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CULTIVATING RESILIENCE: A PARTICIPATORY APPROACH TO PERMACULTURE FOR MARGINAL FARMERS IN INDIA.

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ABSTRACT | Permaculture farming is a pivotal solution to the pressing global challenges of climate change, resource depletion, and food security. In India, where over 80% of the farming community comprises marginal farmers, transitioning to sustainable practices is crucial yet challenging. The primary barrier to this transformation is the significant knowledge gap these farmers face in integrating permaculture principles into their agricultural practices. A year-long study engaging directly with farming families, explores the intricacies and obstacles encountered by marginal Indian farmers transitioning to sustainable permaculture farming. The research identifies a critical knowledge gap as a major impediment to adopting permaculture, leading to the development of a participatory-based permaculture toolkit. This toolkit aims to revolutionize sustainable agricultural practices among marginal Indian farmers who confront the dual challenges of ecological degradation and economic vulnerability. Employing a participatory design methodology (Sanders, 2012), the study involved farmers co-creating a toolkit that amalgamates permaculture principles with localized agricultural practices. The research provided deep insights into the farmers' needs, preferences, and specific challenges through workshops, interviews, and hands-on sessions. The findings highlight the toolkit's success in enhancing the farmers' understanding and implementation of sustainable practices, evidenced by their understanding of permaculture farm design collaboratively. Also, the initiative fostered stronger community ties, promoting knowledge exchange and mutual support among participants. This research not only underscores the tangible benefits of a participatory approach to permaculture in enhancing the livelihoods of marginal farmers but also contributes to the discourse on sustainable agriculture globally by offering a model that is both scalable and adaptable. The successful field study underlines the potential of participatory-based tools in empowering farmers towards ecological resilience and a sustainable agricultural future, facilitating sustainable farm designs, community building, and localizing food and resources. This initiative represents a significant step towards addressing current challenges and encouraging the widespread adoption of sustainable agriculture practices.

1. Introduction

The primary aim of this research was to comprehensively investigate the challenges and opportunities associated with the adoption of sustainable permaculture farming practices among marginal Indian farmers. This research delves into the complexities and hurdles faced by marginal Indian farmers during their journey towards sustainable permaculture farming. Through a year-long research conducted in collaboration with farming families, we aim to identify the major challenges faced by these farmers during the transition period. Our primary focus is on the knowledge gap and its impact on permaculture adoption. In response, this research has led to the development of participatory-based research. This innovative initiative empowers marginal Indian farmers to design sustainable farms, build resilient communities, and support the localization of food and resources, which is essential for long-term sustainability. By addressing the knowledge gap, this approach not only offers hope for overcoming immediate challenges but also contributes to the broader adoption of sustainable agriculture, strengthening the path towards global sustainability.

Sustainable agriculture has emerged as a critical solution to some of the most pressing global challenges of the 21st century (CEEW 2021). These challenges include climate change, resource depletion, and ensuring food security for a growing global population (Rockström et al., 2017). At the core of this transition lie the fundamental principles of sustainable farming, focusing on optimising land utilisation, reducing environmental harm, and ensuring a consistent food source. Sustainable agriculture is not merely a goal. It is imperative for the welfare of our planet and the well-being of generations to come. A significant and integral part of the global agricultural community, particularly in the Indian subcontinent, comprises marginal farmers. India has over 90 million farmers, and 80% are small and marginal and have less than 2 hectares of farmland (Ministry of Agriculture & Farmers Welfare, 2020). These farmers, who own or cultivate small parcels of land, often struggle to make ends meet, facing many challenges, including limited access to resources, uncertain weather patterns, and economic constraints (Shiva, 1991). In sustainable agriculture, the role of Indian marginal farmers is important. They contribute significantly to the nation's food production and hold the key to addressing broader sustainability concerns.

