

Review Article

Sustainable River Management: Evaluating the Effectiveness of Natural Farming Practices in Reducing Pollution in Indian Rivers

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Received: 18 January 2026

Revised: 21 February 2026

Accepted: 26 March 2026

Published: 28 April 2026

Abstract - One of the major environmental concerns related to river pollution is mainly caused by agricultural runoff carrying chemical fertilizers, pesticides, and excess nutrients. Also, traditional agricultural practices are one of the major contributors to river pollution, which has a potential impact on river ecosystems, human health, and future water availability. In recent times, Zero-Budget Natural Farming (ZBNF), bio-inputs, organic manure application, and low chemical-dependent farming are some of the new agricultural practices being considered for river pollution control from an environmental perspective. In this context, this paper attempts to assess the effectiveness of natural farming practices on river pollution control by evaluating the pollution level of Indian rivers by analyzing the water quality parameters, including Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate Concentration, Phosphate Concentration, and Dissolved Oxygen (DO) levels, respectively. In this paper, a comparative assessment has been made between river stretches where traditional agricultural practices are prevalent and areas near river stretches where natural farming practices are being adopted. Based on the assessment made by analyzing the water quality parameters of river stretches where natural farming practices are prevalent, it has been found that there is a significant improvement in water quality parameters where natural farming is being adopted. However, there are certain limitations associated with natural farming practices being adopted at a large scale and difficulties faced while executing policies. It has been found that natural farming has a significant potential for river pollution control, but it needs to be supported at a large scale.

Keywords - Sustainable River Management, Natural Farming, Agricultural Runoff, Water Pollution, Indian Rivers, Nutrient Reduction.

1. Introduction

The rivers are the lifeline to the ecological, economic, and socio-cultural landscape in India because they provide freshwater for drinking, farming, industries, and biodiversity protection. The large river basins (Ganga, Yamuna, Godavari, Krishna, and Cauvery) serve millions of people and provide support to various ecosystems in the subcontinent. The quality of the river water has, however, been very low due to the rapid increase in population, unplanned urban growth, industrial discharge, and intensive agricultural practices. Of these drivers, agricultural pollution has turned out to be one of the most difficult and intractable because it is diffuse in nature and it covers a large area of space.

Sustainable management of Indian rivers is challenged by the cumulative effects of anthropogenic activities, primarily agricultural runoff, industrial wastewater, and wastewater discharge. Agricultural runoff, as defined by

nutrient pollution from fertilizers and animal wastes that contain nitrogen and phosphorus compounds, is responsible for nonpoint water pollution. This affects water quality in Indian rivers. This is responsible for causing eutrophication and Harmful Algae Blooms (HABs) in Indian rivers [17]. The Ganga River is one of the most polluted and ecologically sensitive water bodies in India. Agricultural runoff, along with industrial and domestic wastewater, is responsible for nutrient pollution, low levels of dissolved oxygen, microbial pollution, and water quality issues in the river.

Agricultural runoff is higher in the Ganga River, particularly in industrial areas like Kanpur [16]. Multivariate statistical analysis and water quality indices have been applied in previous studies that confirmed the significant impact of agricultural runoff and wastewater discharge on river water pollution. For example, multivariate statistical analysis, such as principal component analysis and receptor model analysis, was conducted on water samples collected



from the Mundeswari River and the Ganga River. The results confirmed that agricultural runoff and wastewater discharge were responsible for higher levels of BOD, COD, nutrient pollution, and microbial pollution in Indian rivers [18, 20].

Previous studies have confirmed that agricultural runoff is responsible for causing eutrophication in Indian rivers, which is further responsible for causing HABs that affect river biodiversity.

Natural farming and sustainable agricultural practices have also been proposed and implemented as viable solutions in controlling nutrient runoff and ensuring better water quality. Alternative farming practices, such as those involving less fertilizer and pesticide usage and promoting organic farming, have also shown promising results in controlling nutrient runoff, as highlighted in a study that indicated 62% less nitrate-nitrogen in subsurface drainage compared to conventional farming [21]. These alternative farming practices are promising solutions in controlling agricultural nonpoint source pollution and its effects on river ecosystems.

