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Institutional Support and Policy Framework for Promoting Zero Budget Natural Farming (ZBNF) and Organic Agriculture in India: Challenges, Opportunities, and the Way Forward

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Abstract

Agriculture is central to India's economy but heavy reliance on chemical inputs has led to soil degradation, environmental harm, and farmer distress. Sustainable alternatives like Zero Budget Natural Farming (ZBNF) and organic farming reduce costs and improve soil health, yet large-scale adoption faces policy gaps, financial barriers, weak infrastructure, and limited market access.

While states like Andhra Pradesh have shown success through strong government support, challenges include yield fluctuations, high transition costs, limited credit, and weak certification systems. Strengthening institutional frameworks, offering financial incentives, and improving extension services are critical. Public-private partnerships, digital platforms, and advanced tools like blockchain and AI can enhance certification, market linkages, and adoption.

Policy reforms should integrate ZBNF into mainstream agricultural plans, expand schemes like RKVY, and provide low-interest credit and insurance. Farmer cooperatives, training programs, and awareness campaigns can further ease the transition.

India's path to sustainable agriculture requires robust policies, institutional coordination, and financial support. By addressing these gaps, India can lead in sustainable farming, ensuring food security, farmer prosperity, and environmental sustainability.

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KEYWORDS: Sustainable Intensification, Pesticide Reduction, Farmers' Livelihoods, Sustainable Food Systems, Smart Farming Solutions.

1. INTRODUCTION

Agriculture is crucial to the Indian economy, providing livelihoods for many in rural areas. However, reliance on chemical farming techniques has resulted in significant environmental and economic issues. Additionally, the high input costs associated with conventional farming have placed a financial burden on farmers, pushing many into debt and economic distress cycles. Given these challenges, the need for a sustainable alternative has become critical for ensuring food security, environmental conservation, and financial stability. Sustainable agricultural practices like Zero Budget Natural Farming and organic farming have become increasingly popular in response to environmental concerns. These approaches focus on eliminating synthetic inputs, enhancing soil health, and reducing dependency on external agricultural inputs. ZBNF specifically promotes no- cost farming by utilizing natural inputs like cow dung, cow urine, and plant-based fertilizers to sustain soil health and safeguard crops from pests. Organic farming, similarly, promotes eco- friendly methods while ensuring the production of healthy, chemical-free food. Both approaches align with the global shift toward sustainable food systems and the principles of agroecology. Despite the evident benefits of ZBNF

and organic farming, their large-scale adoption in India faces significant challenges. The transition from conventional to sustainable farming requires strong institutional support and policy frameworks to assist farmers in adopting these techniques. Various government programs, including the Paramparagat Krishi Vikas Yojana, state-supported ZBNF initiatives, and the broader National Mission for Sustainable Agriculture, focus on encouraging organic and natural farming methods. However, these policies often suffer from fragmented implementation, inadequate financial incentives, and lack of awareness among farmers. Institutional interventions are essential for bridging gaps by offering financial aid, technical training, research support, and market connections for organic farmers. Strengthening institutional frameworks, enhancing public-private collaborations, and leveraging technology for better market access can pave the way for a successful transition to sustainable agriculture. Moreover, integrating ZBNF into mainstream agricultural policies and expanding farmer education programs will be essential to overcoming existing barriers. The study examines advancing natural and organic farming practices across India. It highlights the key challenges faced by farmers, assesses policy effectiveness, and explores potential opportunities for expanding sustainable agricultural practices across the country. By addressing these concerns, India can position itself as a global leader in environmentally friendly farming, ensuring longterm agricultural sustainability, rural prosperity, and food security.

2. Statement of the Research Problem

The rapid expansion of chemical-intensive farming in India has led to significant environmental degradation, declining soil fertility, and increased financial burdens on farmers. Sustainable agricultural methods, such as ZBNF and organic farming, provide alternatives that support soil health, reduce dependency on chemical inputs, and promote enduring farm viability. However, the large-scale adoption of these methods faces numerous challenges, including policy gaps, financial constraints, institutional inefficiencies, and limited market access. This research focuses on the influence of institutional support and policy frameworks in promoting the adoption of ZBNF and organic farming in Ponneri Taluk, Thiruvallur District, India. By assessing farmer awareness, adoption levels, and challenges, the study seeks to identify key policy and institutional interventions necessary to facilitate a successful transition toward sustainable farming.