The challenges faced by these marginal farmers are multifaceted. Their small landholdings often result in lower economies of scale, making technological investments less feasible (World Bank, 2019). Lack of access to credit and modern farming techniques, coupled with dependency on erratic monsoons due to inadequate irrigation facilities, further exacerbates their vulnerabilities (Ranganathan, 2011). Price volatility in agricultural produce and a lack of bargaining power in the market further diminish their earning potential (Chand, R., & Srivastava, S. K., 2014). Additionally, they often grapple with land degradation due to continuous farming with chemicals, fertilizers and pesticides without adequate knowledge or resources for soil health replenishment (FAO, 2018). However, adopting sustainable permaculture farming practices among marginal Indian farmers is far from straightforward. Transitioning from conventional farming to permaculture is complex and challenging (Sharma, 2023). One of the primary impediments to this transition is a substantial knowledge gap. The knowledge gap arises from a lack of awareness and understanding of permaculture principles and sustainable farming techniques (Altieri, 2002). Although rooted in historical and regional contexts, traditional farming methods often fail to address modern environmental and economic challenges (CEEW 2021). The transition to sustainable agriculture, specifically permaculture (Mollison, 1988), offers a promising solution. The inherent complexity of permaculture and its scientific underpinnings present a formidable learning curve for these farmers. Bridging this gap is difficult for marginal farmers, who often rely on conventional practices and chemical-based farming. As a result, the adoption of permaculture principles, which promise more resilient and sustainable farming systems, is hampered. To effectively promote sustainable agriculture among marginal Indian farmers, addressing this knowledge gap and providing them with the tools and resources needed for a successful transition is imperative. To achieve this overarching goal, the research has been structured around the following specific objectives. Firstly, a comprehensive examination of their current knowledge levels, awareness, and perceptions regarding permaculture principles and sustainable farming techniques. Secondly, the research seeks to investigate the multifaceted challenges these farmers face during their transition to sustainable

permaculture farming. This involves conducting detailed interviews, surveys, and on-site observations, as well as participatory workshops to pinpoint the specific barriers, including limited access to resources, economic constraints, and social factors, that hinder the adoption of sustainable practices. Building on these insights, the third objective involves the development of a participatory toolkit to bridge the identified knowledge gap and address the challenges faced by marginal Indian farmers.

2. Literature Review

2.1 Sustainable Agriculture and Permaculture

Sustainable agriculture, as defined by (Pretty, 2008), is a holistic approach prioritizing environmentally sound, economically viable, and socially responsible farming practices to ensure current and future generations can meet their food needs, highlighting the significance of soil health, water conservation, pollution reduction, and biodiversity enhancement. The Food and Agriculture Organization (FAO, 2018) underscores the global imperative for sustainable agriculture, emphasising its role in achieving the Sustainable Development Goals (SDGs) related to hunger, food security, nutrition, and sustainable agricultural practices. Permaculture, introduced by (Mollison and Holmgren, 1978), embodies a design philosophy for sustainable habitats, emphasising care for the earth and people and the redistribution of surplus through the development of agriculturally productive ecosystems mimicking natural systems' diversity and resilience. Yet, (Altieri, 2002) and (Shiva, 1991) notes the challenges in adopting such sustainable practices in developing countries like India, where a significant knowledge gap, reliance on chemical inputs, inadequate market access, and climate change impacts pose barriers to small and marginal farmers, who form over 80% of the farming community (Sharma, 2023). This confluence of sustainable agricultural principles and the unique challenges faced in implementing permaculture in developing nations underscores the urgent need for tailored solutions that address specific local challenges to foster environmental sustainability, food security, and economic viability.

2.2 Marginal Farmers in India

Marginal farmers, who own less than one hectare of land, form an essential part of Indian agriculture, accounting for over 80% of all farmers (Ministry of Agriculture & Farmers Welfare, 2020). These farmers are pivotal in sustaining agricultural biodiversity and contributing significantly to the rural economy despite facing multifaceted challenges. Economically, they struggle with limited access to credit (Verma, 2021), market volatility, and inadequate irrigation, which enhances their vulnerability to monsoon variability (Sharma, B. R., Rao, K. V., Vittal, K. P. R., & Amarasinghe, U., 2010). Environmentally, challenges like land degradation due to the overuse of chemicals and climate-induced extreme weather events threaten their agricultural productivity and food security (Bhattacharyya et al., 2020). Socially, the scenario is compounded by limited access to education on sustainable farming and gender inequality in community building, which restricts their capacity to adopt sustainable agricultural practices (Rajbhandari, 2015). This intricate array of economic, environmental, and social challenges highlights the urgent need for comprehensive support and interventions to bolster the sustainability and resilience of marginal farmers within the Indian agricultural framework.