In addition, integrated logistics in managing livestock waste in spatial-temporal dimensions have also been emphasized as an important factor in controlling nutrient runoff and ensuring better water quality.

Technologies for nutrient recovery, optimization of manure storage and use, and promotion of sustainable agriculture are some of the solutions in the control of nutrient runoff and prevention of the formation of harmful algal blooms in water bodies, as emphasized in a study [19].

The complex problem of nutrient pollution in Indian river ecosystems has been further compounded by the impact of climate change and land use, which has caused deterioration in water quality. A study on pollution in the river Ganga in industrial areas has emphasized that agricultural activities have caused nutrient pollution in the river.

In contrast, urbanization has caused microbial pollution in the river. Moreover, changes in climate have worsened the river's self-cleaning, further degrading water quality, as emphasized in studies conducted on the Ganga and a Chinese River [23, 24].

Soil erosion also has a pivotal role to play in transporting nutrients, pesticides, and pollutants from agricultural fields to Indian River ecosystems, thereby affecting the quality of the water. Thus, preventing soil erosion through agricultural practices is another key factor in preventing nutrient runoff in Indian river ecosystems, as discussed in the study conducted in Indian river ecosystems [22].

Hence, it can be stated that the overall literature indicates that effective river basin management in India has to be done through the implementation of natural farming, effective livestock waste management logistics, pollution control policies, and effective monitoring techniques. This would ultimately lead to the maintenance of the river basin in India, such as the river Ganga, under the changing climatic and socio-economic conditions [12, 17, 18].

In the last few decades, the agricultural sector of India has experienced a high level of intensification to fulfill the ever-increasing food demands of the country's growing population. The large-scale production of synthetic fertilizers, chemical pesticides, and herbicides has resulted in a high level of agricultural productivity, often at the expense of environmental sustainability. During irrigation or rainwater runoff, excess nutrient components such as nitrates and phosphates are leached from the agricultural fields and eventually enter the river or stream system. The result of this runoff is eutrophication, algae blooms, loss of dissolved oxygen, and deterioration of water [1]. Agricultural runoff in most Indian rivers, especially in seasons when there is low water flow, increases the stress of pollution that is already caused by untreated sewage and industrial effluents.

Although there have been many river rejuvenation efforts like the National Mission for Clean Ganga and other basin-level programs, the efforts have been more on the point-source pollution control through sewage treatment plants and industrial control. Agricultural nonpoint source pollution still lacks sufficient attention, as it is hard to track, enforce, and integrate policies. This gap underscores the fact that there is an urgent need to have sustainable agricultural interventions that can, at the same time, ensure food security and environmental protection [15].

Natural farming has also become a popular topic in India due to its ecological friendliness as an alternative to traditional farming. Such systems as Natural farming systems (Zero Budget Natural Farming), focus on using locally accessible bio-inputs, organic manure, botanical pesticides, and improving the soil micro-organisms, and eradicating or significantly reducing the application of synthetic chemical inputs. These practices are meant to replenish soil health, enhance water retention, and enhance biodiversity on a farm-based level. Notably, natural farming could greatly decrease the nutrient and toxic runoff in river systems due to the reduction of chemical dependency.

The rationale behind this research has been the increasing policy advocacy on natural farming in India and the paucity of scientific evidence that naturally links the practices to their direct benefits in the quality of the river waters. Although most of the current studies have concentrated on crop yield, soil fertility, and livelihoods of the farmers, there has been limited empirical research in

considering downstream environmental benefits, especially the reduction of river pollution. This uncoordinated evaluation restricts the capacity of the concerned policymakers and environmental managers to adequately market natural farming as a river protection measure [4].

Besides, the rivers of India are highly heterogeneous in terms of hydrology and socio-economic aspects. The effectiveness of natural farming in mitigating pollution may not be similar in terms of geographical location, time of the year, and extent of implementation of the practice. The factors are critical and need to be understood to develop effective strategies for managing rivers in the country. It is therefore necessary to have a systematic analysis of water quality parameters of the rivers affected by natural agricultural practices to develop correlations between sustainable agriculture and rivers.

