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Opportunities and Challenges on Natural Farming

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Natural Farming, an ecological and sustainable agricultural practice, emphasizes minimal human intervention and the use of natural resources for crop cultivation. Unlike conventional farming, which relies heavily on chemical inputs, Natural Farming integrates practices such as minimal tillage and organic inputs like cow dung and plant-based preparations. This case study explores Natural Farming practices among farmers in Tamil Nadu, focusing on their experiences, opportunities, and challenges. The study includes detailed case studies of three farmers in Coimbatore District and each farmer employing different natural farming techniques and facing

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unique obstacles. The findings reveal that Natural Farming offers significant benefits, including reduced farming costs, improved soil health, and enhanced market opportunities for organic produce. Farmers reported that these practices lead to better crop resilience and higher-quality produce, often fetching premium prices. However, challenges persist, including difficulties in weed control, pest and disease management, labor shortages, and delay in certification, which can affect market access and profitability. The study underscores the potential of Natural Farming to transform agricultural practices by promoting sustainability and reducing dependence on chemical inputs. It also highlights the need for supportive interventions, such as enhanced market access, comprehensive farmer training, and government support to address the identified challenges and maximize the benefits of Natural Farming. This study contributes to a deeper understanding of Natural Farming's role in sustainable agriculture and its implications for farmers in Tamil Nadu.

Keywords: Natural farming; opportunities; challenges; case studies.

1. INTRODUCTION

Natural Farming is an ecological and sustainable agricultural practice that emphasizes minimal human intervention and the use of natural resources to cultivate crops [1]. Unlike conventional farming, which relies heavily on chemical fertilizers, pesticides, and intensive tillage, Natural Farming seeks to work harmoniously with nature [2,3]. It focuses on building soil health, enhancing biodiversity, and promoting organic growth through the use of natural inputs like cow dung, urine, and plant-based preparations.

The concept of Natural Farming was first introduced by Japanese farmer and philosopher Masanobu Fukuoka in the mid-20th century. Fukuoka's principles, often referred to as the "do-nothing" approach, advocate for minimal human interference in the natural growth processes of plants. He emphasized the importance of allowing nature to take its course, with practices such as no-tillage, no chemical fertilizers or pesticides, no weeding by tillage or herbicides, and no dependency on prepared compost [4]. In India, Natural Farming gained prominence through the work of Subhash Palekar, who developed the Zero Budget Natural Farming (ZBNF) model. Palekar's approach promotes the use of locally available resources, such as cow dung, cow urine, and green manure, to rejuvenate soil health and improve crop yield without the need for costly external inputs [5]. The Natural Farming has been widely adopted in several Indian states, driven by its potential to reduce the financial burden on farmers and increase their income through sustainable practices [6].

The adoption of Natural Farming is gaining momentum across various states in India. Seventeen states across India are actively practicing eco-friendly agricultural techniques, reflecting a growing commitment to sustainable agricultural practices nationwide. The practice covers a significant area of approximately 952,313 hectares across the country, with nearly 2,008,710 farmers actively engaged in it (https://naturalfarming.dac.gov.in/). Andhra Pradesh leads the way with 290,000 hectares under Natural Farming, involving 630,000 farmers. States like Gujarat and Himachal Pradesh also have substantial participation, with 186,000 hectares and 50,000 hectares respectively, benefiting a large number of farmers (NITI Aayog,2022). States like Gujarat and Himachal Pradesh also have substantial participation, with 186,000 hectares and 50,000 hectares respectively, benefiting a large number of farmers. In Southern India, Kerala and Tamil Nadu are notable for their involvement in Natural Farming. Tamil Nadu, although covering an area of 2,000 hectares and has 2,360 farmers dedicated to the practice which is shown in the Fig. 1 and Fig. 2 (https://naturalfarming.dac.gov.in/). This trend reflects a growing awareness and shift towards more sustainable and less resource-intensive farming practices across diverse agricultural landscapes. As more farmers transition to Natural Farming, the cumulative benefits for the environment, human health, and rural economies become increasingly evident. This shift is not just a movement towards sustainable agriculture but also a step towards building resilient farming communities capable of facing the challenges of climate change and resource scarcity.

