medicines provided by the Government. In the year 2017-2018, the Government of India allocates the subsidy of 70,000 crore rupees for chemical fertilizers and pesticides.

II. AGRICULTURE WITH FERTILIZERS AND PESTICIDES

Fertilizers such as Urea (46% N), Urea (coated) (45% N), Ammonium Sulphate, Ammonium Chloride, Calcium Ammonium Nitrate (26% N), Calcium Ammonium Nitrate (25% N), Anhydrous Ammonia are used in farming. Fertilizers increase the nutrients content of the soil but at the same time, it also pollutes the soil. Synthetic fertilizers are by-products of naphtha such as urea-based fertilizers. These fertilizers require more water for their proper functioning which results in more water consumption. These fertilizers are absorbed by the plants through soil. Some amount of these chemical fertilizers even gets into fruits and vegetables which is finally consumed by humans and other herbivorous animals. Long-term consumption of such fruits and vegetables results in diseases. According to All India Institute of Medical Science, every year 2mg of urea is consumed by peoples indirectly.

The substances which are meant to control pests and weeds are known as pesticides. Pesticides such as herbicides, insecticides, fungicides, molluscicides, bactericide, etc. are used to protect crops from unwanted agents such as insects, fungi and weeds. The use of pesticides kills even the good insects such as bees which play a vital role in agriculture by pollination. In China, the

population of bees is too low that the farmers need to do hand pollination. Earthworms are even called the friends of farmers as they maintain the physiochemical properties of soil by converting organic waste and biodegradable materials into nutrient rich products which are also killed by the use of pesticides. Excessive use of pesticides results in the contamination of water, air pollution and soil pollution. Figures below describe the number of fertilizers and pesticides used by top agricultural producing countries.

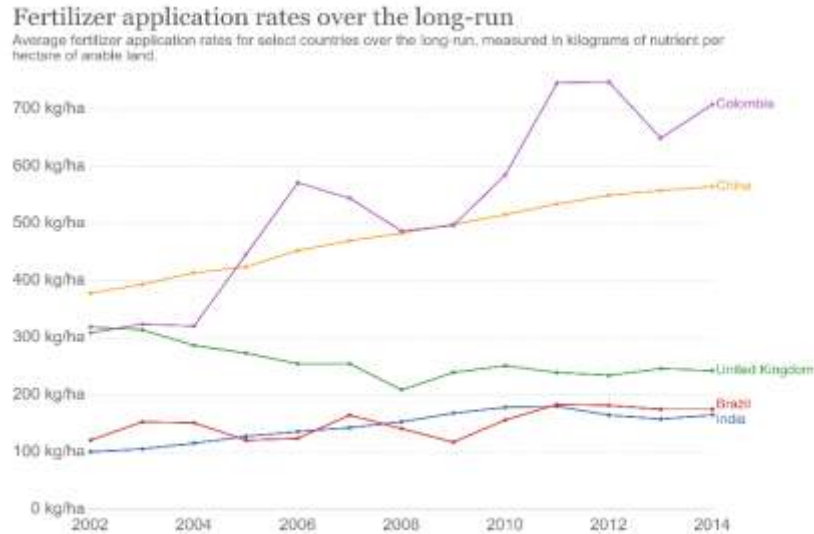


FIGURE 1: Fertilizers use per hectare of cropland in year 2002 – 2014

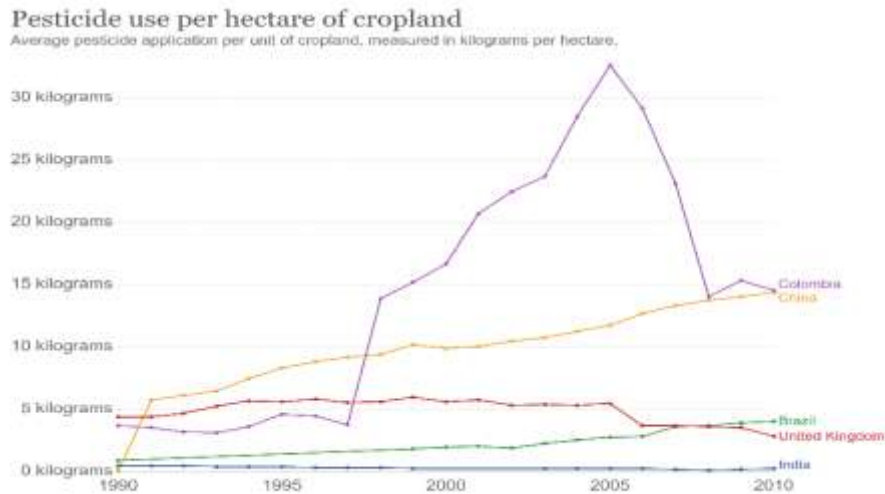


FIGURE 2: Pesticides use per hectare of cropland in year 1990 – 2010

III. EFFECTS OF USE OF FERTILIZERS AND PESTICIDES

In India, consumption of chemical fertilizers containing nitrogen, potassium and phosphorus are increased from 1 million tonnes in 1960 to 25.6 million tonnes in 2014-2015, while the consumption of pesticides increased from 55,540 tonnes in 2010-2011 to 57,353 tonne in 2014-2015. Extensive application of fertilizers and pesticides pollutes the environment by polluting air, contaminating groundwater and lakes, ponds, rivers, and polluting the soil. Plants use 50% of the nitrogenous fertilizers applied

to the soil, out of the remaining 2 to 20% lost in evaporation, 15 to 25% react with organic compounds and the remaining 2 to 10% interfere with the surface and groundwater. Urea fertilizers result in the evaporation of ammonia (NH₃). Ammonia further oxidizes and turns into nitric acid, sulfuric acid from industrial sources and results in acid rain after this chemical transformation. Acid rain damages vegetation, organisms that live in both lakes and reservoirs. The soil has strong buffering power due to its components thus effects of chemical fertilizers are not seen immediately but over a long run element present in the soil decreases. Thus, degradation of the fertility of soil increases the demand for chemical fertilizers. Fertilizers containing more amount of Nitrogen, Potassium, and Sodium causes a decrease in the pH value of soil.