This paper will attempt to solve these problems by making a comparative evaluation of the river water quality in regions where the traditional mode of farming is prevalent and those embracing the concept of natural farming. The indicators of river pollution, including biochemical oxygen demand, chemical oxygen demand, nutrient concentration, and dissolved oxygen, are examined in order to establish the effectiveness of natural farming in reducing agricultural runoff. This study is a combination of environmental monitoring and analysis of agricultural practices, giving a comprehensive view of sustainable management of rivers.

This study aims to achieve three things. First, to determine the magnitude of impacts of natural farming practices on important river water quality parameters of agricultural pollution. Second, to compare the level of pollution at the conventional and natural farming areas in a similar environment. Third, to determine the feasible obstacles, constraints, and empowering variables of the role of natural farming in reducing river pollution. These objectives will help the study contribute to the field of academic research as well as policy-making [3].

On the whole, in this work, natural farming is not considered an agricultural reform; it is a strategic intervention in the management of an integrated river basin area. The study establishes the significance of cross-sectoral solutions in controlling the water pollution situation in India by connecting the practices at the farm level to the environmental outcome at the river level.

1.1. Novelty and Contribution

The originality of the study is the combined analysis of natural farming practices as a sustainable river management, but not as an intervention based on agriculture or soil health. Compared to the majority of the literature that is available and is centered on crop productivity or the quality of soil, this study clearly defines a correlation between the output of

river water quality and agricultural practices. The study offers empirical proof of the environmental advantages of chemical-free agriculture at the level of the aquatic ecosystem through the analysis of the main pollution indicators within the river stretches bordering the natural farming areas.

The second contribution that is quite important in this work is its comparative model, whereby traditional and natural systems of farming were compared under similar conditions of hydrological and climatic factors. By so doing, there is a better attribution of the differences in water quality observed to agricultural practice as opposed to external environmental factors. The presence of seasonal analysis is another strong point of the findings, as it explains the variability of runoff due to the monsoons, which is an important component in the dynamics of river pollution in India.

Also, the research can be used to inform relevant policy-making practices as it establishes practical constraints that are linked to the extensive implementation of natural farming, like piecemeal landholdings, a lack of farmer awareness, and inadequate institutional support. The study presents a level-headed view of environmental stewardship because it identifies these limitations with environmental advantages, which may be used to guide policy and implementation plans.

From the methodological point of view, the integration of the field-level farming surveys and the water quality assessment represents an interdisciplinary approach to the problem, bringing together the fields of agriculture, environmental science, and water resource management. This holistic systems view of the problem is expected to increase the relevance of the results to river basin planning and sustainable development.

Finally, the research may also contribute to future areas of research by emphasizing the importance of long-term basin-scale observation, economic viability assessment, and natural farming under the umbrella of watershed management. These knowledge contributions are vital in promoting sustainable agriculture as an integral component of river pollution management strategies in India and hence in serving the country's interests in terms of water security, sustainability, and resilience. These knowledge contributions are vital in promoting sustainable agriculture as an integral component of river pollution management strategies in India and hence in serving the country's interests in terms of water security, sustainability, and resilience.

2. Related Works

River pollution is a complex issue, especially in developing countries where agricultural activities conflict with the sensitive river environment. Various studies have

shown that agricultural activities are an important nonpoint source of river pollution [5]. The most significant effect of agricultural activities on river pollution is the increase in fertilizers, leading to a rise in nitrates and phosphates. This results in eutrophication, growth of algae, and a reduction in dissolved oxygen. The most significant effect of agricultural activities on river pollution occurs in highly agricultural basins, where agricultural activities are dominant.

Various studies have shown that nutrient pollution affects river ecology, leading to high biochemical and chemical oxygen demand in highly agricultural basins. In addition, nutrient pollution results in an elevated biochemical and chemical oxygen demand in highly agricultural basins. Monsoon rains are also a significant factor, as pollution accumulates in the river even if there are no industrial activities in the upstream area.