3. Research Questions

3.1 What role do government and private institutions play in advancing ZBNF and organic farming in India?
3.2 What are the major policy challenges in implementing large-scale sustainable farming practices?
3.3 How can institutional frameworks be improved to enhance farmer participation?

4. Research Gap

4.1 Limited Studies on Long-term Economic Viability: Existing literature acknowledges the benefits of Zero Budget Natural Farming (ZBNF) and organic agriculture, but there is a lack of empirical studies assessing their long-term profitability and financial sustainability compared to conventional farming.

4.2 Inadequate Evaluation of Institutional Effectiveness: While policies and institutional frameworks exist to promote sustainable agriculture, studies on their effectiveness in addressing farmer challenges, ensuring smooth implementation, and achieving large-scale adoption are insufficient.

4.3 Lack of Comparative Analysis: There is a need for research that systematically compares ZBNF, organic farming, and conventional farming regarding yield stability, market accessibility, and environmental impact, which is important for policy development and farmer choices.

5. REVIEW OF LITERATURE

The Zero Budget Natural Farming (ZBNF) and organic farming in fostering sustainable agriculture. This study explores that ZBNF reduces dependency on chemical inputs, enhances soil fertility, and improves farmers' income in the long run. Studies on organic farming emphasize its role in reducing environmental pollution and ensuring food safety. However, existing literature points out policy gaps, financial constraints, and inadequate institutional support as major barriers to large-scale adoption. While government initiatives such as PKVY and NMSA aim to promote sustainable farming, their effectiveness varies across different states. Researchers have also stressed the need for stronger market linkages, farmer awareness programs, and financial incentives to support this transition. Comparative studies between ZBNF, organic farming, and conventional agriculture indicate mixed results, with concerns about initial yield fluctuations. This study builds upon existing research by evaluating institutional and policy interventions to enhance the adoption of sustainable farming in India. Bharucha *et al*. (2020) [3] evaluate the large-scale adoption of ZBNF in Andhra Pradesh, analyzing its impact on farmer incomes, crop yields, and sustainability. Their study provides evidence of improved farm health and reduced costs, advocating for the model's expansion. Khadse and Rosset (2019) [8] trace the evolution of ZBNF from a grassroots movement to an institutionalized practice. They discuss its spread in India and highlight concerns about government-led implementation potentially altering its original farmer- centric model. Kumar *et al*. (2023) [14] examine natural farming practices as an alternative to chemical-based agriculture. Their findings suggest that while yields under natural farming vary, integrating farmyard manure improves productivity. The study underscores the economic benefits of reducing input costs while promoting soil health. Sawant (2022) discusses the concerns surrounding pesticide residues, highlighting their impact on health, environment, and agriculture. The study emphasizes the necessity of adopting alternative pest management strategies, such as organic farming, to reduce chemical contamination in food and soil. Sarial (2019) [29] discusses agricultural diversification in Himachal Pradesh,

highlighting its potential due to diverse agroclimatic conditions. The study identifies challenges like declining yields and climate change while emphasizing the benefits of high-value cash crops and organic farming. It suggests adopting advanced technologies to enhance farmers' income and sustainability. Diversification is presented as a key strategy for economic stability and environmental conservation.

6. OBJECTIVES OF THE STUDY

6.1 To explore farmers' awareness, adoption levels, and challenges related to Zero Budget Natural Farming (ZBNF) and organic farming in Ponneri Taluk, Thiruvallur district.

6.2 To evaluate the effectiveness of institutional support and policy measures in promoting ZBNF and organic farming across India.

6.3 To analyze the socio-economic effects of ZBNF and organic farming on farmers, with a focus on income stability, production expenses, and market access.

6.4 To examine the role of digital platforms, cooperatives, and private sector collaborations in enhancing market linkages and financial support for organic farmers in India.