Natural Farming presents a transformative approach to agriculture, offering both significant opportunities and notable challenges [7,8]. The method's focus on soil health, organic matter, and biodiversity can lead to improved crop

resilience, higher nutritional quality, and better long-term yields. Additionally, Natural Farming aligns with global efforts to combat climate change by enhancing carbon sequestration in soils and reducing greenhouse gas emissions. Its adoption can also open up new market opportunities for organic and sustainably produced foods, catering to the growing demand for environmentally friendly and health-conscious products [7]. Despite its promise, the widespread adoption of Natural Farming faces several challenges. One of the primary hurdles is the initial transition period, during which farmers may experience a temporary decline in yields as the soil adjusts to the new practices. The lack of standardized certification processes and market infrastructure for natural farm produce also limits its commercial viability. Additionally, the success of Natural Farming relies heavily on the knowledge and skills of farmers, requiring extensive training and support to ensure proper implementation. In regions with deeply entrenched conventional farming practices, convincing farmers to adopt this new approach can be difficult.

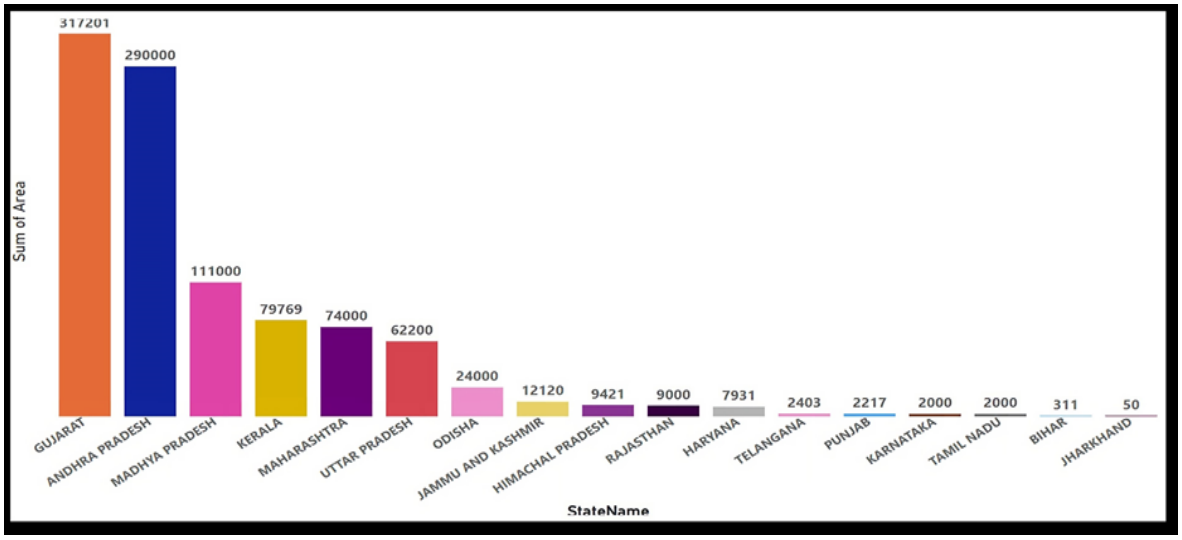

Fig. 1. Total area under natural farming in India
(Source: National Mission on Natural Farming Management and Knowledge Portal,2023)

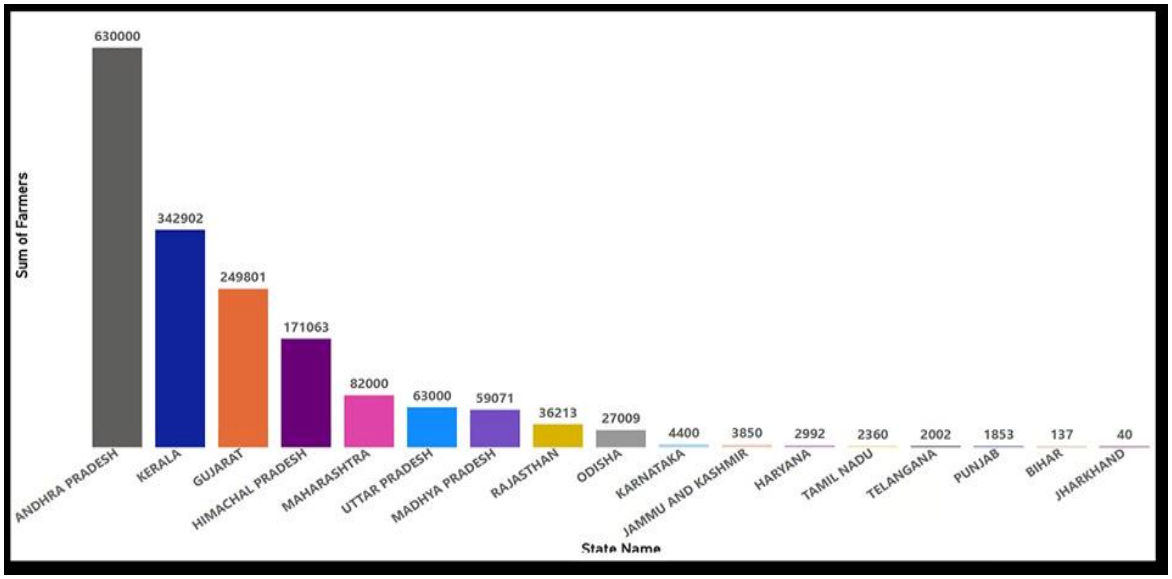

Fig. 2. Total number of farmers practicing natural farming in India
(Source: National Mission on Natural Farming Management and Knowledge Portal,2023)