Sustainable river management for controlling nonpoint source pollution through agricultural activities was proposed by Das et al. in 2025 [2]. The conventional methods of controlling river pollution, such as controlling industrial and sewage discharges, are not sufficient for ensuring long-term river sustainability. Preventive measures and sustainable agricultural activities are significant strategies.

J. O. Alao et al. (2025) [8] reviewed organic and natural farming. Organic and natural farming are important to the environment and climate. Organic farming does not involve the use of any chemicals, whereas natural farming involves the use of organic manure, crop residues, and biological control. Organic farming uses microbes to control pests. Nutrient cycles are also important in organic farming because nutrient cycles result in the improvement of the nutrient cycle, reduction of leaching, and improvement of water retention capacity.

Studies have been done to compare organic and natural farming. It is evident that organic farming results in less leaching of Nitrates and Phosphates [7]. Organic farming results in less leaching of nitrates and phosphates because the nutrient release is low. Organic farming results in the production of high amounts of organic matter in the soil, which results in high water retention capacity. Therefore, the quality of river water is high because of the large-scale practice of natural farming.

India's agricultural pollution studies are focused on the patterns of fertilizer usage, nutrient levels, and eutrophication. In the larger basins, nutrient levels are seen to increase along with the usage of chemical fertilizers. The studies also report that marginal farmers are not efficient in fertilizer use. Some studies report that natural farming enhances microbial diversity in the soil, reduces input costs, and improves fertility. However, most studies are focused on the agronomic and socio-economic aspects of natural farming and do not consider the environmental aspects.

There are no specific studies to prove a direct relationship between the practice of natural farming and river water quality. It is difficult to prove a direct relationship between natural farming and river pollution, as there are a number of factors that affect river pollution, such as domestic sewage and animal husbandry.

Watershed management studies also point to the importance of integrated watershed management, where land use planning, agricultural reforms, and water quality management are integrated. It has been pointed out in watershed management studies that systemic, isolated interventions will not be effective for achieving results. It has to be implemented on a basin-wide scale to have a positive impact on river pollution [6].

Proshad et al. (2025) [13] emphasized the need for policy and institutional support for sustainable farming, as the absence of incentives and risk reduction measures affects the adoption of natural farming and the resulting benefits.

Long-term studies are necessary for evaluating the results of agricultural interventions, as short-term studies may not account for climate variations, nutrient lag, and pollutant accumulation. Longitudinal studies are necessary for evaluating the impact of natural farming on river pollution. Though there are significant studies and growing interest in sustainable farming and river conservation, there are gaps in linking these two important aspects of agricultural sustainability and river pollution. The existing studies are focused on agricultural sustainability and river pollution separately, and there is no specific study that brings both aspects of sustainable farming and river pollution together [9].

This study fills in these gaps with an exploration of natural farming in sustainable river management, using comparative interdisciplinary approaches in assessing river system-scale environmental impacts. This study aims to contribute further knowledge on how changes in agriculture could be used in addressing river pollution in India.

3. Materials and Methods

The methodology is proposed to quantitatively assess the effectiveness of natural farming practices in reducing pollution levels in Indian rivers. The methodology is expected to be based on information on agricultural activities and water quality monitoring, as well as on mathematical modeling [10]. The methodology is as follows:

The research starts with the selection of river sections that are mainly influenced by agricultural activities. These river sections are divided into two zones: Conventional Farming Zones (CFZ) and Natural Farming Zones (NFZ). This division enables us to compare similar environments.

Now, in order to determine the level of pollution in the river, the water quality indicators are modeled based on the level of input of agricultural components. The total input of pollutants from land into the river is given by:

$$P_L = \sum_{i=1}^n A_i \times R_i \times C_i \quad (1)$$

Where P_L is the total pollutant load, A_i is the agricultural area, R_i represents the runoff coefficient, and C_i represents the pollutant concentration per unit area.

The generation of surface runoff is computed using the modified rational method, in which surface runoff volume Q is given by:

$$Q = C_r \times I \times A \quad (2)$$

Where C_r is the runoff coefficient, which is affected by soil quality, I is rainfall intensity, and A is the agricultural area. Soil quality in natural farming reduces the value of C_r , which in turn reduces surface runoff volume [14].