7. METHODOLOGY

This study employs a quantitative research approach to assess the adoption of ZBNF and organic farming. Data was collected from 75 farmers in Attur and Erumalvettipalayam, Ponneri Taluk, Thiruvallur District, through structured questionnaires. A snowball sampling technique was employed to identify farmers practicing these sustainable agricultural methods. Initially, a few farmers engaged in ZBNF and organic farming were approached directly, and they then referred other farmers involved in similar practices. Additionally, secondary data from government reports, academic studies, and policy documents were reviewed to provide a broader context. The study utilized descriptive statistics to examine demographic characteristics and the statistical test (Chi- Square) examined educational background and awareness of sustainable farming, as well as between marketing challenges and perceived demand for organic produce. Its goal is to offer empirical insights into the essential institutional and policy measures required to promote the adoption and long-term viability of natural and chemical-free farming in India.

8. Test of Hypothesis

8.1 Null Hypothesis (H_0): There is no significant association between educational qualifications and awareness of Zero Budget Natural Farming (ZBNF) and organic farming.

8.2 Alternative Hypothesis (H_1): A significant association exists between educational qualifications and awareness of Zero Budget Natural Farming (ZBNF) and organic farming.

8.3 Null Hypothesis (H_0): There is no substantial link between challenges in marketing organic produce and the perceived demand for it in the region.

8.4 Alternative Hypothesis (H_1): A substantial link exists between challenges in marketing organic produce and the perceived demand for it in the region.

9. Limitations of the Study

9.1 Dependence on Self-Reported Data: This study relies on self-reported information from farmers, which may not always reflect actual farming conditions. Factors such as recall bias and social desirability bias can influence responses, potentially affecting the accuracy of the findings.

9.2 Limited Generalizability: Since the research is conducted in specific villages of Ponneri Taluk, the results may not apply to other regions with different environmental conditions, farming practices, and policy support. Regional differences in climate, soil fertility, and government initiatives can impact the adoption of organic farming and ZBNF.

9.3 Variability in Government Data and Policies: The study incorporates secondary data from government reports and policy documents, which may not always align with realworld farming experiences. Inconsistencies in policy implementation, delays in financial support, and changing market conditions can influence the long-term relevance of the study's recommendations

Interpretation

Table 1: Testing the association between Farmers' Educational Qualification and their Awareness of ZBNF and Organic Farming

Frequency Table (Educational Qualification and Awareness)				
	Frequency	**Yes (Aware)**	**No (Not Aware)**	**% Within Qualification**
No Formal Education	27	20	7	74.1
Primary Education	14	14	0	100.0
Secondary Education	18	18	0	100.0
Graduate	13	13	0	100.0
Post Graduate	3	3	0	100.0
Total	75	68	7	-

Source: Primary Data, Computed by the researcher

Chi-Square Test Results

Test Statistics	**Value**
Chi-Square (χ^2)	13.725
Degree of Freedom (df)	4
p-value	.008

Source: Primary Data, Computed by the researcher

The null hypothesis is rejected, since $p < 0.05$, indicating a statistically significant association between educational background and awareness of sustainable farming practices. The results suggest that individuals with higher education levels are more likely to be aware of ZBNF and Organic Farming. Notably, 25.9% of respondents with no formal education were unaware of these practices, whereas awareness was higher among those with formal education. However, due to some expected cell counts being below 5, caution is needed in interpreting the results, as this may affect the reliability of the chi-square test.

Table 2: Testing the association between the challenges faced in selling organic produce and the perception of strong demand for organic products in the region

Frequency Table (Challenges in Selling Organic Produce and Perception of Market Demand)				
	Yes	**No**	**Not Sure**	**Total**
Yes	18 (24.0%)	19 (25.33%)	29 (38.67%)	66 (88.0%)
No	7 (9.33%)	0 (0.0%)	2 (2.67%)	9 (12.0%)
Total	25 (33.33%)	19 (25.33%)	31 (41.33%)	75 (100.0%)

***Source*:** Primary Data, Computed by the researcher

Chi-Square Test Results

Test Statistics	Value
Chi-Square (χ^2)	9.555
Degree of Freedom (df)	2
p-value	.008

Source: Primary Data, Computed by the researcher

The null hypothesis is rejected, since $p < 0.05$, indicating a statistically significant association between the challenges of selling organic produce and the perception of strong demand for organic products. The findings suggest that farmers facing difficulties in selling organic produce have varying perceptions of market demand. Specifically, 88% of respondents reported challenges in selling organic products, yet their views on demand differed 24% believed demand was strong, 25.33% disagreed, and 38.67% were uncertain. Conversely, among those who did not experience such challenges, only 9.33% perceived strong demand, while none believed demand was lacking, and 2.67% were unsure. These results indicate that challenges in marketing organic produce may influence farmers' perception of demand. However, since some expected cell counts are below 5, caution is required in interpreting the results, as this may affect the reliability of the chi-square test.