3. Methodology

The methodology of this study utilised a participatory design approach, chosen for its effectiveness in actively engaging stakeholders, in this case, farming families, in the research process. This approach aligns with the objectives by ensuring that the development of the permaculture toolkit is grounded in the real-world experiences and needs of the target population, thereby enhancing the relevance and applicability of the research outcomes. Sampling involved a carefully structured selection process to represent a diverse cross-section of the farming community, focusing on marginal farmers most impacted by the challenges

the study aims to address. Data collection methods were multi-faceted: Structured interviews were designed around key themes, such as current farming practices, knowledge of permaculture, and barriers to sustainable agriculture, to delve deep into the participants' experiences and perspectives. Workshops and hands-on sessions were conducted to facilitate active learning and engagement, focusing on permaculture design principles and sustainable farming techniques and creating a community of practice among participants, expecting to foster a collaborative learning environment and tangible skill development. To quantify the prevalence of certain practices and perspectives within the sample, surveys complemented these methods by covering a broad range of areas, including demographic information, farming practices, and attitudes toward sustainability. Analysis of the collected data employed qualitative techniques to interpret the rich, narrative data from interviews and workshops, alongside quantitative analysis of survey responses to identify patterns and trends that could inform the toolkit's development and the broader research findings. We conducted several participatory workshops to co-create and test the toolkit (Sanders, 2012). This toolkit was very useful for the farmers to design and plan their permaculture farms collaboratively. Toolkit also helped farmers to articulate their tacit needs and translate them into design decisions. This comprehensive methodological framework was designed to provide a holistic understanding of the challenges and opportunities associated with adopting sustainable permaculture practices among marginal farmers, facilitating the creation of a targeted, effective intervention.

4. Findings

The research findings have led to the development of a transformative participatory-based permaculture toolkit aimed at enhancing sustainable agricultural practices among marginal farmers in India. Through an extensive year-long study, we meticulously mapped out the various activities involved in permaculture farming (see Figure 1), identified farmers' understanding of permaculture principles, and uncovered their tacit knowledge of sustainable farming practices. A significant revelation from the study was that while farmers may not initially be familiar with permaculture principles, they demonstrate a remarkable ability to grasp the concepts when provided with explanations and guidance. Workshops, interviews, and hands-on sessions were instrumental in deepening farmers' knowledge of sustainable farming techniques and permaculture design principles, empowering them to make well-informed decisions about farm management. We conducted several workshops to co-create the toolkit with farmers to understand its nuances. The participatory-based toolkit facilitated farmers in articulating their needs and sharing their knowledge with the community to collaboratively design the farm and devise strategic plans. Also, the critical role of the social aspect of sustainability in agriculture often overlooked. Through the toolkit, farmers not only learned to design and maintain their farms but also cultivated a sense of community, promoting the localization of the food system. Farmer's participation in workshops fostered a heightened sense of community and empowerment among farmers, facilitating knowledge exchange, mutual support, and a shared sense of purpose. This collaborative ethos not only strengthened social bonds but also bolstered the sustainability of farming practices adopted by promoting localized food system and community development. Our findings underscore the effectiveness of a participatory-based approach in addressing knowledge gaps and overcoming barriers to sustainable agriculture among marginal farmers. By equipping farmers with the necessary knowledge and tools for sustainable farming, the toolkit has the potential to catalyze broader adoption of permaculture principles and contribute to the resilience and sustainability of agricultural systems, both in India and beyond.

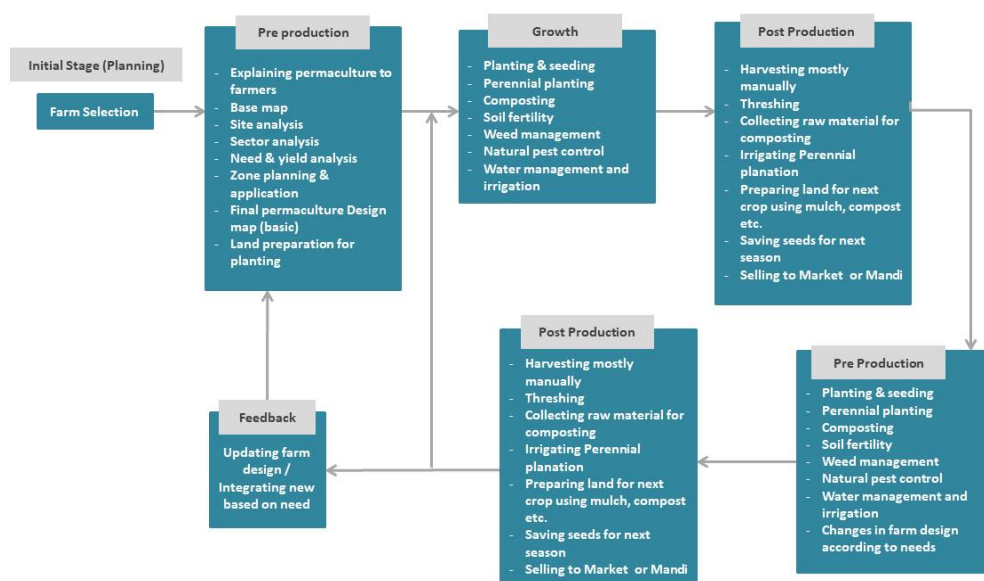


Figure 1. Map of various activities at different stages in permaculture farming. (Source: Author: Sharma, 2023).