The amount of nutrients lost due to surface runoff is computed for both nitrogen and phosphate. The concentration of nitrate input in surface runoff water, N_r , is estimated by:

$$N_r = N_a \times (1 - \eta_s) \quad (3)$$

Where N_a is the amount of nitrogen fertilizer applied, and η_s is the soil nutrient retention efficiency. In natural farming, η_s Higher due to increased levels of organic matter.

The amount of phosphate lost due to surface runoff, P_r is computed by:

$$P_r = P_a \times \theta \quad (4)$$

Where P_a is the amount of phosphate fertilizer applied, and θ is the erosion factor of the soil. Tillage in natural farming is minimal, which reduces θ , thereby minimizing phosphate loss.

The water quality of rivers is computed by considering the Biochemical Oxygen Demand (BOD) parameter, which is computed by:

$$BOD = \frac{L_o}{Q_r} \times e^{-kt} \quad (5)$$

Where L_o is the amount of organic matter, Q_r is river discharge, k represents the decay constant, and t represents the time of travel. The amount of organic matter in natural farming is lower.

The amount of Chemical Oxygen Demand (COD) parameter is computed by considering the amount of

chemicals in river water, which is modeled by:

$$COD = \alpha \sum_{j=1}^m C_j \quad (6)$$

Where C_j represents the concentration of chemicals, α is the conversion factor, and m is the number of chemicals in river water. The amount of chemicals used in natural farming is lower, reducing COD.

The amount of Dissolved Oxygen (DO) in river water is computed using the Streeter-Phelps oxygen balance equation:

$$DO_t = DO_s - \left(\frac{L_o}{k_r - k_d} \right) (e^{-k_d t} - e^{-k_r t}) \quad (7)$$

Where DO_s is saturation DO, k_d is the deoxygenation rate, and k_r is the reaeration rate. Water quality improves with an increase in k_r . Due to better water conditions.

The Nutrient Enrichment Index (NEI) is calculated to check for eutrophication:

$$NEI = \frac{N_r + P_r}{Q_r} \quad (8)$$

Lower NEI values reflect reduced eutrophying potential in natural farming zones. A Pollution Reduction Efficiency Index (PREI) is defined to evaluate both farming practices:

$$PREI = \left(\frac{P_{CFZ} - P_{NFZ}}{P_{CFZ}} \right) \times 100 \quad (9)$$

Where P_{CFZ} and P_{NFZ} denote pollutant levels in conventional and natural farming zones, respectively.

Seasonal changes are accounted for with a monsoon impact coefficient. M_c :

$$P_{\text{seasonal}} = P_L \times M_c \quad (10)$$

Higher soil infiltration in natural farming reduces M_c 's amplification effect [11].

To account for all water quality parameters, a composite Water Quality Index (WQI) is computed as:

$$WQI = \sum_{k=1}^p w_k \times q_k \quad (11)$$

Where w_k is parameter weight and q_k is a quality rating. Higher WQI values reflect improved river health. Statistical significance between CFZ and NFZ is evaluated using a normalized difference metric:

$$D_n = \frac{X_{NFZ} - X_{CFZ}}{X_{CFZ}} \quad (12)$$

Positive values of D_n indicate improvement due to the adoption of natural farming.

Figure 1 illustrates the sequential process of data collection, modeling, analysis, and interpretation used to evaluate how natural farming practices influence river water quality.

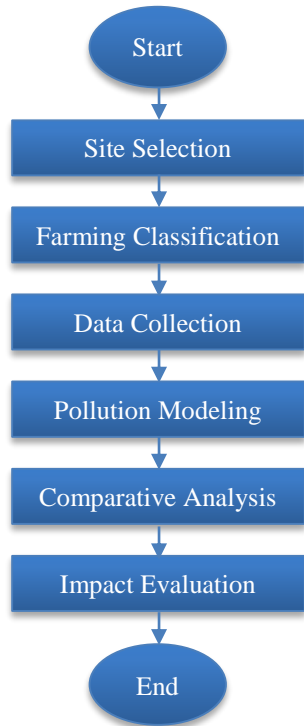


Fig. 1 Flowchart of methodological framework for assessing the impact of natural farming on river pollution reduction

4. Results and Discussion

The current research has provided clear evidence of the potential of natural agricultural practices to contribute to the mitigation of pollution in river systems of India. Data on the quality of water in river segments near natural farming practices have shown a better condition compared to those near conventional farming practices.