10. Challenges

While Zero Budget Natural Farming (ZBNF) and organic agriculture have potential advantages, their implementation in India faces numerous challenges. A significant obstacle is the lack of a well-defined national policy that ensures uniform implementation across different states. This results in fragmented efforts, and poor coordination among government bodies, research institutions, and farmers, leading to inefficiencies. Additionally, inconsistencies in organic certification standards and regulatory frameworks make it difficult for farmers to access high-value markets. Economic constraints pose another major challenge, as transitioning from conventional to organic farming requires initial investments that small-scale farmers struggle to afford. The absence of adequate subsidies, financial assistance, and credit options further discourages farmers from making the shift. Market-related barriers also hinder adoption, as organic farmers often lack proper supply chains and struggle with weak market linkages, leading to lower price realization for their produce. Limited consumer awareness and skepticism regarding organic certification authenticity further reduce demand. Moreover, farmers face knowledge gaps due to inadequate extension services, lack of research on the long-term profitability of ZBNF, and restricted access to digital learning tools. Regional and climatic limitations also play a role, as not all areas are equally suitable for organic farming due to variations in soil health and weather conditions. Fluctuating yields during the initial transition phase discourage many farmers from adopting sustainable practices due to concerns about financial risks.

11. Opportunities

Despite these challenges, ZBNF and organic farming present significant opportunities for Indian agriculture. Strengthening institutional support through enhanced government policies and targeted programs can accelerate the transition toward sustainable farming. Initiatives like the PKVY and the NMSA support organic farming, and successful state programs such as the APCNF initiative offer examples for other areas to follow. Financial and market incentives, including low- interest loans, subsidies, and better access to organic certification, can help farmers transition without economic distress. Establishing farmer cooperatives and self-help groups can further enhance market access and ensure fair pricing. Technological advancements also provide an opportunity for improving organic farming practices. The combination of blockchain, artificial intelligence, and precision agriculture can improve transparency in certification, optimize farm management, and boost productivity. Additionally, the increasing demand for organic produce offers significant opportunities as consumers prioritize health and environmental sustainability. Expanding e-commerce platforms can facilitate direct farmer-to-consumer sales, reducing dependence on intermediaries and increasing farmer profitability. The environmental and climate advantages of Zero

Budget Natural Farming (ZBNF) and organic agriculture, including better soil health, water conservation, and biodiversity preservation, support India's efforts toward global sustainability goals, highlighting the importance of these practices for long-term agricultural resilience.

12. Policy Initiatives and Institutional Support in India

In India, policy initiatives and institutional support play an important role in advancing natural and organic farming. Various government bodies, research organizations, NGOs, and private stakeholders actively contribute to promoting sustainable agricultural practices. The country's leading agricultural research institutions and state-level universities focus on research and development in organic farming, offering scientific validation and training programs for farmers. The National Centre of Organic Farming (NCOF) supports organic input production, certification processes, and farmer training, while NGOs and international organizations work towards policy advocacy, awareness campaigns, and skill-building initiatives. Public-private partnerships also contribute to market development by linking organic farmers directly with consumers and ensuring better price realization. The government has introduced various policy initiatives such as PKVY which operates under the broader framework of the NMSA. This program encourages organic farming using a cluster-based approach and offers financial support for organic certification, farmer training, and market connections to improve sustainable agricultural practices. Under this scheme, farmers receive ₹50,000 per hectare over three years, covering organic inputs and certification costs, helping them transition to chemicalfree farming. The Rashtriya Krishi Vikas Yojana (RKVY) provides funding for state-led initiatives aimed at capacity building, organic input procurement, and infrastructure development. The National Programme for Organic Production sets standards for organic farming. Additionally, state-led initiatives, such as the APCNF program have supported farmers in transitioning to chemical-free agriculture through financial aid, training, and peer learning. Despite these efforts, the effectiveness of these policies is often limited by inadequate funding, fragmented implementation, and a lack of awareness among farmers. Strengthening institutional frameworks, ensuring better coordination among stakeholders, expanding financial support, and integrating ZBNF into mainstream agricultural policies are essential to accelerating the transition towards sustainable agriculture in India.

