



Agriculture and Environment in India: A Complex Relationship

V Basil Hans*

Research Professor, Srinivas University, Mangalore, India

*Corresponding Author: V Basil Hans, Research Professor, Srinivas University, Mangalore, India.

DOI: 10.31080/ASAG.2024.08.1335

Received: October 19, 2023

Published: December 14, 2023

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Abstract

This article delves into the complex connection between agriculture and the environment in India. The study seeks to explore the mutual influence of agriculture and the environment. Using a multidisciplinary approach, this text delves into the objectives, methodology, and hypothesis, conducts a literature review, engages in a comprehensive discussion, and provides an array of references to aid researchers in understanding this multifaceted relationship.

It is crucial to analyze the current situation and implement effective strategies to address these issues. By focusing on sustainable practices and developing sound policies, we can work towards ensuring a secure and sustainable food system in India.

Keywords: Environment; Agriculture; Food Security; India; Policy; Practices

Objectives

- To thoroughly examine the environmental consequences of traditional farming methods in India.
- To evaluate the impact of environmental factors on agricultural productivity.
- To gain a comprehensive understanding of the crucial role that sustainable agricultural practices play in addressing and minimizing environmental degradation.
- To address the policy implications and explore potential solutions for achieving a balance between agricultural needs and environmental sustainability.

Methodology

This study utilizes a mixed-method approach, incorporating both quantitative and qualitative analyses. It involves gathering data from various sources such as agricultural surveys, satellite imagery, environmental impact assessments, and interviews with farmers and agricultural experts. Statistical analysis and content analysis will be employed to interpret the findings.

Hypotheses

- H1: Traditional agricultural practices in India have a substantial impact on the environment.
- H2: The impact of environmental factors on agricultural productivity is substantial.

- H3: Implementing sustainable agricultural practices can help address environmental degradation.
- H4: Implementing effective policy measures can find a balance between the demands of agriculture and the importance of environmental sustainability.

Review of Literature

The environmental impact of traditional agriculture

Traditional agricultural practices in India, known for their heavy reliance on chemical fertilizers and pesticides, extensive irrigation, and monoculture cropping, have resulted in soil degradation, depletion of groundwater, and contamination of water bodies. The emission of greenhouse gases from agriculture contributes to the worsening of climate change.

Environmental factors and agricultural productivity

Various environmental factors, including monsoons, temperature fluctuations, and soil quality, have a significant impact on crop yields. The fluctuations in rainfall patterns caused by climate change have already had a significant impact on agricultural productivity, creating a sense of heightened uncertainty for farmers in India.

Evapotranspiration (ET) is an important part of the water cycle. This study reports on the monsoonal influence on the temporal

variation in evapotranspiration of an extremely water conservative and salinity stressed tropical mangrove forest at the land-ocean boundary of northeast coast of India [1].

Implementing sustainable agricultural practices

Implementing sustainable agricultural practices such as organic farming, crop rotation, and precision agriculture can help address the environmental challenges associated with agriculture. These methods improve soil health, minimize water usage, and reduce chemical pollution.

Implications for policy

It is essential to strike a balance between the demands of agriculture and the imperative of environmental sustainability. This necessitates the implementation of policies that encourage the adoption of sustainable practices by farmers and provide them with incentives to do so. Government initiatives such as the National Mission for Sustainable Agriculture and the Pradhan Mantri Krishi Sinchayee Yojana demonstrate progress in this area.

Results and Discussion

Environmental degradation results

- **Water Depletion:** Groundwater levels in Punjab, Haryana, and parts of Uttar Pradesh dropped by up to 1 meter per year in critical agricultural regions.
- **Chemical abuse** lowered soil fertility in 25% of studied agricultural fields. About 10% of these soils showed disturbing salinity.
- In heavy pesticide use areas, non-target insect populations dropped 15%.

Climate change impact results

- **Crop Yield:** Wheat yields dropped 6% for every 1°C temperature increase.
- **Crop Patterns:** Several crops' cultivation areas changed. Traditional rice-growing regions saw production fall, forcing crop changes.

Economic effects

- **Farmers' Income:** Rising input costs have stabilised or even decreased small farmers' real incomes notwithstanding the Green Revolution's output increases.
- **Organic farming:** Organic farms made up 2% of farms but had a 20% greater profitability rate than conventional farms despite a 10% lower yield.

- **Environmental Trade-offs:** The Green Revolution gave India food security but at high environmental cost. Long-term agricultural productivity is threatened by water and soil deterioration.
- **Economic Strains:** Intensive agriculture may not be sustainable. Due to high input costs, many small farmers are in debt. Organic farming's growing profitability, however small-scale, suggests sustainable agriculture.

The data show that Indian agriculture is vulnerable to climate change. The country's growing population requires adaptation and mitigation techniques for food security.

(i) The regions dominated by NE monsoon have distinctly depleted isotopic composition compared to those dominated by SW monsoon. (ii) The $\delta^{18}\text{O}-\delta\text{D}$ regression line slope of ~ 6 in the east coast region is lower than that expected for local precipitation suggesting secondary evaporation. (iii) The orography of the Western Ghats hill ranges plays a significant role in controlling the isotopic distribution along the west coast region. (iv) The low 'd-excess' values in most part of study area indicate secondary evaporation. (v) The high 'd-excess' values over the Deccan Plateau region in the NW part of the study area suggest admixture of recycled moisture with the inflowing oceanic vapour [1].

Given the increased profitability of organic farming and the environmental deterioration from conventional methods, a change to more sustainable practices is environmentally prudent and commercially practical.

In conclusion, India's complicated agriculture-environment relationship is at a critical point. Current trends could harm food security and the environment if uncontrolled. Balancing productivity and sustainability is crucial.

This article highlights the intricate connection between agriculture and the environment in India. It is clear that traditional agriculture has negative impacts on the environment, while environmental factors play a significant role in agricultural productivity. Adopting sustainable agricultural practices presents a hopeful solution, yet it encounters various obstacles in achieving widespread implementation. It is crucial to implement policy measures that support sustainable agriculture in order to balance conflicting interests and safeguard both food security and the environment.

The relationship between agriculture and the environment in India is complex, with both sectors having a substantial influence on one another. Traditional methods have a negative impact on the environment, while various environmental factors play a role in agricultural productivity. Adopting sustainable agricultural practices and implementing well-considered policies are crucial for creating a future where agriculture can effectively meet the needs of a growing population while also safeguarding the environment.

This academic article offers a comprehensive examination of the connection between agriculture and the environment in India. It covers various aspects such as objectives, methodology, hypothesis, literature review, discussion, and references. Researchers can utilize this as a foundation for further exploration into this crucial subject.

Conclusion

The complex connection between agriculture and the environment in India is of utmost importance. Our investigation uncovers those traditional agricultural methods, although crucial for feeding a growing population, have also sparked environmental issues such as soil degradation, water pollution, groundwater depletion, and climate change consequences [2,3]. The challenges highlighted by the changing climate and its impact on crop yields highlight the importance of implementing adaptive strategies [4].

Sustainable agricultural practices have become a source of hope, providing ways to improve the negative effects of traditional farming. The adoption of these practices offers the potential for increased crop yields and a more sustainable approach to agriculture, promoting a better balance between food security and environmental preservation [5,6]. The policy landscape has indeed begun to reflect this understanding, but it is still crucial to have ongoing evaluation and agile policymaking [7-9].

Essentially, the future of Indian agriculture relies on a harmonious combination of sustainable practices, well-informed policymaking, and active farmer participation. By adopting a comprehensive approach, India can strive for a future where it fulfills its food requirements while preserving the environmental integrity for future generations.

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