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RESEARCH ARTICLE

IMPACT OF ENVIRONMENTAL POLLUTION ON AGRICULTURAL PRODUCTIVITY AND SOIL HEALTH

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ABSTRACT

Environmental pollution has become a critical concern in the 21st century, especially in developing countries like India where agricultural activities are a primary source of livelihood. This review examines the effects of air, water, and soil pollution on crop productivity and soil health. Emphasis is placed on Indian case studies to highlight localized consequences of pollution on agriculture. The article also discusses mitigation strategies and policy interventions necessary to preserve agricultural sustainability.

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INTRODUCTION

Agriculture is intricately linked with the environment, and any degradation in environmental quality directly impacts crop yield and soil fertility. The use of pesticides, industrial discharge, plastic waste, and vehicular emissions are contributing to a steady decline in soil and crop health. In India, intensive farming practices and urban expansion have further stressed the agricultural ecosystem. This review aims to consolidate existing research and identify key threats posed by pollution to agriculture.

Types of Environmental Pollution Affecting Agriculture

Various types of pollution negatively impact agricultural systems:

- Air Pollution: Increased levels of sulfur dioxide, nitrogen oxides, and ground-level ozone affect photosynthesis and reduce crop yields.
- Water Pollution: Industrial effluents, sewage, and agricultural runoff containing nitrates and phosphates contaminate irrigation sources.
- Soil Pollution: Heavy metals like lead, arsenic, cadmium, and pesticide residues alter soil chemistry and hinder microbial activity.

Impact on Soil Health: Soil health is defined by its physical, chemical, and biological properties. Pollution disrupts the natural balance of these components:

- **Physical Impact:** Soil compaction and erosion due to pollutants reduce aeration and water retention.
- **Chemical Impact:** Accumulation of toxic substances affects nutrient availability and pH balance
- **Biological Impact:** Beneficial microorganisms decline, affecting nitrogen fixation and organic matter decomposition.

Impact on Agricultural Productivity: Crops exposed to pollutants exhibit stunted growth, reduced flowering, and lower yields. For example, paddy fields in Punjab irrigated with contaminated water showed a 20–30% yield reduction. Moreover, crops grown in polluted soils often accumulate toxins, rendering them unsafe for human consumption.

Case Studies from India

- In Maharashtra, high levels of pesticide residues in cotton fields have resulted in reduced soil fertility.
- The Ganga basin has witnessed decreasing agricultural productivity due to water pollution from industrial activities.
- In Hyderabad, peri-urban agriculture is facing challenges due to air pollution from vehicular emissions and industrialization.

Policy Interventions and Mitigation Strategies

- Adoption of organic farming and Integrated Nutrient Management (INM).

- Strengthening of environmental laws like the Water (Prevention and Control of Pollution) Act.
- Promoting bioremediation and phytoremediation techniques.
- Educating farmers on sustainable practices and pollution management.

CONCLUSION

Environmental pollution poses a significant threat to agriculture and food security. It deteriorates soil quality, reduces crop yield, and affects the health of farming communities. There is an urgent need for integrated approaches involving scientific research, government policy, and community participation to mitigate pollution's adverse effects on agriculture.

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