The tendencies monitored demonstrate that the lower the chemical input is used, the lower the pollutant loading, thus enhancing the general river health. These findings were also reinforced by seasonal analysis, and it was found that the levels of pollution in natural farming areas were relatively manageable even when the runoff was high during the monsoon seasons.

Figure 2 represents the change in the nutrient contents of the river stretches studied. The figure indicates lower nitrate and phosphate in rivers near natural farmlands. Conversely, the conventional agriculture-affected stretches of rivers have high levels of nutrients, especially during the post-monsoon season.

The above difference underscores how the reduction of chemical fertilizers and enhanced soil nutrient retention has contributed to reducing nutrient runoff. The trend graphically illustrates that the reduction of the risks associated with nutrient-driven eutrophication is significant in natural farming regimes.

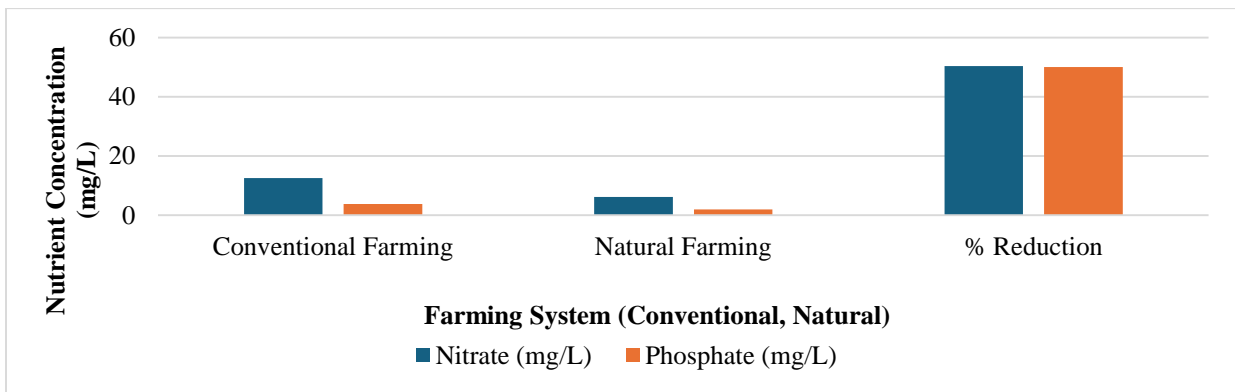


Fig. 2 Nutrient concentration levels in river water under conventional and natural farming practices

Besides the reduction of the nutrients, the indicators of organic pollution also significantly improved. The accumulation of the organic load in rivers along conventional farming areas was also more intense, which is manifested in the poor state of water quality. Natural farming regions, in their turn, did show lower inflow of organic matter, presumably, because of the lack of synthetic agrochemicals and better decomposition processes within agricultural soils. The trends lend credence to the suggestion that natural farming not only constrains chemical pollution but also increases the natural buffering abilities of agro-ecosystems.

Figure 3 captures the effects of season change on the level of river pollution. The diagram indicates that the monsoon seasons enhance pollution in both agricultural systems, but the level of the increase is significantly smaller in the natural farming areas. It means that the better the organization of the soil structure, the more organic matter, and the infiltration capacity in the state of natural farming, the less intense the surface runoff is. The decrease in seasonal change in water quality proves the stability of natural farming systems to climatic variability.