Despite the growing momentum behind the adoption of natural farming practices across India, there remains a significant gap in understanding the specific opportunities and challenges encountered by farmers in various regions. While natural farming is being promoted for its potential to reduce chemical inputs and improve soil health, the success and barriers to its adoption vary widely depending on local conditions. Thus the research topic has been selected, as it addresses the pressing need to explore both the opportunities and challenges of natural farming at a deeper, region-specific level. The research question for this study is as “What are the key opportunities and challenges faced by farmers practicing natural farming?”. The specific objectives of this study is to identify the key opportunities associated with natural farming and to analyze the challenges farmers encounter in adopting and maintaining natural farming practices.

2. RESEARCH METHODOLOGY

This study adopts a case study approach to explore the practices, opportunities and challenges of natural farming among farmers in Tamil Nadu. In order to fully comprehend a particular phenomenon, case study research entails a careful evaluation of a single individual or small group in a real-world setting [9]. The case study method allows for an in-depth understanding of the farmers' experiences, reasons for adopting natural farming, their opportunities and challenges. The research is conducted in Coimbatore District of Tamil Nadu, where natural farming has gained momentum. A purposive sampling method was used to select the farmers practicing natural farming. The farmers were selected for detailed case studies which was collected during the month of August,2024 ensuring a diverse range of socio-economic backgrounds, land sizes, and crop types. These farmers were identified through agricultural extension offices, local farmer cooperatives, and natural farming advocacy groups. In-depth interviews were conducted with the selected farmers to gain insights into their motivations for adopting natural farming, the techniques they use, and the challenges they face. Direct observations of farming practices were conducted to document the techniques used in natural farming [10]. Document Analysis was made by reviewing of relevant government policies, local farming manuals, and reports from agricultural departments was conducted to understand the broader context of natural farming adoption [11].

3. RESULTS AND DISCUSSION

3.1 Case Study 1

3.1.1 Key roles of the farmer

The farmer was an Automobile Engineer by profession and spent several years working in the field of fabrication in the northern region. His passion for farming, combined with his engineering background, led him to achieve superior quality in his agricultural produce. His unwavering dedication and hard work became key factors in his success. Alongside managing his farm, he took the initiative to train students and fellow farmers in Natural Farming techniques, sharing his knowledge and experience. In addition to this, he also prepared and sold natural farming products such as *Amirthakaraisal*, Fish Amino Acid, *Jeevamirtham*, and *Karpurakaraisal* to local farming communities, contributing significantly to the spread of sustainable agricultural practices in the area.

3.1.2 Opportunities in natural farming

The farmer identified several opportunities that have emerged from practicing natural farming. One of the most significant benefits is the reduction in farming costs, as natural farming techniques minimize the reliance on expensive chemical inputs, fertilizers, and pesticides [12]. This cost-saving approach is complemented by the rising demand for natural and organic products, which has opened up new markets and provided farmers with a competitive edge [13]. Additionally, natural farming fosters stronger community networks, where collaboration among farmers becomes easier. These networks support the exchange of knowledge, resources, and assistance, further enhancing farming practices.

Another opportunity lies in the enhancement of soil fertility through the use of natural inputs such as compost, bio-fertilizers, and traditional methods like *Jeevamirtham* and *Amirthakaraisal* [14]. These practices not only improve the health of the soil but also increase crop yields in the long run. The high-quality produce resulting from these methods attracts premium prices in the market, with the farmer earning a net return of Rs. 75,000 per month from vegetable crops alone. This premium pricing, driven by consumer preference for organic and chemical-free products, underscores the economic potential of natural farming for both small and large-scale farmers.

