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THE EFFECTS OF CHEMICAL FERTILIZERS AND PESTICIDES ON THE ENVIRONMENT AND HUMAN HEALTH

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ABSTRACT

Various practices, such as the use of high-yield seeds, the modification of equipment, and the application of chemical fertilizers, were used to increase the production of food grains. Unfortunately, these methods led to the development of dangerous chemicals. This article looks into the effects of chemical fertilizers and pesticides on the environment and human health. Surplus agriculture can contribute to a country's economic development. It is also important to meet the needs of its growing population. Through the Green Revolution, developing nations can increase their agricultural production to overcome their chronic food shortages.

Keywords: Green revolution, chemical fertilizers, pesticides, environment, human health.

INTRODUCTION

The primary goal of agriculture is to meet the needs of the society while exporting surplus supplies. This can be achieved through the utilization of various chemical inputs. One of these is the use of pesticides, which are designed to kill harmful pests. Pesticides are commonly used to kill or control various kinds of pests that can severely impact livestock and crops. They have been known to increase the agricultural yield of farmers, and the Green Revolution has resulted in a rise in the number of these chemicals being utilized in Indian agriculture. This has also contributed to the country's efforts to address food shortages. Despite the use of pesticides to prevent harmful pests from damaging crops, they can still cause long-term harm to the environment and human health. India is the largest producer of such chemicals in Asia, and despite the country's lower consumption rate, residue of these chemicals is still an issue.

Due to the growing concerns about the use of harmful chemicals in agriculture, a government initiative has been launched to develop safer alternatives. This process can be carried out through the development of methods that can minimize the exposure of people to pesticides.

Even though they are low in concentration, the use of pesticides has a serious effect on the environment. (Agrawal et al. 2010).

The data for the last two decades regarding pesticide exposure and human health revealed that several pesticides cause neuronal disorder and degenerative diseases, some effect fetal growth and cause congenital anomalies and other are carcinogenic for human (Asghar et al. 2016). Over the past three decades, the indiscriminate use and improper handling of pesticides in agriculture have caused serious human health problems in many developing countries (Dasgupta et al. 2007).

EFFECTS OF CHEMICAL FERTILIZERS AND PESTICIDES ON HUMAN HEALTH

Chemical fertilizers and pesticides are commonly used to increase crop productivity. Bhandari (2014) observed that although agrochemicals help raise agricultural output in developing countries, they also create serious risks for human health, including the possibility of cancer. Similar patterns can be seen in Rajasthan's Sri Ganganagar district, where large-scale cotton, wheat, mustard, and vegetable cultivation requires frequent chemical spraying.

A major concern is that farmers often spray pesticides without using safety measures such as masks, gloves, or protective clothing. Due to this, chemicals easily enter the body through inhalation or through the skin. This leads to irritation in the eyes, skin problems, respiratory difficulties, and long-term health complications. A study from Bhopal (Choudhary, 2014) showed that farmers directly involved in spraying had high rates of burning eyes, blurred vision, itching, excessive sweating, sore throat, and breathing issues. Similar symptoms are commonly reported by farmers and laborers working in the fields of Sri Ganganagar, especially during the peak spraying season for cotton and paddy.

When pesticides are sprayed on crops, residues remain on vegetables, grains, and fodder. These chemicals ultimately reach human and livestock bodies through food and water. Excessive use of nitrogen fertilizers contaminates underground water with nitrates—a growing concern in canal-irrigated areas of Sri Ganganagar. High nitrate levels can reduce the oxygen-carrying capacity of blood, particularly affecting infants and pregnant women.

Organophosphate pesticides, widely used in the vegetable belts of Sri Ganganagar, are known to cause abdominal pain, dizziness, nausea, headaches, and skin problems. Long-term exposure to these chemicals has been linked with cancer (Miah et al., 2014).

Wimalawansa and Wimalawansa (2014) pointed out that indiscriminate use of fertilizers and pesticides contaminates soil, water, and the food chain. In Sri Ganganagar, where farmers are heavily dependent on canal irrigation and chemical inputs to improve crop yield, slow contamination is often unnoticed. The harmful effects appear years later, increasing risks of chronic diseases such as kidney disorders.