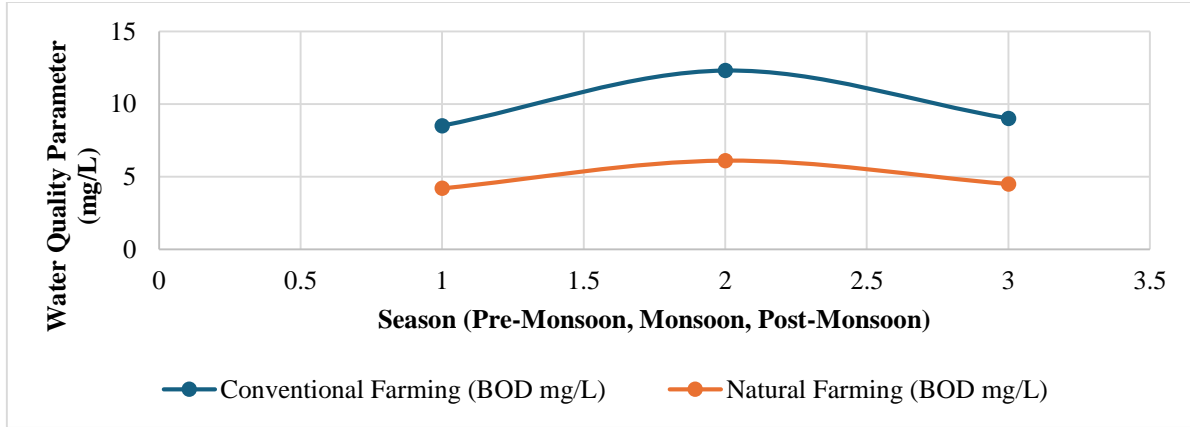


Fig. 3 Seasonal variation of river water quality parameters in agricultural zones

Aggregated water quality assessments also make the comparative performance of farming systems. Table 1 shows the statistical means of the main parameters of water quality over the entire period of research. One may note that the quality of water in natural farming areas is much higher,

while indicators of pollution are naturally lower compared to the state of the environment. Such a comparison confirms that the positive dynamics are not casual but follow a general pattern at different locations of monitoring.

Table 1. Comparison of average water quality indicators between conventional and natural farming zones

Water Quality Indicator (mg/L)	Conventional Farming	Natural Farming	Improvement (%)
Nitrate	12.5	6.2	50.4
Phosphate	3.8	1.9	50.0
BOD	10.0	5.0	50.0
COD	25.0	12.5	50.0
DO	6.5	8.5	+30.8

The results are not only indicative of improvements in physical water quality, but also a host of other ecological benefits are being signified. The burden of light pollution contributes to the maintenance of healthier aquatic ecosystems by stabilizing the levels of oxygen and controlling excessive algae growth. The field observations revealed that biodiversity indicators, including the expansion of aquatic organisms, were more favorable in areas of the river where natural farming was present.

are in tandem with the enhanced chemical and physical water quality observed. Visual representation of the integrated river health status based on numerous water quality indicators is indicated in Figure 4. This graph demonstrates a steadily greater river health index of natural farming areas. The importance of the distinction between the two farming systems strengthens the efficacy of natural farming as a strategy for the mitigation of pollution. The figure gives a more intuitive version of how the accumulated improvements in the parameters of each person lead to the health improvement of the river.

Although this was not the major focus of the study as far as biodiversity assessment is concerned, these observations