13. Findings

The study highlights significant differences in how farmers in Ponneri Taluk, Thiruvallur District, adopt Zero Budget Natural Farming and organic farming. The applied statistical test gives results show educational qualifications have a significant effect on farmers' awareness of ZBNF and organic farming ($p=0.008$), resulting in the null hypothesis being rejected. Farmers with higher education levels exhibit greater awareness and a stronger tendency to adopt sustainable agricultural practices, highlighting the need for specialized educational programs and training efforts. Furthermore, the study identifies a strong correlation between challenges in selling organic produce and farmers' perceptions of market demand ($p=0.008$). Farmers who encounter difficulties in marketing their products tend to perceive lower demand, emphasizing the need for better market linkages, streamlined certification processes, and consumer awareness campaigns. Economic constraints, including high transition costs, limited financial assistance, and inadequate government subsidies, emerge as key obstacles to adoption. Despite the availability of programs like PKVY and the NMSA, their fragmented execution limits their overall effectiveness. To address these challenges, the study recommends strengthening institutional support, utilizing digital platforms, and fostering collaborations with the private sector to promote the widespread integration of ZBNF and organic farming.

14. CONCLUSION

The study highlights ZBNF and organic farming for achieving long-term agricultural sustainability, protecting the environment, and ensuring economic stability. Despite the promising benefits of these farming practices, large-scale adoption is hindered by policy gaps, financial challenges, market limitations, and low farmer awareness. Strengthening institutional frameworks, enhancing financial incentives, and leveraging technology-driven solutions can bridge these gaps. Expanding government schemes, enhancing certification processes, and promoting digital market linkages can support a sustainable and profitable ecosystem for organic farmers. A holistic approach involving policymakers, research institutions, private stakeholders, and farmer cooperatives is essential for establishing India as a global leader in sustainable agriculture.

15. Suggestions and Recommendations

Based on their practical experiences, farmers have suggested valuable measures to improve natural and chemical-free farming methods. Ensuring fair prices for organic produce is crucial, as it helps sustain farming practices and encourages more farmers to transition to organic methods. Financial support, particularly subsidies for organic fertilizers and farming equipment, should be increased, with at least 75 percent subsidy on organic fertilizers to make them more affordable. Training programs must be widely available, and an organic farming trainer should be appointed at every agricultural extension center to provide continuous guidance. Additionally, free distribution of vermicompost from sugarcane mills can further support organic farmers. Establishing infrastructure for value-added organic products at low rental costs in Krishi Vigyan Kendras (KVKs) will facilitate better processing and marketing opportunities. To create a stable market, government schools should prioritize sourcing organic produce for student meals, while cooperative stores should actively purchase and sell organic products, directly linking farmers with consumers. Recognizing organic farmers in districtlevel meetings and providing incentives can encourage wider adoption of organic farming practices. Furthermore, the formation of a dedicated Natural Farming Department at the state level, similar to Agriculture and Horticulture Departments, will ensure better policy coordination

and support. Strengthening the institutional framework is essential to addressing the challenges faced by organic farmers. A well-structured policy framework should guarantee fair pricing mechanisms through minimum support prices, direct procurement channels, and financial incentives to reduce dependence on conventional markets. Increased research funding for organic farming techniques and cost-effective organic inputs is necessary to enhance productivity and sustainability. Training programs should be established within agricultural universities, KVKs, and farmer-producer organizations to provide farmers with essential knowledge and skills. Policymakers must facilitate the establishment of organic marketplaces, direct-to-consumer platforms, and collaborations with private retailers to improve supply chains. Additionally, government institutions, including schools and public sector canteens, should integrate organic produce into their procurement policies, ensuring a stable demand. Strengthening cooperative networks will further promote organic agricultural products and create a sustainable market. At the administrative level, a dedicated Natural Farming Department will streamline policies and ensure effective coordination between stakeholders. Regular engagement with organic farmers through monthly district-level meetings will help policymakers stay informed about challenges and refine strategies accordingly. By implementing these measures, organic farming can be strengthened, leading to long-term benefits for farmers, consumers, and the environment.

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