Indian Dietetic Association analyzed the report presented by the National Institute of Nutrition with the previous report published in the year 1989 and found that in the last 28 years micronutrients of soil essential for plants decreased in the last 30 years as shown in the table below.

**TABLE 1
 DECREASE IN CONSTITUENTS OF SOIL**

Sr. No.	Essential elements of soil	Decrease of constituents in percentage
01.	Boron	18.3%
02.	Copper	5.4%
03.	Iron	12.1%
04.	Magnesium	5.6%
05.	Zinc	4.3%

Nowadays in many urban regions of India vegetables and fruits are grown by using contaminated water, drainage water, etc. This results in the deposition of heavy metals in vegetables and fruits above the specified limit set by the Food Safety Standard Authority of India (FSSAI). Table 2 shows the comparison between the specified limit of heavy metals set by FSSAI and obtained results from vegetables grown near the Yamuna river at Akshardham point. The results obtained are tested in a laboratory registered by the government of India.

**TABLE 2
 COMPARISON BETWEEN MAIN METHOD**

Sr. No.	Heavy metals	Amount set by FSSAI (in ppm)	Amount of heavy metals present in tested samples of vegetables (in ppm)
01.	Lead	0.1	19.34 to 28.06
02.	Mercury	1.0	105 to 139
03.	Cadmium	0.1 to 0.2	2.30 to 3.42
04.	Arsenic	—	209 to 318

IV. CURRENT HEALTH ISSUES

Pollution has badly affected the lives of all living beings. Deadly diseases do not occur overnight, it takes time, shows many symptoms and can be cured if treatment is done on time. Proper diet and exercise could be very helpful to stay healthy, but the impact of increasing pollution causes many health problems directly or indirectly. Due to an increase in pollution, every person's

2 years of average life span decreases. Every year more than 7 million people die due to air pollution and more than 1.2 million people die due to unsafe water. In India, more than 840,000 children die before completing the first year of their lives. In the health statistics of the BRICS countries, India lies in the lowest position. According to world health statistics, India ranks 187th out of 194 countries. Globally cardiovascular diseases are the biggest reason for the death of 17.79 million people every year, followed by cancers (9.56 million) and respiratory diseases (3.91 million). According to the World Health Organization, more than 4.25 billion people suffer from diabetes. After China, India is the second country whose majority of the population is suffering from diabetes. In India, in the year 1991-1992 average sugar consumed per person was 12kg which has increased to 20kg per person in the year 2011-2012. In India 1 out of 10 people suffers from kidney diseases. According to the All India Institute of Medical Science report, in the last 20 years, 3 out of 5 people in Delhi suffer from high blood pressure. In the last 20 years, people suffering from high blood pressure increased from 23% to 43% in urban areas and from 11% to 29% in rural areas. According to World Health Organization in 2030, India will have more than 10 crore people suffering from diabetes and 23 lakhs 30 thousand crore rupees will be spent for their treatment which is more than 5 times of total health budget of India. Only 5% of the total population of the world is completely healthy.

National Institute of Nutrition researched on 528 food products collected from 6 different geographical regions and measured values of 151 nutrients present in it and published a report in 2017. In this report, it has been found that many essential micronutrients present in the food have decreased in the last 3 decades, while some of the micronutrients even increased. Table 3 shows the percentage change in the micronutrients of some of the selected food analyzed by the National Institute of Nutrients.

TABLE 3
PERCENTAGE CHANGE IN THE MICRONUTRIENTS OF SOME FOODS

Sr. No.	Foods (/100g)	Carbohydrates (%)	Fats (%)	Protein (%)	Iron (%)	Magnesium (%)	Zinc (%)
		Present in g			Present in µg		
01.	Apple	-2.16	28	45	-60	15.57	50
02.	Banana	-13.12	10	2.5	-22	-14.68	-6.66
03.	Egg	---	-31.2	-0.15	-13.33	-7.61	---
04.	Mung bean	-18.64	-12.3	-6.12	11.13	55.9	-11
05.	Mustard seed	-29.41	1.23	-2.45	70.76	---	-16.04
06.	Potato	-34.11	130	-3.75	18.75	-19.76	-47.17
07.	Rice	0.05	4	16.76	-7.14	-78.55	-13.57
08.	Tomato	-11.11	25	-15.55	-65.62	---	-73.17
09.	Wheat	-9.1	-2	-17.26	-25	-9.42	5.55

V. CONCLUSION

Today increasing pollution is the biggest problem globally, it is directly proportional to the increasing population. With an increase in population, demand for resources also goes on increasing but due to the limited resources available, new technologies and innovations are needed to fulfill this never-ending demand. The Green Revolution, the Industrial Revolution, Globalization are some of the significant steps taken to overcome these challenges but now its adverse effects are seen globally. Today we need a sustainable technology that maintains a balance between natural resources and urbanization. The use of eco-friendly things,

natural fertilizers, pesticides, and compost, instead of harmful chemicals will help us to maintain the quality of crops, air, water, and soil. If the environment in which we live, the water we drink and the food that we eat is healthy and pure, then most of the health problems can be avoided, as we all know, "Prevention is better than cure".

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