Case Study 1:

Farmer 1		
Name of the Farm	**:**	Manasrovar, Thondamuthur
Block and District	**:**	Thondamuthur, Coimbatore District
Farming Experience	**:**	7 years
Land (in acres)	**:**	8 acres
Package of Practices	**:**	Preparation and Selling of *Amirthakaraisal*[1], *Jeevamirtham*[2], Fish Amino Acid, Vermicompost, 10 Leaf Extract, Effective Microorganisms (EM), Friuts Extract, *Karupura Karaisal*[3], Cyanobacteria Mixture, Aloevera Extract.
Crops Cultivated	**:**	Tomato, Cabbage, Cauliflower, Beans, Banana, All Guards Varieties, Papaya, Moringa, Brinjal, Lady's Finger, Onion. Potato, Big Onion, Spices are the crops which are not tried yet.

[1] *A fermented liquid made from cow dung, cow urine, jaggery, and water, used as a bio-fertilizer to enhance soil fertility and plant growth.*
[2] *A microbial culture made from cow dung, cow urine, pulse flour, and jaggery, applied to soil to enrich it with beneficial microorganisms and improve crop yields.*
[3] *A natural pest repellent made from camphor and other herbal ingredients, used to deter pests in crops without chemicals.*

Case Study: 2

Farmer 2		
Name of the Farm	:	KPS Farms, Kuppanur, Madhampatti
Block and District	:	Thondamuthur, Coimbatore District
Age	:	45
Farming Experience	:	6 years
Package of Practices	:	Preparation and Spraying of *Amirthakaraisal, Jeevamirtham*, Fish Amino Acid, Neem cake, Castor Cake
Land (in acres)	:	8 acres
Crops Cultivated	:	Coconut, Banana, Arecanut, Spinach, All Guards Varieties

3.1.3 Challenges in natural farming

One of the major challenges in natural farming is the difficulty in controlling weeds, as the practice avoids the use of chemical herbicides. Farmers must rely on labor-intensive manual weeding or natural methods, which can be time-consuming and less efficient, leading to increased labor costs and effort [15]. Additionally, pests and diseases pose significant challenges in natural farming since synthetic pesticides are not used. Farmers must adopt alternative, organic pest management techniques, which may not always be as effective or readily available, leading to potential crop losses.

Another critical challenge is the delay in receiving certification for natural farming. Certification is essential for farmers to market their produce as organic or natural and to access higher-value markets [16]. Without timely certification, farmers may face difficulties in commanding premium prices for their products, which can limit their income potential and discourage others from adopting natural farming practices.

3.2 Case Study 2

3.2.1 Reason for adopting natural farming

The farmer adopted natural farming out of his own deep-seated interest and passion for sustainable agriculture. His decision was driven not only by personal curiosity but by a strong commitment to ensuring a healthier and more sustainable future for the next generation. He recognized the long-term benefits of natural farming in preserving soil health, reducing environmental impact, and providing chemical-free produce. This sense of responsibility towards future generations played a crucial role in his choice, as he aimed to create a farming system that would sustain both the land and the community for years to come.

3.2.2 Opportunities of farmer towards natural farming

The farmer highlighted that natural farming (NF) significantly contributes to improving soil health and enhancing biodiversity. By avoiding chemical inputs and synthetic fertilizers, the natural processes of the soil are restored, allowing it to regain its fertility and structure. This leads to healthier, more nutrient-rich soil that is capable of supporting diverse plant life and sustaining long-term agricultural productivity [17].

In addition to improving soil health, natural farming also promotes biodiversity by encouraging the presence of beneficial insects. Earthworms, for example, play a crucial role in aerating the soil, allowing air and water to penetrate deeper, thus improving soil texture and fertility [18]. Similarly, ants help in breaking down organic matter, creating natural pathways for nutrients to reach plant roots. These natural allies not only support plant growth but also maintain the ecosystem balance, reducing the need for chemical pest control.

3.2.3 Challenges in natural farming

The farmer mentioned that one of the major challenges in natural farming is the difficulty in finding reliable markets for their natural or organic produce. Despite the growing demand for chemical-free products, many farmers still struggle to establish consistent market connections, leading to uncertainty in selling their produce at fair prices [19]. This challenge is compounded by the issue of controlling weeds, which remains a significant problem in natural farming due to the avoidance of chemical herbicides. Managing weeds manually requires substantial time and labor, making it more labor-intensive than conventional farming.

Case Study: 3

Farmer 3		
Name of the Farm	:	Kaapiyam Organic Farm, Madhampatti
Block and District	:	Thondamuthur , Coimbatore District
Farming Experience	:	3 years
Package of Practices	:	Preparation and Spraying of *Amirthakaraisal, Jeevamirtham*, Fish Amino Acid, Vermicompost, 10 Leaf Extract,EM
Land (in acres)	:	15 acres
Crops Cultivated	:	Tomato, Cabbage, Cauliflower, Beans, Banana, All Guards Varieties, Papaya, Moringa, Brinjal, Lady's Finger

Additionally, the farmer highlighted the shortage of skilled labor as another major obstacle. Natural farming techniques often require specific knowledge and skills, and finding trained laborers who are proficient in these practices is difficult. This lack of skilled labor can impact productivity and the successful implementation of natural farming methods.