મારા ખેતરની માહિતી/મેરે खेत की जानकारी

Farmer Details- किसान की जानकारी- ખેડૂત માહિતી:-		Farm Area- खेत क्षेत्र- ખેતર વિસ્તાર:-	No of Farmlands- કૃષિ પૃથ્વી કી સંખ્યા- ખેતીની જમીનની સંખ્યા:-
Month-મહીને- મહિનાઓ :-	માર્ચ/ચૈત્ર	અપ્રેલ/વૈશાખ	મઈ/ચૈત્ર
	જૂન/આષાઢ	જુલાઈ/શ્રાવણ	અગસ્ટ/ભાદ્ર
	સિતમ્બર/આશ્વિન	ઑક્ટોબર/કાર્તિક	નવંબર/માર્ગશીર્ષ
	ડિસંબર/પૌષ	જાનવરી/માઘ	ફેબ્રુઆરી/ફાલ્ગુન
Crops- फसलें- પાક :-	Groundnut- ગ્રાઉન્ડનટ- અખરોટી	Cotton- કોટન- કપાસ	Tobacco- ટોબેકો- તબાકુ
	Sugarcane- સુગરકેન- શેરડી	Rice- રાઇસ- ભાત	Cucumber- ક્યુકર- કાડી
	Chilli- પેપર- મરચું	Tomato- ટોમેટો- ટમેટા	Coriander- કોરિંદર- હાલદી
	Papaya- પેપૈય- પેપૈયા		
Type of Soil- मिट्टी का प्रकार- માટીનો પ્રકાર:-	Black soil- કાળી માટી	Red soil- લાલ માટી	
Water source- जल स्रोत- પાણીનો સ્ત્રોત :-	Well- કુવે	Canal- કાનાલ	River- નદી
	Tube well- ટ્યુબવેલ	Hand pump- હાન્ડપમ્પ	Tractor- ટ્રેક્ટર
Tools and techniques used - પ્રયુક્ત ઉપકરણ એવં તકનીક-વપરાયેલ સાધનો અને તકનીકો :-			
      			

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Figure 2. Sensitizing kit “Know your Farm” in the local language (Gujarati) to understand farmers’ needs and existing farms.



Figure 3. Participatory-based permaculture toolkit for farmers to design farms using permaculture principles and ethics.



Figure 4. Learning from Permaculture design course at Aranya Permaculture farm.



Figure 5. Participatory workshop with the farmers to design permaculture farm using the toolkit developed.

5. Conclusion

The study successfully bridged the significant knowledge gap among marginal farmers in India regarding permaculture and sustainable agricultural practices, underscoring the efficacy of a participatory design approach in fostering an understanding and implementation of these practices. This research not only identified the initial knowledge levels and perceptions around permaculture but also meticulously documented the multifaceted challenges faced by farmers during their transition to sustainable farming. The development and utilisation of a participatory-based toolkit, co-created with the farmers, directly addressed these challenges and knowledge gaps, demonstrating a practical application of theory to real-world circumstances. The findings from this research highlight the critical role of community engagement and participatory methodologies in enhancing the knowledge base, thereby facilitating the adoption of sustainable practices among marginal farming communities. Also, the study contributes significantly to the global discourse on sustainable agriculture by illustrating a scalable and adaptable model of community-based learning and adaptation. Recommendations for future research include exploring the long-term impacts of toolkit implementation on farming sustainability and productivity, assessing the toolkit's applicability in different agricultural contexts, and expanding the participatory approach to include a wider range of stakeholders. The potential areas for the toolkit's application are vast, encompassing diverse agricultural settings and varied socio-economic contexts, thereby offering a valuable resource for promoting sustainable agriculture practices worldwide. This study lays the groundwork for future initiatives to empower farmers with the knowledge and tools necessary for sustainable farming, paving the way for a more resilient and food-secure future.

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