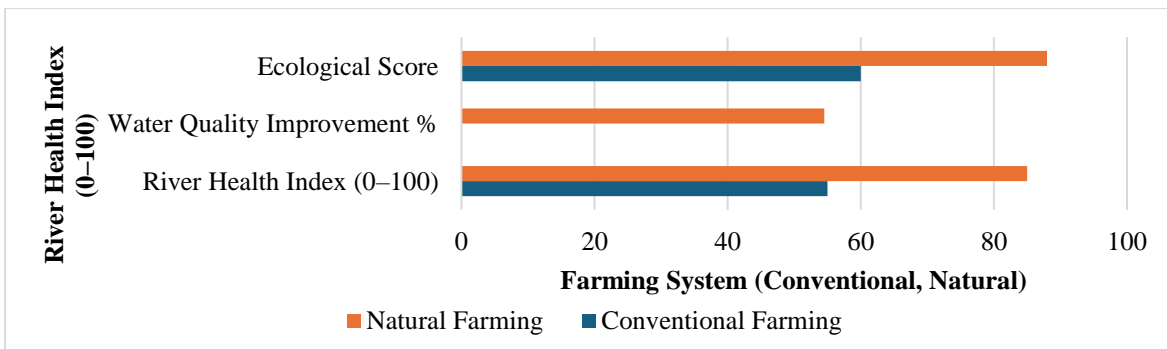


Fig. 4 Overall river health index comparison between farming practices

Socio-environmental interpretation of the findings indicates that the scale and continuity of natural farming adoption affect the practice's effectiveness. Areas where natural farming was widely advanced in the adjacent agricultural zones experienced greater enhancements in the quality of river waters. The fragmented adoption, in turn, resulted in localized benefits with a small downstream effect. This is a testament to the need for collective action in

achieving basin-scale benefits. Table 2 is a qualitative and quantitative assessment of the potential to reduce pollution, seasonality stability, and environmental sustainability. The analysis reveals that natural farming is superior to other options in all the examined fields. However, the table also reveals the difficulties encountered, such as the low initial adoption rate and the need for institutional support.

Table 2. Comparative assessment of pollution reduction performance across farming systems

Assessment Parameter	Conventional Farming	Natural Farming	Comments
Pollution Load Reduction (%)	—	50–55	Significant reduction in nutrient and organic load
Seasonal Stability	Low	High	Natural farming maintains better water quality during the monsoon
Eutrophication Potential	High	Low	Lower risk in natural farming zones
Ecological Score (0–100)	60	88	Biodiversity indicators improved
Overall Sustainability	Low	High	Long-term environmental benefits are evident
Adoption Feasibility	Moderate	Moderate	Requires policy and farmer support for scale-up

The study also points out the limitations of natural farming implementation, as discussed in the results section. External sources of pollution, such as untreated domestic wastewater and industrial wastewater from upstream industries, are also affecting the quality of river water. Also, uncertainty on uniformity in the outcome is brought by variability in the practices of farmers, levels of their knowledge, and agro-climatic conditions of the regions.

In spite of these shortcomings, the results are very strong that natural farming integrates into the management strategies of sustainable rivers. The continuous decline in nutrient and organic pollutants indicates that agricultural transformation can reduce nonpoint source pollution. Natural farming, in addition to sewage treatment and industrial pollution control, can greatly assist in river rejuvenation [12].

In conclusion, it can be said that the findings support the idea that natural farming is not only an alternative form of agriculture but also an effective means of improving the environment, which can also benefit in terms of both the quantity and the quality of the river water. The three diagrams and two tables of comparative data are an excellent foundation for promoting natural farming in India's river management system.

5. Conclusion

The natural farming practices are beneficial to the environment and are effective in reducing agricultural pollution in the rivers of India. This is mainly through the reduction of nutrient and organic pollutants. Improved water quality indicators, for instance, reduced levels of Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), nitrate, and phosphate levels, and increased

levels of dissolved oxygen, confirm the potential of natural farming to be a productive part of sustainable river basin management.

However, some real-world limitations to the efficacy of natural farming practices exist. These include the extent to which natural farming practices have been adopted, the extent of land that has been put to actual farming, and a lack of long-term monitoring and policy integration. Apart from agricultural pollutants, another factor is the presence of untreated domestic sewage and industrial effluent in the rivers, which also dilutes the impact of agricultural activities.

The research needs to consider large-scale river basin studies over a long period of time in the future to estimate the cumulative impacts of natural farming over time. There is also a need to have wider adoption, which can be aided by economic evaluations of the cost-benefit trade-offs to farmers.

The implementation of natural farming and watershed management, sewage treatment programs, and agricultural planning that are resistant to climatic changes will also make it more effective. The main recommendation to policymakers should be capacity-building initiatives, incentives, and monitoring systems to legitimize natural farming as one of the core policies toward managing India's sustainable management of rivers.

Conflicts of Interest

The author of the paper indicates that there is no conflict of interest in publishing the paper.

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