The farmer also pointed out the challenges in controlling pests and diseases. In natural farming, chemical pesticides are avoided, so farmers must rely on alternative, often labor-intensive, pest control methods, which may not always be as effective.

3.3 Case Study 3

3.3.1 Reasons for adopting natural farming

The farmer told that Kappiyam Organic Farm was established with a vision to create a farming model that honors the principles of sustainable and holistic agriculture inspired by great thinkers such as Nammazhvar and Masanobu Fukuoka (Father of Natural Farming). The farm was born out of a desire to provide a healthier, more environmentally conscious alternative to conventional farming practices. "Know your farmer, know your food" is the motto of the Kappiyam Organic Farm. Recognizing the impact that modern agricultural methods have on both the land and our food, Kappiyam was founded to bridge the gap between responsible farming and nutritious, fresh produce. Our mission is to cultivate vegetables in harmony with nature, ensuring that our farming practices not only support the well-being of our crops but also contribute positively to the planet. By opening Kappiyam Organic Farm, we aim to offer a transparent, eco-friendly approach to agriculture, where consumers can enjoy high-quality, organic produce while also supporting sustainable farming practices**.**

3.3.2 Opportunities in natural farming

At Kappiyam Organic Farm, we prioritize reducing chemical use as a core aspect of our farming philosophy, embracing natural methods that foster a healthier environment and better-quality produce. This commitment not only aligns with sustainable practices but also enhances the integrity of our products. Achieving certification for our natural farming practices is a significant milestone, as it opens doors to international markets, allowing us to reach a broader audience and share our high-quality produce with the world. Additionally, our focus on natural farming techniques leads to reduced farming costs, further benefiting our operations and allowing us to offer competitive prices [20]. Our produce is sold through esteemed outlets such as Isha Kitchen and Uyir Organic Store, as well as various local markets, ensuring that our organic vegetables are accessible to a diverse range of consumers who value quality and sustainability. By maintaining these standards, we strive to contribute positively to the agricultural community and the global market while upholding our commitment to environmental stewardship.

3.3.3 Challenges in natural farming

Natural farming at Kappiyam Organic Farm comes with its set of challenges, which we address with dedication and resilience. Controlling weeds is a major issue, as traditional methods are often less effective in natural farming, necessitating constant vigilance and innovative approaches. Additionally, pests and diseases present significant hurdles, requiring careful management and ongoing adaptation to ensure that our produce remains healthy and free from harm. Natural farming can be more vulnerable to erratic weather patterns, such as drought or unseasonal rains, as it depends on biodiversity and soil health to sustain crops, rather than external inputs like chemical fertilizers and pesticides.

4. CONCLUSION

The case study highlights the growing interest among farmers in adopting sustainable agricultural practices that improve soil health, promote biodiversity, and reduce dependence on chemical inputs. Natural farming offers numerous benefits, including lower farming costs, enhanced ecosystem resilience, and the potential for higher market value due to increasing consumer demand for organic and chemical-free products.

The case studies of these three farmers demonstrate the potential and challenges of adopting natural farming practices. Each farmer has leveraged the opportunities presented by natural farming, such as reduced input costs, improved soil health, and access to premium markets, to enhance the sustainability and profitability of their operations. The commitment to sustainable agricultural practices such as the preparation and use of natural inputs like *Jeevamirtham, Amirthakaraisal* and organic extracts reflects a growing awareness of the benefits of eco-friendly farming. Furthermore, the passion for sharing knowledge and training others shows the pivotal role these farmers play in expanding the adoption of natural methods in their communities.

However, despite the benefits, these farmers face significant challenges, particularly in areas such as weed control, pest and disease management, certification delays, and market access. The reliance on labor-intensive methods and the absence of chemical herbicides or pesticides make farming more demanding, both physically and financially. Additionally, the lack of skilled labor and awareness about organic farming methods further complicates the process, highlighting the need for better training and support systems.

The insights gathered from these case studies underscore the importance of government support, certification systems, and market infrastructure in facilitating the wider adoption of natural farming. While the environmental and health benefits of natural farming are clear, addressing the challenges of weed management, pest control, and reliable market access is crucial to ensuring its long-term viability. By overcoming these obstacles, natural farming has the potential to revolutionize sustainable agriculture, benefiting both farmers and consumers alike.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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