India's Green Revolution brought higher food production, but states like Punjab and adjoining border districts of Rajasthan—particularly Sri Ganganagar and Hanumangarh—now face problems such as soil nutrient imbalance, pesticide residues in food, and rising cases of cancer (Rahman & Debnath, 2015). These issues are increasingly reported in the belt near the Rajasthan–Punjab border.

Even though the pesticide DDT is banned internationally, some rural areas still witness its illegal use. Thuy (2015) noted that DDT remains harmful due to its long-term presence in soil and the food chain. It can cause cancer, nervous system damage, lung problems, reproductive disorders, birth defects, and hormonal imbalance.

Pesticides introduced during the Green Revolution were intended to support food security, yet today they are associated with several human health hazards. Tomer et al. (2015) highlighted that pesticide exposure through food is much higher than exposure through water or air. This risk is highly relevant in Sri Ganganagar, where vegetables, cotton, and paddy fields receive frequent chemical treatment. The health effects range from allergies and rashes to neurotoxicity, infertility, and cancer.

Reducing these risks requires promoting sustainable farming practices, farmer education, and steps to minimize pesticide residues in food and water.

EFFECTS OF CHEMICAL FERTILIZERS AND PESTICIDES ON THE ENVIRONMENT

Soil pollution is a major environmental challenge caused by the continuous use of fertilizers and pesticides. Atafar et al. (2010) noted that heavy metals like cadmium (Cd), lead (Pb), and arsenic (As) enter the soil through fertilizers, sewage water, industrial waste, and pesticides. Sri Ganganagar—one of Rajasthan's most intensively farmed districts—faces similar risks due to long-term and excessive use of chemical fertilizers on canal-irrigated lands.

Kumar et al. (2013) stated that pesticides contaminate soil, air, and groundwater. These chemicals also harm beneficial soil microorganisms, insects, plants, fish, and birds. In Sri Ganganagar, such contamination can affect the fertility of sandy loam soils and threaten local biodiversity.

A study from the Sharda River region (Maurya & Kumar, 2013) found high residues of organochlorine pesticides in surface water. Although this study is from Uttar Pradesh, similar patterns are likely in canal systems of Sri Ganganagar, especially where intensive cotton farming requires frequent pesticide spraying. Transboundary pollution from Punjab also contributes to contamination.

Sitaramaraju et al. (2014) emphasized that pesticide residues are now found in air, soil, surface water, and groundwater. In districts like Sri Ganganagar, where groundwater is already affected by salinity and nitrate contamination, the presence of pesticide residues increases long-term environmental risks.

Soil tests from other agricultural regions (Natraj & Katyal, 2014) show issues similar to those found in Sri Ganganagar:

* Moderate to high alkalinity
* Low organic carbon
* Low nitrogen content
* High potassium levels
* Imbalances in micronutrients such as zinc, copper, iron, and manganese

Groundwater in many villages of Sri Ganganagar also shows rising nitrate levels due to chemical fertilizers.

A study conducted in Iran (Yargholi & Azarneshan, 2014) found that long-term use of pesticides and fertilizers increased soil bulk density and heavy metal accumulation. These findings are applicable to Sri Ganganagar as well because similar agricultural practices exist—large-scale irrigation, continuous cropping, and heavy reliance on fertilizers.

Overall, the environment of Sri Ganganagar is slowly becoming vulnerable due to chemical overuse, affecting soil fertility, water quality, and ecological health.

CONCLUSION

The studies clearly show that unsafe and excessive use of chemical fertilizers and pesticides has harmed both human health and the environment. In districts like Sri Ganganagar, where agriculture is the main livelihood, farmers frequently handle pesticides without proper safety measures. This increases the risk of respiratory problems, skin diseases, eye irritation, poisoning, and long-term illnesses such as cancer and kidney disorders.

Continuous use of fertilizers has polluted soil and groundwater, leading to nutrient imbalance and nitrate contamination. Pesticide residues are increasingly found in crops, milk, and canal-irrigated water systems.

To address these problems, it is essential to promote organic farming, integrated pest management, bio-fertilizers, and safe handling practices. Although the government has taken steps to encourage organic agriculture, awareness and adoption are still low in rural areas of Sri Ganganagar. More training programs, demonstrations, and subsidies for organic inputs are needed.

As organic food demand rises in India, shifting to sustainable farming in Sri Ganganagar can help protect soil health, water quality, farmers' well-being, and future generations.

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